

Protecting Biodiversity

A Qualitative Study of METRO and the Wholesaling Business

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Title Page

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Executive Summary

Global environmental challenges led to recent developments with regards to the protection of biodiversity. Governments, country unions, and supranational organisations started to develop new guidelines and frameworks with regards to biodiversity protection in the last years/decades. Many companies expect these guidelines to be enforced in a similar way that others were before. The United Nations' sustainable developments goals are at the forefront and have served in the past as the greatest inspiration for national laws. Thus, the research question in this bachelor thesis is "What changes can METRO implement to assist in biodiversity protection in order to comply with the 14/15th goal of the United Nations' sustainable development goals until 2030?". The aim of this bachelor thesis was the formulation of actionable recommendations that can easily be translated into METRO's strategies going forward. These recommendations assisted in the protection of biodiversity and are based on current scientific standards as well as the current situation present at METRO (and the wholesaling industry).

First, the United Nations' 14/15th sustainable development goals were used as a framework for the investigation of the topic of biodiversity. Second, Porter's Value Chain Model was utilised to streamline the research on METRO's key activities. Third, the Fishbone Diagram was used to merge the gathered information and identify root causes, for which recommendations were formulated. Fourth, the Analytic Hierarchy Process was used to judge and evaluate the formulated recommendations. ATLAS.ti was used to facilitate most the qualitative analysis within this research project. This bachelor thesis relied mostly on qualitative desk research – which was supported by two semi-structured expert interviews. The analysis methods ranked from content and thematic analyses to qualitative secondary analysis.

In order to most effectively work on the 14/15th sustainable developments goals, land-based pollutants, agriculture, climate, and land use change were identified as the topics that METRO can work on in the upcoming years. For each topic at least one recommendation was formulated. Using the criteria effectiveness, likelihood of success, and synergy with METRO's other commitments, the formulated recommendations were put in order of relevancy for METRO. The recommendations are as follows:

1. Increase the usage of electric vehicles by changing policies evolving around electric mobility and reduce CO2 emissions cause by company cars by 30% until FY2030.
2. Develop and implement an own meat procurement policy, at competitors standards, by focussing on topics such as biosecurity, health, and welfare of livestock, trained and competent staff, and minimised factory farming, to increase the proportion of sustainably procured meat to regular meat to 75% until FY2030.
3. Increase the proportion of bio-labelled products to regular products, within METRO stores, to 35% until FY2030.
4. Increase the proportion of products provided by smallholder farmers/producers to products provided by regular farmers/producers by 10% until FY2030.
5. Promote biological agriculture outside of the European Union by increasing the percentage of non-European suppliers that fit bio criteria to regular suppliers to 20% until FY2030.

Preface

In front of you lies the bachelor graduation thesis “Protecting Biodiversity: A Qualitative Study of METRO and the Wholesaling Business”. This thesis focusses on the creation of actionable recommendations for wholesalers, for the future formulation of strategies with a biodiversity focus. The research is embedded within an internship at the Research Group Business Innovation, one of the lectorates of the Fontys University of Applied Sciences. These lectorates carry out practically oriented research in business-related fields. This piece of research was realised within the framework of the International Business (B.B.A.) study programme at Fontys International Business School. I was both researching and writing this thesis from February to June 2022.

The overarching theme of this thesis was proposed by the Research Group Business Innovation, since a project about biodiversity is fitting neatly into its portfolio of sustainability-related studies. The research question was mainly designed under the supervision of my company supervisor Dr Floto-Stammen. This report entails a literature review about the causes for biodiversity loss, an assessment of METRO’s operations, and it concludes with the formulation and recommendation of solutions. These recommendations are based on current scientific standards as well as on the United Nations’ sustainable development goals. In addition to my first, second, and third assessors, this thesis is meant to be read by decision-makers within the wholesale and retail industry (specifically METRO), as well as business partners of the latter.

I would like to take this opportunity and thank all the people that were either directly or indirectly involved in my project. Thank you, Dr Sonja Floto-Stammen, for your continuous support as my company supervisor, you provided me with valuable input every single week and helped me steer my research in the right direction. Thank you, Mr Raihan and Mr Piegeler, for your invaluable support and guidance as my university supervisors. Many thanks to my other colleagues at the Research Group Business Innovation, namely Dr Natalia Naranjo Guevara, for their support and for giving me the opportunity to find a fitting project at the research group in the first place. I also wish to thank my interviewees Heidi Giesenkamp (Faculty of Agricultural Sciences and Landscape Architecture – University of Applied Sciences Osnabrück, Research & Development at Bactiva GmbH) and Marina Billinger (CEO & founder at Leroma), without your support I would not have been able to create such a detailed analysis. Lastly, I would like to thank my family and friends for their continuous support throughout the project and my studies as a whole. You kept me motivated and thanks to you I always had someone to count on.

I hope you enjoy your reading.

Venlo, The Netherlands, 07 June 2022



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Glossary

<i>Acidification</i>	The process of becoming an acid or the act of making something become an acid.
<i>Anthropogenic</i>	(Environmental pollution and pollutants) originating in human activity.
<i>Chlorophyll-a</i>	It is the pigment that makes plants and algae green.
<i>Coniferous forest</i>	A forest which's vegetation is composed primarily of cone-bearing needle-leaved or scale-leaved evergreen trees.
<i>Construct validity</i>	Construct validity is about how well a test measures the concept it was designed to evaluate.
<i>COVID-19</i>	Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus.
<i>Dead zone</i>	Dead zone is a more common term for hypoxia, which refers to a reduced level of oxygen in the water.
<i>Deciduous forest</i>	A forest which's vegetation is composed primarily of broad-leaved trees that shed all their leaves during one season.
<i>Deoxygenation</i>	The process of removing dissolved oxygen from a liquid, such as water.
<i>Eutrophication</i>	The excessive richness of nutrients in a lake or other body of water which causes a dense growth of plant life.
<i>Expanded polystyrene</i>	Expanded polystyrene (EPS) refers to a rigid, tough, and lightweight thermoplastic product.
<i>External validity</i>	External validity is the extent to which you can generalize the findings of a study to other situations.
<i>Food web</i>	A food web consists of all the food chains in a single ecosystem.
<i>Holism</i>	Holism (also called methodological or metaphysical holism) is the view that explanation of social phenomena must proceed at the macroscopic level in terms of social 'wholes'.
<i>Internal validity</i>	Internal validity is the extent to which you can be confident that a cause-and-effect relationship established in a study cannot be explained by other factors.
<i>Interpretivism</i>	Interpretivism, also known as interpretivist, involves researchers to interpret elements of the study.

<i>Key Biodiversity Area</i>	Key Biodiversity Areas are sites contributing significantly to the global persistence of biodiversity.
<i>Liquefied natural gas</i>	Liquefied natural gas (LNG) is natural gas that has been converted to a liquid form for the ease and safety of natural gas transport.
<i>Liquefied petroleum gas</i>	Liquefied petroleum gas (LPG) is a fuel gas made of petrol which contains a flammable mixture of hydrocarbon gases.
<i>Logging</i>	The activity or business of felling trees and cutting and preparing the timber.
<i>Polyvinyl chloride</i>	Polyvinyl chloride is a plastic material that is used for many purposes, for example to make clothing, shoes, or to cover chairs.
<i>Potentiometric hydrogen ion concentration</i>	The pH is the degree of concentration of hydrogen ions in a substance or solution and is represented as the log of the hydrogen ion concentration in an aqueous solution.
<i>Science Based Targets Framework</i>	The Science Based Target initiative defines and promotes best practice in science-based target setting.
<i>Temperate mixed forest</i>	Temperate broadleaf and mixed forest is a temperate climate terrestrial habitat type with broadleaf tree ecoregions, and with conifer and broadleaf tree mixed coniferous forest ecoregions.
<i>Trophic level</i>	Each of several hierarchical levels in an ecosystem, consisting of organisms sharing the same function in the food chain and the same nutritional relationship to the primary sources of energy.
<i>Zoonotic disease</i>	A disease transmitted from animals to humans.

List of Abbreviations

AG	Aktiengesellschaft (German)
CBD	Convention on Biological Diversity
EPS	Expanded polystyrene
FAO	Food and Agriculture Organization
GSSI	Global Sustainable Seafood Initiative
GTA	Global Tuna Alliance
KPIs	Key performance indicators
LBP	Land-based pollutants
METRO	METRO GmbH
POTC	Palm Oil Transparency Coalition
PVC	Polyvinyl chloride
R#	Recommendation number
RSPO	Roundtable on Sustainable Palm Oil
RTRS	Roundtable on Responsible Soy
WWF	World Wide Fund for Nature

1. Introduction

“It is that range of biodiversity that we must care for – the whole thing – rather than just one or two starts.” – David Attenborough

This bachelor thesis deals with the topic of biodiversity protection at METRO and the wholesaling industry. Global environmental challenges have been neglected for a long time. In the past years/decades, many governments, country unions, and supranational organisations started to formulate various guidelines, laws, and frameworks that deal with the topic of repairing, preserving, and protecting biodiversity. Specifically, the United Nations and its sustainable development goals are at the forefront. It is expected that the further legal enforcement of such regulations will force companies to adapt their business processes. METRO's business operations and processes are not designed to extensively protect the biodiversity all over the world and METRO's key activities require changes that allow for an alignment with the United Nations' 14/15th sustainable development goals. Thus, the main research question being dealt with in this thesis is “What changes can METRO implement to assist in biodiversity protection in order to comply with the 14/15th sustainable developments goals until 2030?”

An adaption of processes is particularly relevant, due to the expected downsides in the future. Other laws have already been formulated based on other goals of the United Nations' sustainable development goals. The German "Lieferketten/Sorgfaltspflichtgesetz" is based on the sustainable development goals and deals with the transparency of supply chains. Violations of such a law could result in fines up to 800.000,00€, underlining the relevance of the topic for businesses. The aim of this bachelor thesis is to provide METRO with five actionable recommendations that can be used for further strategy formulation. These recommendations will allow METRO to prepare effectively for upcoming regulations and stay one step ahead by already adapting crucial business processes within their value chain to fit the agenda of the United Nations sustainable development goals.

The structure of this bachelor thesis is reminiscent of a GAP analysis. At the beginning both the topic of biodiversity protection, as well as METRO's business operations will be investigated. After having clarified the current situation, the information will be merged to identify missing links and possible opportunities for METRO. Having identified these possibilities, recommendations will be formulated that bridge the gaps. Lastly, the formulated recommendations will be judged and evaluated to improve accessibility and understanding of the action steps.

2. Research Design

The following chapters will introduce the project as a whole. This includes information about the bachelor internship company as well as any research-relevant information. After that, the theoretical framework will be presented, in which the structure of the research is laid out. Finally, the research methodology will describe the research methods used in order to gather and analyse the presented data.

2.1. Project Description

2.1.1. Company Description

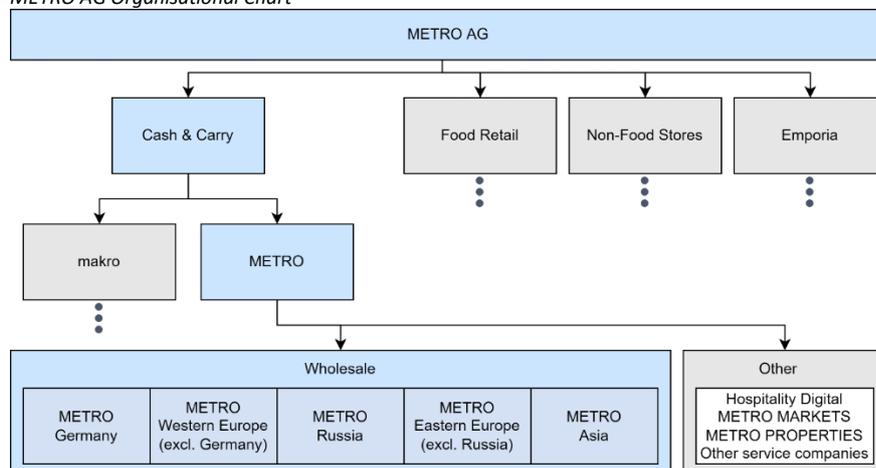
The Research Group Business Innovation supports companies in their transition process of becoming or staying competitive and resilient. The research group aims to increase the innovative performance of organisations, specifically through topics such as business modelling, servitization, and sustainability/circular economy. Through a multitude of, mostly, applied/practical research, the research group strives to be a recognized institute for applied research and education. This graduation assignment falls into the area of sustainability. The project itself cannot be assigned to any of the overarching projects within the research group since the initial idea stems from a conversation with the food wholesaler METRO GmbH (METRO).

METRO finds its origins in 1964. Together with the Schell-family, the brother Wilhelm Schmidt-Ruthenbeck and Erwin Schmidt founded the first METRO store. This date marks the creation of the first cash and carry wholesaler, a sort of self-service wholesaler (METRO Deutschland GmbH, 2021b). After experiencing great success with this concept, METRO quickly expanded throughout all of Germany, becoming very prominent in larger German cities. Through acquisitions and a growing business, METRO kept on expanding until they reached the status of a multinational corporation. The METRO AG is a public limited company (German: Aktiengesellschaft [AG]) (METRO AG, 2020d), which means it is publicly traded on the stock market. The executive board consists of: Dr. Steffen Greubel, Christian Baier, Andrea Euenheim, Rafael Gasset, and Claude Sarrailh. The chairman of the board of directors is Jürgen Steinemann (METRO AG, 2020d).

Figure 2 depicts the organisational structure of the METRO AG. In the overall structure, the METRO AG acts as the central management holding. Areas such as finance, controlling, legal, compliance, purchasing, and human resources are all centrally managed. The food wholesaler METRO is part of the cash and carry category. All the central management and administrative functions for METRO are anchored within the METRO AG.

Figure 2

METRO AG Organisational Chart



There is a clear hierarchy present within this centralised structure, with the METRO AG overseeing all the operations. The overall organisational structure can be described as a divisional structure with distinctions between business types (wholesale/retail/etc.) as well as distinctions within wholesale fields. In the case of METRO's wholesale operations, there are clear distinctions between geographical areas – hinting towards a geographic divisional structure. METRO's headquarters are situated in Düsseldorf, Germany, but METRO's operations span 30 countries worldwide. Altogether, there are 681 wholesale markets and 67 delivery depots worldwide (METRO AG, 2020c). METRO's product categories span vegan products, bio products, meat, dairy products, fish, fruit, vegetables, drinks (with and without alcohol), as well as convenience foods (METRO Deutschland GmbH, 2021c). METRO describes its ambition as: "METRO is a leader in the food wholesale and distribution sector. We intend to further build on our success alongside our professional HoReCa and Trader customers." (METRO AG, 2020e, Section 1). In the formulation of its ambition, METRO specifically mentions its customers in the fields of hotel gastronomy, restaurants, and catering. There are no clear mission or vision statements formulated, though certain aspects were always emphasized throughout its reports. An emphasis on a multichannel model is set to bring organic growth (METRO AG, 2020e) and the importance of business ethics/transparency and responsible sourcing/sustainable assortment have been brought forward as important for stakeholders (METRO AG, 2021b).

2.1.2. Research Problem

2.1.2.1. Problem Context. Due to the upcoming and already existing global challenges, international organisations, national governments, and political/economic unions started formulating and updating their own guidelines and frameworks for the repairing, preservation, and protection of the biodiversity all over the world. The enforcement of such regulations forces and will force organisations to implement their own strategies regarding the protection of biodiversity. Especially food companies (including retailers and wholesalers) will be impacted by these regulations due to multiple contact points within their business operations. The initial idea for this project stems from conversations with the METRO AG (in the following METRO), which is why the METRO will be treated as the client. Thus, this research project focusses on answering a specific business problem METRO sees itself confronted with. Facing the above-mentioned problems, METRO is particularly interested in precise and concise recommendations that allow for the flexible development of strategies in the coming years until 2030. To provide a better grasp of the problem at hand, the 5W1H framework will be applied, providing detailed information regarding the questions what, where, when why, who, and how.

What: The specific problem can be described as key activities not being adapted to upcoming regulations. These regulations are posed by both governments and supranational organisations. Actors that propose such restrictions are not only the United Nations, but also, for example, the European Union (European Commission, 2022b). The United Nations formulated so-called Sustainable Development Goals for the year 2030. The 14th and 15th goal specifically are aimed at the protection of biodiversity. The following points are emphasized: Marine biodiversity, mountain ecosystems (15.4), natural habitats/threatened species (15.5), national/local planning that integrates biodiversity values (15.9), increase financial resources (15.a) (United Nations Department of Economic and Social Affairs, 2015). National guidelines, such as Germany's (Bundesamt für Naturschutz, n.d.), France's (MINISTÈRE DE LA TRANSITION ÉCOLOGIQUE ET SOLIDAIRE, n.d.), or China's (Convention on Biological Diversity, 2011), build on these frameworks for their own regulations.

Where: The underlying process of biodiversity loss is a worldwide phenomenon. It affects a multitude of areas (such as mountain areas, marine diversity, forests, etc.) – forcing companies to adapt in a multitude of ways. Generally, it is understood that business areas with a greater impact on biodiversity should receive more attention. In order to comply with the new above-mentioned guidelines, business processes within METRO, as well as the business operations between business partners, need to be adapted to be more environmentally friendly. For this study specifically,

customer/people-centric business operations, such as marketing, service, and human resource management, will be neglected, due to minimal additions possible in the field of biodiversity protection. Generally, the most effective measures, to comply with the given national and international guidelines, without compromising business operations, need to be chosen. The only existing alternatives hold too many risks. An unfavourable alternative might be a gamble that guidelines will not be enforced to a degree that extensive changes in operations are not necessary, though this is very unlikely. Instead, wholesalers might change their locations of main operations into countries that are not likely to enforce guidelines. This is, as well, a subpar solution since it would limit the company in its operations – causing a very likely revenue loss.

Where: The issue of biodiversity loss has been measured for decades and thus plans to counteract biodiversity loss should have been enacted multiple years ago. Just now that the effects are becoming inevitable, national governments are acting upon the threat. Taking the United Nations' sustainable development goals as the guiding principle, goals should be set that fit into the time frame until 2030. Since the deadline is already determined, companies need to work around it as there are no favourable alternatives, timewise.

Why: The above-described problem commenced multiple years ago with the first measurements of biodiversity loss across the world. These measurements were followed by both neglectance from governments as well as multinational corporations. The latter is partially caused by missing self-initiative as well as a missing incentive (or missing pressure). This unfavourable behaviour across stakeholders led to the problem becoming more severe the longer time went on. The current situation asks for fast acting in the following years, which is rooted in the non-actions of the past.

Who: There is a variety of stakeholders involved that have an interest in the successful (or unsuccessful) implementation of measures. First of all, national governments as well as supranational organisation, such as the United Nations, have expressed their interest in these measures for a long time – being the initiators of the mentioned guidelines. METRO itself and all its internal stakeholders, such as shareholders, employees, board of directors, have an explicit interest in the research for biodiversity measures. Lastly, METRO's business partners, for example, supply chain partners and suppliers, will be impacted by proposed measures – given the nature of the wholesaling industry.

How: The problem will be tackled by companies taking responsibility and taking measures to protect the biodiversity all over the world. Currently, many companies designed their own plans to improve their sustainability within their own framework for corporate social responsibility ambitions. Indicators, proposed by the United Nations, exist, but are often very broad (United Nations, 2022), asking, for example for 'sustainable' solutions.

It is of major significance to realise that multiple perspectives on the topic of biodiversity are relevant for this study in order to investigate the most effective ways to tackle the mentioned challenges. It is part of this study and of major significance for the METRO to identify which parts of biodiversity a food wholesaler can significantly influence. Since there is little to no literature in this very specific field, it is seen as an essential part of this study. The business problem can be formulated as follows: *"METRO's business operations and processes are not designed to extensively protect the biodiversity all over the world and METRO's key activities require changes that allow for an alignment with the United Nations' 14/15th sustainable development goal."*

2.1.2.2. Research Relevance. The focus of this project lays on the United Nations' sustainable development goals, which are formulated until 2030. The sustainable development goals themselves are not legally binding, though it is expected of governments to translate the set goals into national law in order to achieve all 17 goals (United Nations, n.d.). The responsibility of acting upon and reviewing the process of the goals lies with the national governments. This includes quality

assessments and data collection (United Nations, n.d.). Taking Germany as an example, there are currently no draft legislations that resulted from the 14/15th sustainable development goal (which are the ones concerning biodiversity) (Global Policy Forum, 2020). This makes it even more likely that there are going to be additional laws and regulations in the coming years. An example of what such enforcement would look like can be seen in the 12th sustainable development goal. The sustainable development goal 12.6 mentions the task of governments to be to incentivise multinational corporations to follow sustainable operations and apply detailed reporting for their actions for sustainability. For example, in Germany, there has been a lack of enforcement throughout all of the sustainable development goals. But, in the case of the 12th sustainable development goal, the “Lieferketten/Sorgfaltspflichtgesetz” took strong inspiration from points mentioned by the United Nations. The draft for this law was also largely supported by civil society groups (Global Policy Forum, 2020). A similar enforcement of the 14/15th sustainable development goal would force METRO to react quickly, thus plans to adapt now act as pre-emptive measures. To put the possible damage into perspective, Prof. Dr. Rolf Bietmann explains that intentional or negligent violations of the regulations of the, above-mentioned, “Lieferkettengesetz” could result in fines of up to 800,000.00€ and exclusions from the awards of public contracts for up to 3 years (ROLAND Rechtsschutz, 2022). In an accurate and careful assessment of risk, similar consequences can be expected for other potential laws, for example in biodiversity protection. Thus, the research relevance for METRO lies in a better preparation for future developments with regards to sustainability. The Research Group Business Innovation is primarily interested in an expansion of its research portfolio, especially sustainability related research.

2.1.2.3. Cause-Problem-Symptom Analysis. Table 1 depicts the cause-problem-symptom analysis, which serves as the basis for this research project. The displayed cause must be the centre of attention when it comes to the decision for recommendations. The issue at hand can only be resolved by distinct actions that target the loss of biodiversity in the world. These actions will most likely consist of changes within METRO’s operations, strategies, and policies. Besides taking on the cause shown in the cause-problem-symptom analysis, these actions also solve the practical problem mentioned above.

Table 1.

Cause-Problem-Symptom Analysis

Cause	Problem	Symptom
Over the past decades, biodiversity loss has been monitored worldwide. The immense effects on humanity and its future lead to biodiversity loss being seen as one of the largest threats to humanity as a whole.	The current business operations and processes within METRO are not designed to extensively protect and limit biodiversity loss. Biodiversity protection as a topic was never correctly implemented into the key activities of METRO.	The missing biodiversity protection and the need for fast solutions led to national governments and supranational organisations to design and develop guidelines, frameworks, and laws for the protection and recovery of biodiversity around the world. Most of these are created with a specific deadline and goals in mind. These plans already/will be enacted in the coming years.

2.1.3. Research (Sub-)Question(s)

The main research question formulated for this thesis is: “*What changes can METRO implement to assist in biodiversity protection in order to comply with the 14/15th goal of the United Nations’ sustainable development goals until 2030?*” As a mean to answer the main research question,

the structure of a GAP Analysis will be applied (Kim & Ji, 2018). The first and second sub-question deal with the current situation surrounding the topic of biodiversity loss and METRO. The third sub-question paints a picture of the desired changes/situation. Sub-question 3.2. and sub-question four consist of the formulation of recommendation/action steps that allow METRO to reach the desired state.

The first sub-question stands in connection with the United Nations and its views on biodiversity protection. It summarises the literature and scientific perspective and concludes on the most relevant factors. This sub-question is necessary to (1) assist in the creation of a desired situation and (2) identify the different aspects of biodiversity that hold relevance for food wholesaling. The first sub-question is formulated as follows: (1) *“What are the most prominent causes of biodiversity loss?”*

The second information gap deals with the general question about METRO’s operations. This sub-question is needed to define key activities (or cluster of activities) of METRO. In order to assess ways to restrict potential negative impact of business operations on biodiversity loss, it is necessary to gain a clear overview about the internal and external mechanisms of such wholesalers. In this sub-question, the wholesaler’s operations as well as business partners will be examined. The second sub-question is formulated as follows: (2) *“What parts from METRO’s value chain are most relevant for the protection of biodiversity?”*

The third sub-question consists of two sub-sub-questions, which help in the identification of the desired changes. The division into multiple questions allows for a more methodological approach. The third sub-question is formulated as follows: (3) *“Which actions are needed to overcome the causes of biodiversity loss?”*

In the first sub-sub-question, the causes for biodiversity loss, in their respective fields, will be explained. Additionally, these causes will be mirrored with the previously researched business operations of METRO, in order to define causal relationships. The first sub-sub-question is formulated as follows: (3.1) *“Which causal relationships between METRO’s operations and causes of biodiversity loss exist?”*

In the second sub-sub-question, the previously researched causal relationships will be used in order to identify the exact key activities that METRO needs to work in in order to most effectively improve its footprint on the global biodiversity. The second sub-sub-question is formulated as follows: (3.2) *“What key activities need to be adapted?”*

The fourth sub-question largely builds on the first sub-question and deals with the creation of criteria that allow for a judgement of possible solutions. The researched criteria will be ranked and weighed which will allow for effective judgements towards the end of the thesis. This last sub-question rounds up the research by evaluating the possible solutions with the previously created criteria in order to define the best solutions for food wholesaling to comply with the United Nations’ sustainable development goals. The last sub-question is formulated as follows: (4) *“Which recommendations are best suited to reach the United Nations’ sustainable development goals 14/15?”*

2.1.4. Research Objective & Research Aim

This graduation assignment has been conducted for the Research Group Business Innovation of the Fontys International Business School. The aim of this graduation assignment was to formulate concrete recommendations that allow food wholesalers, such as Metro, to comply with the regulations, frameworks, and guidelines set by both national governments and supranational organisations, such as the United Nations. The set of recommendations formulated at the end of this report were meant to be actionable and realistic for METRO (and other food wholesalers) to use as a basis for the further development and formulation of specific strategies. Based on this, SMART research objectives were formulated.

The criteria for SMART objectives depicted in table 2 were reformulated into: (1) “By 07 June 2022, a list of ten reasons for biodiversity loss around the world will be curated.” and (2) “By 07 June 2022, five recommendations will be formulated that allow METRO to limit their biodiversity footprint and decrease the overall biodiversity loss in the world.” Objective one identified the problem at hand and created an overview of the situation. It broke down a complex and broad topic, and made it tangible for other actors, such as food wholesalers. The second objective then built the basis for the formulation of action steps. This bridged the gap between two fractions, namely the research and the industry.

Table 2.

SMART Research Objectives

Criteria	Objective 1	Objective 2
<i>Specific</i>	Define the reasons for biodiversity loss	Create recommendations for METRO to decrease biodiversity loss
<i>Measurable</i>	A list of ten reasons	Five recommendations are to be formulated
<i>Achievable</i>	Given the resources available (expert interviews, articles, etc.) it is reasonable to assume this objective to be achievable	Given the resources available, within the research group and the time scheduled, it is reasonable to assume this objective to be achievable
<i>Relevant</i>	This research objective is aligned with the United Nations’ perspective on biodiversity	This research objective is aligned with METRO’s organisational directives
<i>Time-Bound</i>	Until 07 June 2022	Until 07 June 2022

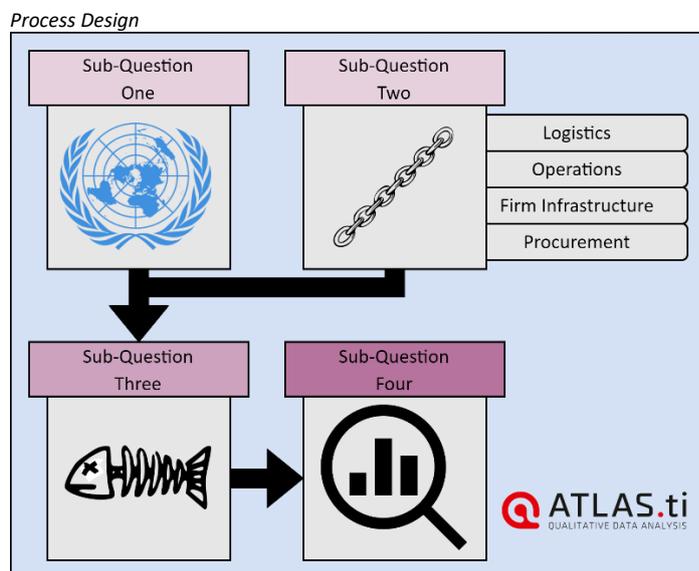
2.1.5. Research Scope & Limitations

This research project dealt with METRO in specific, who is operating in the food wholesaling industry. The study is set to be finished until 07 June 2022 specifically. This study will investigate operations processes and business decisions taken within the food wholesaling industry and mirror those with up-to-date research regarding biodiversity loss and its causes. The recommendations in the end will be formulated for METRO but they may hold significance for other players in the food wholesaling business as well, dependent on the generalizability of the formulated suggestions. This study will not dive deep into the biology of biodiversity, it rather focusses on the application of biology as a science for businesses, specifically for METRO. The geographical location covered in this study includes the biodiversity loss all over the world, since the recommendations formulated are meant to be general and useful for food wholesalers in all situations. Additionally, the United Nations and the influence of its sustainable development goals are worldwide, subsequently an approach that considers the global environment is best suited. Due to a lack of previous research on the topic of biodiversity protection in food wholesaling, both the research design and the research process had to be designed from the ground up, including measures to ensure reliability and validity. Furthermore, limited access to data might have caused possible recommendations to not be considered. METRO’s company data, as well as the data from competitors, is restricted and only free/Fontys licensed databases, such as Statista and Euromonitor, could be accessed. Additionally, due to this bachelor thesis being applied research, there is a prevalent time constraint. This graduation assignment is scheduled to be finished by 07 June 2022.

2.2. Theoretical Framework

Figure 3 shows the process design used within this graduation assignment. There are specific theories depicted within the figure, all of which found application in this research project. In the following sub-chapters, these theories and models will be further examined.

