

# On track towards carbon-neutrality? A case study of the climate strategies of major Austrian companies

A Master's Thesis submitted for the degree of  
“Master of Science”

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## Affidavit

I, **JULIAN SCHMID, BA**, hereby declare

1. that I am the sole author of the present Master's Thesis, "ON TRACK TOWARDS CARBON-NEUTRALITY? A CASE STUDY OF THE CLIMATE STRATEGIES OF MAJOR AUSTRIAN COMPANIES", 130 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted the topic of this Master's Thesis or parts of it in any form for assessment as an examination paper, either in Austria or abroad.

Vienna, 16.09.2020

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Signature

## Abstract

Global warming is one of the largest threats our generation, our children and future generations (will have to) face. After wasted decades of taking all too small steps to tackle the problem, policy makers have set increasingly ambitious climate targets in recent years, culminating in the Paris Agreement's target to hold global temperature rise below +1,5°C or well below +2°C target, the European Green Deal's plan to make the EU carbon-neutral by 2050 and Austria's even more ambitious declaration to become climate-neutral by 2040. Although, currently no legal obligation exists that directly requires companies to reduce their CO<sub>2</sub> emissions to near-zero, companies will undoubtedly be key-actors in the transition towards a carbon-neutral economy. Companies in all sectors will need to decarbonise their entire activities within the foreseeable future, so that countries will be able to achieve their climate goals. In this master's thesis, twelve qualitative case studies of the reported climate strategies of Austrian-based companies were conducted to examine, whether these strategies are fit to achieve the goal of carbon-neutrality. The selected companies, represent Austria's most emission relevant sectors: energy, heavy industry, transportation, retail, construction, agriculture and forestry. Together, the twelve companies currently emit - conservatively calculated - more than twice the annual territorial CO<sub>2</sub> emissions of Austria. In order to assess the twelve climate strategies, as they are provided in the companies' annual and sustainability reports that were available in March 2020, specific analysis criteria were developed by the author on the basis of a review of official documents, voluntary standards and current scientific research. These criteria include a comprehensive emission inventory, adequate targets, no offsetting and no end-of-pipe technologies, and they consider a company's avoided and decreasing emissions. The results of the case studies indicate that all selected companies report certain climate strategies, which, however, vary massively in terms of comprehensiveness and ambition. Based on the analysis criteria, the research revealed that none of the researched major Austrian companies' reported climate strategies is currently fully on track to achieve carbon-neutrality by 2050 or even 2040 yet. Nevertheless, four companies reported climate strategies which are close to being on track to achieve the goal of carbon-neutrality. Three companies have reported relatively ambitious climate strategies - but, all in all, these climate strategies are lagging behind considerably. Two companies' reported climate strategies are not on track, but the respective companies are planning to issue new strategies towards carbon-neutrality soon. Three companies do not report a substantial climate strategy. The master's thesis ends with recommendations for research, policy and business to accelerate and support the transition towards a zero-carbon economy.

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## List of Abbreviations

AG	Aktien Gesellschaft
BIG	Bundesimmobiliengesellschaft
CCS	Carbon Capture and Storage
CCU	Carbon Capture and Utilisation
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CDP	Carbon Disclosure Project
CH <sub>4</sub>	Methane
CO <sub>2</sub>	Carbon dioxide
CO <sub>2e</sub>	Carbon dioxide equivalent
EU	European Union
EU-ETS	European Union Emission Trading System
GHG	Greenhouse gas
G20	Group of Twenty
HFC	Hydrofluorocarbon
IPCC	Intergovernmental Panel on Climate Change
LCA	Life Cycle Assessment
MWh	Mega Watt hour
N <sub>2</sub> O	Nitrous oxide
ÖBAG	Österreichische Beteiligungs Aktien Gesellschaft
ÖBB	Österreichische Bundesbahnen
PFC	Perfluorcarbon
SBT	Science Based Target
SF <sub>6</sub>	Sulfur hexafluoride
TCFD	Task Force on Climate Related Disclosures
UNFCCC	United Nations Framework Convention on Climate Change
VCÖ	Verkehrsclub Österreich
WRI	World Resource Institute
WBCSD	World Business Council for Sustainable Development