Figure 3



2.2.1. Stipulative Definitions

The first sub-question used the word “prominent” to describe causes of biodiversity loss. “Prominence” is generally understood as “The state of easily seen or well known” (Cambridge Dictionary, 2022a, Section 1). It is often used interchangeably with “importance” or “fame”, as indicated by von Heusinger and Schumacher (2019). Within this research project, the word “prominent”, or the concept of “prominence”, was understood in a more quantitative way, in contrast to the usual subjective definitions. “Brand prominence is defined as the extent to which the brand is salient or top of mind” (Gill-Simmen et al., 2018, p.1) – By replacing concepts such as “extent” with numerical values, “prominence” was stipulated as a “comparably high number of times a concept/word/factor sees appearance within a set of texts”. This stipulative definition eased the analysis and made results more tangible and less subjective, resulting in more reliable conclusions.

The second sub-question used the word “relevant” when referring to parts of METRO’s value chain. “Relevance” can be understood as “the degree to which something is related to or useful to what is happening or being talked about” (Cambridge Dictionary, 2022b, Section 1). Generally, it refers to the quality of something that is closely connected. Schamber et al. (1990) believes “[...] that relevance is a multidimensional concept” (p.1) that relies on both internal and external factors. Thus, in order to stipulate “relevancy” – both factors needed to be identified. The external factor was guided by the topic of biodiversity. It can be defined as “environmental concerns”. The internal factor represented human judgement and was thus dependent on the scenarios that will be presented in the coming chapters. With this clarified, “relevance” was stipulated as “the size of the overlap between operations and environmental concerns”. This stipulative definition clarified the presented analysis and improved the understanding of the second sub-question.

2.2.2. The United Nation’s Sustainable Development Goals

The United Nations’ Sustainable Development Goals were at the heart of this research project. The 2030 agenda for sustainable development functioned as the framework and starting point for the investigation of the topic of biodiversity protection. The United Nations formulated 17 different

sustainable development goals, two of which directly concern the protection of biodiversity. Thus, the 14th and 15th sustainable development goal were used to both guide the used definition for biodiversity, but also the different action fields within the topic, since each sub-field of biodiversity requires its own investigation into the causes for biodiversity loss. The United Nations' sustainable development goals were adopted by all member states in 2015 (United Nations Department of Economic and Social Affairs, n.d.). Since then, dependent on the country, these goals were translated into national guidelines and laws by governments and country unions. The sustainable development goals display the most complete/detailed collective agreement between governments on the topic of biodiversity. As already explained above, they build the foundation for many of the national laws in the past and generally cover the most relevant aspects of sustainability related topics. Since METRO operates as a multinational corporation, and the formulated recommendations should be widely applicable, it was necessary to choose a framework that is designed with global environments in mind – making the sustainable development goals the best viable options. Within the context of the complete theoretical framework, the sustainable development goals not only served as the starting point for research, but they also provided the general structure moving forward in the thesis.

Possible alternatives to the United Nations' sustainable development goals were scarce. Since the research project evolves around these goals, a fitting alternative would have to cover the same topics to the same extent. Instead of using the framework prepared by the United Nations, one possibility could consist of a merging of national guidelines – using it as a substitute for the sustainable development goals. But there were some glaring problems with this approach. There would be many criteria to be met. First, only countries in which METRO operates would be relevant (E.g. Germany, France, and China). These countries must have updated their biodiversity plans to “new standards”, similar to the United Nations. If that is the case, another problem is that the plans only deal with ecosystems that are present within the respective country, meaning there are no “all encompassing” suggestions. If all these criteria were met, the curated plans would most likely be based on the United Nations' suggestions anyway, making the sustainable development goals the most optimal choice to answer the first sub-question.

2.2.3. Porter's Value Chain Model

Porter's value chain concept is a model created by Michael Porter and it depicts two sets of supporting and primary activities. These activities are all aligned towards value creation, most often in order to create competitive advantage (Nagy et al., 2018). The supporting activities mentioned by Porter are infrastructure, human resource management, technological development, and procurement. The primary activities are inbound logistics, operations, outbound logistics, marketing and sales, and service. The depiction of a value chain in this way should include every single necessary and crucial business activity and operation within a company (University of Cambridge, 2016). Within this study, Porter's value chain model was used to grasp the most crucial activities within the daily business of METRO that could potentially amplify or cause overall biodiversity loss. Due to the scope of the study, this model was slightly adapted. As portrayed in figure 3, this study will only focus on inbound logistics, operations, outbound logistics, procurement, and firm infrastructure. Not only did this decision complement the set scope of this research project, but by putting an emphasis on the non-customer-related aspects of the model, the evaluation of operations within and between organisations became more straight forward. Additionally, the red marked activities can strongly vary between different wholesalers. The evaluation of such would have worked against the goal of generalizable recommendations. Within the context of the complete theoretical framework, Porter's value chain model was used as a mean to structure the investigation of METRO and the wholesaling business. Since it is essential for the research project to identify connections between business activities and negative externalities, such as biodiversity loss, Porter's value chain model provided the necessary structure to identify such key activities (Simatupang et al., 2017).

Alternatives to this model, in the presented use case, must have generally provided some sort of structure or guidance that allowed for an investigation of the key activities of an organisation. Two alternatives included the business model canvas (Universität Duisburg Essen, n.d.) and the SWOT Analysis (Fordham University, n.d.). The business model canvas, created by Osterwalder and Pigneur, depicts (in some way similar to the value chain model) all of the fields of operation of a company (Osterwalder & Pigneur, 2010). The business model canvas covers a wide range of very broad fields. Such a model did not provide the guidance needed for this research project. In other studies it has been found that the business model canvas is being interpreted differently by different actors (Keane et al., 2018), underlining the argument. The business model canvas lays specific emphasis on the value proposition of a company, even putting it in the middle of the canvas. With the value proposition in the centre, this model shows a higher degree of customer/consumer focus. Direct relationships with customers/consumers are not something this study aimed to investigate in detail. A SWOT analysis on the other hand would have promoted the investigation of the strengths and weaknesses of METRO and the wholesaling business, pairing it with the opportunities and threats posed by the external environment (St. Cloud State University, 2022). The inherent difficulty with the SWOT analysis lied with the missing guidance and lack of focus. The SWOT analysis provided no structure to specifically analyse the internal mechanisms of METRO/the food wholesaling business. Without a proper framework to funnel the research in the correct direction, the SWOT analysis might have led to the disregard of crucial factors. Thus, the final choice fell on Porter's value chain model in order to answer the second sub-question.

2.2.4. Fishbone Diagram

The Ishikawa Fishbone Diagram is a model that is used for root-cause analyses as well as prioritization. The Fishbone Diagram can be used to sort causes into different categories, which allows for a more effective treatment of said causes (Centers for Medicare & Medicaid Services, n.d.). It is described as a "[...] graphical technique to show the several causes of a specific event or phenomenon." (Coccia, 2018, p.1). The Fishbone Diagram allowed for an investigation of the direct connection between business operations and the causes for specific types of biodiversity loss. It is one of the most flexible root-cause analysis models, with variations of it being applied interdisciplinary (Luo et al., 2018). In the case of this thesis, the Fishbone Diagram assisted in the merging of the results of the two previous sub-questions. While the large fishbones within the diagram depicted the main (root) causes of biodiversity loss, the smaller fishbones showed the current actions of METRO that assist in the mitigation of such. This visual depiction allowed for an investigation of the direct connections between business operations and the causes for specific types of biodiversity loss. When looking at the Fishbone Diagram as a cause-and-effect diagram (Shinde et al., 2018), the application within this research project showed the actions that stand in-between the cause and effect. The "cause" being the triggers for biodiversity loss and the "effect" being the biodiversity loss in a specific ecosystem. Within the theoretical framework, the fishbone diagram served to combine all relevant information and posed the last step before the final evaluation of possible recommendations.

Alternatives to the Fishbone Diagram must have shown similar attributes with regards to the root-cause analysis and flexibility in terms of application so that it could be effectively used for this research project. Possible alternatives might have been the five whys method or the Fault Tree Analysis (FTA) (Lundteigen & Rausan, n.d.). The five whys method is a useful tool, when it is used to funnel down to one specific root cause. This method was not applicable due to the complexity of the topic at hand. For example, many different "root-causes" were expected to be present, making the five whys method only reliable when it is applied multiple times. Even then, it was not as adaptable as the proposed Fishbone Diagram. Furthermore, it did not provide an overview like the Fishbone Diagram. The FTA was prone to becoming very confusing and convoluted. Furthermore, it would have most likely branched out into a lot of smaller sub-categories, which would have prolonged the research into another step of grouping the identified categories. Lastly, similar to the five whys method, the FTA

could not be shaped and adapted like the Fishbone Diagram due to a very straight forward way of working. Thus, the final choice fell on the Fishbone Diagram to help answer the third sub-question.

2.2.5. Analytic Hierarchy Process

Inherently, the analytic hierarchy process (AHP), is a decision-making tool that relies on the weighting and evaluation of decision criteria (Mühlbacher & Kaczynski, 2013). Dyson (2017) mentions that “The AHP uses alternatives and attributes [...] and structures alternatives within a hierarchy of attributes for evaluation.” (Section 10). The AHP is particularly valuable in clear hierarchical structures, in which it quantifies the decision-making process (Meng & Pian, 2016), minimising the objectivity within the decision-making process itself. By combining qualitative and quantitative information (Liang et al., 2017), the AHP approach delivers results that are difficult to produce by hand. For the purpose of this thesis, a generic AHP framework was applied that relates each level within the AHP to the level above (Khosravanian & Aadnøy, 2022). The AHP was used for the final evaluation of the formulated recommendations. The purpose of the AHP was to rank the given recommendations according to relevant criteria. Within the theoretical framework, the AHP concluded on the research conducted and provide relevant recommendations for METRO.

As an alternative to the AHP, the analytic network process (ANP) follows a similar approach. The ANP is considered to be the successor of the AHP and provides a ‘generally’ more nuanced approach towards decision-making. In contrast to the AHP, the ANP allows for the influence of criteria on each other. This difference might hold value for this research project, depending on the applied criteria and grading. Generally, the choice for an ANP is made if “a more exact solution of the multiobjective/multicriteria problem is required” (Gkionakis & Batzias, 2016, p. 306). Since this was not the case in this research project, the AHP promised a more straight-forward approach. Considering that a simple conversion of an AHP to an ANP, using GNU Octave (a programming language for scientific computing) (Eaton, 2022), resulted in the same values (Manoj Mathew, n.d.), the final choice fell on the AHP to answer the fourth sub-question.

2.2.6. ATLAS.ti

ATLAS.ti is a tool that can be used for the qualitative analysis of text, graphic, audio, and video data. ATLAS.ti offers different functions for the effective coding of named material and thus assists in the subsequent content analysis. Furthermore, ATLAS.ti offers the function to create visuals that help in the presentation of the qualitative data (ATLAS.ti, 2022). ATLAS.ti was used throughout the thesis whenever qualitative data was analysed, most notably in the literature review and the analysis of interviews. ATLAS.ti provides options for the coding process of texts/interviews and can produce visual representations of the data. It served as a tool that funnels the data in order to streamline the decision-making in both a structured, as well as semantically meaningful way. Furthermore, is one of the most widespread qualitative analysis tools throughout universities all over the world and was thus considered a good fit for the research in this report. Within the theoretical framework, ATLAS.ti served as a supporting tool that assist in the successful implementation of other models through high quality analysis of qualitative data.

Alternative software packages to ATLAS.ti exist in many different forms. Dependent on the ultimate goal of the thesis, an alternative such as UserBit (2022) or Quirkos (2022) could have been used. Often, these software packages do not have distinguishing features, as they cover the same functions. The decision fell on ATLAS.ti due to its ease of use and wide range of application. Furthermore, it is a well-known and reliable software that already found application in many fields with overwhelmingly positive reviews (Capterra, 2022). Lastly, Fontys University of Applied Sciences provides students with a license that allows for the usage of the complete program, which is unique. Other alternatives, such as software for statistics and quantitative analysis, such as SPSS (IBM, 2022), did not fit the project, due to the nature of the research. Thus, the final choice fell on ATLAS.ti as the qualitative analysis tool within the thesis.

2.3. Research Methodology

2.3.1. Research Philosophy

The research philosophy describes how data will be research and subsequently analysed and interpreted (Metcalf Daison, 1998). Opposed to the school of thought named *interpretivism*, pragmatism can be described as a flexible school of thought that allows for variations in research design, with special regards to ontology and axiology (Dudovskiy, n.d.-c). This graduation assignment was structured around a clear research question, which served as the determinant for the type of research, research approach, as well as the data collection methods used. This leads to the project being written under a pragmatist umbrella. This allowed for both deduction and induction in the research approach, as well as qualitative and quantitative research strategies, dependent on the given scenario (Dudovskiy, n.d.-c). Given the research context, flexibility in the usage of research methods and data gathering allowed for a better design to satisfy all stakeholders involved.

2.3.2. Type of Research

This research project was created to answer a specific practical question and is thus “all about solving problems that have a practical application, ...” (Verhoeven, 2019, p.23). This report contains a research project that was initiated by the Research Group Business Innovation in order to create recommendations facing the above-explained business problem. Having identified this project as applied research, it is relevant to note that the purpose, context, and methods used in the project differ, opposed to fundamental research. Described as “Evaluation Research” by Dudovskiy (n.d.-a), the type of research presented analysed existing/historical data/information in order to formulate outcomes. The main research question posed was a practical question that aims at the solution to an urgent real-life problem, as displayed above. The advantages of applied research lie in the way problems are solved. Applied research shines in its ability to provide solutions for very specific problems. Typically, these solutions are formulated based on a carefully designed research procedure, improving the research validity, and eliminating biases. The following chapters will explore the research type’s influence on the research approach, as well as the data collection, and analysis methods, with special regards to the evaluation of reliability and validity.

2.3.3. Research Approach

The research approach chosen for this graduation assignment is an inductive approach. Inductive reasoning, generally, works by going from observing and testing to the identification of patterns and afterwards the creation of a theory (Dudovskiy, n.d.-b). In this research project, the order of reasoning can be described as: Observing to identification of pattern to formulation of recommendations. This approach is an adaption of the classical approach: Observation to pattern to theory. While looking for so-called “empirical regularities” (Tijmstra & Boeije, 2011, p.32), iteration serves as a principle that allows for better tested results as well as a more structured way of working. Iteration allows for more reliable research, especially given the qualitative nature of this study. This iterative nature impacts the way the research (sub-)questions were formulated and thus dictated a general direction in terms of research (Verhoeven, 2019). The research design that was elaborated on in the past chapters led to an overall research approach of qualitative manner. Typically, qualitative research methods do not rely and are not based on numerical information (Verhoeven, 2019). In alignment with the concept of *holism*, this study focussed and investigated a business environment as a whole (Verhoeven, 2019). This study did not rely on elaborate statistical methods but focussed on research that is/was conducted ‘in the field’. Inductive research is best suited for topics without any strong research background (Verhoeven, 2019), as it was the case for this research project. Additionally, it synergizes well with qualitative research. Since the reliability of data is always in question when working with qualitative data, reliability was sustained through the iterative process (Verhoeven, 2019), for example through an alternation between analysis and data collection phases. This also revealed a downside of inductive research. If the conducted analysis is not detailed enough, transparency issues might reveal themselves (O’Kane et al., 2021). Deductive research would require an (existing) theory

to work with, something that does not clearly exist for this research project, due to a lack of previous research. Thus, theory-testing was replaced by the above-described inductive research approach.

2.3.4. Ethical Considerations

Prior to the conducted research, the full written consent of every single participant was acquired, and every participant/interviewee was over the legal age in Germany as well as the respective country of origin. All participants/interview partners were not forced or subject to any harm in any way whatsoever. All of the gathered data was treated with utmost respect and an adequate level of confidentiality in order to secure and provide the privacy of every participant/interviewee. Prior to the study every affiliation as well as possible conflict of interest has been declared. If applicable, all the works of other authors and researchers are being acknowledged and identified as per the American Psychology Association referencing style seven. High levels of objectivity in data gathering, discussion, and analysis throughout the report were seen with utmost importance.

2.3.5. Data Collection Methods

As already hinted at in the previous chapters concerning the research design, triangulation, i.e., the application of a variety of research methods, was used to answer the proposed sub-questions. Each of the formulated sub-questions was dealt with in a slightly different way, thus each research method was paired with one data collection method and one analysis method, respectively. Table 3 shows the research-oriented sub-questions as well as the respective research methods, data collection methods, and analysis methods. Please see the chapter of the critical appraisal for an exact assessment of the limitations of research, data collection, and analysis methods.

Table 3.

Data Collection & Analysis

Research Questions	Research Methods	Data Collection Methods	Analysis Methods
<i>Sub-Question 1</i>	Qualitative desk research	Literature & archive studies	Content & qualitative secondary analysis
<i>Sub-Question 2</i>	Qualitative desk research	Literature & archive studies	Qualitative secondary analysis
<i>Sub-Question 3</i>	Qualitative desk research	Literature & archive studies	Qualitative secondary analysis
<i>Sub-Question 4</i>	Qualitative desk research Interview	Literature & archive studies Semi-structured interview	Qualitative secondary analysis Thematic Analysis

The first sub-question concerned the gathering and analysis of data surrounding the general topic of biodiversity loss, as well as the United Nations' 14/15th sustainable development goals. This sub-question was answered through extensive desk research, which is categorized as qualitative research. During this qualitative research, secondary (or existing) data was gathered. Since the first sub-question dealt with a literature review, as mentioned above, the focus is set on the gathering of secondary data. This literature review was supposed to reveal the current scientific consensus on the causes of biodiversity loss, as well as the United Nations' view on biodiversity protection. As there was no direct need for any primary data collection within this specific data gathering phase, the results of sub-question one solely relied on a literature review through qualitative desk research. The used data collection method can be described as a literature (or archive) study. The first sub-question included mostly the investigation of primary and secondary literature. The sources used for data collection included studies, journal articles, press releases, annual reports, as well as public, and Fontys licensed databases. The choice for the sources was grounded in a need for reliable sourcing, which was supported through the usage of official scientific literature, as well as established and proven

databases. The analysis methods used include both a content analysis and qualitative secondary analysis. According to Verhoeven (2019), content analyses are fitted for all levels of literature. Within a content analysis, different coding types can be used to create connections within and between textual data. As explained above, secondary data in text form was used as input for the content analysis. The coding process made use of qualitative variables to group characteristics, which steered the analysis (Verhoeven, 2019). This approach did not involve numerical data, but within the analysis it partially relied on a quantitative aspect. By counting the number of times, a code or group of codes was mentioned throughout the coding process, the relevance of said code for the project would be judged. Additionally, dependent on the source, qualitative secondary analysis was used as a more efficient way to analyse data – provided it was once researched for a different purpose. In this analysis method, the researcher uses his research question to look at the information from a different perspective and subsequently reuse it for their own purpose (Verhoeven, 2019).

The second sub-question dealt with the investigation of METRO's key activities. Similar to the first sub-question, a qualitative research method, namely desk research, was applied. Mirroring the first sub-question, a clear need for secondary data within the investigation of METRO's operations was identified. Thus, it was the aim of the qualitative desk research to deliver such data. In contrast to the previously conducted desk research, this sub-question did not necessarily aim at the investigation of scientific literature and previous studies. Still, it can be described as a literature and archive study, due to the investigated documents. This part of the project included data from annual reports, press releases, case studies, as well as public, and Fontys licensed databases. The overall categories represented by the above-named sources did not differ from the first sub-question. The content of said sources simply differed due to a new goal (the investigation of a company). As for the kind of analysis, a qualitative secondary analysis was used. The data used within this type of analysis generally referred to METRO operations and the wholesaling business. Since this qualitative data was not intended to be used for this research project, the used analysis method is a qualitative secondary analysis (Tate & Happ, 2018). As already explained above, the main research question, and the second sub-question, formulated for this thesis were used to analyse the data from a new perspective.

The third sub-question dealt with the establishment of causal relationships between aspects of METRO's key activities and the identified causes for the loss of biodiversity. The additional research conducted for this chapter consisted of qualitative desk research in order to find secondary (existing) data that assisted in the formulation of relationships, and ultimately goals. The limited amount of data that was researched for this sub-question was supporting in its nature, thus it was sufficient to focus solely on secondary data. There was no apparent need for a detailed investigation aimed at finding primary data. Especially because the following sub-question substantiated the findings of sub-question three. Similar to the previous sub-questions, the data collection method can be described as a literature (and archive) study. The sources used to support the claims made in this chapter include studies, journal articles, press releases, annual reports, as well as public, and Fontys licensed databases. Specifically, the annual reports and sustainability reports of METRO added useful information for the formulation of recommendations. The analysis for the third sub-question is the same qualitative secondary analysis that was already presented. Amongst other use cases, qualitative secondary analysis can be used to “[...] derive new and/or additional interpretations and conclusions that were absent in the original research findings.” (Sherif, 2018, Section 1). This was particularly relevant within the framework of the third sub-question, considering that other research findings were partially repurposed to fit the goal setting.

The fourth sub-question dealt with the formulation of criteria and subsequently the judgement regarding the priorities of the recommendations. In order to facilitate the decision-making process, data was collected that was free from any possible biases and subjections. This was done by applying a mixed method approach. The applied mixed method approach spun two sets of triangulations, namely method triangulation and data triangulation. Method triangulation refers to a mixed method

approach in data collection, while data triangulation refers to the investigation of various groups in, for example, interviews (Verhoeven, 2019). First, qualitative desk research with the aim of finding useful secondary data on possible criteria and the respective performances of the recommendations in said criteria was conducted. The desk research entailed a literature and archive study, mostly focussed on up-to-date scientific literature. The secondary data served as the foundation of further research and complemented the following steps. Similar to the previous sub-questions, the sources used for the research were studies, journal articles, press releases, annual reports, as well as public, and Fontys licensed databases. Together, these offered a wide range of possibilities with regards to high quality sourcing. Second, two sets of semi-structured interviews, one with an industry expert and one with an expert in the field of biology, were conducted. Since the primary data gathered was supposed to reflect the experts' opinions, it was important to create an environment in which the interviewees could express themselves, thus semi-structured interviews were conducted. These semi-structured interviews provided primary data that was specifically gathered for the purpose of the study. They were based on a rough topic guide that included four open questions (see Appendix L for the full topic guide). Together with the above-mentioned secondary data, conclusions were drawn on which of the recommendations to pursue first. On the one hand, qualitative secondary analysis, in the form as previously presented, was conducted, while on the other hand, thematic analyses for the interviews were done. The thematic analyses were based on an interview transcript. The interview transcript was then analysed by means of a thematic analysis. Within the thematic analysis, an inductive approach (or grounded theory approach) was followed. The coding structure consisted of open coding into axial coding into selective coding (Verhoeven, 2019). This is represented by the steps taken to conclude on the analysis: (1) Coding, (2) grouping codes into themes, (3) refining themes, (4) defining and naming themes, (5) results (Braun & Clarke, 2006).

2.3.6. Approaches for the Respective Sub-Questions

2.3.6.1. Sub-Question One. The first sub-question was answered by utilising descriptive research, as the beginning parts of the research resemble the structure of a GAP analysis. The nature of the literature review led to secondary research being done and since this thesis is a qualitative study, no numerical data was gathered. First, a list of keywords was curated. These keywords helped with the search for relevant literature. The keywords included, inter alia, biodiversity loss/causes/protection, ecosystems, degradation, etc. Second, the identified literature was evaluated and only the most relevant sources were chosen for further analysis. Third, patterns and themes were identified that spun all of the literature. Fourth, the structure of the literature review was decided. In the case of this research project, a thematic structure using different ecosystems as guidance was chosen, as the research was organized around several sub-topics (University of North Carolina at Chapel Hill, 2022). Fifth, the body and conclusion of the literature review was written. The analysis of said literature review was made with ATLAS.ti. The analysis made use of an iterative coding process (see Appendix D) that allowed for the exploration of the topic. The identified codes were then analysed using groundedness scores and the relationships with each other. The reliability of results of sub-question one was guaranteed through the above-mentioned iteration in data collection, as well as the use of a profound qualitative data analysis tool to assist in the analysis. Furthermore, the sources used for the first sub-question have high standards and were filtered within the process of the literature review (Verhoeven, 2019). *Construct validity* was ensured through a creative and thought through process design, meanwhile *internal validity* was ensured by a time frame for data collection (roughly 2018-2022) – ensuring no extreme variations in data (Verhoeven, 2019).

2.3.6.1. Sub-Question Two. The second sub-question was answered through descriptive research, due to it still being part of the beginning of the GAP analysis. The research conducted was of secondary nature, due to METRO's reports being at the heart of it. Furthermore, it can be classified as qualitative research, due to the investigation of METRO's strategy, structure, and policies. Within the research conducted for Porter's Value Chain Model, first the primary activities and then the secondary activities were researched. Although it must be mentioned that the research structure is not

represented in the chapter itself for reading purposes. The second step consisted of the identification of key factors through qualitative secondary analysis. The reliability of the results of the second sub-question was, on the one hand, assured through an iterative process in the data collection for both primary and secondary activities and, on the other hand, through a careful selection of sources that accurately represent METRO and the wholesaling industry. *Construct validity* was, again, ensured through the presented process design, while *internal validity* was covered through a focus on only the most recent information available regarding METRO's operations.

2.3.6.1. Sub-Question Three. The third sub-question was answered with descriptive research since existing information were merged in order to discover new links. The research was classified as secondary research due to mainly supporting data being used. Additionally, it was qualitative research as no (new) numerical data was added to the existing information. First, three fishbone diagrams were created, each relating to one ecosystem (ocean, coast, and forest). Then, the identified causes of biodiversity loss from sub-question one were added to the diagrams of the respective ecosystems. Lastly, METRO's key activities were matched with the causes of biodiversity loss – painting both a visual and a logical picture of the missing links. These missing links represented the low amount/effectiveness of current policies/operations. As for the qualitative secondary analysis, the missing links were then written according to the *Science Based Targets framework* to clarify further goal setting. Based on this framework five SMART goals were formulated. The reliability within this chapter was mainly ensured through reliable sourcing, referring to the previously gathered information. Additionally, an iterative process in data collection resulted in reliable results. Similar to the previous sub-question, *construct validity* was covered by the above-explained process design, while *internal validity* was ensured by the time frames set in previous research segments.

2.3.6.1. Sub-Question Four. The fourth sub-question was also answered through descriptive research, as the aim was to describe the experts' opinions without intervening. The research was both considered to be of secondary and primary nature, due to the additional research done and semi-structured interviews conducted. There was no numerical data used, thus it is classified as qualitative research. The interview partners for the semi-structured interviews were Ms Giesenkamp (Faculty of Agricultural Sciences and Landscape Architecture at University of Applied Sciences Osnabrück, research and development at Bactiva GmbH) and Ms Billinger (CEO & Founder at Leroma). The former is an expert in the field of biology, while the latter is an industry expert with a focus on raw material procurement. In order to ensure effective triangulation, an expert from each field with a different perspective was chosen – that way, industry and science were represented equally, and could be assisted by the already gathered information. Each interview had a length of 30-45 minutes and was conducted via MS Teams. Both interviews were held in German, as it was the easiest for both interviewees. Four questions were formulated within the topic guide for both interviews (see Appendix L for the topic guide). The questions spun a wide array of topics in order to get as much information as possible. Both interviewees were asked beforehand to sign a confidentiality agreement to ensure high levels of data security, especially because the interview was recorded. Both interviews were transcribed and through inductive coding, two hierarchical coding structures were created (see Appendix E and Appendix K respectively). The gathered information were then used within the AHP in order to evaluate the recommendations based on effectiveness, likelihood of succeeding, and synergy with METRO's other commitments. The reliability for this sub-question was ensured by a triangulation of methods, iteration within the data collection process, as well as a use of tools such as ATLAS.ti and recording equipment. Additionally, the sampling (choice of interviewees) is very goal-oriented, which leads to *internal validity*. Furthermore, set time frames, as well as consistent instrumentation in interview structure, assisted in achieving *internal validity*. Although only two interviews were conducted, the nature of expert interviews ensured a sort of "sample-representativeness" to ensure *external validity*. Lastly, both interviews were in line with the process design, ensuring *construct validity*.

3. Main Findings & Analysis

After having introduced both the project outline as well as the methodological and theoretical foundations of the research, this chapter will include a discussion about the topic of biodiversity, its connections with the food wholesaling business, and the major causes for the loss of biodiversity around the world. These findings are then re-evaluated using a new understanding of the wholesaling industry, applying specific knowledge gained by analysing METRO. The third chapter will then conclude with an examination of possible recommendations and an appraisal of such.

3.1. The United Nations and Biodiversity

The following sub-chapters will provide an in-depth view on the topic of sustainability and biodiversity protection. First, ground-rules, which are necessary to achieve a mutual understanding of this complex topic, will be set about the definition and meaning of biodiversity. Following this introduction, up-to-date scientific literature will be used to present a collection of causes for biodiversity loss. Throughout these sub-chapters, the perspective of the United Nations will always be present and included in the analysis.

3.1.1. Introduction to Biodiversity

To create a common ground that allows for a meaningful discussion of all the different facets of biodiversity, a pre-emptive definition for biodiversity must be found. As of May 2022, a definitive formulation that describes biodiversity as a whole is something that the scientific community did not agree on. In the words of Martin Sharman and Musa C-Mlambo (2012): “Biodiversity is notoriously difficult to define, [...]” (p.275). Sharman and Mlambo (2012) go on to explain that the concept of biodiversity holds many nuances, and the slightest differences in stipulation can turn out to be incredibly meaningful. As far back 1990, Reed F. Noss (1990) said that “A definition of biodiversity that is altogether simple, comprehensive, and fully operational (i.e., responsive to real-life management and regulatory questions) is unlikely to be found.” (p.356). Noss (1990) theorized that a description of the components of biodiversity would serve a goal better – a characterization of some sort. Such an approach might not be as ambiguous or illusory, which are common criticisms, for example by Ladle and Malhado (2018). Given the multi-faceted aspect of biodiversity, the reviewed literature proposed many components of biodiversity that can be of value for this research project. In the following, multiple aspects of biodiversity will be presented, all of which were reoccurring throughout the investigated literature.

First, the spatial extent/state of natural habitats. Leclère et al. (2020) mentions land conservation, land degradation, as well as certain biodiversity trends, all within the context of habitat conversion. Habitat conversion, meaning the change of a (natural) habitat, most often happens through human activity, and is thus a valuable aspect to consider in the interpretation of biodiversity. To elaborate further, Haahtela (2019) adds the variable of not only the spatial extent of habitats, but also the state – which has an effect on the functioning of biotopes.

The functioning of such biotopes, or rather ecosystems, is heavily dependent on a multitude of factors, as indicated by the paragraph above. The variety of and between species is another factor that is recognised within most attempts to define biodiversity. Species diversity almost always includes animals, plants, and any other form of life. Rahbeck et al. (2019) mentioned speciation rates as a determining factor in the creation of “[...] opportunities for co-existence and persistence of lineages, [...]” (p.2). Ladle and Malhado (2018) continue by placing species variety at the beginning of their definition of biodiversity. Rohr et al. (2020) not only describes the variety of species, but biodiversity as a whole, as the abundance of species (in an area). Other definitions include species variety by listing certain aspects which is in line with the more nuanced approaches needed for some studies. Cardinale et al. (2012) lists plants, animals, as well as protists, and fungi in his definition.

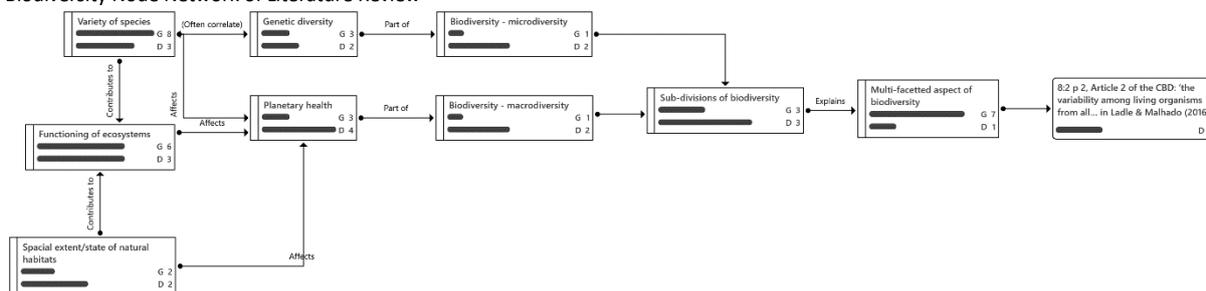
Both the variety within and between species, as well as the spatial extent and state of natural habitats contribute to the functioning of ecosystems as a whole. Ladle and Malhado (2018) put special emphasis on the interaction between species within a habitat and portray it is a vital part of biodiversity. This is hinting at an overarching effect across the ecosystem if one part fails. The functioning of ecosystems is also directly mentioned by Haahtela (2019) and it is said to be fundamental for the survival of humans as well. Leclère et al. (2020) states that biodiversity provides (the basis for) ecosystem services. Ecosystems in specific are mentioned by Cardinale et al. (2012) and Rahbeck et al. (2019) in their respective interpretations of biodiversity. With the above-mentioned insights, it can be derived, that planetary health, another component of biodiversity, is largely dependent on the health and functioning of separate ecosystems on earth. This assessment of macrodiversity (Haahtela, 2019) will lead to the final conclusion on the formulation of biodiversity going forward.

Before the final characterization can be concluded, another part of biodiversity must be mentioned. The genetic diversity, as part of microdiversity (Haahtela, 2019), describes the number of characteristics within species and is thus closely linked to the paragraph about the variety of species. Cardinale et al. (2012) speaks of human actions that are “[...] eliminating genes, [...]” (p.59) while Kremen and Merelender (2018) elaborate on the range of genetic diversity, mentioning “[...] from microbes to mammals, [...]” (p.1).

The presented findings lead to biodiversity often being divided into separate sub-divisions that deal with certain (most often geographical) areas, for example mountains, forests, the ocean, etc. These divisions will be further elaborated on later in the document through the view of the United Nations. Figure 4 depicts a node network which summarises the above-described findings. The literature review was conducted with the assistance of the qualitative data analysis tool ATLAS.ti. For each code applied, ATLAS.ti provides a groundedness score which shows the number of times a code has been used in a project. This allows for an assessment of the importance of certain characteristics through a quantitative lens. For this thesis, variety of species, functioning of ecosystems, planetary health, and the overall multi-facetted aspect of biodiversity are seen as the most important factors that a characterization of biodiversity should include. The final definition will emphasize these points in particular.

Figure 4

Biodiversity Node Network of Literature Review



Note. G-Score (Groundedness) = The number of times a code has been applied in the literature review; D-Score (Density) = The number of (manually assigned) links between codes and quotations (Illinois Library, 2020)

A fitting definition is provided in article two of the Convention on Biological Diversity (CBD). It states: “The variability among living organisms from all sources including, inter alia, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.” (Ladle & Malhado, 2018, p. 825). This

definition is not only widely accepted in the scientific community, but it also correlates with the United Nations understanding of biodiversity and can thus be used for this project.

3.1.2. Triggers for Biodiversity Loss

Due to the complexity of the topic, and in order to create a meaningful list of topics for wholesalers, the most relevant key points regarding biodiversity loss will be outlined. The researched information will show a focus on coastal, ocean, and forest ecosystems. Furthermore, only factors with relevance towards the selling of food products will be presented.

3.1.2.1. Coastal Ecosystems. Regarding coastal areas, it makes sense to differentiate between land-based pollutants (LBP) and other (more general) causes, due to the relevance for the wholesaling business. Starting off with general causes, the *acidification* of bodies of water, caused by CO₂ emissions, plays a large role according to the United Nations. The *pH values* in marine ecosystems have continually declined over the past 20 to 30 years (United Nations, 2021d). It is stated that “Rising CO₂ emissions are driving ocean warming, *acidification* and *deoxygenation*” (United Nations, 2021, p. 54). Ocean *acidification* is listed as one of the five key areas that threaten marine resource protection (United Nations, 2021a). The United Nations’ global indicator framework also specified that *acidification* must be minimised (United Nations, 2021b). Another direct result of rising CO₂ emissions is *deoxygenation*. A lack of oxygen can create *dead zones*, as explained by the United Nations. They have risen by 300 from 2008 to 2019 (United Nations, 2021a). *Deoxygenation* and its results, if not stopped, will have a negative effect on fish stocks, (rare) fish species, and general interactions with fishing (Arneeth et al., 2020). This not only harms the environment, but also the organisations that rely on selling fish (e.g., wholesaler).

Most LBPs have been observed to be amplified by economic zones, as they generally incentivise the development of industry, and thus harmful behaviour. “Global satellite data shows that countries’ exclusive economic zones have higher levels of *chlorophyll-a* [...]” (United Nations, 2021, p. 54) – proving the impact of economic zones, and thus industry, on the *eutrophication* of marine ecosystems. Before discussing *eutrophication*, another important issue must be addressed. In an assessment of the human impacts on commercially important fish species, Brown et al. (2018) identified several human-driven pressures on aquatic life. One of those pressures is plastic pollution. Lefcheck et al. (2018) sees humans having a strong impact on coastal ecosystems. *Anthropogenic* stressors heavily impact the biodiversity in coastal regions, which are often land-based in nature. Cabral et al. (2015) also touches upon this factor in an evaluation of the service potential of marine habitats. Terrestrial human activities are mentioned as the cause for plastic waste in the ocean (Zhai et al., 2020), threatening the health of marine ecosystems – this claim is supported by Prakash (2021). Industrial waste, which, inter alia, includes plastic waste (Jiang et al., 2018), contributes to the diminishing functionality of coastal areas. This related back to special economic zones which are attractive for various industries.

The United Nations (2021a) mentioned *eutrophication* as one of the major concerns for aquatic ecosystems. In its own evaluation, sewage discharge, fertilizer runoff, and livestock waste are the most mentioned causes of *eutrophication* (UN. Secretary General, 2021). Sewage (discharge) is described as one of the most relevant *anthropogenic* pressures (Brown et al., 2018). Both Jiang et al. (2018) and Zhai et al. (2020) agree that sewage and sewage discharge are prominent in their role and impact on the environment. Flawed sewage disposal practices are also a talking point within Sharma et al.’s (2019) research on India’s Ganges River Basin. The input of organic matter and its contribution to *eutrophication* is further supported by Cabral et al. (2015). The factor of livestock waste stands in direct connection with food production – especially the meat supply chain. Livestock waste can be classified as a type of nutrient/sediment runoff – falling into the same category as sewage discharge (Lefcheck et al., 2018). “Human uses and pressures” (Cabral et al., 2015, p.1) of coastal regions include various types of pollutants, as hinted at by Brown et al. (2018) – of which livestock waste is very common.

Fertilizer runoff, as another nutrient runoff, is associated with agriculture and the general production of food and feed. Classified as an organic pollutant, fertilizer runoffs and inputs of fertilizers are understood as major contributors to *eutrophication* (Cabral et al., 2015). These runoffs can happen both in farm and nonfarm applications (for example, in highly urbanised areas) (Lefcheck et al., 2018), although agriculture is still considered to be the largest factor. It should also be noted that this factor increases and decreases in importance depending on the type of crop and location. Other factors that affect *eutrophication* include nitrogen and phosphorus emissions. According to the United Nations (2021d), atmospheric nitrogen emissions are one of the primary drivers of *eutrophication*. It causes algal blooms and blocks out sunlight for other species in that body of water. Relating it back to the agriculture industry, “Excessive nitrogen and phosphorus emissions from agricultural production [...] had an impact on [...] the ecosystem health of the coastal zone” (Zhai et al., 2020, p. 8). It is apparent that coastal ecosystems are closely linked to ocean ecosystems, thus ocean ecosystems will be the subject of the next part.

3.1.2.2. Ocean Ecosystems. The above-mentioned factors in the context of coastal ecosystems generally show a close relation of ocean ecosystems and thus hold relevance with their effects on open ocean marine life. The United Nations (2021b) state that “The overexploitation of marine environments counts practices of overfishing, illegal fishing, unreported and unregulated fishing and destructive fishing practices” (p.15). Over a third of the worldwide fish stocks are already overexploited, and the practice of overfishing only accelerates this problem (United Nations, 2021d). The overexploitation of the ocean (including using it as a means of getting rid of industrial waste) has immense negative effects on (rare) fish species. Many developing countries are slow with the adoption of measures to restore or protect overfished stocks (UN. Secretary General, 2021). One reason is often the reliance on large fishing corporations. Arneth et al. (2020) sees the continued growth of the human population and its rising consumption rates per capita as one of the main reasons for the acceleration of overexploitation of marine resources. In order to classify this statement, one must look at the consequences of growth for the wholesaling industry. Due to rising consumption rates, (larger) corporations fall back to unsustainable fishing practices. Smaller fisheries are less known for such schemes and are generally considered the more sustainable choice (United Nations, 2021d).

The implications of sewage discharge were already explained and exemplified above. The arguments presented can mostly be applied to ocean ecosystems as well. Thus, only the direct connection to ocean ecosystems will be elaborated on. According to Smale (2020), Ocean phenomena, such as kelp forests, are largely influenced by factors such as temperature, nutrients, and substrate – to which sewage can contribute massively. This is also in line with Prakash’s (2021) assessment, that nutrient enrichment poses a “serious challenge to aquatic ecosystems” (p.314). Lastly, Winther & Dai (2020) emphasize the role of LBPs, due to a growing economy, in the increase of human-made pressures on the ocean.

Acidification, and CO₂ emissions in that sense, play a similar role as noted during the discussion about coastal ecosystems. Ocean *acidification*, as explained by Arneth et al. (2020), has a direct impact on the growth rates of a multitude of species, including gastropods, crustaceans, shellfish, and corals. Taking the perspective of a food wholesaler, some of the named species are a direct part of the revenue stream. Following this logic, CO₂ emissions result in less supply of food during a time of rising demand due to population growth. This will ultimately result in higher prices and worse environmental conditions, harming the business. The process of *acidification* is expected to have negative effects on fisheries and aquaculture, linking it back to unsustainable fishing practices. Generally, ocean *acidification* “[...] can determine changes in the biotic potential, mobility, survival rates and can increase the risk of their [marine species] extinction.” (Rastelli, 2020, p. 1).

Although most arguments have already been presented due to the close links between coastal and ocean ecosystems, there are a couple of things to mention in regard to oceans specifically. Most

of the fish stocks in the world are present within open oceans. This means that the greatest marine *food webs* can be found there as well – rather than in coastal or river ecosystems. According to Arneth et al.'s (2020) study, the 'business as usual' plastic production is growing exponentially and it threatens aquatic life on all *trophic levels*. This relates directly to the wholesaling business that will be investigated in the upcoming chapters, as it is largely reliant on the health and productive capacity of such marine environments.

3.1.2.3. Forest/(Other terrestrial) Ecosystems. Species loss and the extinction of species is considered to be one of the main drivers of biodiversity loss (United Nations, 2021d). First, the area of wildlife will be investigated. Second, forests as a general topic will be assessed. And third, human development as a whole will be discussed. As part of the investigation of wildlife, two factors will be discussed, unsustainable hunting and invasive alien species. Damage to local wildlife can happen through various means. Watson et al. (2018) mentioned the over-harvesting of particular species in the form of over-hunting. Gross (2019) observed that mainly markets drive unsustainable hunting around the globe, damaging the overall biodiversity. He goes on to say that "Unsustainable hunting of animals on land, [...] has already skewed the size distribution of biodiversity and is set to continue disrupting entire ecosystems" (Gross, 2019, p.1). It is a reoccurring theme that a lot of the issues evolving around biodiversity stem from the consumption of animal products, specifically meat and fish. Invasive alien species, ranging from insects, to birds, and other animals, can be considered a direct result of (1) globalised supply chain/globalisation and (2) illegal wildlife trafficking. According to the United Nations, invasive alien species cost the economy billions of dollars annually (United Nations, 2021c). Wildlife trafficking can hurt economic development in numerous ways, one of which are *zoonotic diseases*, such as *COVID-19*. These are direct consequences of threatened biodiversity (United Nations, 2021d). Arneth et al. (2020) describes, inter alia, that the risk of expansion for alien species is high for *temperate mixed, deciduous, and coniferous forests*.

Especially in tropical regions, forest degradation remains one of the key issues affecting biodiversity (United Nations, 2021d). *Logging* and other forms of deforestation are considered to be amongst the main drivers of species loss around the world (United Nations, 2021d). From the year 2000 to 2020, the world has lost approximately 100 million hectares of forest (United Nations, 2021c) – with *Key Biodiversity Areas*, such as rainforests, leading the list. It is common understanding that "Deforestation and forest degradation, continued biodiversity loss and the ongoing degradation of ecosystems are having profound consequences for human well-being and survival" (UN. Secretary General, 2021, p. 22). Sustainable forest management (afforestation and reforestation) is encouraged to combat/halt deforestation and the connected issues (United Nations, 2021b). The above-mentioned unsustainable hunting practices can also be considered to be a form of degradation (Watson et al., 2018). Watson (2018) elaborates that "Of the remaining forests, as much as 82% is now degraded to some extent as a result of direct human actions, such as *industrial logging*, urbanization, agriculture and infrastructure." (p.1). Topics such as agriculture and infrastructure will be explained further into the report. According to the United Nations (2021d) "Land degradation now affects one fifth of Earth's land area" (p.56). Land degradation is driven by desertification, degraded land and soil, and drought and floods (United Nations, 2021b). The general exploitation of resources (animals, plants, fungi, metals, oil, salt, etc.) as a cause for land degradation was also researched by Zhai et al. (2020).

Human development is mostly about land conversion, an important topic with regards to the direct human impact on biodiversity loss. According to the United Nations, the transformation from forest to agricultural land is most prominent (highest rates) in South-Eastern Asia, Africa and least economically developed countries (United Nations, 2021d). Agricultural processes that are resilient and support/maintain ecosystems should be at the centre of goal formulation. Agriculture development (mostly by larger corporations) increased the worldwide fertilizer production and 27% of nitrogen fixation can already be attributed to agriculture (Schmitz et al., 2019). Prakash (2021) elaborates that "[...] clearing of forest land for agriculture and other non-agricultural uses have

significantly impacted the biodiversity.” (p.316). Other non-agricultural uses are, for example, urban development. Urban development (meaning industry, living space, etc.) is associated closely with species loss (United Nations, 2021d) and many types of pollution – which were discussed above. This relates back to the above-mentioned economic zones and the attracted industry/agriculture. Urban development, as stated by Lefcheck et al. (2018) is also often positively associated with nutrient loading, linking urban development back to *eutrophication*. Human industrial/agricultural activities and urban development severely impact environment through various types of pollution (Zhai et al., 2020). Li et al. (2018) mentions land reclamation, urbanization, and harbour/navigation channel constructions, which can be used as examples that fit urban development.

3.1.3. Interim Conclusion on the Literature Review

The sub-question to be answered by the literature review is “What are the most prominent causes of biodiversity loss?”. Figure 5 shows a Sankey diagram summarising the findings of the literature review.

Figure 5

Sankey Diagram for the Causes of Biodiversity Loss



Note. The Sankey diagram show the connections between the sub-divisions of ecosystems and the main causes of biodiversity loss. Generally, the thicker the lines, the ‘more relevant’ the cause. Blue colour = LBPs, red colour = other causes.

There is a distinction between LBP as a direct cause for the loss of biodiversity through, for example, *eutrophication*, and another category, which summarises broader causes of the loss of biological diversity. The Sankey diagram also shows how interconnected the causes are. This has a profound impact on the recommendations that will be formulated later on. The ‘treatment’ of one cause for purpose of improving the health of one ecosystem might also have positive effects on another ecosystem, as indicated with the reduction of CO₂ emissions. The factors presented in figure 5 are chosen based on the quantitative frequency in which they were mentioned within the reviewed literature.

The results presented in figure 5 can be further grouped into themes. These themes will assist in the further analysis. The most relevant themes, as presented in table 4, include the most mentioned factors and grouped them based on similarity. For example, CO₂ emissions and climate change were grouped together. With the themes laid out, the first sub-question is concluded.

Table 4.

Sub-Question One Results

Coastal Ecosystems	Ocean Ecosystems	Forest Ecosystems
<ul style="list-style-type: none"> • Fertilizer runoff • Livestock waste 	<ul style="list-style-type: none"> • Plastic pollution • Unsustainable fishing & overexploitation of marine resources • CO₂ emissions • <i>Acidification</i> 	<ul style="list-style-type: none"> • Agriculture development • Urban development • Land/Forest degradation

The findings presented within chapter 3.1. lay the groundwork for the evaluation of possible measures. In order to identify possible shortcomings or areas that are already covered, it is necessary to describe the current situation and scientific opinion on the topic of biodiversity protection. Besides the focus points, this chapter also revealed insights in how certain factors affect each other and how situational measures against biodiversity loss must be. Lastly, the research shown in chapter 3.1. also indicates which parts are necessary to be investigated with regards to METRO’s operations – due to obvious/strong connections with the topic of biodiversity protection.

3.2. METRO and the Wholesale Industry

The following sub-chapters will provide an assessment of the wholesaling industry with specific examples from and references to METRO. The subjects to be investigated include inbound and outbound logistics, METRO's firm infrastructure and its relevant levels, METRO's operations, as well as its procurement strategy/policies. Throughout these sub-chapters, missing relevant information about METRO will be supported by general available data about the food wholesaling industry and vice versa.

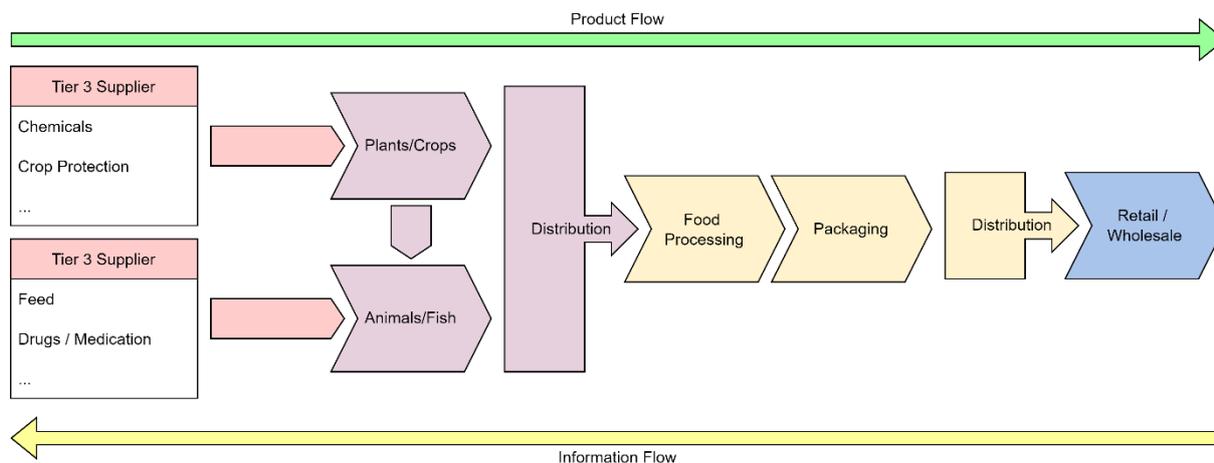
3.2.1. Inbound/Outbound Logistics

When discussing inbound logistics, processes relating to receiving, storing, and distributing inputs internally are meant. Outbound logistics include the collection and storage of items, as well as its distribution systems. The overall food supply chain can be divided into 'before the farms', 'at the farms', and 'after the farms' (Guarnieri et al., 2021).

Figure 6 shows a general overview of what a supply chain from the tier three supplier to the wholesaler looks like. If a food wholesaler would like to directly influence and change the sustainability of its supply chain, in most cases, it could only influence the tier one suppliers, including certain distribution and packaging processes. These processes are marked in yellow within figure 6. As already indicated during the literature review above, most environment-harming practices, at least the most prominent ones, happen within the tier three and tier two levels.

Figure 6

Product and Information Flows in the Food Supply Chain



Note. Tier 3 supplier = pink; Tier 2 supplier = purple; Tier 1 supplier = yellow

Davis et al. (2021) concluded that the economic influence rises following the product flow, while the environmental variability rises following the information flow. He also sorted algal blooms and coral bleaching (both are harming biodiversity) to the production processes within the supply chain (Davis et al., 2021), supporting the presented arguments. Thus, if a wholesaler would like to achieve the greatest impact on the environment, it must find a way to affect 'before the farms' and 'at the farms' processes. There exists the possibility to indirectly apply pressure/influence business partners during these stages through changes in directives, strategy, and operations, presumably because of the leverage the wholesaler holds over its business partners. Their dependency on the wholesaler can and is being used to enforce sustainability measures. Examples for this happening will be presented in the following sub-chapters.

Following Onstein et al.'s (2019) research on distribution structures, METRO, and other international food wholesalers of equivalent size, will have both national and international stockholding points, dependent on the size of the country as well as location of the warehouse. This would indicate a 'Multicountry System II', as described by Onstein et al. (2019). This assessment is in line with the wide variety of products sold, as well as the different food supply chains that merge at the wholesaler. METRO has roughly 50.000 suppliers all over the world (METRO AG, 2017). METRO (2021a) mentioned in their annual report of 2021 that the availability of goods/products is one of the key aims of its supply chain. Considering the variety in products sold, as well as the uncertainties within every single supply chain – a responsive and flexible supply chain is required. In order to cope with raw material shortages, or shortages in drivers in the logistics sector, a certain agility is required for the supply chain. According to the assessment criteria formulated by Agarwal et al. (2006), METRO follows the principles of an agile supply chain. This is most likely the case for other food wholesalers as well, due to similar business practices and product assortments. Identified bottlenecks in the agri-food supply chain include, inter alia, low inventory levels and a high utilisation rate of logistics services (METRO AG, 2021a).

METRO, and other international wholesalers, operate on a global scale, not only with regards to the supplier side, but also the location of warehouses and stores. In the case of METRO, the expansion of the store-based business via new locations has become less important in recent years (METRO AG, 2021a). Nonetheless, decisions about [new] store locations are considered core processes. As shown in table 5, and as stated by METRO, the expansion of the store-based business slowed down. At the end of 2021, the total number of METRO stores in the world is 681. The only geographical area that gained stores was Asia with four additional stores in the time span from 2020 to 2021 – meanwhile every other geographical area stayed the same and Germany lost one store. The number and location of stores is particularly relevant for food wholesalers, due to “extra”-factors, such as cooling, both in the warehouse and in the supply chain.

Table 5.

METRO Store Network Expansion 2018 to 2021

	2018/2019	2019/2020	2020/2021
Germany	103	103	102
Western Europe	240	240	240
Russia	93	93	93
Eastern Europe	193	196	196
Asia	46	46	50
<i>Sum:</i>	<i>675</i>	<i>678</i>	<i>681</i>

Note. Data for METRO store network expansion. Data for 2018/2019 adapted from METRO AG (2019), for 2019/2020 from METRO AG (2020a), and for 2020/2021 from METRO AG (2021a)

Looking at the total energy consumption of METRO from 2020 to 2021, the overall consumption shrunk by 7,848 MWh (METRO AG, 2021a). The overall electricity used was lowered. Within the electricity mix, there is a growing use of renewable and self-generated renewable PV energy to be noted. The energy used for district heating/cooling stayed the same. The overall fuel consumption (heating oil, gas, petrol, diesel, *liquefied petroleum gas*, *liquefied natural gas*) grew by around 27,519 MWh (METRO AG, 2021a). These numbers show a development that hints at greater efficiency with electricity, but also still great reliance on fuel.

METRO considers it its core objective to drive the transformation towards responsible and sustainable business practices. This is supposed to happen within METRO's own business operations, but also, more importantly, in collaboration with its suppliers and customers (METRO AG, 2021a). As already mentioned above, METRO uses its position as one of the largest food wholesalers to leverage

better sustainability deals with its business partners. One way in which this is happening is METRO's single plastic policy. METRO (2021b) states that "By 2025, we will empower our customers' businesses to move into a 100% future without any conventional single use plastic [..]" (p.44). This is a practice that could be extended into other areas. METRO's other commitments and policies will be elaborated on in the following sub-chapters.

3.2.2. Firm Infrastructure/Strategy

METRO (2017) developed a sustainable development model, also called sustainable value creation mode, which includes sourcing, logistics, operations, and sales. Sales will be disregarded for now, due to the usage of the above-explained value chain model. Some of the achievements attributed to said sustainable value creation model include various sourcing policies for fish, meat, soy, palm oil, and wood – which will be further investigated during the sub-chapter about procurement policies. The aspect of logistics included fleet management and e-mobility as part of the logistics strategy. The reduction of emissions let METRO to further incentivise electric vehicles through e-trucks and electric chargers for employees (METRO AG, 2017). Concerning METRO's operations, goals for 50% reductions of food waste and greenhouse gas emissions were set for 2025 and 2030, respectively (METRO AG, 2017).

METRO (2020b) mentioned certain 'global threats', such as resource consumption, climate, and food availability, as tasks that need to be dealt with immediately. In order to tackle these global challenges, METRO (2020b) developed, inter alia, a global framework that is guided by the United Nations' sustainable development goals – with a focus on the second, eighth, 12th, 13th, and 17th goal. This global framework entails a sustainability approach with 'METRO SUSTAINABLE' at its heart. This strategy focusses specifically on METRO's own business, supply chain, and customers. METRO tries to work on the issue of sustainability using a top-down approach, consisting of strategic focus areas. These are: Conscious consumption, organic products, food waste, packaging and plastic, raw material sourcing, and climate (METRO AG, 2020b). In order to work on these strategic focus areas, METRO aims to work with both internal and external stakeholders, such as suppliers and business partners, local communities, political representatives, employees, non-governmental organisations, customers, and competitors. This again reiterates the perspective that it is not possible to tackle large (biodiversity-related) problem alone, but it should instead be dealt with in coordination with other stakeholders. To further substantiate this hypothesis, a "weakened negotiating position" (METRO AG, 2021a, p. 100) was mentioned in METRO's annual report for the year 2021 in the context of procurement risks, due to a reduction of the group volume. This indicates that METRO tends to use its position to negotiate better deals and push through strategic goals.

A materiality analysis from the year 2020 identified 18 important topics, of which seven are directly linked to the topic of biodiversity, considering the literature review shown above. These seven topics are depicted in table 6. The so-called 'materiality issues' are the building blocks for all the policies and commitments that dictate operations and procurement.

Table 6.

METRO's Materiality Analysis

Areas of Responsibility	Materiality Issues
People	---
Product	<ul style="list-style-type: none"> • Responsible Sourcing & Sustainable Assortment • Healthy & Nutritious Products • Packaging and Plastic
Planet	<ul style="list-style-type: none"> • Food Waste Management • Resource-Efficient Operations

Note. Data for Materiality Analysis. Data adapted from METRO (2020b)

Sales revenues for 2020/2021 were 24,765 million € (METRO AG, 2021a). These numbers are for METRO Germany, METRO Western Europe, METRO Russia, METRO Eastern Europe, METRO Asia, and 'others'. METRO's income statement of 2020/2021 makes a distinction between 'store-based and other business' and 'delivery sales' – hinting at two separate revenue streams, with the 'store-based and other business'-stream making up roughly 83% of the overall revenue generated (METRO AG, 2021a). Since METRO is a food wholesaler and sales are generated by selling food, it can be assumed that most resources/products/items are being handled within these revenue streams. This gives a clear indication towards a focus for possible recommendations. Improving processes related to store-based sales (for now) seems to be a greater lever for change.