## 1.1 Introduction and State of the Art

The climate crisis is one of the largest challenges to my generation and the generations to come. Although the topic has already been on the international political agenda around the day of my birth in 1989, no adequate mitigation measures have been taken until today in 2020. Between the establishment of the UN Framework Convention on Climate Change (UNFCCC) in 1992 and the Paris Agreement of 2015, global CO<sub>2</sub> emissions have even risen - making it increasingly difficult to act upon global warming and requiring even more radical action to reduce the risk of potential long-term catastrophe (IPCC, 2014a). The Intergovernmental Panel on Climate Change (IPCC) considers human caused greenhouse gas emissions to be the major cause of global warming<sup>1</sup> and further states a reduction of greenhouse gases to be key for limiting the global rise in temperatures<sup>2</sup>. Furthermore, there is the high risk of rising temperatures triggering positive natural feedback-loops, which further heat the atmosphere, such as methane leaks from unfreezing permafrost, smaller albedo through melting ice shields and less cloud formation and deforestation through increasing bush-fires (see inter alia, Lenton, 2011).

The fight against anthropogenic CO<sub>2</sub> emissions<sup>3</sup> has eventually gained global momentum in recent years. In 2015, the Paris Agreement was adopted, which aims at holding global warming below +1,5°C or below +2°C of pre-industrial times (Paris Agreement, 2015, Art. 2). In 2018 and 2019, the FridaysForFuture movement mobilised millions of young people around the world (Taylor et al, 2019), while in December 2019, the European Commission announced the “European Green Deal” which strives to make Europe the “*first carbon-neutral continent*” by 2050 (European Commission, 2020, 1). At the Beginning of 2020, the newly formed Austrian Government proposed

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<sup>1</sup> “*Anthropogenic greenhouse gas emissions have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever. This has led to atmospheric concentrations of carbon dioxide, methane and nitrous oxide that are unprecedented in at least the last 800,000 years. Their effects, together with those of other anthropogenic drivers, have been detected throughout the climate system and are extremely likely to have been the dominant cause of the observed warming since the mid-20th century*” (IPCC, 2014b).

<sup>2</sup> “*Without additional efforts to reduce GHG emissions beyond those in place today, global emissions growth is expected to persist, driven by growth in global population and economic activities. Global mean surface temperature increases in 2100 in baseline scenarios - those without additional mitigation - range from 3.7°C to 4.8°C above the average for 1850–1900 for a median climate response. They range from 2.5°C to 7.8°C when including climate uncertainty (high confidence)*” (IPCC, 2014b).

<sup>3</sup> For the purpose of this master’s thesis, the term “CO<sub>2</sub>” refers to CO<sub>2</sub> and CO<sub>2</sub>-equivalents (see p. 26).

even more ambitious targets: Austria should become carbon-neutral by the year 2040 (Regierungsprogramm 2020, 104). Following these new European and Austrian goals, the transformation towards a carbon-neutral economy will have to take place rapidly within the next two to three decades. Year by year, directly and indirectly, emitting hundreds of millions of metric tonnes of greenhouse gases into the atmosphere (Umweltbundesamt, 2019a), Austrian companies will thus have to undergo a radical transformation of their business activities to achieve these carbon-neutrality targets<sup>4</sup>. This decarbonisation will require nothing less than a new industrial revolution, which needs to transform all economic sectors: from energy production, industrial processes, housing, transportation, agriculture and services (Rifkin, 2019). According to Perez, the this green transition will be, together with the digital transition, the largest opportunity of our times to create economic progress and new jobs, since it will require large scale innovation and investment (Perez, 2016). Austrian companies will have the potential to be ambitious leaders in this green transition. If they miss this chance, these are times, in which even the most established companies may be destroyed and replaced by more timely and better adapted competitors. According to a recent study carried out by the Boston Consulting Group (BCG), only 65% of Austrian industry leaders consider decarbonisation as one of their companies' top three priorities - compared to an international average of 75% (Strobl, 2020a). These figures show that Austrian companies are currently less prepared than their international competitors. Without deep rethinking, radical innovation and sustainable investments, not only the global climate, but hundreds of thousands of Austrian jobs are being put at risk.