3.2.3. Operations

METRO's product assortment can be divided into two categories, food, and non-food. Non-food categories make up around 31.66% of all the products sold at METRO, around 8,287 products. These number are taken from the German METRO store in Kassel (METRO Deutschland GmbH, 2021d). The food category makes up the remaining 68.34%, around 17,891 products. The food products are the focus of the study. Of all the (food) products sold only 0.24% are classified as vegan, and roughly 1.63% are classified as 'bio' (See Appendix G for more details). 'Bio', as stated by METRO, are all certified products, which were produced in ecological agriculture. This would include environmentally friendly production without artificial fertilizers, sewage sludge, or synthetic pesticides. 'Bio'-animal products can only be classified as 'bio' if the animals were kept species appropriate and if they were not treated with antibiotics and growth hormones (METRO Deutschland GmbH, 2021a). These, rather vague, definitions come straight from the official EU label for 'bio'/organic products (European Commission, n.a.). Roughly 20% of the product assortment are METRO own brand products (MPUL.SE, 2019). These statistics are relevant due to the commitments that were formulated by METRO. The commitments formulated by METRO that are relevant for biodiversity protection, more often than not, do not count for all the products in the portfolio. This phenomenon will be further investigated in the following sub-chapter.

As part of METRO's raw material sourcing strategy, policies for packaging and plastic were formulated. METRO's single use plastic policy was already elaborated on in a previous sub-chapter, nonetheless, there are other packaging regulations/goals, such as a *polyvinyl chloride* (PVC) and *expanded polystyrene* (EPS) phase out. METRO also agreed to use certifications for paper, cardboard, and wood packaging for their own brand products (METRO AG, 2021c). With regards to climate action and CO₂ emissions, METRO follows environmental guidelines, such as 'science-based climate protection targets' – these targets consist of three scope that aim to reduce emissions on all levels, from selling and delivery space to the supply chain. Furthermore, METRO is committed to the EV100 initiative, by expanding charging infrastructure and promoting electric mobility (METRO AG, 2021c). Further actions within METRO include a goal to reduce food waste by 50% by 2025. The reason why this is interesting is that it also includes the step of involving 20 suppliers to reduce food waste – further exerting power over business partners (METRO AG, 2020b).

3.2.4. Procurement

Table 7 displays the relevant commitments and policies of METRO at the end of 2021. These commitments are common amongst many international companies. With special regards to METRO, one of the most notable things is that many of the policies mentioned, apply only to METRO's own brands (METRO AG, 2021c). As stated above, METRO's own brands only make up around 20% of the product catalogue. This would mean, considering that these commitments work 100% like intended, that effective measurements only exist for roughly 20% of the product assortment. Another thing to be noticed is that there is no actual meat procurement policy in place. According to METRO, both the soy procurement policy and the animal welfare policy are supposed to substitute this missing link. Though it must be mentioned that these substitutes are in themselves flawed, especially for the purpose of biodiversity protection. METRO's animal welfare policy, for example, hardly shows any

connections to biodiversity protection, besides its guidelines on minimal animal transportation. Furthermore, some of the policies show overlaps – the POTC, for example, partially aims at achieving RSPO standards. METRO also formulated other commitments that entail more generic goals, such as environmental guidelines and energy management (see Appendix F for a full list of relevant commitments).

Table 7.

Raw Material Sourcing Policies

Policy	Definition	Scope
Soy procurement policy	Roundtable on Responsible Soy (RTRS)	Own brand products
Palm oil procurement policy	Roundtable on Sustainable Palm Oil (RSPO), Palm Oil Transparency Coalition (POTC)	Own brand products
Paper & wood procurement policy	The Consumer Goods Forum Resolution on Deforestation	Own brand products
Meat procurement policy	Builds on soy & animal welfare policies (no new targets)	---
Animal welfare policy	Transparency, no use of antibiotics, no cloning, no genetic modifying, no routine mutilation, minimal animal transportation	METRO's product assortment
Fish and seafood procurement policy	Global Sustainable Seafood Initiative (GSSI), Global Tuna Alliance (GTA), Tuna 2020 Traceability Declaration	Own brand products

Note. Data for raw material sourcing policies. Data adapted from METRO (2021c)

The RTRS has been labelled 'unfair' in the past. This is due to its very strict auditing practices. (1) The drafting and content nature of the RTRS standard is very business focussed/oriented. (2) Auditing requires certain resource requirements and structural prerequisites. (3) Domestic and contextual factors often hinder the auditing process (Schilling-Vacaflor et al., 2021). This makes it very difficult for smaller companies and farmers to be RTRS certified. Without this certification, companies like METRO might not even consider them in the first place. Additionally, different national interpretations of the guidelines might now allow for effective problem solving (Johnson, 2019). Lastly, there were overall difficulties reported regarding the correct implementation and reporting of measures. Regarding the RSPO, strict standards often make it difficult for some producers to gain the certificate. Especially for local, indigenous, or smaller producers, property titles can be a reason. On top of that, the adoption of the RSPO is limited, similar as the RTRS, due to resource constraints (Rodthong et al., 2020). The GSSI makes sure that fisheries comply with the minimum standards of the Food and Agriculture Organization (FAO) of the United Nations. This does not necessarily mean that they can be considered sustainable in the scientific sense, as indicated by the World Wide Fund for Nature (WWF) (2015), a part of the GSSI's global network. The 'minimum requirements' formulated by the FAO are also very generic in nature (Food and Agriculture Organization, 2011). Lastly, the Consumer Goods Forum Resolution on Deforestation is METRO's primary driver to combat deforestation. Looking at the overall performance of the key performance indicators (KPIs) within the Consumer goods Forum, a reporting problem becomes apparent. Up to 50% and more of companies are not reporting at all for certain KPIs. The key topic mentioned by the Consumer Goods Forum (2021) are soy, paper, pulp, fibre-based packaging, and beef – all showing similar weaknesses in reporting. The Consumer Goods Forum (2021) also expressed the need for retailers to report on which suppliers they are engaging with, specifically mentioning that retailers should impact and monitor the performance of their direct suppliers.

3.2.5. Interim Conclusion on METRO and the Wholesaling Industry

The sub-question to be answered in chapter 3.2. is “What parts from METRO’s value chain are most relevant for the protection of biodiversity?”. In the previous chapters, Porter’s Value Chain model was used to define and dissect the most strategically relevant activities (Harvard Business School, n.d.) within METRO’s value chain, with respect to the topic of biodiversity. It is strongly suggested that changes in these strategically relevant areas can impact other companies in the overall value chain system, both upstream and downstream. Within the whole system, each activity must be seen not only as a cost (Harvard Business School, n.d.), but rather as a step towards the final consumer.

The investigated activities are firm infrastructure and procurement as supporting activities, and outbound/inbound logistics and operations as primary activities. Throughout the chapters, and due to the selection of activities, it has been made clear that certain factors hold more relevance than others. The investigation of METRO and its processes revealed focus areas that hold potential for future strategies. In its materiality analysis, METRO formulated the groundwork for its current strategies and operations with regards to sustainability. The results of this analysis are shown throughout METRO’s activities. The store-based business, in spite of a decreasing rate of expansion, remains a major source of revenue – influencing the supply chain and electricity infrastructure. METRO’s procurement policies have a heavy focus on own-brand products, next to a focus on palm oil and soy procurement policies. There is also a lack of a specific meat procurement policy. Most policies are based on certain initiatives and round tables, which are often criticised for their reporting problems and missing assertiveness. Through the lens of logistics, it became apparent that agriculture and its processes greatly influence biodiversity. If a wholesaler wants to impact biodiversity, the greatest results will be achieved through the influencing of business partners (especially tier two and three suppliers). Lastly, METRO’s product assortment is mostly made out of non-organic or non-bio products, presumably due to METRO’s internationality and globalised sourcing operations.

The presented results hold high significance for the formulation of recommendations since they represent the last missing piece for the discussion of possible measures. Besides this, the past chapters have shown that the protection of biodiversity is most likely a collaborative effort, meaning that stakeholders across the value chain system should work together. Overall, chapter 3.2. prepared the industry/METRO perspective which will be mirrored with the literature review in the following chapters.

3.3. Causal Relationships & Key Factors

In the following sub-chapters, the results of the investigations of biodiversity and METRO will be combined. First, the main causes for biodiversity loss will be put in relation to the actions that are being made by METRO to combat said causes. Afterwards, missing links, that will help combat the causes of biodiversity loss, will be identified. These links pose key factors for METRO and other wholesalers in the fight against biodiversity loss. Lastly, the key factors will be translated into complete recommendations for METRO.

3.3.1. Missing Links

Given the information gathered in previous stages of this thesis, there are certain actions with which biodiversity loss is being counteracted. The measure can vary between minimal and extensive. Figure 7 shows which actions directly align with the previously defined triggers for biodiversity loss. In the case of figure 7, only coastal ecosystems are shown – although it must be mentioned that there is a massive overlap in causes and measures, making the topic appear more homogenous. The key takeaways, from the fishbone diagram in figure 7, are that the current substitutes for the meat procurement policy, is not affecting the root-causes enough. This is indicated by the lack of fishbones with regards to livestock waste and sewage discharge. Moreover, it is underlined by the previous evaluation of the memberships and animal welfare policy. Thus, an **own meat procurement policy** is suggested. Companies, such as Sainsbury, base their meat procurement policy on, for example, the Red Tractor Assurance Standard (Sainsbury, 2021). A standard such as that would improve/ensure, inter alia, biosecurity, the health and welfare of livestock, trained and competent staff, and minimised factory farming (Assured Food Standards, 2022a, 2022b, 2022c). These factors would complement the already existing policies and directly benefit biodiversity protection within the industry, since factors such as waste, sewage, and emissions are directly linked to the production of animal products, especially factory farming. Second, a study of the bio/organic products within METRO's (Germany) product assortment shows a lack of bio-labelled products. A possible measure would be to **expand the already existing bio label** to (1) all of the own brand products and (2) a higher percentage of regular products. Currently, roughly 1.63% of products are labelled as bio. The European Union's label for bio/organic products is does not necessarily cover all the important aspects of biodiversity protection, but an expansion would complement the already existing measures.

Figure 7

Fishbone Diagram Coastal Ecosystems

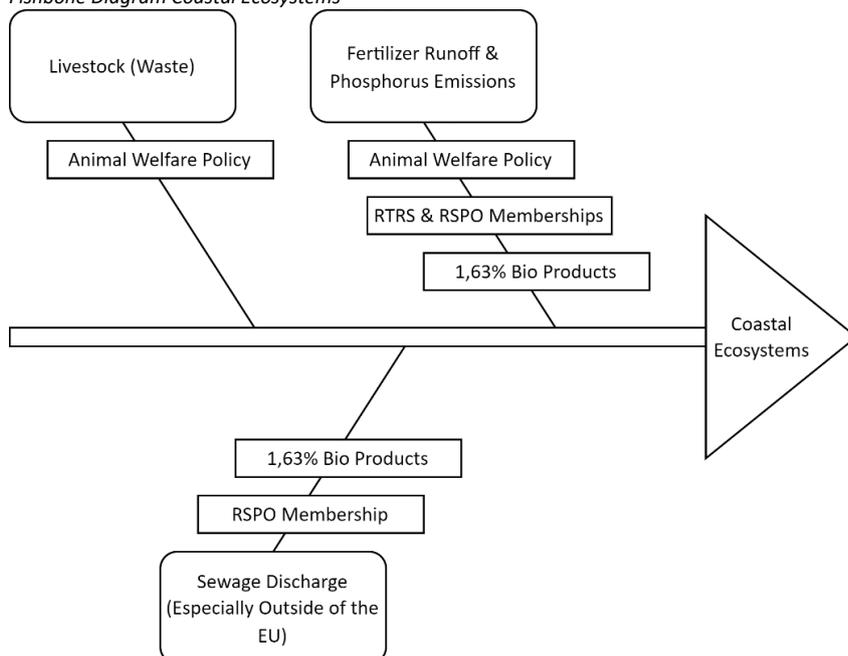


Figure 8 depicts the discussed causes measures with a profound impact on ocean ecosystems. Figure 8 works in the same fashion as the depiction above. One thing to note is that many of the measures that were assigned to ocean ecosystems also help improve the environment in coastal ecosystems due to a close connection of the two. Assessing the root causes, and METRO's responses, it becomes apparent that METRO relies heavily on policies with regards to fishing, and its own measures with regards to emissions and plastic pollution. The former brings an important issue with it, the exclusion of smaller fisheries. This phenomenon was already investigated in an earlier chapter. Stated multiple times by the United Nations, it is useful to include smaller suppliers/smallholder farmers in the value chain – since they are most likely to practice more sustainable farming/fishing. The **integration of smaller farmers/fishers** would help solve multiple problems at once. (1) Raw material shortages would affect METRO as much, due to a diversification of the supplier side. This is a practice that was researched by Birhanu et al. (2014) when he mentioned the “pooling of suppliers to hedge uncertainties” (p.2295) as a possible solution for the problems of agile supply chains. (2) A vertical integration of smallholder farmers/fishers, and generally smaller organisations throughout the agri-food supply chain, as proposed by Davis et al. (2021), could assist in the negation of staff shortages within the supply chain – as mentioned in METRO's (2021a) annual report. The two mentioned factors would only be positive side effects, considering the main goal of biodiversity. The second takeaway concerns METRO's strategy to energy efficiency and its behaviour towards electric mobility. Throughout its annual report, METRO (2021a) emphasized incentives to push employees toward electric cars – though electric cars are not required. A **switch from incentives to obligations with regards to electric mobility in company cars** would allow METRO to better work with its strategy. As mentioned in this thesis, METRO stated that more and more sustainable electric energy is being used. This fact is complemented by METRO's ambitions to build a more robust infrastructure for electric mobility, building, for example, charging stations for employees. If METRO were to make it an obligation that new company cars are required to be electric, METRO Germany alone could save up to 2,374kg of CO₂ per year (See Appendix H for the full calculation). This is the equivalent of a 10,500km journey with a conventional plane, roughly the flight distance from Berlin to Singapore.

Figure 8

Fishbone Diagram Ocean Ecosystems

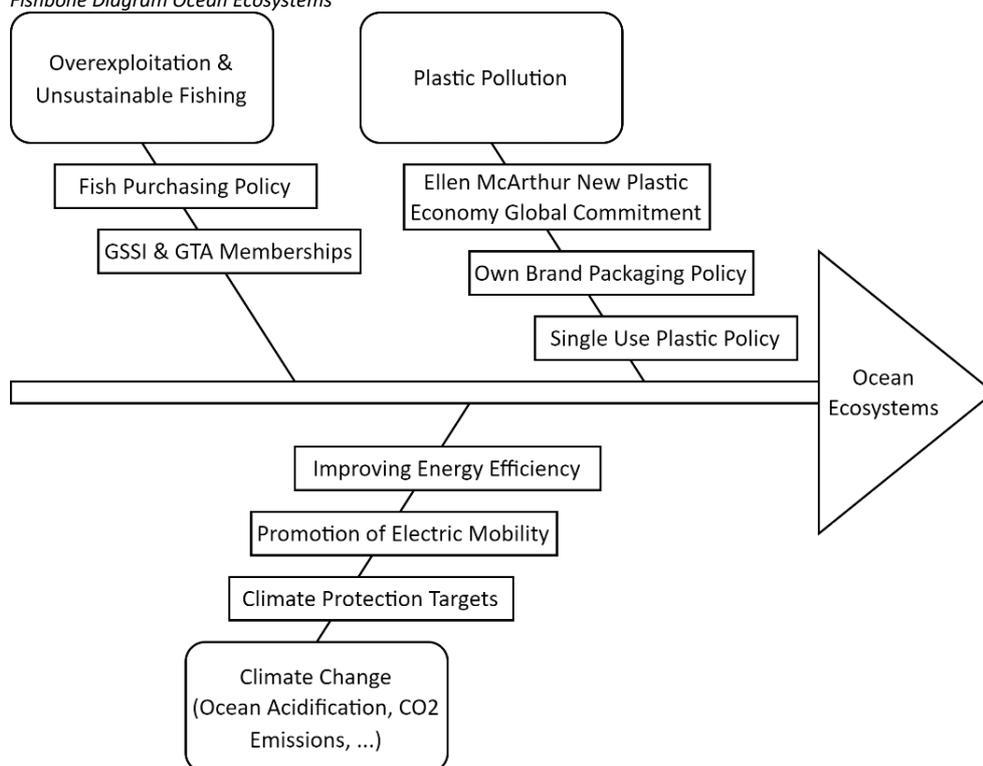
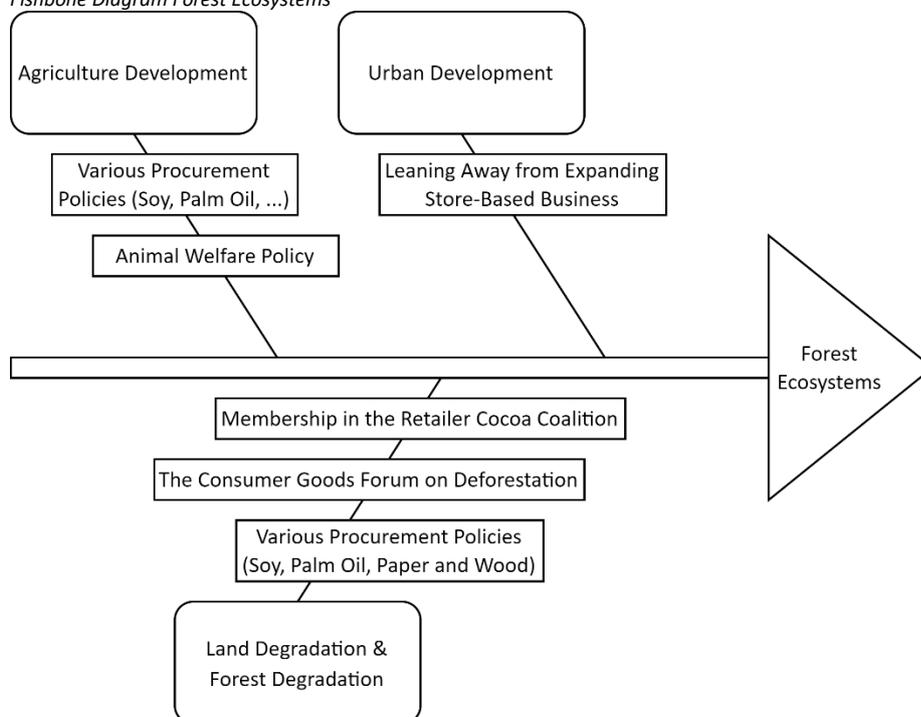


Figure 9 shows all relevant measures of METRO that have an impact of agriculture development, urban development, and land degradation. A lot of the focus points within procurement policies, but also other memberships, evolve around product that are not primarily produced within European borders. Soy, palm oil, and wood often comes from other continents – and thus, the production/farming abides other rules/guidelines, if any – lowering standards and safety (The Economist, 2021). Within the European Union, it is possible to certify products using certain labels. These labels do not always exist for imported products and outside of the European Union, regulations change between every country (METRO Cash & Carry India Pvt. Ltd., 2020a). This is why most wholesalers such as METRO or Sainsbury fall back on generalized procurement policies based on company coalitions. These are also often criticised for a lack of focus and missing assertiveness. That is why **bio agriculture must also be promoted outside of the European Union**. METRO should formulate its own criteria, based on the European Union’s bio label (European Commission, 2022a), in order to apply it to suppliers worldwide. Important areas to consider are (1) using energy and natural resources responsibly, (2) preserving biological diversity, (3) maintaining the ecological balance, (4) preserving soil fertility, and (5) protecting the water quality (European Commission, 2022a).

Figure 9

Fishbone Diagram Forest Ecosystems



3.3.2. Key Issues

Table 8 provides an overview of the key issues that were outlined in the previous sub-chapter. The ‘Target’ describes the area of biodiversity protection that a goal is aimed at, ‘Goals’ describes the concrete ambition, “Indicator” shows the proposed metric to track the development of the goal, and ‘Alignment’ indicates the which SDG is being dealt with in every goal.

Table 8.

Recommendations in Science-Based Targets Format

Target	Goals	Guidance	Indicator	Alignment
LBP	Meat procurement policy	SMART goal 1	Proportion of meat sourced	SDG 14/15

<i>Agriculture/LBP</i>	Bio label	SMART goal 2	Proportion of bio-labelled products	SDG 14/15
<i>Agriculture</i>	Diversification of supplier	SMART goal 3	Proportion of products provided by smallholder farmers/producers	SDG 14
<i>Climate</i>	Electric mobility	SMART goal 4	CO ₂ emissions	SDG 14
<i>Use Change (Land)</i>	Bio-agriculture outside of the European Union	SMART goal 5	Proportion of non-European suppliers that fit bio criteria	SDG 15

Note. Table structure and style of goal formulation adapted from *Science Based Targets Network* (2020)

The 'Guidance' index tab should show the fully formulated SMART goal – but for visibility purposes, table 9 contains all five SMART formulations.

Table 9.

SMART Goals

Goals	Explanation
1. Develop and implement an own meat procurement policy, at competitors standards, by focussing on topics such as biosecurity, health, and welfare of livestock, trained and competent staff, and minimised factory farming, to increase the proportion of sustainably procured meat to regular meat to 75% until FY2030.	The share of certified own-brand products has risen by 14% from 2021 to 2022 (METRO AG, 2022b). A slightly slower growth rate for non-own-brand products is considered throughout seven years until 2030.
2. Increase the proportion of bio-labelled products to regular products, within METRO stores, to 35% until FY2030.	It can be argued that the 20% own-brand products are easier to adapt. The other 15% are expected to be achieved through either new products being offered or existing products being changed through communication with suppliers.
3. Increase the proportion of products provided by smallholder farmers/producers to products provided by regular farmers/producers by 10% until FY2030.	There are over 2,000 separate suppliers of food and non-food products, of which approximately 1,300 supply exclusively food products (METRO Cash & Carry India Pvt. Ltd., 2020b). A 10% increase would account for 130 additional suppliers worldwide – a realistic assumption.
4. Increase the usage of electric vehicles by changing policies evolving around electric mobility and reduce CO ₂ emissions cause by company cars by 30% until FY2030.	A 30% reduction of CO ₂ emissions is the estimated to be feasible (see Appendix H). Company cars are often leased for a time span of four years, making the goal achievable within a time span of seven years until 2030.
5. Promote biological agriculture outside of the European Union by increasing the percentage of	Arguments have been presented for an increase of bio-labelled products to 35%.

non-European suppliers that fit bio criteria to regular suppliers to 20% until FY2030.	This goal asks for similar regulations, though adapted and worldwide. Thus, an increase to 20% is seen as reasonable.
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3.3.3. Interim Conclusion on Key Issue Evaluation

The sub-question to be answered in chapter 3.3. is “Which actions are needed that help to overcome the causes of biodiversity loss?”. Chapter 3.3. dealt with the formulation of recommendations and the evaluation of such. It built on the results from chapter 3.1. and 3.2. in that it combines the interim conclusions and mirrors METRO’s current processes with the triggers for biodiversity loss. This allowed for the identification of missing links, which ultimately translated into five actionable recommendations.

Goal 1: *“Develop and implement an own meat procurement policy, at competitors standards, by focussing on topics such as biosecurity, health, and welfare of livestock, trained and competent staff, and minimised factory farming, to increase the proportion of sustainably procured meat to regular meat to 75% until FY2030.”* The first goal is aimed at the improvement of quality/sustainability standards within animal farms, such as a reduction of CO₂ emissions, livestock (waste), and general factory farming. The mentioned factors are also expected to positively impact other connected businesses, such as the production of animal feed through soy.

Goal 2: *“Increase the proportion of bio-labelled products to regular products, within METRO stores, to 35% until FY2030”* The second goal will improve the overall product assortment of METRO, especially within the biggest markets in the European Union. The bio label is already established within the European Union and METRO, and it is thus easier to expand it. The European bio label and the United Nations also use the same reasoning when formulating measures – meaning that the bio label covers many areas also mentioned by the United Nations.

Goal 3: *“Increase the proportion of products provided by smallholder farmers/producers to products provided by regular farmers/producers by 10% until FY2030.”* The third goal aims at a diversification of the supplier side. Next to the discussed biodiversity-improving factors, a vertical integration of smallholder farmers/producers might also assist with current logistics issues, outlined by METRO. Additionally, the diversification of suppliers might reduce supplier side raw material shortages – which is relevant for METRO as mentioned in its risk analysis (METRO AG, 2021a).

Goal 4: *“Increase the usage of electric vehicles by changing policies evolving around electric mobility and reduce CO₂ emissions cause by company cars by 30% until FY2030.”* The fourth goal builds on the ever-expanding electricity infrastructure of METRO. Not only did the number of charging stations at METRO facilities grow in the past years – the electricity mix also hints at more sustainably generated electricity. The success of this goal might also cause further electric mobility within METRO’s logistics, due to a further expansion of, for example, charging stations.

Goal 5: *“Promote biological agriculture outside of the European Union by increasing the percentage of non-European suppliers that fit bio criteria to regular suppliers to 20% until FY2030.”* The fifth goal goes hand in hand with the second, in that it promotes European standards around the world. The proposed standards are loosely based on the bio label and will need adaption for specific countries, but generally, the bio label serves as a good guideline to improve the sustainability around the world.

The results presented in chapter 3.3. are the goals that are recommended in order to reach the United Nations’ 14th and 15th sustainable development goals. They are formulated to be as specific as possible to make the implementation easier. The results of chapter 3.3. serve as the last step before the final evaluation of recommendations and their ranking in chapter 3.4.

3.4. Evaluation of Possible Actions

3.4.1. Criteria and Solutions

The last step within this research project is to evaluate the provided recommendations using a specific set of criteria. The criteria chosen for this evaluation are the expected effectiveness, the likelihood of succeeding, and the synergy with existing operations/commitments. The effectiveness of a measure indicates the urgency, or rather the optimal focus going forward. The likelihood of succeeding is a measure needed to assess the chances of positive impact occurring. Since biodiversity is such a broad and ambitious topic, the likelihood of positive outcomes is a valid factor to consider. Lastly, the synergy between the proposed measures and existing commitments should be assessed, since a good synergy allows for more effective strategies overall. The evaluations will be based on existing literature, as well as expert interviews with Ms Giesenkamp (see Appendix C for the full interview transcript) and Ms Billinger (see Appendix J for the full interview transcript).

The chosen criteria have different degrees of impact on the overall grading since some criteria are more relevant than others with respect to the United Nation's sustainable development goals. Looking at the main research question, it becomes apparent that it is most important for METRO to be able to report change in the first place. With respect to the AHP, the 'likelihood of succeeding' makes up 58.81% of the overall grading. The effectiveness of a measure speaks for the quality and possible impact of the recommendation, both of which could be assessed through future reporting regulations. Thus, 'effectiveness makes up 32.3% of the overall grading. Lastly, the synergy with existing commitments is a criterion most relevant for METRO. Since the topic of biodiversity is very broad, it is important to be very efficient in terms of resources. The creation of policies that achieve better results when paired with already existing measures is thus a valuable part of strategy formulation. Thus, 'synergy with other commitments' makes up 8.86% of the overall grading (see Appendix M for the detailed calculations behind the AHP criteria).

Recommendation #1: A separate meat procurement policy would have lasting effects on the mass production of animal products, especially factory farming. The interview with Ms Giesenkamp (see Appendix C) has shown that factory farming is considered one of the major drivers, accelerating problems such as *eutrophication*. It was also brought forward that feed production is closely connected to the production of animal products, posing a threat to biodiversity through irresponsible farming methods. Generally, plant and animal products cannot be decoupled – and should always be dealt with as one. The conversation with Ms Billinger (see Appendix J) infers that feed production is a good lever for change, emphasizing that the sustainability of a product is always connected to the sustainability between actors within the value chain. Ms Giesenkamp expects future regulations, with regards to factory farming, to be formulated in the future. This would lower the risk of long-term viability mentioned by Ms Billinger. Generally, the proposed actions should be sustainable for the long-term, otherwise a long-lasting positive effect on biodiversity cannot be expected. Recommendation #1 has many promising synergies with existing policies, inter alia, the animal welfare policy and the soy procurement policy. Together these policies cover all relevant areas proposed by the United Nations with respect to animal products. Soy procurement is closely associated with feed production, as pointed out by Ms Giesenkamp, and is thus, as a connecting industry, seen as a strong lever for change together with a new meat procurement policy. Impacting multiple actors on the value chain was also proposed multiple times by Ms Billinger.

Recommendation #2: Increasing the percentage of bio labelled products aims at promoting biological/organic agriculture. As indicated by the coding categories (see Appendix E), Ms Giesenkamp mentioned both positive and negative aspects of biological agriculture, though it must be mentioned that the latter can be mostly ironed out by the promotion of biological agriculture as a whole. Positive aspects of biological/organic agriculture include future proofness and a limited use of pesticides/artificial fertilizers. In contrast, regular agriculture, especially in industrialized countries, often opposes biodiversity protection through its way of working. This is underlined by Ms Billinger

(see Appendix J) stating that not only the product, but also the production must be considered. One-sided, and often optimized, processes tend to diminish biodiversity – contributing to biological agriculture as a big lever. Ms Giesenkamp stated that up to 70% of all the agriculture in the future could be organic. Although this trend is also affected by bio agriculture slowly adopting practices from regular agriculture to increase productivity. Since there are not many ‘unknown variables’ when increasing the usage of the bio label, the expansion of it is likely to achieve the expected results. The bio label covers very basic aspects of sustainability, thus completing existing procurement policies and aligning with the United Nation’s ambitions. Furthermore, recommendation #2 can be combined with other recommendations, for example recommendation #3, in order to achieve even better results.

Recommendation #3: Increasing the percentage of smallholder farmers and small/medium sized suppliers can show multiple positive impacts within the value chain. On a general note, Ms Giesenkamp (see Appendix C) mentioned smaller suppliers with regards to less factory farming, less use of artificial fertilizers, less monocultures, and often more sustainable farming through, for example, rotation of crops. Throughout the coding process, within the interview with Ms Billinger (see Appendix K), an overarching theme of diversity within the value chain was identified. This diversity directly correlates to smallholder farmers. Connected factors are sustainability as a unique selling point for smaller farmers, access to the general trading pool, stronger upcycling, more balanced processes, and diversity in processes. As with every business decision, there are some risks connected to recommendation #3. Ms Billinger mentioned reputational risks, long-term viability, and the reliability of potential new business partners. Ms Giesenkamp also mentioned that small and medium sized organisations might be difficult to distinguish. As already mentioned above, recommendation #3 will help with the diversification of suppliers. This can assist METRO and the environment on multiple fronts. More diverse suppliers will ease raw material supply shortages, or at least make them less frequent. Furthermore, a vertical integration of suppliers can also relieve stress from the logistics infrastructure – stresses such as a shortage of drivers.

Recommendation #4: Increasing the usage of electric vehicles by METRO employees is a safe and direct way to reduce CO₂ emissions. The swapping of fuel-powered cars with electric cars is a measure that was already considered by METRO. METRO tries to incentivise the usage of electric vehicles by making the environment at METRO spaces more electric vehicle friendly. Thus, the practice of using electric vehicles to limit CO₂ emissions is nothing new. The proposed measure of recommendation #4 is easy to implement and it can be easily achieved until 2030, due to the average leasing time of company cars being 24 to 36 months (Carvolution, 2021). Downsides of this recommendation might include a dissatisfaction amongst employees/potential new employees and subsequently less company cars being used. Although this can be mitigated through an expansion of the electric mobility infrastructure at METRO. Recommendation #4 synergizes with the current developments with regards to the electric infrastructure at METRO facilities. The current electricity mix shows an increase in sustainable electricity. Most revenue is still generated through non-online-wholesale streams, meaning that although growth slowed down, METRO facilities will still be relevant in the near future, especially until 2030.

Recommendation #5: The promotion of biological agriculture outside of the European Union is an important topic to consider. Many standards that are required within the European Union do not exist in the same way in other countries. Especially the soy and palm oil production often does not abide clear and strict regulations. Many of the arguments for recommendation #2 apply in this scenario as well. Ms Billinger (see Appendix J) stresses the importance of diversity in measures in order to avoid tunnel vision. This includes more general standards for products produced around the world. Similarly, to recommendation #2, the long-term viability and reliability of business partners poses a concern. Recommendation #5 works well together with recommendation #2 in that it creates a united perspective on biological agriculture. This also includes synergies with several of METRO’s procurement policies. According to the interview with Ms Giesenkamp (see Appendix C), sustainable

farming can be mentioned in connection with small/medium sized farmers. This means a promotion of biological agriculture can be combined with the search for new suppliers, as outlined in recommendation #3.

After assessing the recommendations using the information provided by the expert interviews, the AHP will be used to apply the above-defined criteria on the recommendations and conclude chapter 3.4. The above-mentioned percentages for the criteria are calculated in the same way as the evaluation of the recommendations. The process is as follows: First, a matrix is created that confronts all five recommendations. This is done using fractions (e.g. 1/2, 3/1, 1/5, etc.). In the next step, the content of this matrix is written in decimals. After that, the matrix is squared. Using the example of 'effectiveness', the Table 10 can be created:

Table 10.

AHP Matrix Depiction

Effectiveness	<i>R1</i>	<i>R2</i>	<i>R3</i>	<i>R4</i>	<i>R5</i>
<i>R1</i>	5,0000	20,0000	10,0000	20,0000	10,0000
<i>R2</i>	1,2500	5,0000	2,5000	5,0000	2,5000
<i>R3</i>	2,5000	10,0000	5,0000	10,0000	5,0000
<i>R4</i>	1,2500	5,0000	2,5000	5,0000	2,5000
<i>R5</i>	2,5000	10,0000	5,0000	10,0000	5,0000

The following matrix results from table 10:

$$\begin{pmatrix} 5,0000 & 20,0000 & 10,0000 & 20,0000 & 10,0000 \\ 1,2500 & 5,0000 & 2,5000 & 5,0000 & 2,5000 \\ 2,5000 & 10,0000 & 5,0000 & 10,0000 & 5,0000 \\ 1,2500 & 5,0000 & 2,5000 & 5,0000 & 2,5000 \\ 2,5000 & 10,0000 & 5,0000 & 10,0000 & 5,0000 \end{pmatrix} = R$$

Every position within the matrix can be defined as $R_{1,1}$, $R_{1,2}$, $R_{1,3}$, etc. Every row within this matrix is defined as "i" and every column is defined as "j". This means both "i" and "j" can be every number from one to five. For example, $R_{1,1}$ would be 5,0000. With this clarified, the formula to calculate the normalised values, which are needed for the final calculation, is as follows (see Appendix M for all calculations):

$$\text{Normalised value} = \frac{\sum_{j=1}^5 R_{i,j}}{\sum_{i=1}^5 \sum_{j=1}^5 R_{i,j}}$$

After having calculated the normalised values for all criteria and for all recommendations with respect to all criteria, the normalised values will be multiplied with each other, and each alternative's value will be added to each other (see Appendix M for the complete calculation). The results show recommendation #4 with 32.38%, recommendation #1 with 21.06%, recommendation #2 with 17.10%, recommendation #3 with 16.01%, and recommendation #5 with 13.45%.

3.4.2. Interim Conclusion on Evaluation

Concluding on the results of the AHP, and based on effectiveness, likelihood of success, and synergy with other commitments, METRO should set the focus accordingly: (1) Electric mobility change, (2) meat procurement policy, (3) bio-labelling, (4) smallholder farmers, and (5) biological agriculture outside of the European Union. Following this structure will ensure a more effective and quicker handling of biodiversity loss within METRO's value chain.

4. Conclusion

The main research question asked for this thesis is: *“What changes can METRO implement to assist in biodiversity protection in order to comply with the 14/15th goal of the United Nations’ sustainable development goals?”*. In order to be better prepared for the future, recommendations have been formulated that are based on an assessment of the scientific view of biodiversity, as well as the organisational perspective.

There are three areas within biodiversity that are most often mentioned within literature and directly references by the United Nations. These are coastal ecosystems, ocean ecosystem, and forest ecosystem. Besides a few overlapping factors, these different ecosystems show different causes for the loss of biodiversity. The analysis has curated a list of the ten most influential causes for biodiversity loss, according to the investigated literature. The following causes stand out: fertilizer runoff, livestock waste, sewage discharge, plastic pollution, overexploitation of marine resources, CO₂ emissions, *acidification*, agriculture development, urban development, as well as land and forest degradation. These causes have shown the highest rate of appearance/referencing, answering the first sub-question: *“What are the most prominent causes of biodiversity loss?”*.

The areas investigated at METRO are logistics, firm infrastructure/strategy, operations, and procurement. The most relevant/striking discoveries include, inter alia, the importance of the store-based business for METRO. The store-based business influences the overall logistics, electricity mix, and electric mobility strategies. Furthermore, the current procurement policies are very own brand focussed and based on often criticised labels. Additionally, there is no concrete meat procurement policy. The investigation has shown that agriculture plays a key part and needs changes that can be achieved through influencing suppliers and business partners. The mentioned factors also have an impact on METRO’s product assortment, of which only minimal parts consist of bio/organic agriculture products. The mentioned factors answer the second sub-question: *“What parts from METRO’s value chain are most relevant for the protection of biodiversity?”*.

By mirroring the results of sub-question one and two, missing links can be identified and translated into actions. First, to target LBPs, a separate meat procurement policy is advised (#1). Second, to target agriculture/LBPs, an expansion of the bio label is proposed (#2). Third, to target agriculture, a diversification of suppliers is recommended, helping to solve a multitude of problems (#3). Fourth, to target climate change, an expansion of electric mobility has been identified as a useful lever (#4). Lastly, to target changes in land use, the promotion of biological agriculture outside of the European Union is recommended (#5). Together, these results answer the third sub-question: *“Which actions are needed to overcome the causes of biodiversity loss?”*.

The above presented actions are evaluated by effectiveness (32.33%), likelihood (58.81%), and synergy with other commitments (8.86%). Using this evaluation method, the recommendation should be focussed on in the following order: Recommendation #4 (32.38%), recommendation #1 (21.06%), recommendation #2 (17.10%), recommendation #3 (16.01%), and recommendation #5 (13.45%), answering the fourth sub-question: *“Which recommendation are best suited to reach the United Nations’ sustainable development goals?”*.

Overall, the conclusions show that METRO must enact a multi-functional approach. This approach must consist of actions directly relating to METRO’s business operations and actions that aim at the influencing of business partners, mostly suppliers of raw materials and agricultural products. These proposed recommendations should be dealt with in a specific order, referring to the developed criteria. A more detailed look at the developed recommendations and their consequences is provided in the following chapter.

5. Recommendations

Table 11 depicts the final list of recommendations, as well as the order in which they should be addressed by METRO. The provided goals will help minimise the loss of biodiversity in three different types of ecosystems. The recommendations are designed to cover many different fields, such as agriculture, land use change, LBPs, and climate, as these are all referenced by the United Nations and measures are likely to be enforced in these areas. Through either directly implementing or using them as a basis for strategy formulation, METRO will be better prepared for upcoming challenges concerning the topic of biodiversity protection.

Table 11.

Final Recommendations

Order	Recommendations
1	Increase the usage of electric vehicles by changing policies evolving around electric mobility and reduce CO ₂ emissions cause by company cars by 30% until FY2030.
2	Develop and implement an own meat procurement policy, at competitors standards, by focussing on topics such as biosecurity, health, and welfare of livestock, trained and competent staff, and minimised factory farming, to increase the proportion of sustainably procured meat to regular meat to 75% until FY2030.
3	Increase the proportion of bio-labelled products to regular products, within METRO stores, to 35% until FY2030.
4	Increase the proportion of products provided by smallholder farmers/producers to products provided by regular farmers/producers by 10% until FY2030.
5	Promote biological agriculture outside of the European Union by increasing the percentage of non-European suppliers that fit bio criteria to regular suppliers to 20% until FY2030.

Implementing the recommendations listed in table 11, or variations of such, will require certain resources. In the following, the recommendation numbers (R#) refer to the order presented in table 11. R#1 might result in a weaker negotiation position with new employees or upset current employees due to a change of the status quo. Other than that, there are no resource implications expected. Depending on the existing contracts for company cars (roughly four years), R#1 should be started immediately. There is little managerial work to be done, meaning R#1 can be fulfilled during regular business. R#2 requires managerial efforts in the formulation and development of the new procurement policy. The additional costs of such an undertaking are connected with that. Further risks include the long-term reliability of new business partners (due to different production capacities), as well as a potential necessary increase of product costs, if current revenue levels are to be sustained. R#3 is the expansion of an already used label. This results in less time pressure due to existing experience with the label. This recommendation will result either in an expansion of the product portfolio or the replacement of current products in the assortment. This can result in planning uncertainties, though no direct additional costs are expected. R#4, again, holds the risk of uncertain reliability. Additionally, a lot of planning, both managerial and logistical, is necessary. Especially the scouting phase is expected to take up a lot of time. Furthermore, the success of this recommendation specifically is difficult to quantify, as the targeted companies, typically, do not use well-known labelling or extensive reporting. The last recommendation faces the same resource requirements as R#3, only with extra work necessary with regards to the scouting and managing of new suppliers. It must be mentioned, that although both negative and positive implications have been shown, all the work is expected to be necessary for the future of the METRO. Particularly the direct financial costs will be low due to the recommendations being mostly policy changes. Together, the presented recommendations, answer the main the research question. Lastly, the listed implications are mostly eventualities and not certainties. As already mentioned above, they might change together with regulations and are best considered as baselines.

6. Critical Appraisal

In this chapter, research design and the carried-out research will be critically appraised. In this bachelor thesis, several limitations with regards to data gathering, methodology, analysis, and subsequently the formulation of recommendations were found.

Concerning the limitations of research methods, it is apparent that more secondary than primary data was gathered. Usually, an even mix between the two results in more accurate assumptions. Furthermore, a lot of desk research was conducted if put in relation to the two interviews. With regards to the analysis, it is in question if the full potential of ATLAS.ti was utilized, as this was the first use case for the researcher. Lastly, the research topic itself was very complex and due to the present time limit, the used analysis methods could be stretched out. This increased the chance of certain misinterpretations – although unlikely. These mishaps might have resulted in the missing of some details but overall, the outcome of the research still represents what it was intended to show.

Throughout the research design, a lot of emphasis was put on the reliability and validity of data, inspecting both topics from a variety of angles. It was ensured that multiple types of each were achieved to create the best possible results. Thus, there is no direct problem to be expected with regards to the reliability and validity of the researched data. Other principles that ensure reliable/valid results exist, but those did not fit the research project. In order to cover these principles as well, the research design could have been adapted, but due to time and resource constraints, this was not seen as an option. Generally, literature reviews increase in representativeness and significance the more literature is scanned, but due to time limits, all resources were exhausted. Since the semi-structured interviews were held with experts, not many interviews were needed- There is only a minimal chance that certain viewpoints vary between interviewees. Nonetheless, to ensure effective triangulation, the interview partners were chosen based on their expertise and thus perspective on the same topic (research perspective & industry perspective)

The reliability and validity of the conclusion/recommendations relies heavily on the stability of the research design. Since the research design is considered to be well thought through – there are no specific issues to be identified with the presented recommendations. Although given more time and resources (especially insights into METRO), the recommendations could have been formulated even more specific to METRO, relating better to internal issues.

There are multiple suggestions for follow-up research, since this bachelor thesis is the first of its kind to deal with biodiversity protection in food wholesaling. There were several factors identified within this research project that were out of scope. Namely, the effect of economic zones on biodiversity loss, the specific effect of small/medium farmers on biodiversity loss, and lastly the formulation of country/region specific recommendations based on *key biodiversity areas*. Further research into these topics would not only be of interest for the Research Group Business Innovation, but it would also benefit wholesalers such as METRO for even more detailed strategy formulation, once new guidelines are decided on.

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Appendix A
Statement of Authenticity

I hereby solemnly declare,

1. that I myself wrote my graduation report, without the assistance of any third party;
2. that in my report, I identified and specified all direct literal quotes from literature and indirect quotes (ideas/indirect quotations) from other authors.
3. that the content of the copy version equals the content of the digital version handed in

I am fully aware that any violation of this code may result in disadvantageous consequences for me (for example withdrawal of study credits and, in the case of a repeated violation, withdrawal of complete study units). If fraud can be proved, I will be required to bear the costs of investigation into and sourcing of the original document.

Venlo, 06 July 2022

N. Meisel

Appendix B

Interview Biodiversity Transcript, Ms Giesenkamp (German)

Niklas Meisel: Dann warten wir mal kurz. Alles klar. Er müsste jetzt laufen. Perfekt. Gut. Dann fangen wir an mit der ersten Frage. Wie groß sehen Sie die Rolle der Landwirtschaft/Agrarindustrie bei dem Schutz der allgemeinen Biodiversität?

Heidi Giesenkamp: Grundsätzlich glaube ich, dass die heutige Landwirtschaft oder die Agrarindustrie dem Schutz der Biodiversität entgegensteht, weil oberstes Ziel ist, tatsächlich auf den vorhandenen Böden so viel wie möglich zu erwirtschaften. Und da ist die Biodiversität im Grunde genommen im Weg, also je. Je mehr Diversität ich haben möchte, desto mehr Einschränkungen habe ich bei der Produktion, wenn ich rein an homogene Bestände und einheitliche Erträge und bestmögliche Inhaltsstoffe denke. Das heißt, wenn ich Geld verdienen möchte mit einem Boden, dann muss ich so viel wie möglich ernten, in einer hohen Qualität, möglichst gleichmäßig. Und das schaffe ich nur, indem ich möglichst viel dünge, indem ich sehr stark auf Pflanzenschutz setze. Und das setzt im Grunde genommen auch voraus, dass ich gegen verschiedene Unkräuter in dem Sinne oder bei gerade vorgehe, mit Herbiziden. Das schmälert schon mal immens meine Biodiversität. Wenn ich diese Kräuter nicht habe, habe ich automatisch weniger Insektenpopulation. Viele der Mittel, die eingesetzt werden, verändern auch die Zusammensetzung im Boden, das heißt die Mikroorganismen und auch die höheren Tiere. Verschiedene Mollusken werden eingeschränkt, Käfer alles Mögliche. Und ich schädige natürlich auch das Wasser. Und bei Abdrift sowohl von Düngemitteln, Abschwächungen und ins Grundwasser und auch von verschiedenen Pflanzenschutzmitteln verändere ich meine Umgebung im Allgemeinen. Sprich: Alles das, was moderne Landwirtschaft und Agrarindustrie im Moment ausmacht, ist eigentlich absolut kontraproduktiv, wenn ich Biodiversität fördern möchte. Wenn ich mir die zweite Möglichkeit Biolandwirtschaft oder biologische Landwirtschaft ansehe, war das viele Jahre lang so, dass ich damit Biodiversität fördern konnte. Im Moment ist es aber auch so, dass die Biolandwirtschaft sehr stark auf ihre Erträge achten müssen und damit auch da die Biodiversität immer mehr eingeschränkt wird, weil auch diese dann verschiedene Mittel einsetzen oder bestimmte Produktionsweisen und auch mechanische Bodenbearbeitung, die dem Ganzen entgegenstehen.

Niklas Meisel: Wo genau sehen Sie den Unterschied zwischen Bio-Landwirten und den normalen Landwirten in der Agrarindustrie?

Heidi Giesenkamp: Im Moment ist, glaube ich, der Abstand zwischen beiden oder der Unterschied immer kleiner werdend. Es gibt keinen riesigen Unterschied mehr. Reine konventionelle Landwirtschaft ist auf dem Rückzug. Das heißt, es ist immer mehr integrierte Landwirtschaft, die kombiniert die besten Möglichkeiten aus beiden Welten, also aus dem konventionellen Anbau, sprich die chemischen Düngemittel und auch Pflanzenschutzmittel, mit nachhaltiger Produktion. Biolandwirtschaft heißt für mich persönlich, dass ich möglichst Pestizid-arm produziere, wobei auch in der Biolandwirtschaft sehr, sehr viele Pflanzenschutzmittel zugelassen sind, die auch nachhaltig schädigen. Also die Kupfer Spritzmittel, Schwefel Spritzmittel und Co. schädigen alle sehr stark, sowohl Insekten als auch Pilz Population als auch die Bodenzusammensetzung. Das ist auch da vorgegeben. Der Nachteil an biologischer Produktion ist auch die starke mechanische Bearbeitung des Bodens, die damit einhergeht. Sprich, wenn ich gegen verschiedene Unkräuter etwas tun möchte und möchte, den ja die Kräuter reduzieren, muss ich sehr stark wendend arbeiten im Boden, das heißt entweder pflügen oder grubbern und damit die Oberfläche bearbeiten, was die Mikroorganismen wieder schädigt. Insofern schwierig zu sagen. Der Vorteil an der biologischen Produktion ist tatsächlich, dass ich mit organischen Düngemitteln arbeite und damit Humus aufbringe und so die Zusammensetzung des Bodens und Humus und CO₂ speichere. Das finde ich sehr positiv. Weniger Pflanzenschutzmittel stimmt auch, aber teilweise nur bedingt. Ich glaube, in den nächsten Jahren werden die Einschränkungen da stärker werden. Insofern wird es hoffentlich nachhaltiger. Was die Erträge angeht, nähern sich beide immer mehr an, insofern ist da kein großer Unterschied mehr zu sehen.

Niklas Meisel: Alles klar, vielen Dank. Dann gehen wir, würde ich mal sagen, zur zweiten Frage über. Viele Probleme werden oft auf die Produktion von Tierprodukten zurückgeführt, in dem sie dann die Futter Produktion für die Tiere und die damit zusammenhängenden, zum Beispiel die Abfälle der Regenwälder für Soja Produktion etc. die Abfälle, die durch Tierprodukte entsteht, einmal durch die Tiere selbst, zum Beispiel unter anderem auch der CO₂ Ausstoß bei der Produktion von Tierprodukten. Sollte Ihrer Meinung nach dort der Fokus bei der Formulierung von neuen Maßnahmen liegen oder wäre das zu kurz gedacht? Gibt es da zum Beispiel andere Punkte innerhalb der Landwirtschaft, die man eher angehen sollte?

Heidi Giesenkamp: Na ja, insgesamt sehr komplexe und schwierige Frage. Also, ich sehe das zweigeteilt. Punkt eins ist, ich kann Pflanzenproduktion nicht komplett von der Tierproduktion abkoppeln. Wenn ich Pflanzen produzieren möchte, brauche ich Nährstoffe und die kann ich mir auf verschiedenen Wegen holen. Entweder hole ich mir klassische Mineraldünger, die irgendwo entweder chemisch produziert oder irgendwo abgebaut werden müssen im Falle von Roh Phosphat. Da schädige ich dann auch extrem die Umgebung und die Landschaft, wie zum Beispiel in Marokko, wo ganze Berge abgegraben werden oder wie bei Kali und Salz, wo tatsächlich Mineraldünger aus dem Gestein gelöst werden. Das wäre tatsächlich ein Produzieren ohne tierische Produkte. Ich kann damit düngen und setze keinerlei tierische Anteile ein. Wenn ich aber in geschlossenen Kreisläufen produzieren möchte, dann brauche ich im Grunde genommen die Ausscheidungen des Tieres in Form von Dung, um meine Felder entsprechend zu bewirtschaften und Nährstoffe zuzuführen. Alternativ wäre rein vegane Landwirtschaft theoretisch möglich, indem ich pflanzliche Reste wie Putzreste, Blätter, Stroh zum Düngen nutze. Aber die Nährstoffe, die da eingebracht werden, führen dann zu immensen Mindererträgen und reichen wahrscheinlich nicht aus, um die Anzahl der Menschen auf unserem Planeten zu ernähren. Insofern bin ich für Tierproduktion, aber in stark reduzierten Maßen. Das heißt man müsste die Tierproduktion so reduzieren, dass es keine Massentierhaltung mehr gibt, dass die Anzahl der Tiere, die pro Hektar gehalten werden dürfen, immens reduziert wird, sodass ich auf ein verträgliches Maß zurückkomme und die Böden dann auch diese Einheiten oder Fäkalien auch verwerten und nutzen können.

Heidi Giesenkamp: Heißt im Umkehrschluss, das, was ich im Moment an Massen Tierproduktion habe, führt auch zur Eutrophierung von Gewässern, weil ich viel mehr Ausscheidungen der Tiere pro Hektar habe als das oder als unsere Böden in der Lage sind zu verkraften. Die Futtermittel Produktion ist tatsächlich ein Riesenproblem aus meiner Sicht. Soja aus Übersee sollte eigentlich gar nicht eingesetzt werden. Optimal wäre eine Vorgabe, dass die Tiere regional ernährt werden müssen. Das heißt nur das, was die Felder vor Ort hergeben und als Tierfutter genutzt werden kann. Daran sollten dann auch die Tierzahlen gebunden sein. Das heißt ein Import von Soja aus Brasilien, für das Regenwald gerodet werden muss, sollte möglichst verboten werden, denn im Grunde genommen sind das weltweite Warenströme. Ich nutze pflanzliches Eiweiß aus Übersee, um hier tierisches Eiweiß zu produzieren und das ist nicht zielführend. Was man alternativ sicherlich machen kann, sind, wenn Reste aus der Nahrungsmittelindustrie da sind, die in anderes hochwertiges Eiweiß umzuwandeln, zum Beispiel in Form von Insekten. Dass ich Reststoffe auch aus der Nahrungsmittelindustrie, egal ob Brot, Reste oder was auch immer da anfällt, als Futter nutze, um zum Beispiel ‚Soldier Flies‘, also in Insekten, Larven oder Maden zu ernähren. Die können dann entweder direkt in die menschliche Ernährung gehen, vermahlen als Mehl in Form von Burgern oder was auch immer oder dann theoretisch auch wieder Geflügel ernähren, weil das auch die natürlichere Ernährung für Hühner zum Beispiel ist, die ja auch im Boden Regenwürmer fressen würden, wenn ich die Tiere, die ich produzieren möchte, an wirklich die Fläche binde.

Heidi Giesenkamp: Das heißt nicht nur rechne, wie viel scheidet das Tier aus und auf welche Fläche kann ich das verteilen? Sondern auch was geben. Meine Böden in der Nähe und den Umkreis müsste man dann tatsächlich definieren. Das ist wieder sehr, sehr schwierig, wie weit man den Begriff

regional fasst. Aber wenn man, das in irgendeiner Form koppelt und man sagt Okay, wir haben in Deutschland so und so viel Hektar Agrarfläche, die ich nutze, sowohl für die Produktion von Lebensmitteln, für die menschliche Ernährung, also direkt zum Beispiel Brot, Getreide, Salate, Gemüse, Obst, was auch immer und dann noch gewisse Flächen nutze, um die Tiere hier vor Ort zu ernähren. Das kann entweder als Weidehaltung, was ich als weniger problematisch ansehe, in Form von Gras passieren oder Silage. Es gibt Flächen, die sind nicht tauglich für die Gemüse, Obst Produktion oder für Brotgetreide. Die sind aber als Weideflächen durchaus tauglich für Weidetiere. Extensiv zum Beispiel. Und dann würde ich sagen, ist das verträglich? Alles das, was wir jetzt haben, sprich Ställe mit 1000 Mastschweinen aufwärts, mit mehreren Stockwerken, Hühnern übereinander, das ist absolut kontraproduktiv und sollte in den nächsten Jahren immens zurückgefahren werden.

Heidi Giesenkamp: Da das privatwirtschaftlich glaube, ich nicht möglich ist, glaube ich, in dem Fall sind staatliche Verordnungen sinnvoll, weil die Landwirte müssen ja auch in der Lage sein, zurück und umzubauen. Und trotzdem wirtschaften zu können. Sie müssen eine Möglichkeit bekommen, von den jetzigen Produktionsweisen auf umweltverträgliche Produktionsweisen und vielleicht auch ganz untere Kulturen umzusteigen. Also warum nicht deutlich mehr Gemüse hier produzieren? Wir haben in Deutschland nur 30 % Eigenversorgung mit Gemüse. Da könnte man sicherlich was machen über verschiedene Produktionsweisen, um dann nicht mehr das Schwein in Form eines Schnitzels zu produzieren, sondern vielleicht hochwertiges, auch pflanzliches Eiweiß. Egal ob Süßlupine, ob Soja hier vor Ort. Dank Klimawandel wird es immer wärmer, das heißt Soja Produktion hier vor Ort ist auf Dauer sicherlich machbar und auch andere Eiweißpflanzen, die wir hier produzieren können. Also es muss eine Kombination sein. Ich bin nicht absolut gegen Tierproduktion, nur Pflanze rein wird nicht gehen, aber wir müssen es auf verträgliches Maß zurückführen und damit dann auch CO₂ Ausstoß senken. Abfälle sinnvoll weiter verwerten, egal ob Biogasanlage oder zum Beispiel Insekten Produktion und die Futterproduktion muss auch gebunden sein an die Tierzahlen. Nur das, was der Boden hergibt, sollte dann auch an Tiere verfüttert werden.

Niklas Meisel: Alles klar. Sie hatten ja gerade schon erzählt, dass es so einen kleinen Unterschied gab zwischen Landwirtschaft und der Biolandwirtschaft. Sehen Sie zufällig auch einen Trend von der Tierproduktion gestützten Landwirtschaft, die wir kennen, zu einer veganen Landwirtschaft? Oder ist das mehr so ein Seiten Thema?

Heidi Giesenkamp: Es glaube ich im Moment noch die absolute Nische der Nische, weil rein vegane Landwirtschaft sehr, sehr schwierig ist aufgrund der Nährstoff-Ströme. Also biologisch Gemüse anbauen ist überhaupt kein Problem. Wenn man sich damit gut auseinandersetzt, ist das machbar. Rein vegane Landwirtschaft würde ja bedeuten, ich muss immer wieder die Nährstoffe, die meinem Boden fehlen, in irgendeiner Form zuführen und in der Regel führe ich mehr vom oder hole ich mehr vom Acker runter, als wie ich über Kompost oder organische pflanzliche Masse wieder dem Boden zuführen kann. Das heißt, irgendwann komme ich in ein Nährstoffdefizit. Man kann sicherlich, wenn man sehr extensiv produziert, kann man das machen. Also es gibt ja genug Initiativen, solidarische Landwirtschaft, die dann auch mit weniger Ertrag pro Hektar trotzdem noch Erträge erwirtschaften können, über dieses Solidaritätsprinzip, sodass die Betriebe leben können. Das ist, glaube ich eine Möglichkeit das zu tun und das wird auch wachsen und stärker werden. Also, das wird sicherlich wachsen in den nächsten Jahren, aber auf sehr, sehr niedrigen Niveau. Ich glaube nicht, dass sich der Weg dahin bewegen wird. Ball ist so komplex. Auch für den Anbauer ist die Bioproduktion also die klassische Bioproduktion. Die wird aber immens zunehmen. Also ich denke, dass wir da in wenigen Jahren bei 30, 40, 50 % sind und dass die zukünftig auch ja der Hauptweg der Lebensmittelproduktion sein wird, dann wird klassisch konventionell, zumindest in, ja, in den Dach Ländern sicherlich Deutschland, Österreich, Schweiz, Niederlande wird, ja, meine Perspektive für die Zukunft wird die Biolandwirtschaft sicherlich hoffentlich irgendwann bei 70 bis 80 % landen und die konventionelle Landwirtschaft eher die Nische sein. Weltweit betrachtet sieht das vermutlich anders aus. Also aufgrund der Überbevölkerung in manchen Teilen der Welt wird man rein mit Biolandwirtschaft

sicherlich die Leute nicht ernähren können. Und da wird es dann weiterhin sehr stark klassische und konventionelle Landwirtschaft geben.

Niklas Meisel: Das also der Grund, warum vegane Landwirtschaft so kompliziert ist? Gar keine Preisfrage, wie es ja bei vielen Industrien ist. Von wegen es wird nicht genug Geld. Wie sagt man? Es wird nicht genug Geld in die Industrie gegeben, dass man sich die Sachen nicht aufbauen kann, sondern es ist eine rein biologische Grenze, die es da gibt?