Due to this, companies' climate related failings, targets and activities have increasingly gotten into focus of investors (see inter alia Sorkin, 2020; Wared and Siegel 2020), policy makers, civil society, consumers and science. Hence, it is time to ask, whether major Austrian companies have a strategy to steer their business models towards a carbon neutral future and what do their strategies look like? With this master's thesis, I want to contribute to answer this question by conducting case studies of the climate strategies of twelve major Austrian companies as presented in the companies' latest climate related reporting. My topic of my master's thesis is highly relevant at least because of two aspects: CO<sub>2</sub> emissions are causing anthropogenic climate change (IPCC, 2018a, 6-8), without radically reducing CO<sub>2</sub> emissions of all economic sectors, the goals of the Paris Agreement to curb global temperature rise can not be achieved (IPCC, 2014a). Much research does exist with regards to decarbonisation on the international-level (Ibid.), on country-level (see inter alia Umweltbundesamt, 2019b; or

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<sup>4</sup> The legislation currently in place does not impose any direct obligations on Austrian-based companies with regards to reducing their overall CO<sub>2</sub> emissions. On the long run, companies will, however, undoubtedly have to decarbonise their businesses in order for the countries to meet the goal of carbon-neutrality by 2040 or 2050, respectively.



Meyer and Steininger, 2017.), or the sector-level (see inter alia Gerbaulet, 2019; Griffin 2018). Much less scientific research has been conducted, which puts focus on the zero-carbon transition on the company-level. From my point of view, adding such a perspective is indispensable, since companies undoubtedly represent key-actors of the green transition. Major companies will, in the end, need to set decisive activities in order to bring their CO<sub>2</sub> emissions down. Some literature exists with regards to the company-level (see inter alia Sihn-Weber and Fischler, 2019; Lamngård C., 2012). Two, more comprehensive, qualitative studies exist with regards to climate-related activities on the company-level, which also include Austrian companies. These studies were carried out not by researchers, but by consulting agencies, namely Boston Consulting Group (BCG) with their international study "*Green factory of the Future*" about the wishes and the realities of emission reductions within the industrial sector (Küpper, 2020; Strobl, 2020a), and Pricewaterhouse Coopers (PwC) that conducted an study about climate related reporting which assessed Austrian companies in 2019 (PwC, 2019). Moreover, in order to accelerate decarbonisation on the company-level, various global initiatives have formed over the years, such as the GHG-Protocol (see p. 14), the GDP (see p. 14), SBT-initiative (see p. 15) and the TFCF (see p. 15) which developed various voluntary standards - mostly with regards to climate-related reporting. My master's thesis aims to be a relevant contribution to this emerging field of climate governance and policy, as I contextualised and analysed the reported climate strategies of major companies in a unique way.

First, as far as it can be seen, no other scientific case study has been conducted yet, which analyses major Austrian companies' reported climate strategies in a comparably comprehensive manner. In order to depict a sufficiently realistic picture of the status-quo, I did not only contextualise my case studies politically, but I also included companies of all major emitting sectors in Austria, based on two different national CO<sub>2</sub> accounting methods, namely the territorial- and consumption based method (see p. 17-19).

A second unique contribution of my master's thesis is its clear focus on the question, whether the selected companies' reported climate strategies are in line to achieve carbon-neutrality by 2040 or 2050 respectively, as opposed to only investigating, if the companies reported climate strategies aim merely at reducing CO<sub>2</sub> emissions. For this purpose, I developed specific analysis criteria (see p. 38). These criteria can potentially help companies to formulate more effective climate strategies on the one hand and can serve different stakeholders as a tool to assess the climate strategies of companies against the backdrop of the goal of carbon-neutrality on the other hand.

Third, I applied the analysis criteria in my case studies, and thereby gained unique insights concerning the reported climate strategies of major companies. The analysis criteria further enabled me to formulate recommendations for research, business and policy-making to accelerate the transition towards a zero-carbon economy.