Heidi Giesenkamp: Ja, also das ist tatsächlich beides ist. Einerseits kann ich, wenn ich rein vegan produzieren möchte, nur deutlich niedrige Erträge erwirtschaften und bin dann als Betrieb sicherlich ab einem gewissen Punkt nicht mehr in der Lage, die Betriebskosten zu stemmen. Das ist die finanzielle Geschichte. Ich glaube, Abnehmer für die so produzierten Produkte werden sich finden. Also der Anteil Vegetarier und Veganer sind in den letzten Jahren so immens gestiegen und wird das auch weiterhin tun, dass die Abnahmeseite sicherlich nicht das Problem ist. Also dass das gibt es so viele Leute, die das als absolut Förderns wert ansehen, dass sie auch bereit sind, höhere Preise für die Lebensmittel zu bezahlen, die so produziert wurden. Das Ding ist glaube ich, dass auf Dauer die Nährstoffkreisläufe so schwierig werden, dass man auf diesen Böden über Jahrzehnte hinweg dann immer weniger produzieren kann und es dann sicherlich nicht mehr ausreicht, um so einen Betrieb am Leben zu erhalten. Aber vielleicht finden sich ja auch da Lösungen. Sicherlich wird es da auch noch Weiterentwicklungen in der Forschung geben, um da vielleicht auch andere Abfallströme zu nutzen, um vielleicht städtische Abwässer auch zur Düngung bereitzustellen. Das ist die Frage, was davon dann in der rein veganen Landwirtschaft nutzbar sein wird. Ja, da. Da wo es Probleme gibt, wird es in Zukunft auch Lösungen geben. Aber stand jetzt würde ich vermuten, dass es auf Dauer nicht möglich ist.

Niklas Meisel: Alles klar, dann gehen wir zur Frage drei, im Hinblick auf die Abholzung von Wäldern und Monokulturen wird sich oft ausschließlich auf Soja und Palmöl konzentriert. Das sehen wir unter anderem auch in den sogenannten Commitments der Metro GmbH. Da wurden verschiedene Policies formuliert oder da wurden verschiedene Guidelines, an die sich gehalten wird, aufgeschrieben und da wird sich sehr stark auf Soja und Palmöl fokussiert und da werden kaum andere Sachen genannt. Die Umsetzung von Maßnahmen, zum Beispiel der ROSPO und der RTRS, das sind der Round Table of Sustainable Palm Oil und der Round Table of Responsible Soil Production. Die hinken jedoch massiv. Jetzt ist die Frage Ist ein Tunnelblick auf Soja und Palmöl überhaupt gerechtfertigt? Oder gibt es noch andere Sachen, die für die Umwelt genauso oder noch schwerwiegender sind, auf die man eher die Aufmerksamkeit lenken sollte?

Heidi Giesenkamp: Ich glaube, alle Kulturen, die in reiner Monokultur angebaut werden und für die bestehenden Systeme verändert werden, um diesen Anbau möglich zu machen, sind per se problematisch. Soja ist natürlich der Haupt-Eiweißträger im Moment und ist damit besonders im Fokus, aber nicht im Fokus für die menschliche Ernährung, sondern eigentlich als Tier für Futtermittel, weil das der Hauptanteil des Soja-Verbrauchers ist. Also würde ich sagen definitiv sehr problematisch. Palmöl sehe ich auch als problematisch an, ist für die Anbauer vor Ort aber oftmals die einzige Einnahmequelle. Und da muss man sich genau angucken, wie viel Palmöl wird wirklich nachhaltig produziert. Und ich schätze, dass das nicht mehr als 5% sind tatsächlich nachhaltig. Das sollte man weiter fördern. Diese nachhaltige Produktion, weitere Kulturen, die ich als problematisch ansehe, sind aber alle Monokulturen. Also Zuckerrohr in Monokultur ist genauso problematisch, selbst wenn man aus Zuckerrohr und Zuckerrohr Burggasse mittlerweile teilweise Bioplastik herstellt. Es ist eine Monokultur, die über Jahre und Jahre immer wieder auf denselben Flächen kultiviert wird und teilweise auch entsprechende Spritzmittel da sein müssen, um kultivieren zu können. Reis finde ich auch äußerst problematisch, weil bei der Nass-Reis Produktion ja die Flächen geflutet werden und damit auch Methan Ausstoß einhergeht. Reis ist aber auch ein Grundnahrungsmittel, was nicht wegzudenken ist. Aber überall da, wo große Flächen nur mit einer Kultur bestehen, sind ja Nachbau, Problematik und Einschränkung und Verarmung der Böden.

Heidi Giesenkamp: Und Biodiversität ist da ja zum großen Teil gar nicht mehr vorhanden, weil seit Jahrzehnten und Jahrhunderten auf denselben Flächen dieselben Kulturen angebaut werden. Also sind diese alle problematisch. Im Grunde genommen müsste man zurückgehen zum Mittelalter und drei, vier oder fünf Felder Wirtschaft wieder einführen, regelmäßig auf diesen Flächen rotieren und damit möglich machen, dass auch Teile, Parzellen oder Flächen dauerhaft bebaut sind. Also dass zum Beispiel bestimmte Insekten, Populationen oder Tiere auch zwischen den Flächen wechseln können. Wenn ein Teil abgeerntet wird und ein weiterer Teil noch steht, dann hat man zumindest gewisse Migrationsbewegungen. Und wenn der bestehende Teil dann geerntet wird, ist der Aufwuchs an den Seiten daneben schon wieder da, sodass man teilweise eine Fläche hat oder Abstände und Versatz. In den Aussagen, sodass man damit zu nachhaltigerem Anbau kommt. Ja, aber tatsächlich ist es so, dass Soja und Palmöl im Moment im Hauptfokus sind und das auch, glaube ich berechtigterweise, besonders bei Soja, Palmöl. Ja, es ist auch sehr, sehr viel in den Medien. Es wird viel darüber gesprochen und das ist aber glaube ich, sehr länderspezifisch, dass manche Länder immens auf nachhaltigen Anbau von Palmen Pflanzen setzen und andere aber gar nicht. Insofern. Ja, sollte man im Fokus behalten, ist auch sicherlich Hauptschwerpunkt, aber andere Kulturen sind zum Teil nicht besser. Ja.

Niklas Meisel: Sie haben gerade als anderes landwirtschaftliches Produkt auch noch Reis erwähnt, dass beim Reisanbau oftmals Felder und ganze Berghänge geflutet werden beim Nass Reis Anbau. Und dass dieser Prozess an sich schon sehr der Biodiversität und grundsätzlich der Umwelt schadet. Gibt es denn überhaupt umweltschonende Anbauarten von diesen landwirtschaftlichen Produkten oder ist das an sich immer ein Problem, Reis, zum Beispiel, massig anzubauen?

Heidi Giesenkamp: Also ich meine, es gibt eine Produktionsart, das muss ich noch mal nachgucken von trockenem Reisanbau, wo nur Teil geflutet wird, wo die Flächen nicht dauerhaft unter Wasser stehen und mit diesem dauerhaft unter Wasser stehen, geht ja einher, dass die Wurzeln nicht an Sauerstoff kommen und ich praktisch Sauerstoffmangel auch im Boden habe und damit gewisse Mikroorganismen nicht überleben können, sondern nur die, die tatsächlich anaerobe, ja, sind. Und dieser trockene Reisanbau, wo nur eine Teil-Überflutung stattfindet, ist, glaube ich für die Biodiversität per se besser. Soweit ich weiß, sind aber die Erträge nicht so hoch. Ja, ist insgesamt schwierig. Also alles das, was als Eingriff in die Landschaft zu verstehen ist, terra musste für Reis ja jahrhundertlang sein, sonst hätte man nicht anbauen können. Veränderungen in dem Moment sind dann auch kulturell zu sehen und teilweise wurde ja auch in Bereichen angebaut, wo sonst gar kein anderer Nahrungsmittelanbau möglich war. Insofern für die Ernährung der Bevölkerung vor Ort sicherlich sehr, sehr wichtig, aber über Jahrhunderte hat man damit teilweise auch starken Schwermetall Eintrag und Abtrag in den Böden. Also Reis ist ja auch stark Arsen belastet. Das kommt sicherlich auch durch die Belastung im Boden vor Ort. Aber je mehr ich abtragen, auch durch das Fluten und wieder Wasser ablassen, desto weniger organische Masse im Boden habe ich und desto mehr schädige ich die Flächen auf Dauer. Die optimale nachhaltige Reisproduktion ist mir persönlich jetzt nicht bekannt, aber vielleicht gibt es die ja.

Niklas Meisel: Dann würde ich sagen Gehen wir zur letzten Frage über. The United Nations verweisen oft auf die Rolle von kleinen oder mittelgroßen Produzenten von tierischen und nicht tierischen Produkten mit dem Hinweis, sie seien oft nachhaltiger. Warum sollte so etwas der Fall sein? Haben Sie damit Erfahrungen?

Heidi Giesenkamp: Okay, auch schwierig. Also kleine Produzenten in Form von ganz kleinbäuerlicher Landwirtschaft ist sicherlich nachhaltiger, weil dann sehr viele verschiedene Kulturen von diesen Landwirten angebaut werden. Ich habe damit schon Unterschiede in den Ansprüchen der Pflanzen an den Boden. Ich muss regelmäßig rotieren, um anbauen zu können und ich habe das ganze Kleinteilige. Und ich würde also zum Beispiel nicht 3000 Hektar in einem Schlag Weizen ernten,

sondern immer ganz kleine Parzellen von vielleicht wenigen 100 Quadratmetern oder ein, zwei Hektar von einer Kultur, sodass ich damit schon einen nachhaltigeren Anbau per se habe. Beim mittelgroßen Produzenten ist es, glaube ich, gar nicht mehr so gut gegeben, weil auch die, um wirtschaftlich arbeiten zu können, zumindest hier in Deutschland viele Flächen zusammengelegt haben. Zum Beispiel Wallhecken, Knicks herausgenommen wurden und die waren insbesondere wichtig. Erstens um Bodenabtrag durch Winderosion zu reduzieren und die Humus Gehalte auf den Böden zu erhalten und natürlich auch für verschiedene Insektenpopulationen und auch Vögel. Also wenn ich viele Hecken Bestandteile in der Landwirtschaft habe, dann habe ich zum Beispiel weniger Befall in den Kulturen, weil ich natürlich durch die Vögel auch Entnahme dieser Schadinsekten also für uns schade Insekten für die Natur nicht zwangsläufig habe. Und ich habe damit sowohl bei den höheren Tieren viel mehr verschiedener Arten als auch bei den Insekten. Es ist immer die Frage, wo macht man klein und mittelgroß fest? Also je kleiner die Landwirtschaft, desto mehrteiliger und desto diverser, desto nachhaltiger, je größer, desto wirtschaftlicher die Produktion. Und das heißt im Umkehrschluss größere Maschinen, mehr Druck auf den Boden, mehr Verdichtung, mehr Monokulturen. Und da würde ich dann definitiv sagen, sowohl beim Tierischen als auch beim Pflanzlichen. Je größer die Betriebe sind, desto weniger nachhaltig.

Niklas Meisel: Das alles klar. Gerade bei den United Nations in den Sustainable Development Goals, die für 2030 formuliert wurden, jedenfalls die Biodiversität Ziele, die für 2030 formuliert wurden. Da wird sehr oft gesagt. Da werden verschiedene Stichpunkte genannt, an die sich gehalten werden soll, und was die Firmen am besten, im besten Fall umsetzen sollten. Und im selben Atemzug wird dann auch noch gesagt, man sollte auch die kleineren und mittelgroßen Produzenten einbinden, gerade weil die, wenn es zum Beispiel auch um Fischereien zum Beispiel geht, da viel nachhaltiger sind als größere Unternehmen, die dann ein riesiges Netz auswerfen und dann den ganzen Meeresgrund einmal um wühlen. Das sind zum Beispiel auch Sachen, die da gesagt wurden, was aber schon ein bisschen kontraproduktiv ist, weil diese ganzen Stichpunkte, die genannt werden, werden dann von den Firmen so aufgefasst, dass sie sich eben an diese verschiedenen Labels wenden, wie zum Beispiel der Round Table of Sustainable, Palm Oil etc. Und gerade die kleinen und mittelgroßen Firmen haben oftmals überhaupt gar nicht die Möglichkeit, überhaupt diese Labels zu bekommen. Was daran liegt, dass es da verschiedene Voraussetzungen gibt, die erfüllt werden müssen. Gerade was, was den technischen Stand angeht, was die Infrastruktur der Firma angeht, wenn es auch darum geht, das ganze zusammenzuhalten. Und gerade, auch wenn es darum geht, das Ganze zu melden. Also was für Sachen die produzieren, wie die arbeiten, was für Erträge die haben etc. und dazu haben die meistens gar nicht das Personal oder die Möglichkeiten. Das bedeutet, wenn sich Firmen an diese sowieso schon vage gehaltenen Labels halten, denken diese gar nicht darüber nach, sich überhaupt mal an die kleinen oder mittelgroßen Produzenten zu wenden. Das heißt, da wird gar nicht dran gedacht, und deswegen finde ich das ein bisschen, ein bisschen ambivalent, schon fast, dass die UN sagt, diese Sachen müssen alle geändert werden, aber bitte bezieht auch diese Leute mit ein. Das ist dann ein bisschen gegensätzlich.

Heidi Giesenkamp: Es müsste wahrscheinlich kleinbäuerliche Kooperativen geben. Die einen, ja, eine Art Zusammenschluss finden und das gemeinschaftlich gemanagt wird, also dass die Bauern noch selbstständig und klein bleiben können, aber das ganze Reporting halt von einer übergeordneten Organisation, wie auch immer, die dann zusammengesetzt ist für alle Kleinbauern in dieser Kooperative umgesetzt wird. Anders kann ich mir das nicht vorstellen, dass die dann zusammenkommen.

Niklas Meisel: Glücklicherweise sind die ganzen Labels und Zertifikate, die da ausgewiesen werden, an die Firmen, die sind alles, sind alles nur Handlungsvorschläge, die sind rechtlich nicht bindend. Das bedeutet, in der Theorie könnte jede einzelne Firma, die sagt, okay, wir sind Teil der/des Round Tables etc. Jede Firma könnte im Grunde hingehen und sagen „aber daneben machen wir trotzdem noch Kooperationen mit kleineren und mittelgroßen Farmern in Guatemala“. Genau das

wäre zum Beispiel eine Möglichkeit. Jedoch machen es sich Firmen verständlicherweise dann relativ einfach, wenn sie dann einfach sagen „Guck mal, wir haben hier die fünf Labels, um die wir uns kümmern“. Drei davon referenzieren sich gegenseitig, bedeutet, es sind eigentlich fast dieselben Labels und die anderen sind rechtlich nicht bindend.

Heidi Giesenkamp: Schwierig, schwierig.

Niklas Meisel: Aber gut, dann sind wir, glaube ich, am Ende des Interviews, will ich schon sagen. Nun einmal vielen Dank für Ihre Zeit. Die Sie sich genommen haben. Und dann werden wir das Interview hier beenden, würde ich sagen.

Heidi Giesenkamp: Ja, genau. Ich hoffe. Ich kann dir weiterhelfen.

Niklas Meisel: Vielen Dank!

Appendix C

Interview Biodiversity Transcript, Ms Giesenkamp (English Translated)

Niklas Meisel: Let's wait a minute. All right. It should be running now. Perfect. Good. Then we'll start with the first question. How big do you see the role of agriculture/agriculture in protecting overall biodiversity?

Heidi Giesenkamp: Basically, I believe that today's agriculture or agribusiness is contrary to the protection of biodiversity because the ultimate goal is to harvest as much as possible on the available land. And that's where biodiversity gets in the way, soever. The more diversity I want to have, the more constraints I have on production if I'm thinking purely in terms of homogeneous stocks and uniform yields and the best possible ingredients. That is, if I want to make money from the soil, then I have to harvest as much as possible, at a high quality, as uniformly as possible. And I can only do that by fertilizing as much as possible, by relying very heavily on crop protection. And that also means that I have to use herbicides to combat various weeds in the sense that I have just done so. That already reduces my biodiversity immensely. If I don't have these herbs, I automatically have less insect population. Many of the agents that are used also change the composition of the soil, that is the microorganisms and also the higher animals. Different molluscs are restricted, beetles all kinds of things. And I'm also damaging the water, of course. And with the drift of both fertilizers, mitigations into the groundwater and also various pesticides, I'm changing my environment in general. In other words, everything that makes up modern agriculture and agribusiness at the moment is counterproductive if I want to promote biodiversity. If I look at the second option, organic farming or biological agriculture, for many years it was the case that I could promote biodiversity with it. At the moment, however, organic farming is having to pay very close attention to its yields, which is increasingly limiting biodiversity, because they are also using various means or certain production methods and mechanical soil cultivation, which are counteracting the whole thing.

Niklas Meisel: Where exactly do you see the difference between organic farmers and regular farmers in the agricultural industry?

Heidi Giesenkamp: Right now, I think the gap between the two or the difference is getting smaller and smaller. There is no longer a huge difference. Pure conventional agriculture is on the retreat. That means more and more integrated agriculture, which combines the best of both worlds, i.e. conventional farming, meaning chemical fertilizers and also pesticides with sustainable production. For me, organic farming means that I produce with as few pesticides as possible, although in organic farming, too, a great many pesticides are permitted that also cause lasting damage. So the copper sprays, sulfur sprays and co all damage very strongly, both insects and fungus population as well as the soil composition. This is also given there. The disadvantage of organic production is also the strong mechanical processing of the soil that goes along with it. That is, if I want to do something against various weeds and want to reduce the herbs, I have to work very strongly turning in the soil, that is, either ploughing or cultivating and thus work the surface, which harms the microorganisms again. In this respect, it is difficult to say. The advantage of organic production is actually that I work with organic fertilizers and thus apply humus and thus store the composition of the soil and humus and CO₂. I find that very positive. Fewer pesticides are also true, but partly only conditionally. I think in the next few years the restrictions will become stronger there. In that respect, hopefully, it will be more sustainable. As far as yields are concerned, the two are converging more and more, so there's not much difference there anymore.

Niklas Meisel: All right, thank you very much. Then we'll go over, I would say, the second question. Many problems are often attributed to the production of animal products, in that they then include the feed production for the animals and the related, for example, the waste of the rainforests for soy production, etc. the waste that is generated by animal products, once by the animals

themselves, for example, among other things, also the CO₂ emissions in the production of animal products. Do you think this is where the focus should be when formulating new measures, or would that be too short-sighted? Are there, for example, other points within agriculture that should be tackled more?

Heidi Giesenkamp: Well, altogether a very complex and difficult question. Well, I see it in two parts. Point one is, that I can't completely decouple plant production from animal production. If I want to produce plants, I need nutrients and I can get them in different ways. Either I get classic mineral fertilizers, which have to be either chemically produced somewhere or degraded somewhere in the case of raw phosphate. Then I also cause extreme damage to the environment and the landscape, for example in Morocco, where entire mountains are dug up, or as in the case of potash and salt, where mineral fertilizers are dissolved from the rock. That would be producing without animal products. I can fertilize with it and not use any animal components at all. But if I want to produce in closed cycles, then I need the animal's excreta in the form of manure to manage my fields accordingly and add nutrients. Alternatively, pure vegan agriculture would theoretically be possible by using plant residues such as cleaning residues, leaves, and straw for fertilizing. But the nutrients that are brought in then lead to immense lower yields and are probably not enough to feed the number of people on our planet. In this respect, I am in favour of animal production, but in greatly reduced proportions. This means that animal production would have to be reduced in such a way that there would be no more factory farming, that the number of animals that can be kept per hectare would have to be reduced immensely so that I would come back to a tolerable level and the soils would then also be able to utilize and use these units or faeces.

Heidi Giesenkamp: Conversely, this means that what I have at the moment in terms of mass animal production also leads to the *eutrophication* of water bodies, because I have much more excrement from the animals per hectare than that or than our soils can cope with. Feed production is a huge problem from my perspective. Soy from overseas really shouldn't be used at all. The optimum would be a requirement that the animals be fed regionally. That means only what the local fields yield can be used as animal feed. The animal numbers should then also be tied to this. This means that the import of soy from Brazil, for which the rainforest has to be cleared, should be banned as far as possible because these are worldwide flows of goods. I use vegetable protein from overseas to produce animal protein here and that is not purposeful. What you can certainly do alternatively is, if there are leftovers from the food industry, to convert them into other high-quality protein, for example in the form of insects. That I also use residual materials from the food industry, no matter whether bread, leftovers or whatever arises there, as feed, for example, to feed 'Soldier Flies', i.e. insects, larvae or maggots. These can then either go directly into human nutrition, ground up as flour in the form of burgers or whatever, or then theoretically also feed poultry again, because that's also the more natural nutrition for chickens, for example, which would also eat earthworms in the soil, if I tie the animals that I want to produce to the area.

Heidi Giesenkamp: That is not only calculated, how much excretes the animal and on what area can I distribute that? But also what give. My soils in the vicinity and the surrounding area would then actually have to be defined. Again, that's very, very difficult, how broadly you define regional. But if you couple that in some way and say okay, we have so and so many hectares of agricultural land in Germany that I use both for the production of food, for human nutrition, so directly, for example, bread, cereals, salads, vegetables, fruit, whatever, and then use certain areas to feed the animals here on site. That can happen either as grazing, which I see as less problematic, in the form of grass, or silage. Some areas are not suitable for vegetable fruit production or bread grain. But they are quite suitable for grazing animals as pasture land. Extensively, for example. And then I would say, is that compatible? Everything that we have now, i.e. stables with 1000 fattening pigs upwards, with several floors, chickens on top of each other, is counterproductive and should be cut back immensely in the next few years.

Heidi Giesenkamp: Since I don't think that's possible in the private sector, I think in that case government regulations make sense because the farmers have to be able to go back and rebuild. And still, be able to farm. They must be allowed to switch from the current production methods to environmentally compatible production methods and perhaps also to completely lower crops. So why not produce significantly more vegetables here? In Germany, we have only 30% self-sufficiency in vegetables. We could certainly do something about different production methods to no longer produce the pig in the form of a cutlet, but perhaps high-quality, also vegetable protein. Whether sweet lupine, whether soy here on site. Thanks to climate change, it's getting warmer and warmer, which means soy production here on site is certainly feasible in the long run as also other protein plants that we can produce here. So it has to be a combination. I am not absolutely against animal production, the only pure plant will not go, but we must reduce it to a tolerable level and then also reduce CO2 emissions. Waste sensibly recycled, whether biogas plant or for example insect production and the feed production must also be tied to the animal numbers. Only what the soil yields should then also be fed to animals.

Niklas Meisel: All right. You had just told us that there was such a small difference between agriculture and organic agriculture. Do you happen to also see a trend from the animal production supported agriculture that we know to vegan agriculture? Or is that more of a side issue?

Heidi Giesenkamp: I think it's still the absolute niche of the niche at the moment because pure vegan agriculture is very, very difficult because of the nutrient flows. So growing vegetables organically is no problem at all. If one deals with it well, it is feasible. Purely vegan agriculture would mean that I always have to supply the nutrients that are lacking in my soil in some form or another, and as a rule, I supply more from or take more from the field than I can supply back to the soil via compost or organic plant matter. That means at some point I get into a nutrient deficit. You can certainly if you produce very extensively, you can do that. So there are enough initiatives, solidarity agriculture, which can still generate yields even with less yield per hectare, about this solidarity principle so that the farms can live. I think that is a possibility to do that and that will also grow and become stronger. So, it will certainly grow in the next few years, but at a very, very low level. I don't think it's going to move that way. The ball is so complex. So, also for the grower, organic production is traditional organic production. But that's going to increase immensely. So I think that we are there in a few years at 30, 40, 50% and that the future also yes will be the main way of food production, then classic conventional, at least in, yes, in the roof countries certainly Germany, Austria, Switzerland, Netherlands will, yes, my perspective for the future, organic farming will certainly hopefully end up at some point at 70 to 80% and conventional farming will be more the niche. On a global basis, it probably looks different. Because of the overpopulation in some parts of the world, it will certainly not be possible to feed people with organic farming alone. And there will continue to be very strong classical and conventional agriculture.

Niklas Meisel: So that's why vegan agriculture is so complicated? Not a question of the price at all, as is the case with many industries. So much for not making enough money. What do you say? There's not enough money being put into the industry that you can't build things up, but it's a purely biological limit?

Heidi Giesenkamp: Yes, so that is both. On the one hand, if I want to produce purely vegan, I can only generate significantly low yields and then, as a business, I'm certainly no longer in a position at a certain point to be able to support the operating costs. That's the financial story. I believe buyers for the products produced in this way will be found. So the proportion of vegetarians and vegans has increased so immensely in recent years and will continue to do so, that the purchase side is certainly not the problem. So that there are so many people who see that as absolutely *Fördenswert* that they are also willing to pay higher prices for the food that was produced so. The thing is, I think, that in the long run, the nutrient cycles become so difficult that you can produce less and less on these soils over

decades and it is then certainly no longer sufficient to keep such a farm alive. But maybe solutions can be found there as well. There will certainly also be further developments in research to also use other waste streams to perhaps also make urban wastewater available for fertilization. That is the question, what of it will then be usable in purely vegan agriculture. Yes, there. Where there are problems, there will be solutions in the future. But as of now, I would guess that it's not possible in the long run.

Niklas Meisel: All right, then we go to question three, concerning deforestation and monocultures, the focus is often exclusively on soy and palm oil. We see this, among other things, in the so-called Commitments of Metro GmbH. Various policies have been formulated or guidelines have been written down that are adhered to, and there is a very strong focus on soy and palm oil, and hardly any other things are mentioned. The implementation of measures, for example, the ROSPO and the RTRS, that is the Round Table of Sustainable Palm Oil and the Round Table of Responsible Soil Production. However, they are massively lagging. Now the question is Is a tunnel vision on soy and palm oil even justified? Or are there other things that are just as or more serious for the environment that should be given more attention?

Heidi Giesenkamp: I think all crops that are grown in pure monoculture and are modified for the existing systems to make that cultivation possible are problematic per se. Soy, of course, is the main protein source at the moment and so it's particularly in focus, but not in focus for human nutrition, but actually as an animal for feed because that's the main soy consumer. So I would say very problematic. I also see palm oil as problematic, but it is often the only source of income for the local growers. And you have to take a close look at how much palm oil is produced sustainably. And I estimate that no more than 5% is sustainable. That should be further promoted. But this sustainable production, and other crops that I see as problematic, are all monocultures. So sugar cane in monoculture is just as problematic, even if you produce bioplastics from sugar cane and sugar cane Bургasse in the meantime partly. It is a monoculture that is cultivated over and over again in the same areas for years and years, and in some cases, appropriate sprays have to be there to be able to cultivate. I also find rice extremely problematic because the areas are flooded during wet-rice production, which also results in methane emissions. But rice is also a staple food, which is indispensable. But everywhere where large areas exist only with culture are yes post cultivation, problems and restriction and impoverishment of the soil.

Heidi Giesenkamp: And biodiversity is largely no longer present because the same crops have been grown on the same land for decades and centuries. So these are all problematic. You would have to go back to the Middle Ages and reintroduce a three, four or five-field economy, rotate regularly on these areas and thus make it possible that parts, plots or areas are also permanently cultivated. So that, for example, certain insects, populations or animals can also move between the areas. If one part is harvested and another part is still standing, then you have at least certain migratory movements. And when the existing part is then harvested, the growth on the sides next to it is already there again, so you have a partial area or spacing and offsets. In the statements, so that one comes with it to more sustainable cultivation. Yes, but it is so that soy and palm oil are in the main focus at the moment and also, I think justifiably, especially with soy palm oil. Yes, it's also very, very much in the media. There's a lot of talk about it, but I think it's very country-specific, that some countries are focusing immensely on sustainable cultivation of palm plants and others not at all. In this respect. Yes, one should keep in focus, is also certainly the main focus, but other crops are partly not better. Yes.

Niklas Meisel: You have just mentioned rice as another agricultural product, that in rice cultivation, fields and entire mountain slopes are often flooded during wet rice cultivation. And that this process in itself is very damaging to biodiversity and basically to the environment. Are there any environmentally friendly ways of cultivating these agricultural products, or is it always a problem to grow rice, for example, in large quantities?

Heidi Giesenkamp: I mean, there is a type of production, I'll have to look up dry rice cultivation again, where only part of the land is flooded, where the land is not permanently underwater, and this permanent flooding is accompanied by the fact that the roots do not get oxygen and I practically have a lack of oxygen in the soil and therefore certain microorganisms cannot survive, but only those that are anaerobic, yes. And this dry rice cultivation, where there is only partial flooding, I think is better for biodiversity per se. But as far as I know, the yields are not that high. Yes, is difficult overall. So everything that is to be understood as an intervention in the landscape, terra had to be for rice for centuries, otherwise one could not have cultivated it. Changes at that moment are then also to be seen culturally, and in part was also cultivated in areas where otherwise no other food cultivation was possible. In this respect, the nutrition of the local population is certainly very, very important, but over centuries one has partly also strong heavy metal entry and erosion in the soil. Rice is also heavily contaminated with arsenic. This is certainly also due to the pollution in the soil on site. But the more I remove, also by flooding and draining water again, the less organic mass I have in the soil and the more I damage the land in the long run. The optimal sustainable rice production is not known to me personally now, but maybe there is.

Niklas Meisel: Then I would say let's move on to the last question. The United Nations often refers to the role of small or medium-sized producers of animal and non-animal products, saying that they are often more sustainable. Why would that be the case? Do you have any experience with this?