## 1.2 Research Questions

Building on this, I formulated two research questions. First, I want to know, how the climate strategies of the twelve companies in my case studies look like. So my first research question is: *What are the publicly communicated climate strategies of major Austrian companies?* Second, I want to know, whether these twelve climate strategies are on track to achieve the goal of carbon-neutrality.<sup>5</sup> Thus, my second research question is: *Are these climate strategies on track to achieve carbon-neutrality?*

## 1.3 Expected Results

The results of the master thesis will answer the question, how the different reported climate strategies of twelve major Austrian companies' look like and whether these reported climate strategies are on track towards achieving the political target of carbon-neutrality by 2050 or even by 2040. Thereby, different companies' ambitions and efforts in reducing their respective CO<sub>2</sub> emissions will become apparent. On the basis of the case studies it will be possible for me to draw general conclusions regarding the current state of climate governance and climate strategy of companies. Furthermore, recommendations for research, businesses and policymakers to achieve carbon neutrality on a company-level can be derived from the case studies.

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<sup>5</sup> For the purpose of this master's thesis, the term "on track towards carbon-neutrality" means, whether a company's publicly communicated climate strategy is, from today's perspective, in line with the political goal of carbon-neutrality by 2050, to which nations, such as Austria, committed themselves under the Paris Agreement, or by 2040 according to the Austrian government's announcement of 2020 (Regierungsprogramm, 2020). It is important to note that it is not purpose of this master's thesis to scrutinise, whether the selected companies currently fulfil climate-related legal requirements that might currently be imposed on them, but rather to assess the status quo of the companies' climate strategies, as they are outlined in their most recent reports, in light of these international and national climate goals, under which certain nations, such as Austria, have committed themselves to carbon neutrality by 2050 or 2040 respectively.

## 1.4 Outline

As a first step, I analyse the legal context and the most established voluntary standards, on which companies are currently developing their climate-related strategies. The landscape with regard to the legal background and to voluntary standards, which I map in this master's thesis, is, however, not intended as a comprehensive overview, but depicts the - currently - most relevant external drivers for bringing companies' CO<sub>2</sub> emissions down. Chapter 2 is devoted to this.

Secondly, in chapter 3, I discuss the most essential questions and concepts that form the tools to analyse corporate climate strategies. I discuss, how corporate CO<sub>2</sub> inventories are conducted, how CO<sub>2</sub> emissions can be measured, reported and verified. Furthermore, I discuss the role of emission targets that companies might set and which transition pathways for reducing CO<sub>2</sub> emissions exist. Building on this discussion, I derive analysis criteria, which I apply to analyse the companies' climate strategies whether they are on track to achieve carbon-neutrality.

Thirdly, I explain the methodology I use in order to conduct my case studies and to answer my research questions. Chapter 4 reasons, why I select these particular twelve Austrian companies, why I choose the companies' reports to be the basis of my case studies and how I intend to analyse these reports.

Chapter 5, the heart of my master's thesis, form twelve case studies which explore the reported climate strategies of twelve major Austrian-based companies that cover Austria's most emission relevant sectors. In this chapter, I look into each company's reports, extract the company's statements on climate related issues from these reports and - on this basis - scrutinise the company's reported climate strategy in the light of carbon-neutrality. The aim is to not only identify the companies' climate strategies according to their reported emission inventories, emission targets and reduction pathways, but I also critically interpret them against the backdrop of international and national standards and current scientific research.

In chapter 6, I compare the reported climate strategies of the twelve companies and summarise my most important findings, based on my analysis criteria. Moreover, by applying my analysis-criteria, I assess whether these strategies can be considered to be on track towards carbon neutrality. Last but not least, I provide some recommendations for further research and for supporting companies to become carbon neutral.