Heidi Giesenkamp: Okay, also difficult. So small producers in the form of very small-scale farming are certainly more sustainable because then very many different crops are grown by these farmers. I already have differences in the demands of the plants on the soil with that. I have to rotate regularly to be able to grow and I have the whole small-scale thing. And so, for example, I wouldn't harvest 3,000 hectares in one shot of wheat, but I would always harvest very small plots of maybe a few 100 square meters or one or two hectares of one crop, so that already gives me a more sustainable cultivation per se. I don't think the situation is as good for medium-sized producers as it used to be because even they have consolidated a lot of lands, at least here in Germany, to be able to work economically. For example, hedgerows, hedgerows were taken out and they were particularly important. Firstly, to reduce soil erosion by wind erosion and to maintain the humus content of the soil and course also for various insect populations and birds. So if I have many hedges components in agriculture, then I have for example less infestation in the crops, because I have of course by the birds also removal of these harmful insects so for us harmful insects for nature not necessarily. And I have with it both with the higher animals much more different kinds and also with the insects. It is always the question, where do you make small and medium? So the smaller the agriculture, the more multi-part and the more diverse, the more sustainable, the larger, the more economical the production. Conversely, this means larger machines, more pressure on the soil, more compaction, and more monocultures. And then I would say, both in terms of animal and plant production. The larger the farms, the less sustainable they are.

Niklas Meisel: All that clear. Especially at the United Nations in the Sustainable Development Goals, which were formulated for 2030, at least the biodiversity goals, which were formulated for 2030. It is very often said there. Various key points are mentioned, which should be adhered to, and what the companies should best, in the best case, implement. And in the same breath, it is also said that the smaller and medium-sized producers should also be involved, precisely because, for example, when it comes to fisheries, they are much more sustainable than larger companies that then cast a huge net and uproot the entire seabed. These are also things that have been said, which is a bit counterproductive, because all these key points that are mentioned are then interpreted by the companies in such a way that they turn to these various labels, such as the Round Table of Sustainable, Palm Oil, etc. And it is precisely the small and medium-sized companies that are the ones that are most concerned about sustainability. And especially the small and medium-sized companies often cannot get these labels at all. This is because various requirements have to be met. Especially when it comes

to the technical level when it comes to the infrastructure of the company when it comes to keeping the whole thing together and especially when it comes to reporting the whole thing. So what kind of things do they produce, how they work, what kind of earnings they have, etc., and they usually don't have the personnel or the possibilities to do that. This means that if companies stick to these labels, which are already vague, they don't even think about contacting the small or medium-sized producers. That means they don't even think about it, and that's why I find it a bit ambivalent, almost, that the UN says these things all have to be changed, but please include these people as well. That's a bit contradictory.

Heidi Giesenkamp: There would probably have to be smallholder cooperatives. The one, yes, finds a kind of association that is managed collectively, so that the farmers can remain independent and small, but the whole reporting just by a superordinate organization, however, which is then composed for all small farmers in this cooperative is implemented. I can't imagine it any other way, that they come together.

Niklas Meisel: Fortunately, all the labels and certificates that are shown there, to the companies, they're all, they're all just suggested actions, they're not legally binding. That means, in theory, any individual company that says, okay, we're part of the/the round table, etc... Any company could go and say "but besides that, we still do collaborations with small and medium farmers in Guatemala". Exactly that would be a possibility, for example. However, companies understandably make it relatively easy for themselves when they simply say "Look, we have the five labels here that we care about". Three of them reference each other, meaning they are almost the same labels, and the others are not legally binding.

Heidi Giesenkamp: Difficult, difficult.

Niklas Meisel: But well, then I think we are at the end of the interview, I will say. Thank you very much for your time. And then we will end the interview here, I would say.

Heidi Giesenkamp: Yes, exactly. I hope. I could help you further.

Niklas Meisel: Thank you very much!

Appendix D
Literature Review Coding

Table D1.

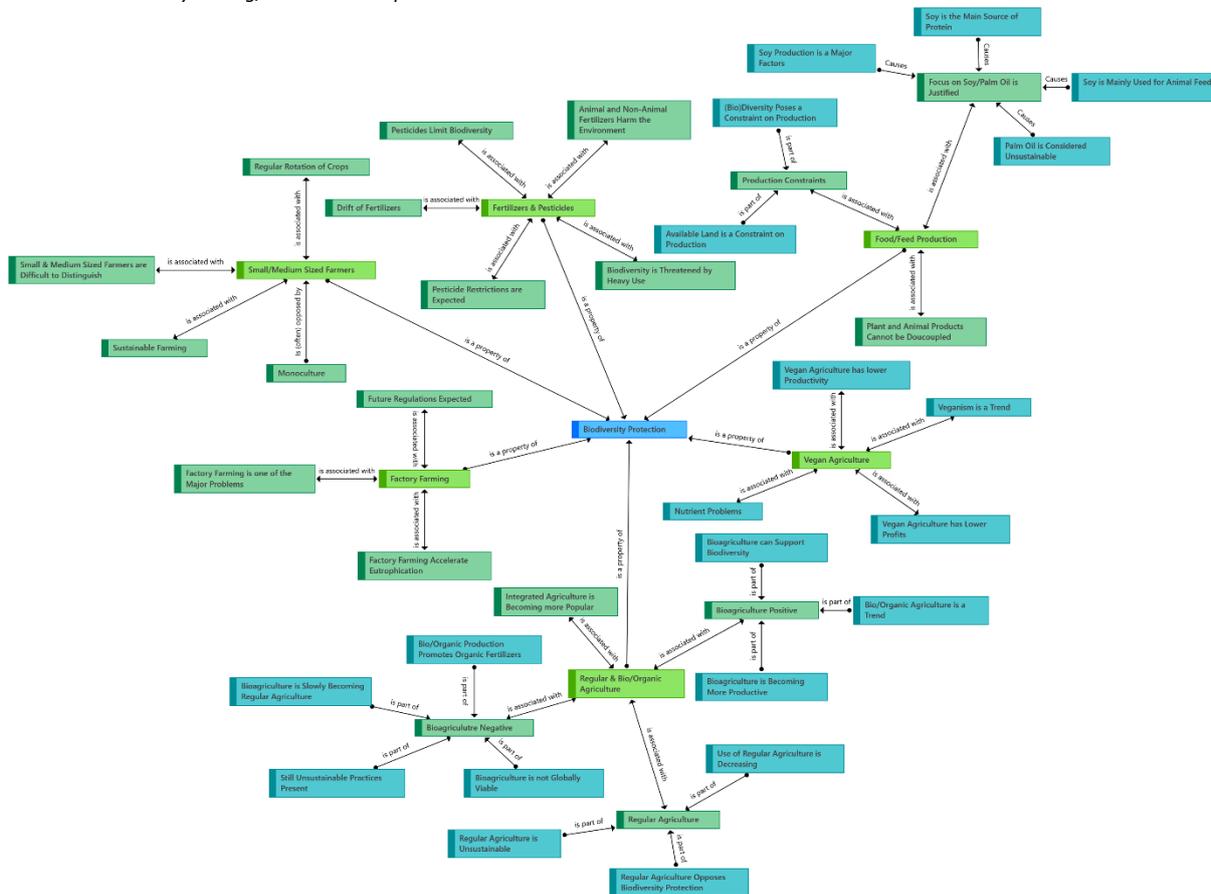
Literature Review Coding Hierarchy

Category	Sub-Categories	Code	[Extra Comment]
Area Subdivisions	Marine	Freshwater Sea Ocean	
	Terrestrial	Coastal Habitats Forests Dry Lands (Other) Terrestrial Ecosystems Mountains	
Biodiversity Loss	Land-Based Pollutants	Artificial Sweeteners Heavy Metal Pollution Pharmaceuticals & Personal Care Products Plastic Pollution Fertilizer Run-Off Livestock Waste Phosphorus Emissions Sewage Discharge	Eutrophication
	(Other) Causes	Nitrogen Emissions (Decreased) Sediment Supply (High) Livestock Numbers (Increased) levels of UV Light Acidification Agriculture Development Change in Land-Use Climate Change CO2 Emissions Dead Zones/Lack of Oxygen Deforestation Deoxygenation Economic Zones Fertilizer Production Forest Degradation Invasive Alien Species Land Degradation Local Subsidence Logging Mining Ocean Warming Overfishing/Overexploitation Rising Sea Levels Soil Acidification Supply Chains/Transportation Trapping Unsustainable Fishing Unsustainable Hunting Urban Development Wildlife Trafficking	

Appendix E Interview Biodiversity Coding, Ms Giesenkamp

Figure E1

Interview Biodiversity Coding, Ms Giesenkamp



Appendix F
METRO Environmental Protection Commitments

Table F1.*METRO's Environmental Protection Commitments*

Memberships	The Consumer Goods Forum	METRO-Specific	Other
Membership in the Roundtable of Sustainable Palm Oil	The Consumer Goods Forum Resolution on Deforestation	Sustainable procurement policies	International standards along the supply chain (Global G.A.P., IFS)
Membership in the POTC	The Consumer Goods Forum Resolution on Sustainable Refrigeration	Guidelines for fish and seafood, meat, animal welfare, cage-free eggs, palm oil, paper and wood, soy, packaging, and disposable plastic	Energy management system according to ISO 50001
Membership in the RTRS	The Consumer Goods Forum Resolution on Food Waste	METRO environmental guideline	EV100 Commitment
Membership in the Retailer Cocoa Coalition		METRO water guideline	World Resource Institute 10x20x30
Membership in the GSSI		METRO climate protection target	Signing of the Tuna 2020 Traceability Declaration
Membership in the GTA		Company car guideline with incentive system for more fuel-efficient vehicles	Signing of the Cerrado Manifesto Statement of Support Signing of the Ellen McArthur New Plastics Economy Global Commitment

Note. Data for Environmental Protection Commitments. Data for Environmental Protection Commitments adapted from METRO (2021c)

Appendix G
Bio Products German METRO Stores

Table G1.*Bio Products German METRO Stores*

Store	Number of Bio Products	Number of Products Overall	Percentage
Kassel, Germany	269	16,896	1.59%
Düsseldorf, Germany	321	18,111	1.77%
Berlin-Friedrichshain, Germany	330	17,529	1.88%
Duisburg, Germany	205	16,540	1.24%
Leipzig, Germany	246	17,458	1.41%
Essen, Germany	226	16,907	1.34%
München-Freimann, Germany	315	17,750	1.77%
Regensburg, Germany	292	17,330	1.68%
Hamburg-Altona, Germany	321	17,115	1.88%
Dresden, Germany	301	17,366	1.73%
<i>Average:</i>	<i>283</i>	<i>17,300</i>	<i>1.63%</i>

Note. Data for Bio Products German METRO Stores. Data for stores, number of bio products, and number of products overall adapted from METRO (2022a)

Appendix H Emission Calculation

$$\frac{\text{Number of Salesforce Employees Worldwide}}{\text{Number of Employees Worldwide}} = \% \text{ of Employees in the Salesforce}$$

$$\text{Number of Employees in German} * \% \text{ of Employees in the Salesforce worldwide} \\ = \text{Number of Employees in the Salesforce in Germany}$$

$$\frac{\text{Number of Existing Electric Vehicles in Germany}}{\text{Number of Salesforce Employees in Germany}} = \% \text{ of Current Electric Cars}$$

$$100\% - \% \text{ of Current Electric Cars} = \% \text{ of Current Diesel Cars}$$

$$\text{Average Driven km per Year} * \% \text{ of Current Electric Cars} \\ = \text{Current Average km Driven by Electric Cars}$$

$$\text{Average Driven km per Year} * \% \text{ of Current Diesel Cars} \\ = \text{Current Average km Driven by Diesel Cars}$$

The number of salesforce employees worldwide is 6,385 (METRO AG, 2021a). The number of METRO employees worldwide is 87,096 (Metro-Gruppe, 2021). The number of METRO employees in Germany is 17,210 (D&B Business Directory, 2022). The number of existing electric vehicles in all of Germany can be estimated to be 350 (METRO AG, 2021a). The overall kilometres driven per year are 40,000km (bfp, 2018). With these numbers and a CO₂ emission calculator (Quarks, 2022), overall emissions of 7,826kg CO₂ per year could be calculated. Using the same calculator, exclusively electric cars would have emissions of 5,452kg CO₂ per year.

Appendix I

Interview Biodiversity Transcript, Ms Billinger (German)

Niklas Meisel: Wir führen das Interview auf Deutsch. Richtig? Perfekt. Gut, dann habe ich auch das Transkript auf Deutsch gestellt. Dann bekommt er das richtig mit. Perfekt. Also. Aber noch mal kurz zu mir. Mein Name ist Niklas Meisel. Ich mache jetzt gerade meinen Bachelor, also ich schreibe gerade meine Bachelorarbeit bei der Research Group Business Innovation. Das ist dieselbe Gruppe, in der auch die Sonja arbeitet, sie ist meine Supervisorin. In meiner Bachelorarbeit dreht es sich um das Thema Biodiversität und Maßnahmen, die im Lebensmittelgroßhandel gemacht werden können, um den Biouniversitäts-Fußabdruck zu vermindern. Viele Unternehmen haben jetzt in den letzten Jahren gesehen, dass sehr viele neue Gesetzesentwürfe und Guidelines und neue Regeln entworfen wurden von zum Beispiel der Europäischen Union oder von verschiedenen anderen Organisationen, wie zum Beispiel den United Nations. Und diese haben jetzt auch die Befürchtung, dass das in der Zukunft auch für Biodiversität geschehen wird. Das bedeutet, jetzt ist meine Aufgabe, schon mal Grundsätze zu entwickeln, was da gemacht werden kann, sodass sie sich schon mal darauf vorbereiten können. Und dafür habe ich jetzt hier vier Fragen formuliert. Das sind Leitfragen, also wenn Sie abschweifen wollen, dürfen Sie das gerne machen. Ich werde Sie da nicht aufhalten. Und wenn Sie bereit sind, dann würde ich jetzt einfach mit der allerersten Frage anfangen. Diese wäre nämlich. Wie groß sehen Sie die Rolle der Landwirtschaft oder der Agrarindustrie beim Schutz der allgemeinen Biodiversität?

Marina Billinger: Ja, die Biodiversität ist stark mit der Agrarindustrie verbunden, vor allem in zivilisierten und Industriestaat Nationen wie Deutschland, da eine sehr hohe Fläche für Agrarflächen benutzt wird und wir generell durch die Produktionsströme einen sehr hohen Einfluss haben auf die Biodiversität. Nicht nur was Landwirtschaft angeht, was die Verarbeitung angeht, aber auch die Auswahl an Tieren und Rohstoffen, die wir entweder züchten oder anbauen. Um, ja, eine gesunde Balance zu halten, sollte dieses Thema natürlich in Zukunft sehr stark, nicht nur in der Agrarindustrie allein, betrachtet werden. Das ist oft das Problem, was ich finde, was sich hoffentlich in der Zukunft ändert, dass das immer nur in einem bestimmten Segment betrachtet wird. Meiner Meinung nach sollten für biologische Vielfalt unterschiedliche Instanzen zusammenkommen. Das ist die Politik, das ist die Wirtschaft. Das ist aber auch die Finanzwelt, die ja stark bestimmte Entscheidungen und Trends und auch eine bestimmte Macht hat, wo die Reise oder die Biodiversität hingeht oder nicht. Und da wird meiner Meinung nach, was die Finanzwelt zum Beispiel angeht, zu stark darauf geachtet. Und das werden hoffentlich in der Zukunft auch die Hebel, die eine Synergie erzeugen und gemeinsam an bestimmten Zielen arbeiten.

Niklas Meisel: Sie hatten gerade noch Industriestaaten herausgestellt und dass Industrien in der Agrarindustrie in den Industriestaaten besonders schwerwiegend sind für die Biodiversität. Wo sehen Sie genau den Unterschied zwischen der Agrarindustrie, zum Beispiel einem Land wie Deutschland im Vergleich zu zum Beispiel einem Entwicklungsland oder einem der BRIC Staaten?

Marina Billinger: Ja, wenn man jetzt allein bestimmte Produkte anschaut, wie, ob jetzt nur Weizen angebaut wird oder andere Arten von Getreide in einer landwirtschaftlichen größeren Fläche betrachtet werden. Da sieht man schon, dass viele Prozesse und Bereiche sehr einseitig sind. Und je mehr Standards in einem zivilisierten Staat auch gefordert werden, desto weniger Biodiversität haben wir. Also wir sehen das ja zum Beispiel auch an Schweinezucht. Die Schweine müssen die perfekte Fettschicht und perfekte Größe haben und die werden quasi sehr einseitig betrachtet, gefüttert, gehalten, geschlachtet. Und das hat alles eine große Auswirkung auf weniger Biodiversität im Allgemeinen. Und je weniger zivilisierte oder kleinere Industriestaaten, Drittländer, auch Entwicklungsländer, wo es weniger Ordnung gibt, sage ich mal, also wir sprechen jetzt nicht, was besser oder schlechter ist, sondern wir fokussieren nur uns nur auf die Biodiversität. Dann ist das natürlich so, dass es da mehr Abweichungen gibt und zum Beispiel das Schwein nicht immer nur Zuckerrüben essen muss, um eine bestimmte Fettschicht zu haben, sondern sie darf dann auch zum

Beispiel andere Sachen essen. Und da haben wir einen viel gesünderen und ausbalancierten Kreislauf auch im Upcycling Thema und dass auch Abfallprodukte eher verfüttert werden an die Tiere und nicht geerntete Produkte, die extra dafür angebaut worden sind. Und da geht es darum, dass man dann ja diese Sachen betrachten kann, um in der Entwicklung, auch später, bei einer höheren Biodiversität ist.

Niklas Meisel: Sie hatten jetzt ja gerade schon die Produktion von Tierprodukten und im Grunde auch die Tierhaltung angesprochen. Das ist eine sehr schöne Überleitung zu meiner zweiten Frage, die ich formuliert habe. Diese lautet: Viele Probleme werden oft auf die Produktion von Tierprodukten zurückgeführt, wie sie ja gerade schon erwähnt hatten in Bezug auf die Futterproduktion für die Tiere, die dann oft eingeflogen werden muss. Und dann hat man ja viele Probleme, auch mit Soja zum Beispiel. Da können wir gerne gleich noch einmal darauf eingehen, unter anderem aber auch Abfälle der Tiere im Winter, wenn wir über Dung zum Beispiel sprechen, aber auch der CO₂ Ausstoß bei der Produktion. Und jetzt ist meine Frage: Sollte Ihrer Meinung nach dort der Fokus bei der Formulierung von neuen Maßnahmen, sowohl staatlich als auch privat, das dürfen Sie gleich beantworten, liegen? Oder wäre das zu kurz gedacht? Gibt es andere Gebiete in der Landwirtschaft, auf die man sich eher fokussieren sollte? Oder sagen Sie schon, dass die Tierproduktion der primäre Treiber ist?

Marina Billinger: Eine Sekunde. Entschuldigung. Wir haben gerade Mittagspause im Büro, deswegen ist es ein bisschen laut hier. Also wir bräuchten, wie ich schon zu der ersten Frage geäußert hatte, auf jeden Fall viel mehr Maßnahmen, aber auch crossfunktionale Maßnahmen auf allen Ebenen, um die Problematiken, die wir haben, nicht natürlich auch alles auf die Tierproduktion zu schieben, zu bewältigen, auch in der ganzen Wertschöpfungskette. Also wir haben eine horizontale Betrachtung und dann eine vertikale Betrachtung, wo wir viel tiefer in einzelne Elemente hereingehen müssten und auch einzelne Bereiche zusammen verknüpfen, um zu schauen, wo es wo man gemeinsam an bestimmten Hebeln ziehen kann, um zum Beispiel mehr Diversität oder auch andere Probleme abzudecken oder hervorzuleuchten und diese Probleme versuchen zu reduzieren. Also staatlich, privat. Es gibt politische Richtlinien, die eingeführt werden, da müssen sich die Unternehmen daranhalten. Das hilft aber allen nichts, wenn der Endverbraucher nicht aufgeklärt wird, was es für Möglichkeiten gibt oder was gesünder oder von der Biodiversität her zum Beispiel auch besser für die Umwelt wäre. Man bekommt dann sehr wenig Blicke im Allgemeinen, dass man alles in einer Synergie betrachtet. Wenn jemand auf Palmöl schaut. Palmöl ist jetzt nicht schädlich für den Körper, aber für die Umwelt natürlich. Durch die Rodung von Wäldern ist es ein negativer Punkt. Aber es gibt sehr, sehr viele Produkte, die als gesund gehypt werden, aber eigentlich so nicht nachhaltig sind, weil da zum Beispiel sehr viel Energie oder auch Ressourcen wie Wasser verschwendet werden. Und wir sind ja in einer globalisierten Rohstoffbeschaffung. Das bedeutet, es gibt sehr, sehr viele Rohstoffe, die aus einem komplett anderen Eck der Erde zu uns kommen, was sehr unnachhaltig ist. Und da geht es halt darum, auf alle Ebenen draufzuschauen und zu sagen: Eine Avocado ist gesund, aber ist vielleicht ungesünder ...

Marina Billinger: ... wenn man die aus Mexiko importieren lässt, dann wäre vielleicht ein Stück Fleisch doch gesünder für alle Beteiligten, weil wir durch diese CO₂-Einsparungen bei dem Transport oder bei dem Wasserverbrauch, die eine Avocado braucht, viel mehr Biodiversität fördern würden in der Zukunft, wenn wir zum Beispiel eine tiergerechte und ausgeglichene Massentierhaltung hätten. Also Sie sehen, es sind sehr viele Faktoren und ich mische auch alles sehr gerne zusammen, aber es sind dann einfach Bereiche, also von der Supply Chain angefangen, von der Agrarpolitik bis hin zum Endverbraucher. Aber es sind viele Faktoren und viele Instanzen, die auch gemeinsam arbeiten müssen. Wir machen ja zum Beispiel auch am Anfang der Wertschöpfungskette, versuchen wir, die Verschwendung zu reduzieren von Rohstoffen und Rohstoffe, die seit Jahrzehnten weggeschmissen werden, sollen genutzt werden oder wiederverwendet werden und nicht nur in der Lebensmittelindustrie, sondern auch benachbarten Industrien, sodass zum Beispiel Food Loss und Waste, was wir heute als Abfallprodukt ansehen, auch viele Restströme, dass diese wiederverwendet

werden, auch in anderen Industrien. So gibt es zum Beispiel tolle Beispiele wie aus Mango Schalen werden Turnschuhe hergestellt oder aus verschiedenen Nebenstrom Produkten wird Bioplastik hergestellt, also aus organischen Abfallprodukten. Und das ist halt der Unterschied. Wenn man dann in die jeweilige vertikale Ebene hereingeht, welche Möglichkeiten gibt es dort und wie vereinen wir das im privaten Sektor auch? Also für mich ist privat halt auch immer der Endverbraucher, ich bin auch ein Endverbraucher am Ende des Tages. Wie vereinbaren wir staatliche und private Ziele und kommunizieren diese auch stark?

Niklas Meisel: Ich finde das sehr interessant, dass sie jetzt in der Wertschöpfungskette einmal den Endverbraucher angesprochen haben. Dazu hätte ich einmal eine Frage Glauben Sie, dass, und das ist jetzt vielleicht das falsche Wort, was ich benutze, aber dass man den Endverbraucher erziehen kann oder kommt die Motivation immer vom Endverbraucher aus und dann passen sich die Unternehmen an?

Marina Billinger: Ich glaube ganz, ganz stark, dass man den Endverbraucher erziehen kann und auch sollte, weil viele Trends auch vorgegeben werden. Also die Menschen sind wachsamer, was Nachhaltigkeit und auch Gesundheit angeht. Das bedeutet, es wird uns in den kommenden zwei Jahrzehnten stark begleiten und das Thema Nachhaltigkeit und Gesundheit die Industrie formen. Das bedeutet aber auch, dass wir einen Rückschluss haben, dass die Industrie und auch die Politik mit der Industrie gemeinsam den Endverbraucher formen kann, um zu sagen Ja, du musst vielleicht keine Avocado essen, es ist, du kannst auch ein Vegetarier sein, aber vielleicht bist du einmal im Monat ein Flexitarier und isst nur heimisches Gemüse und ein Stück Fleisch. Es ist so viel möglich, dass man sich gegenseitig quasi erzieht oder motiviert. Also wir sagen auch, wir motivieren die Branche zu mehr Ressourceneffizienz und dass man Ströme und halbfertig Erzeugnisse nicht entsorgt, sondern weiter reicht, um die Verschwendung zu reduzieren. Das Gleiche probieren wie natürlich auch über den Endverbraucher, dass wir sagen, wir schaffen Awareness, um auf Produkte aufmerksam zu machen. Zum Beispiel wollen wir als Unternehmen auch so eine Art Zertifikat einführen, also so eine Art Fairtrade, dass man sagt, in Fairtrade ist ein B2B Zertifikat, aber der Endverbraucher kennt es und wurde dahin auch erzogen, dass er vielleicht Produkte kauft oder konsumiert, die nachhaltiger gehandelt worden sind und dass der Bauer mehr davon hat als jetzt ein anderes Produkt, das gehandelt worden ist. Und deswegen denke ich ganz stark, dass man den Endverbraucher in alle Richtungen motivieren kann.

Niklas Meisel: Sie nannten gerade Zertifikate. Das ist ein sehr schönes Stichwort, denn meine dritte Frage bezieht sich nämlich auch auf Zertifikate in der Wertschöpfungskette. Die Frage wäre: Im Hinblick auf die Abholzung von Wäldern und im Hinblick auf Monokulturen wird sich sehr oft ausschließlich auf Soja und Palmöl konzentriert. Da gibt es dann zum Beispiel Zertifikate oder sogenannte Round Tables, in diesem Fall der Roundtable of Sustainable Palm Oil oder der Round Table of Responsible Soil. Das sind dann im Grunde so Zertifikate, die bescheinigen sollen, dass das dann nachhaltig gewirtschaftet wird. Jedoch die Umsetzung dieser Maßnahmen und das Reporting von diesen Maßnahmen, das hinkt massiv. Und da gibt es massive Probleme, von allen Seiten wird da im Grunde kritisiert. Jetzt wäre meine Frage an Sie: Ein Tunnelblick auf Soja und Palmöl, wie es den aktuell bei sehr vielen Firmen gibt. Also man sieht ganz oft, es gibt grundsätzliche Environmental Guidelines, aber dann speziell für Soja und speziell für Palmöl nochmal separate Richtlinien. Ist dieser Fokus gerechtfertigt oder gibt es noch andere Produkte oder andere Sichtweisen, die man respektieren sollte?

Marina Billinger: Also für mich ist dieser Tunnelblick ganz falsch, denn wir sprechen hier tatsächlich nur von zwei Produkten. Es gibt weltweit allein in dem Rohstoffbereich über 400 Zertifikate, die sich auf bestimmte Maßnahmen beziehen. Und wenn wir uns jetzt nur auf Palmöl und Soja konzentrieren, werden da bei diesen Zertifikaten auch nur bestimmte Faktoren mit betrachtet, wenn man allein da in die Tiefe gehen würde und auch soziale Faktoren mit betrachten würde. Also man könnte theoretisch jedes Produkt auf die Agenda stellen und sagen, wenn wir soziale oder auch das

Gender Thema ist ja sehr stark in Europa verbreitet, dass man sagt, wir wollen auch eine Gleichheit haben. Diese Gleichheit geht nicht nur auf ein Gender Thema zurück, sondern auf alle Ebenen, auf Handlungsebenen, auf ein Recht auf Wasser oder nicht. Und dann kann man wirklich, jedes Produkt sollte man dann in den Fokus stellen. Also dass ein Unternehmen zum Beispiel Wasser in Europa verkauft, aber dem in einem bestimmten Gebiet, wo die Wasserquelle ist, dieses Wasser dem Volk, was dort lebt, entzieht bzw. eine bestimmte Region durch Chemikalien verseucht, damit wir in Europa bestimmte Rohstoffe haben. Das sind so viele Faktoren und für mich ist das einfach nur Greenwashing. Wenn wir jetzt von diesen Roundtable sprechen und das müsste, also mein Wunsch ist es hier, wie ich schon mehrmals erwähnt habe, dass man mehr Synergien und mehr Umsetzung auf allen Ebenen schafft. Und das geht auch für alle Arten von Primärprodukten. Und ein Unternehmen was sagt wir sind total nachhaltig was Palmöl und Soja angeht, sind dann bei den 380 anderen Rohstoffen sehr unnachhaltig.

Niklas Meisel: Alles klar. Ich hatte ja gerade schon erwähnt, dass Soja und Palmöl oft im Zusammenhang mit Wäldern und der Abholzung von Wäldern und Monokulturen erwähnt werden. Haben Sie dazu vielleicht noch andere Beispiele, die in dieselbe Richtung gehen?

Marina Billinger: Ja, wir sprechen von einer ganzen Futtermittelindustrie für die Tierhaltung, also dass viele Produkte angebaut werden. Dafür werden auch Regenwälder und große Flächen an wertvollen Pflanzen zerstört, um auch zum Beispiel Weizen anzubauen, um Getreide anzubauen, was an die hiesige Tierproduktion, an die Massen Tierproduktion verfüttert wird. Und wir sprechen aber auch von anderen Produkten. Es ist, glaube ich, unheimlich stark. Wir kennen das. Auch bei vielen Gewürzen, dass da Sachen angebaut werden, wo man sagt, die anderen Bereiche leiden aber darunter, vor allem durch die Pestizide, die da verbreitet werden, die dann auf die Nachbarvölker gehen und die Biodiversität zerstören. Und ja, das sind so die stärksten Beispiele, die mir einfallen. Ja.

Niklas Meisel: Gut. Wir hatten in der allerersten Frage auch einmal die Industriestaaten erwähnt und die Agrarindustrie in diesen Industriestaaten. Und oft liest man in der Literatur, aber auch von den United Nations, dass das teils auch daran liegt, dass die Unternehmen, die in diesen Ländern agieren, sehr oft sehr große Unternehmen sind, die, wie Sie schon gesagt haben, sehr viel automatisieren und sehr viel auf Effizienz pochen. Die United Nations selber verweisen sehr oft auf die Rolle von kleinen oder mittelgroßen Produzenten von tierischen und nicht tierischen Produkten, mit dem Hinweis, sie seien oft nachhaltiger. Aber sie hatten das jetzt auch schon angedeutet. Aber warum sollte das denn genau der Fall sein? Haben Sie da Beispiele?

Marina Billinger: Ja, weil viele digitalisierte Prozesse vielleicht in einer großen Industrie oder in großen Prozessen weniger Spielraum lässt für auch einen nachhaltigen Blick. Es gibt ja viele kleinere Unternehmen, die müssen sich ja durch etwas anderes absetzen und behaupten, weil sie ein besseres oder nachhaltigeres oder ein gesünderes Produkt auf den Markt bringen. Deshalb gibt es auch tolle Beispiele. Diese werden leider zu wenig von allen Bereichen auch wieder unterstützt. Die sind dann nicht wettbewerbsfähig, weil das Endprodukt dann so teuer ist, dass sich ja die Produktion kaum lohnt für die jungen Unternehmen oder der Endverbraucher die Preise einfach nicht annimmt. Und dann sind wir wieder bei der Education, dass am Ende der Wertschöpfungskette, dass der Endverbraucher sagt, ich bin bereit, für ein nachhaltiges regionales Produkt mehr Geld auszugeben. Ob jetzt nur kleine und mittelgroße Produzenten nachhaltig sein können und nachhaltig sein werden, das würde ich so nicht unterstreichen. Ich hoffe, dass die Industrie, es gibt ja auch sehr viele tolle Beispiele, wo auch große Unternehmen sagen wir wollen in dem Segment uns ändern und nachhaltiger produzieren oder auch eine Produktpalette mit aufnehmen, die entweder nachhaltige Ressourcen oder einen nachhaltigen Prozess hat oder Logistik weg, dass wir etwas herstellen, was der Allgemeinheit, dem Allgemeinwohl, nicht nur was Gesundheit angeht, sondern Biodiversität unterstützt und wir vielleicht auch sozialer Ebene ein paar Faktoren abdecken können, weil wir zum Beispiel ein paar Bauern in Indien dadurch besser unterstützen durch ein paar Maßnahmen. Hat das die Frage jetzt beantwortet?

Niklas Meisel: Ja, aber ich habe noch eine Follow-up-Frage. Wir hatten gerade über die Labels gesprochen und jetzt gerade über die kleineren und mittelgroßen Firmen, die oftmals außen vor gelassen werden aufgrund, zum Beispiel, des hohen Preises. Was ich sehr oft gelesen habe und was auch sehr oft kritisiert wird, ist, dass viele von den Labels, wie zum Beispiel die RSPO oder RTRS, die haben verschiedene Standards, die erfüllt werden müssen und auch verschiedene Reporting Standards. Das bedeutet, wenn ein kleinerer Unternehmer, eine kleinere Farm oder ein mittelgroßes Unternehmen nicht die nötigen Ressourcen hat, um diese Standards zu erfüllen, bekommen Sie diese Zertifizierung gar nicht. Und theoretisch würden Unternehmen, die sich nur auf diese Roundtable stützen würden, diese Firmen gar nicht in Erwägung ziehen, die als Supplier aufzunehmen. Hätten Sie spontan eine Idee, wie man besser kleinere und mittelgroße Unternehmen einbinden kann? Oder ist das zu kompliziert, das so zu sagen.

Marina Billinger: Ja, wir haben hier ein riesengroßes Problem mit Food Fraud. Das heißt, die Hersteller schützen sich dann natürlich stark davor, dass sie durch diese Zertifizierungen ja eine erst mal ein Risiko Reputation, aber auch ihre Kunden schützen. Das ist dann verständlich das eine in einem Land wie Deutschland auch jeder Supplier, egal aus welchem Land er kommt, dann richtig gescreent wird und überprüft wird. Da können sich die Unternehmen das manchmal gar nicht leisten, einen Lieferanten mit aufzunehmen, der kein Zertifikat hat oder wo man wirklich unsicher ist, ob die Produkte auch langfristig, weil man muss ja immer wieder erstens Standards einhalten, auf der anderen Seite braucht man ja immer eine bestimmte Menge, wo man auch eine dauerhafte Verfügbarkeit hat und von der Qualität, von der Menge und von der Konsistenz des Produktes, da geht es in die Lebensmittel Technologie rein, dass der Rohstoff immer den gleichen STANDARD aufweist und wenn man einen Lieferanten hatte, vielleicht super ist und auch Bioprodukte zur Verfügung stellt, aber die Zertifikate nicht hat, dass man als Unternehmen mehr riskiert, wenn man den jetzt doch als Lieferanten mit aufnimmt. Aber bei der zweiten und dritten Lieferung ist das Produkt dann doch nicht so, wie man es erwarten würde. Und das ist ein großes Dilemma in der Problematik. Und da gibt es natürlich auch viele schwarze Schafe, die genau das auch ausnutzen. Und da habe ich auch im Moment keine Lösung. So eine Art von Lösung möchten wir natürlich zukünftig bei uns auf der Plattform lösen, dass kleinere Unternehmen, kleinere Bauern, die sich das nicht leisten können, durch Hilfsmaßnahmen, durch eine Online-Plattform und durch auch kleinere oder günstigere Audits oder Zertifikate doch noch in den Handels-Pool kommen, um wettbewerbsfähiger zu sein und nicht 20 Trader dazwischen zu haben. Also mit unserer Lösung, mit der Leroma Lösung, versuchen wir in diese Richtung einen Standard aufzubauen in der Zukunft. Aber das wird eine sehr, sehr große Herausforderung sein.

Niklas Meisel: Alles klar. Vielen Dank. Dann, würde ich sagen, sind wir am Ende des Interviews angekommen. Es sei denn, Sie haben jetzt noch persönlich etwas, was Sie anmerken würden. Wenn das nicht der Fall ist. Dann habe ich nämlich keine Fragen mehr.

Marina Billinger: Okay. Super. Ja, vielen Dank. Ich wünsche Ihnen dann alles Gute und viel Erfolg mit der Arbeit und ich freue mich, die Auswertungen zu lesen, wenn die Koordinatorin mir das zuschickt.

Niklas Meisel: Ich kann Ihnen das gerne zukommen lassen.

Marina Billinger: Super. Sehr gerne.

Niklas Meisel: Alles klar. Dann noch einmal vielen Dank.

Appendix J
Interview Biodiversity Transcript, Ms Billinger (English Translated)

Niklas Meisel: We conduct the interview in German. Right? Perfect. Good, then I also put the transcript in German. Then he gets it right. Perfect. So, let's talk about me again. My name is Niklas Meisel. I'm doing my bachelor's degree right now, so I'm writing my bachelor's thesis at the Research Group Business Innovation. That's the same group that Sonja works in, she's my supervisor. My bachelor thesis is about biodiversity and measures that can be taken in food wholesale to reduce the biodiversity footprint. Many companies have now seen in the last few years that a lot of new draft laws and guidelines and new rules have been drafted by, for example, the European Union or by various other organizations, such as the United Nations. And these have now also the fear that this will happen in the future also for biodiversity. This means that my task now is to develop principles for what can be done so that they can prepare themselves for this. To this end, I have formulated four questions here. These are guiding questions, so if you want to digress, feel free to do so. I won't stop you there. And if you are ready, I would just start with the very first question. That would be. How big do you see the role of agriculture or agribusiness in protecting overall biodiversity?

Marina Billinger: Yes, biodiversity is strongly linked to the agricultural industry, especially in civilized and industrialized nations like Germany, because a very large area is used for agricultural land and we generally have a very high impact on biodiversity through production flows. Not only in terms of agriculture, in terms of processing, but also in the choice of animals and raw materials that we either breed or grow. To, yes, keep a healthy balance, this issue should of course be looked at very strongly in the future, not only in the agricultural industry alone. That's often the problem I find, which I hope will change in the future, that this is always looked at only in one particular segment. In my opinion, different entities should come together for biodiversity. That's politics, that's business. But that's also the financial world, which has a strong influence on certain decisions and trends and also a certain power, where the journey or biodiversity is going or not. And there, in my opinion, too much attention is paid to that, as far as the financial world is concerned, for example. And hopefully, in the future, these will also be the levers that create synergy and work together on certain goals.

Niklas Meisel: You had just highlighted industrialized countries and that industries in the agricultural industry in industrialized countries are particularly serious for biodiversity. Where exactly do you see the difference between the agricultural industry, in a country like Germany, compared to, for example, a developing country or one of the BRIC countries?

Marina Billinger: Yes, if you look at certain products alone, such as whether only wheat is grown or other types of grain are considered in a larger agricultural area. You can see that many processes and areas are very one-sided. And the more standards are demanded in a civilized state, the less biodiversity we have. We can see this, for example, in pig farming. The pigs have to have the perfect fat layer and the perfect size, and they are viewed, fed, kept and slaughtered in a very one-sided way. And that all has a big impact on less biodiversity in general. And the less civilized or smaller industrialized countries, third countries, also developing countries where there's less order, I say so we're not talking now what's better or worse, but we're just focusing only on biodiversity. Then, of course, there are more deviations and, for example, the pig does not always have to eat sugar beets to have a certain layer of fat, but she can also eat other things. And there we have a much healthier and balanced cycle also in the upcycling topic and that also waste products are rather fed to the animals and not harvested products that have been grown especially for this purpose. And the point is that you can then look at these things to have a higher biodiversity in the development, also later.

Niklas Meisel: You had just mentioned the production of animal products and basically also animal husbandry. This is a very nice transition to the second question that I have formulated. This is: Many problems are often attributed to the production of animal products, as you have just mentioned

with regard to the production of feed for the animals, which then often has to be flown in. And then you have many problems, also with soy, for example. We can go into that again in a moment, but also waste from the animals in the winter when we talk about manure, for example, but also the CO2 emissions during production. And now my question is: In your opinion, should that be the focus when formulating new measures, both governmental and private, you can answer that in a moment? Or would that be too short-sighted? Are there other areas in agriculture that should be focused on more? Or are you already saying that animal production is the primary driver?

Marina Billinger: One second. Sorry about that. We're on lunch break in the office right now, so it's a little bit noisy here. So, as I said in the first question, we would need many more measures, but also cross-functional measures at all levels, to overcome the problems that we have, not, of course, to blame everything on animal production, also in the entire value chain. So we have a horizontal view and then a vertical view, where we would have to go much deeper into individual elements and also link individual areas together to see where it is where you can pull together on certain levers, for example, to cover more diversity or other problems or highlight and try to reduce these problems. So governmental, private. There are political guidelines that are introduced, companies have to comply with them. But that doesn't help anyone if the end consumer isn't informed about what options are available or what would be healthier or better for the environment in terms of biodiversity, for example. You then get very few views in general that you look at everything in a synergy. If someone looks at palm oil. Palm oil is now not harmful to the body, but the environment of course. Clearing forests is a negative point. But many, many products are hyped as healthy, but are not sustainable, because a lot of energy and resources like water are wasted. And we are in globalized raw material procurement. This means that there are very, very many raw materials that come to us from a completely different corner of the earth, which is very unsustainable. And that's why it's important to look at all levels and say: An avocado is healthy, but it might be more unhealthy...

Marina Billinger: ... if you have them imported from Mexico, then maybe a piece of meat would be healthier for everyone involved, because we would promote much more biodiversity in the future through these CO2 savings in transport or the water consumption that an avocado needs, if we had animal-friendly and balanced factory farming, for example. So you see, there are a lot of factors and I also like to mix everything, but then there are simply areas, so starting from the supply chain, from agricultural policy to the end consumer. But there are many factors and many instances that have to work together. For example, we also do at the beginning of the value chain, try to reduce the waste of raw materials and raw materials that have been thrown away for decades, should be used or reused and not only in the food industry but also in neighbouring industries, so that, for example, food loss and waste, what we see today as a waste product, also many residual flows, that these are reused, also in other industries. For example, there are great examples like sneakers are made from mango peels or organic plastic is made from various sidestream products, so organic waste products. And that's just the difference. If you then go into the respective vertical level, what possibilities are there and how do we combine this in the private sector as well? For me, the private sector is always the end consumer, I am also an end consumer at the end of the day. How do we reconcile government and private goals and communicate them strongly?

Niklas Meisel: I find it very interesting that you have now addressed the end consumer in the value chain. Do you think - and this is perhaps the wrong word to use - that you can educate the end consumer, or does the motivation always come from the end consumer and then the companies adapt?

Marina Billinger: I believe very, very strongly that you can and should educate the end consumer because many trends are also predetermined. People are more vigilant when it comes to sustainability and health. That means it will accompany us strongly in the next two decades and the topic of sustainability and health will shape the industry. But that also means that we have an inference that industry and also policy can work with industry to shape the end consumer to say yes, you may

not have to eat avocado, it's, you can also be a vegetarian, but maybe once a month you're a flexitarian and you only eat local vegetables and a piece of meat. There's so much you can do to kind of educate or motivate each other. So we're also saying we're motivating the industry to be more resource-efficient and that you don't dispose of streams and semi-finished products, you pass them on to reduce waste. Of course, we are also trying to do the same thing with the end consumer, saying that we are creating awareness to draw attention to products. For example, as a company, we also want to introduce a kind of certificate, i.e. a kind of Fairtrade, in which we say that Fairtrade is a B2B certificate, but the end consumer knows it and has been educated to buy or consume products that have been traded more sustainably and that the farmer gets more out of it than another product that has been traded. And that's why I think very strongly that you can motivate the end consumer in all directions.

Niklas Meisel: You just mentioned certificates. That's a very nice keyword because my third question also relates to certificates in the value chain. The question would be: About deforestation and monocultures, the focus is very often exclusively on soy and palm oil. There are then, for example, certificates or so-called round tables, in this case, the Roundtable of Sustainable Palm Oil or the Round Table of Responsible Soil. These are certificates that are supposed to certify that sustainable management is taking place. However, the implementation of these measures and the reporting of these measures lag massively. And there are massive problems, with criticism coming from all sides. Now my question to you would be: A tunnel vision on soy and palm oil, as is currently the case with many companies. So you often see that there are basic environmental guidelines, but then separate guidelines specifically for soy and specifically for palm oil. Is this focus justified or are there other products or other views that should be respected?

Marina Billinger: So for me, this tunnel vision is completely wrong, because we are really only talking about two products here. In the raw materials sector alone, there are over 400 certificates worldwide that relate to specific measures. And if we now focus only on palm oil and soy, only certain factors are considered in these certificates, if we were to go into depth and also consider social factors. Theoretically, you could put every product on the agenda and say that if we want social or gender issues to be very widespread in Europe, we also want to have equality. This equality goes back not only to a gender issue, but to all levels, to levels of action, to a right to water or not. And then you can really, every product you should then focus on. So that a company, for example, sells water in Europe, but in a certain area, where the water source is, takes this water away from the people who live there or contaminates a certain region with chemicals so that we have certain raw materials in Europe. There are so many factors and for me this is just greenwashing. If we now talk about this roundtable and that should, so my wish here, as I have already mentioned several times, is that you create more synergies and more implementation at all levels. And that also goes for all kinds of primary products. And a company that says we are totally sustainable when it comes to palm oil and soy is very unsustainable when it comes to the 380 other raw materials.

Niklas Meisel: All right. I had just mentioned that soy and palm oil are often mentioned in connection with forests and deforestation and monocultures. Do you perhaps have any other examples that go in the same direction?

Marina Billinger: Yes, we are talking about a whole feed industry for animal husbandry, so that many products are cultivated. For this purpose, rainforests and large areas of valuable plants are destroyed, for example, to grow wheat, to grow grain, which is fed to the local animal production, to the mass animal production. And we are also talking about other products. It is, I think, incredibly strong. We know that. Also with many spices, that things are grown there, where you say, but the other areas suffer from it, especially through the pesticides that are spread there, which then go to the neighboring peoples and destroy the biodiversity. And yes, these are the strongest examples that I can think of. Yes.

Niklas Meisel: Good. In the very first question, we also mentioned the industrialized countries and the agricultural industry in these industrialized countries. And you often read in the literature, but also from the United Nations, that this is partly because the companies that operate in these countries are very often very large companies that, as you have already said, automate a great deal and insist very much on efficiency. The United Nations itself very often refers to the role of small or medium-sized producers of animal and non-animal products, saying that they are often more sustainable. But they had already hinted at that. But why exactly should that be the case? Do you have any examples?

Marina Billinger: Yes, because many digitalized processes perhaps leave less room for a sustainable view in a large industry or large processes. Many smaller companies have to stand out and assert themselves through something else because they bring a better or more sustainable or healthier product to the market. That's why there are great examples. Unfortunately, these are not supported enough by all sectors. They are then not competitive because the end product is so expensive that production is hardly worthwhile for the young companies or the end consumer simply does not accept the prices. And then we are back to education, that at the end of the value chain, the end consumer says I am willing to spend more money for a sustainable regional product. Whether now only small and medium-sized producers can be sustainable and will be sustainable, I would not underline that so. I hope that the industry, there are also many great examples, where even large companies say we want to change in the segment and produce more sustainably or also include a product range that either has sustainable resources or a sustainable process or logistics away, that we produce something beneficial to the general public, the common good, not only in terms of health but also supports biodiversity and we can perhaps also cover a few factors at the social level, because, for example, we support a few farmers in India better through a few measures. Has that answered the question now?

Niklas Meisel: Yes, but I have a follow-up question. We had just talked about the labels and now just about the smaller and medium-sized companies, which are often left out because of, for example, the high price. What I have read very often and what is also very often criticized is that many of the labels, such as the RSPO or RTRS, have different standards that have to be met and also different reporting standards. That means that if a smaller entrepreneur, a smaller farm or a medium-sized company doesn't have the resources to meet those standards, you don't get that certification at all. And theoretically, companies that would only rely on these roundtables wouldn't even consider taking those companies on as suppliers. Off the top of your head, would you have any ideas on how to better involve smaller and medium-sized companies? Or is that too complicated to say like that?

Marina Billinger: Yes, we have a huge problem here with food fraud. This means that the manufacturers then of course protect themselves strongly from the fact that through these certifications they, first of all, protect a risk reputation, but also their customers. It is then understandable that in a country like Germany, every supplier, regardless of which country it comes from, is properly screened and checked. Sometimes companies can't afford to take on a supplier who doesn't have a certificate or where they are unsure whether the products will be available in the long term, because first of all you always have to comply with standards, and on the other hand, you always need a certain quantity where you also have long-term availability and quality, of the quantity and the consistency of the product, there it goes into the food technology purely that the raw material always shows the same STANDARD and if one had a supplier, perhaps super is and also bioproducts makes available, but the certificates do not have that one risks as an enterprise more if one takes up now nevertheless as a supplier with. But with the second and third delivery, the product is not what you would expect. And that is a big dilemma in the problem. And of course, there are also many black sheep who exploit this. And I don't have a solution at the moment. Of course, we would like to solve this kind of solution on our platform in the future, so that smaller companies, and smaller farmers who cannot afford it, can still get into the trading pool through support measures, through an online platform and smaller or cheaper audits or certificates, to be more competitive and not have 20 traders

in between. So with our solution, with the Lerona solution, we try to build a standard in this direction in the future. But that will be a very, very big challenge.

Niklas Meisel: All clear. Thank you very much. Then, I would say, we have reached the end of the interview. Now, unless you have anything personally that you would like to comment on. If that is not the case. Because then I don't have any more questions.

Marina Billinger: Okay. Great. Yes, thank you very much. I wish you all the best then and good luck with the work. I look forward to reading the evaluations when the coordinator sends that to me.

Niklas Meisel: I would be happy to send that to you.

Marina Billinger: Great. With pleasure.

Niklas Meisel: All right. Then thank you once again for the interview.

Appendix K Interview Biodiversity Coding, Ms Billinger

Figure K1

Interview Biodiversity Coding, Ms Billinger



Appendix L
Interview Topic Guide

Table L1.

Interview Topic Guide

	English	German
Q1	How big a role do you see agriculture playing in protecting overall biodiversity? Do you see possible greater leverage elsewhere?	Wie groß sehen Sie die Rolle der Landwirtschaft/Agrarindustrie bei dem Schutz der allgemeinen Biodiversität? Sehen Sie woanders möglicherweise einen größeren Hebel?
Q2	Many Problems are often attributed to the production of animal products (feed production, waste, CO2 emissions, etc.). Do you think this is where the focus should be when formulating new measures (public & private) or would that be too short-sighted?	Viele Probleme werden oft auf die Produktion von Tierprodukten zurückgeführt (Futterproduktion, Abfälle, CO2 Ausstoß, etc.). Sollte Ihrer Meinung nach dort der Fokus bei der Formulierung neuer Maßnahmen (staatlich & privat) liegen oder wäre das zu kurz gedacht?
Q3	With regard to deforestation and monocultures, the focus is often exclusively on soy and palm oil. However, the implementation of measures (e.g. the RSPO & RTRS) lags massively. Is a tunnel vision on soy and palm oil justified or are there other, more environment harming, products that need attention?	im Hinblick auf die Abholzung von Wäldern und Monokulturen wird sich oft ausschließlich auf Soja und Palmöl konzentriert. Die Umsetzung von Maßnahmen (z.B. der RSPO & RTRS) hinkt jedoch massiv. Ist ein Tunnelblick auf Soja und Palmöl gerechtfertigt oder gibt es noch andere, für die Umwelt schwerwiegendere, Produkte, die Aufmerksamkeit benötigen?
Q4	The 'United Nations' often points to the role of small/medium-sized producers of animal and non-animal products, saying they are often more sustainable. Why would that be the case? Do you have any experience? To what extent can you confirm this?	Die 'United Nations' verweisen oft auf die Rolle von kleinen/mittelgroßen Produzenten von tierischen und nichttierischen Produkten, mit dem Hinweis, sie seien oft nachhaltiger. Warum sollte das der Fall sein? Haben Sie Erfahrungen? Inwiefern können Sie dies bestätigen?

Appendix M Analytic Hierarchy Process

Table M1.

AHP Criteria Ranking

AHP Criteria	Effectiveness	Likelihood of succeeding	Alignment with other commitments
Effectiveness	1/1	1/2	4/1
Likelihood of Succeeding	2/1	1/1	6/1
Alignment with other commitments	1/4	1/6	1/1

Table M2.

AHP Criteria Ranking, Eigenvector

AHP Criteria	Effectiveness	Likelihood of succeeding	Alignment with other commitments
Effectiveness	1,0000	0,5000	4,0000
Likelihood of succeeding	2,0000	1,0000	6,0000
Alignment with other commitments	0,2500	0,1666	1,0000

Table M3.

AHP Criteria Ranking, Squared Matrix & Normalised Values

AHP Criteria	Effectiveness	Likelihood of succeeding	Alignment with other commitments
Effectiveness	3,0000	1,6664	11,0000
Likelihood of succeeding	5,5000	2,9996	20,0000
Alignment with other commitments	0,8332	0,4582	2,9996

	Sum	Normalized
=	15,6664	0,323305198
=	28,4996	0,588142064
=	4,2910	0,088552737
	48,4570	1

Table M4.

AHP Effectiveness Ranking

For "Effectiveness"	Recommendation #1	Recommendation #2	Recommendation #3	Recommendation #4	Recommendation #5
Recommendation #1	1/1	4/1	2/1	4/1	2/1
Recommendation #2	1/4	1/1	1/2	1/1	1/2
Recommendation #3	1/2	2/1	1/1	2/1	1/1
Recommendation #4	1/4	1/1	1/2	1/1	1/2
Recommendation #5	1/2	2/1	1/1	2/1	1/1

Table M5.

AHP Effectiveness Ranking, Eigenvector

For "Effectiveness"	Recommendation #1	Recommendation #2	Recommendation #3	Recommendation #4	Recommendation #5
Recommendation #1	1,0000	4,0000	2,0000	4,0000	2,0000
Recommendation #2	0,2500	1,0000	0,5000	1,0000	0,5000
Recommendation #3	0,5000	2,0000	1,0000	2,0000	1,0000
Recommendation #4	0,2500	1,0000	0,5000	1,0000	0,5000
Recommendation #5	0,5000	2,0000	1,0000	2,0000	1,0000

Table M6.

AHP Effectiveness Ranking, Squared Matrix & Normalised Values

For "Effectiveness"	Recommendation #1	Recommendation #2	Recommendation #3	Recommendation #4	Recommendation #5
Recommendation #1	5,0000	20,0000	10,0000	20,0000	10,0000
Recommendation #2	1,2500	5,0000	2,5000	5,0000	2,5000
Recommendation #3	2,5000	10,0000	5,0000	10,0000	5,0000
Recommendation #4	1,2500	5,0000	2,5000	5,0000	2,5000
Recommendation #5	2,5000	10,0000	5,0000	10,0000	5,0000

	Sum	Normalized
=	65,0000	0,4
=	16,2500	0,1
=	32,5000	0,2
=	16,2500	0,1
=	32,5000	0,2
<hr/>		
	162,5000	1

Table M7.

AHP Likelihood Ranking

For "Likelihood of Succeeding"	Recommendation #1	Recommendation #2	Recommendation #3	Recommendation #4	Recommendation #5
Recommendation #1	1/1	1/2	1/1	1/4	1/1
Recommendation #2	2/1	1/1	2/1	1/2	2/1
Recommendation #3	1/1	1/2	1/1	1/4	1/1
Recommendation #4	4/1	2/1	4/1	1/1	4/1
Recommendation #5	1/1	1/2	1/1	1/4	1/1

Table M8.

AHP Likelihood Ranking, Eigenvector

For "Likelihood of Succeeding"	Recommendation #1	Recommendation #2	Recommendation #3	Recommendation #4	Recommendation #5
Recommendation #1	1,0000	0,5000	1,0000	0,2500	1,0000
Recommendation #2	2,0000	1,0000	2,0000	0,5000	2,0000
Recommendation #3	1,0000	0,5000	1,0000	0,2500	1,0000
Recommendation #4	4,0000	2,0000	4,0000	1,0000	4,0000
Recommendation #5	1,0000	0,5000	1,0000	0,2500	1,0000

Table M9.

AHP Likelihood Ranking, Squared Matrix & Normalised Values

For "Likelihood of Succeeding"	Recommendation #1	Recommendation #2	Recommendation #3	Recommendation #4	Recommendation #5
Recommendation #1	5,0000	2,5000	5,0000	1,2500	5,0000
Recommendation #2	10,0000	5,0000	10,0000	2,5000	10,0000
Recommendation #3	5,0000	2,5000	5,0000	1,2500	5,0000
Recommendation #4	20,0000	10,0000	20,0000	5,0000	20,0000
Recommendation #5	5,0000	2,5000	5,0000	1,2500	5,0000

	Sum	Normalized
=	18,7500	0,1
=	37,5000	0,2
=	18,7500	0,1
=	75,0000	0,4
=	18,7500	0,1
<hr/>		
	168,7500	1

Table M10.

AHP Synergy Ranking

For "Synergy with Other Commitments"	Recommendation #1	Recommendation #2	Recommendation #3	Recommendation #4	Recommendation #5
Recommendation #1	1/1	2/1	1/2	1/2	4/1
Recommendation #2	1/2	1/1	1/4	1/4	2/1
Recommendation #3	2/1	4/1	1/1	1/1	6/1
Recommendation #4	2/1	4/1	1/1	1/1	6/1
Recommendation #5	1/4	1/2	1/6	1/6	1/1

Table M11.

AHP Synergy Ranking, Eigenvector

For "Alignment with Other Commitments"	Recommendation #1	Recommendation #2	Recommendation #3	Recommendation #4	Recommendation #5
Recommendation #1	1,0000	2,0000	0,5000	0,5000	4,0000
Recommendation #2	0,5000	1,0000	0,2500	0,2500	2,0000
Recommendation #3	2,0000	4,0000	1,0000	1,0000	6,0000
Recommendation #4	2,0000	4,0000	1,0000	1,0000	6,0000
Recommendation #5	0,2500	0,5000	0,1666	0,1666	1,0000

Table M12.

AHP Synergy Ranking, Squared Matrix & Normalised Values

For "Alignment with Other Commitments"	Recommendation #1	Recommendation #2	Recommendation #3	Recommendation #4	Recommendation #5
Recommendation #1	5,0000	10,0000	2,6664	2,6664	18,0000
Recommendation #2	2,5000	5,0000	1,3332	1,3332	9,0000
Recommendation #3	9,5000	19,0000	4,9996	4,9996	34,0000
Recommendation #4	9,5000	19,0000	4,9996	4,9996	34,0000
Recommendation #5	1,4164	2,8328	0,7498	0,7498	4,9992

	Sum	Normalized
=	38,3328	0,2
=	19,1664	0,1
=	72,4992	0,3
=	72,4992	0,3
=	10,7480	0,1
	<hr/> <hr/>	
	213,2456	1

Table M13.

AHP Ranking Conclusion

Effectiveness 32,33%	Likelihood of Succeeding 58,81%	Synergy with Other Commitments 8,86%	Solution
<u>Recommendation #1</u> Recommendation Factor x Criteria Factors = 12,93%	<u>Recommendation #1</u> Recommendation Factor x Criteria Factors = 6,53%	<u>Recommendation #1</u> Recommendation Factor x Criteria Factors = 1,59%	= 21,06%
<u>Recommendation #2</u> Recommendation Factor x Criteria Factors = 3%	<u>Recommendation #2</u> Recommendation Factor x Criteria Factors = 13%	<u>Recommendation #2</u> Recommendation Factor x Criteria Factors = 1%	= 17,10%
<u>Recommendation #3</u> Recommendation Factor x Criteria Factors = 6%	<u>Recommendation #3</u> Recommendation Factor x Criteria Factors = 7%	<u>Recommendation #3</u> Recommendation Factor x Criteria Factors = 3%	= 16,01%
<u>Recommendation #4</u> Recommendation Factor x Criteria Factors = 3%	<u>Recommendation #4</u> Recommendation Factor x Criteria Factors = 26%	<u>Recommendation #4</u> Recommendation Factor x Criteria Factors = 3%	= 32,38%
<u>Recommendation #5</u> Recommendation Factor x Criteria Factors = 6%	<u>Recommendation #5</u> Recommendation Factor x Criteria Factors = 7%	<u>Recommendation #5</u> Recommendation Factor x Criteria Factors = 0%	= 13,45%