## **2. Legal Context and Voluntary Standards**

In order to analyse corporate-level climate strategies in general and of my case studies in particular, it is essential to depict the most relevant legal- and voluntary factors influencing companies' climate-related decision making. By assessing the legal context, I demonstrate that, in recent years, not only the political commitment has become more stringent, but also voluntary initiatives have developed, which pursue setting new standards for companies and aim to push for more ambitious corporate climate action. Although, the legislation and voluntary standards currently in place do not impose any direct obligation on Austrian-based companies with regards to reducing their overall CO<sub>2</sub> emissions, the trend towards decarbonisation of the economy is unmissable. Thus, companies are well-advised to develop climate-strategies which put their businesses on track towards carbon-neutrality until 2040 or 2050, respectively. My following analysis shows that this is particularly true for companies active within the European Union and even more for companies based in Austria.

### **2.1 Legal Context**

In order to examine the legal context, I focus on the most relevant documents on the international, European and Austrian level. My aspiration is not to give a comprehensive overview, but to depict the most relevant legal drivers attempting to bring corporate carbon emissions down. Moreover, I want to show that the political dynamic with regards to ambitious CO<sub>2</sub> emission reduction should not be underestimated by Austrian companies. By analysing the international, European and Austrian legal context for companies based in Austria I will show that political climate ambition has profoundly increased over time. On the international level, I will discuss the implications the Paris Agreement and its predecessor, the Kyoto Protocol, already have on Austrian companies. On the EU level, I will depict the increasingly stringent European climate policies, such as various directives, the EU-ETS, and emission targets, which culminated into the announcement of the European Green Deal and the European Climate Law in 2020. I will show that, in terms of European effort-sharing, the Austria economy will be required to fulfil ambitious targets. Furthermore, I will shortly discuss the recent Austrian governmental agreement that is even more ambitious than the European Commission's proposal.

In order to provide an overview over the most relevant legal context, I use the methodology of Höhne et al. that describes which climate-related policies exist, but I do

not dive into the question how effective these policies are or how they influence each other (Höhne et al., 2015, 8). In a general way, Neyer and Williges, exhaustively list various climate-related policy instruments that can be promoted on different political levels. These policy instruments can differ substantially in design and ambition and which together form the most relevant approaches for climate-related policy making. According to Neyer and Williges these instruments are: *economic instruments*, such as taxes, subsidies for clean technologies or emission trading systems; *regulatory instruments*, such as product standards, emission limits and fines in the case of non-compliance; *information and awareness-raising*, such as labelling of products and disclosure of climate-related data; *strategy and planning*, such as long-term strategies and targets; *incentives* to reduce CO<sub>2</sub> emissions and eliminating *barriers* to decarbonisation, such as certain procurement policies or subsidies for fossil fuels (Neyer and Williges, 2018, 3).

### **International Level**

In 1992 the UN Framework Convention on Climate Change (UNFCCC) was adopted, which for the first time established CO<sub>2</sub> accounting and reporting (i.e. inventories) of nations (Debelke et al., 2019, 25) and established institutions which are key to multilateral climate policy, such as the International Panel on Climate Change (IPCC) (Patt, 2015, 102). Based on the UNFCCC, the Kyoto Protocol of 1997, was the first international attempt to actively reduce global CO<sub>2</sub> emissions. Besides defined reduction targets for developed nations who ratified the Protocol (Kyoto Protocol, Art. 3) (Delbeke 2019a, 8), the treaty established two concepts which are still relevant for many states and companies today: namely, market based instruments for reducing carbon emissions (Patt 2015, 103-106) and emission reduction targets (Ibid., 112). In theory, market based instruments imply the creation of markets to trade CO<sub>2</sub> emissions between sellers and buyers to facilitate the most cost-efficient emission reduction. The market participants can be individuals, companies or states. Whether the theory always fits the reality, is a matter of scientific discussion (Patt 2015, 55-97). First, the Kyoto Protocol established the possibility for nations to pool their reduction commitments (Kyoto Protocol, Art. 3) and to set up emission trading systems between “Annex I countries”<sup>6</sup> (Kyoto Protocol, Art. 6). Secondly, the Kyoto Protocol established the Clean Development Mechanism (CDM) and Joint Implementation (JI), which enabled developed countries - under certain conditions - to purchase Certified Emissions Reductions (CER) from developing countries in order to offset their emissions (Kyoto Protocol, Art. 12). The second concept the Kyoto Protocol established, is the idea of

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<sup>6</sup> The term “Annex I countries” refers to developed countries listed under Annex I of the UNFCCC (UNFCCC, 23)

binding CO<sub>2</sub> emission reduction targets. Signatories to the Kyoto Protocol committed themselves to reduce a certain amount CO<sub>2</sub> of emissions between 2008 and 2012 (Ibid., Art. 3). These emission reduction obligations are different for each Annex I signatory to the Protocol (Ibid., 23) and do sum up to a total minus of 5% CO<sub>2</sub> emissions compared to the base-level of 1990 (Ibid., Art. 3).

In 2015, the Paris Agreement succeeded the Kyoto Protocol and went into force in 2016. Most importantly, the members to the agreement defined scientifically grounded global temperature targets which should limit global warming. In concrete terms the Paris Agreement aims at *“holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels”* (Paris Agreement, 2015, Art. 2). Consequently, the Agreement explicitly aims for carbon-neutrality around the year 2050:

*“In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible (...), and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century”* (Paris Agreement, 2015, Art. 4).

In contrast to the Kyoto Protocol, most nations are parties to the Paris Agreement (189 nations at the 14th of June 2020). These nations committed making Nationally Determined Contributions (NDCs) every five years in order to reach the overall targets of the treaty (Paris Agreement, 2015, Art. 3). Essentially, NDCs are nationally determined emission targets, pathways and activities to achieve the goals of the Paris Agreement (Ibid., Art. 3 and Art. 4). In contrast to the Kyoto Protocol no negotiated and binding targets for signatories do exist. Besides setting off a renewed global momentum for climate action, the Paris Agreement reaffirmed international market based instruments used by public and private actors - although, it is not explicitly mentioned, how these instruments will be operationalised (e.g. Art. 6). Moreover, a distinctive element of the Paris Agreement is its explicit focus on steering future public and private finance and investment towards CO<sub>2</sub> mitigation and adaptation (Paris Agreement, 2015, Art. 2).

### **European Union Level**

According to the Treaty on the functioning of the European Union, activities promoting climate protection explicitly fall under the competence of the European Union (TFEU,

2012, Art. 191 (1)). Since the start of the UNFCCC in 1992, the institutions of the European Union have been internal and external drivers for more ambition regarding the fight against global warming (Debelke, 2019, 1-23). In order to fulfil the EU's commitments to the Kyoto Protocol and the Paris Agreement, the European Union brought various climate policies into place, which aim, increasingly stringent, at decarbonising all emission relevant economic sectors (Ibid.). By 2017, the EU reduced its production based emissions by 22% compared to the year 1990 (Ibid., 4). The main climate policy instruments have been the EU Emission Trading System (EU-ETS) and common emission targets for the Non-ETS sectors. The EU-ETS, as well as the various non-ETS directives and initiatives, directly influence companies to reduce their emissions. Moreover, the EU's climate policies might also indirectly influence corporate climate strategy, as they may determine decision makers' expectations regarding future policies. In 2019, the EU's political ambitions culminated into the European Commission's announcement of the "*European Green Deal*", which aims for Europe to become the first carbon-neutral continent on the planet (European Commission, 2020, 1).

Until today, the most relevant pillar of the EU climate strategy has probably been the market based EU-ETS. The EU-ETS follows a "cap and trade" approach (see p. 36). The theory behind "cap and trade" emission trading is, to define an absolute amount of CO<sub>2</sub> emissions, which are allowed to be made and to allow for the emission allowances to be traded among emitters. Basically, this is a "carbon offsetting" system (see p. 36), which in theory should lead to the most cost-effective outcome, because participants will always reduce those emissions, which can be reduced at the lowest costs. Those participants, who manage to reduce their emissions, will be able to sell (some of) their allocated allowances to other participants. Over time, the overall emission "cap" will be lowered by legislation and hence the system's emissions will be further reduced. This puts an effective price on carbon. The carbon price is not fixed, but dependant on the supply and demand for allowances. In the EU-ETS the trading of emission certificates is taking place between the participants. Furthermore, also certain non-EU CDM-certificates could (see p. 37) be purchased by companies in order to balance their emissions, which made EU companies the major global buyers of emission reduction certificates under the CDM (Meadows et.al, 2019, 84-89).

The EU-ETS covers stationary industrial facilities, such as power plants and steel mills (Runge-Metzger and Van Ierland, 2019, 96). By now, also the aviation sector was included into the EU-ETS. Currently, the EU-ETS covers up to 45% of all of the EU's territorial greenhouse gas emissions (Delbeke, 2019a, 16). Over the years, the EU-ETS has been criticised for its oversupply of carbon credits, its freely allocated permits

and the resulting windfall profits for various industries (Patt, 2015, 74-77). Inter alia, Patt argues that the EU-ETS on its own has little effect to reduce emissions in the way it is needed (Ibid.). In contrast to this, Meadows et al. argue that *“the EU ETS (...) demonstrated that it was able to promote new jobs, expanding sectors concerned with the energy transition while preparing the EU economy for greater carbon constraint in the future”* (Meadows et.al, 2019, 89), and further they consider the EU-ETS a *“learning-by-doing”* project (Ibid.). This shows, that it is a highly discussed topic, whether the EU-ETS is a (sufficiently) effective way to reduce CO<sub>2</sub> emissions. However, the sectors covered by the EU-ETS reduced CO<sub>2</sub> emissions above average over time (Delbeke, 2019a, 15) by 26% since its start (Meadows et al, 2019, 89). In 2018, various reforms were made to reduce the flaws of the trading system and to increase the incentives to reduce emissions (European Parliament and Council, 2018). Furthermore, it was implemented that from 2021 onwards the “cap” will be reduced automatically by 2,2% per year (Ibid., Art. 5). According to current legislation, the EU aims to reduce CO<sub>2</sub> emissions under the EU-ETS by 43% until 2030 (base year: 2005) (Ibid., Art. 2), but according to the higher targets of new *“European Climate Law”* the current emission reduction target will most probably be even further increased. Moreover, there are ongoing discussions, whether more sectors should be included into the EU-ETS, such as road transportation (Delbeke, 2019b, 205). Two EU actioning platforms for trading certificates under the EU-ETS exist. One is the European Energy Exchange AG (EEX) that includes facilities of 25 EU member states, the second is the ICE Futures Europe (ICE), the platform for the United Kingdom (European Commission, 2015).

The second important pillar of the EU’s climate policy is the *“Effort Sharing Regulation”* (Runge-Metzger and Van Ierland, 2019, 95). Up to 60% of the EU’s CO<sub>2</sub> emissions stem from sources, which are not included in the EU-ETS, such as road transport, smaller industrial facilities, heating and cooling of buildings, agricultural practices, waste management and fluorinated gases (Ibid., 96). While the emission reduction efforts of sectors included in the EU-ETS are thereby directly regulated by the European Union, specific policies regarding non-ETS sectors are carried out mostly by the member states (Ibid., 97). Nevertheless, also for non-ETS sectors, binding emission reduction targets are set by the EU. In this regard, the renewed *Effort Sharing Regulation* of 2018 aimed at reducing non-ETS sectors’ emissions overall by 30% in 2030, compared to 2005 levels (Delbeke, 2019a, 16).

In order to support these non-ETS emission reductions, the European Union has put in place comprehensive legislation: namely, CO<sub>2</sub> emission performance standards for vehicles (for passenger car fleets, light-duty vehicles and from 2025 onwards for heavy-duty vehicles), the Renewable Energy Directive (at least 32% total share of



renewable energy in 2030, and 10% biofuels required from 2021 onwards), the regulation to phase down fluorinated greenhouse gases (i.e. reduction of at least 60% by 2030), the Energy Performance of Buildings Directive (e.g. all newly constructed buildings should be “nearly zero-energy” from 2020 onwards) the Energy Efficiency Directive and its amending Directive (minimum increase in energy efficiency of 32,5% in 2030), the Eco Design Directive (e.g. sets efficiency standards for energy related products).

All these European climate policies concern companies’ production processes, (energy) consumption, product standards, vehicle emissions and thus strongly determine companies’ emission reduction strategies. Recently, the European Union has also addressed the investment side: Building on the Paris Agreement’s focus on raising funds for climate protection, the European Commission proposed the *“Action Plan: Financing Sustainable Growth”* in 2018. This action plan aims at fostering investments in sustainable economic activities and at divesting from unsustainable projects. The EU Commission proposed a “taxonomy”, which defines, which economic activities support climate mitigation and adaptation (European Commission, 4). This taxonomy might evolve towards a new investment standard that reduces “greenwashing” by investors and companies (Ibid., 7). To make this possible, large public companies might be required to disclose their climate performance in the future (Ibid., 4). In the wake of these reforms, in 2019, the EU Commission also proposed voluntary *“Guidelines on Reporting Climate Related Information”* as a supplement to the *Non-Financial Reporting Directive* for large publicly listed companies with more than 500 employees. These Guidelines explicitly stress, the importance and new political commitment to foster companies’ climate related reporting:

*“Without sufficient, reliable and comparable sustainability-related information from investee companies, the financial sector cannot efficiently direct capital to investments that drive solutions to the sustainability crises we face, and cannot effectively identify and manage the risks to investments that will arise from those crises. Corporate disclosure of climate related information has improved in recent years. However, there are still significant gaps, and further improvements in the quantity, quality and comparability of disclosures are urgently required to meet the needs of investors and other stakeholders”* (European Commission, 2019, 4).

Last but not least, in 2019, the European Commission proposed the *“European Green Deal”* and the *“European Climate Law”*, which again raised the EU’s overall emission targets towards minus 50%-55% CO<sub>2</sub> emissions by 2030 (European Commission, 2020, Art. 2) and to complete *“climate-neutrality”* (net-zero emissions) by 2050 (Ibid.).

According to the *European Climate Law* of 2020, all policies and directives of the European Union should be assessed, whether they comply with the new targets (Ibid.).

As this master's thesis is written, the European political processes are still ongoing and some uncertainty regarding the final outcome remains, but one can assume that such a continuous and substantial rise in political ambition will have material consequences for all economic stakeholders. This is particularly true for European companies, which are in urgent need for developing substantial decarbonisation strategies to comply with the coming legislation and to stay competitive.

### **Austrian Level**

According to the EU's current *Effort Sharing Directive* of 2018, Austria needs to reduce its non-ETS CO<sub>2</sub> emissions by at least 36% by 2030 compared to 2005 (Umweltbundesamt 2017, 10). Most probably, these targets will increase due to the recently passed *European Climate Law*. On top of this revised target, Austria might raise ambitions even more: According to the most recent governmental agreement of 2020, the Austrian government aims for the republic to become carbon-neutral by 2040 (Regierungsprogramm, 2020, 104). So one can proceed from the assumption that the Austrian emission reductions need to be even more stringent than the EU's legislation, in order to reach Austria's policy goals. According to the Austrian government, a "Climate Protection Law" (Regierungsprogramm, 2020, 105) will concern decarbonisation of all economic areas, from electricity production, energy efficiency, industry, transport, buildings, agriculture and waste management (Regierungsprogramm, 2020, 103-118). For instance, the Austrian government plans to decarbonise Austria's electricity production entirely until 2030 by only using renewables (Regierungsprogramm, 2020, 111). Until these announcements, Austria has not been at the European forefront with regards to reducing its greenhouse gas emissions. In fact, instead of reducing its emissions, Austria's CO<sub>2</sub> emissions even rose between 1990 and 2017 by 4,6% (Umweltbundesamt, 2019b, 6). The Environment Agency Austria considers new measures in the coming years as key in order to bring Austria on a low-carbon trajectory, as such a pathway is not achievable with existing measures in place (Ibid., 11).

Neyer and Williges from the Austrian-based Wegener Center for Climate and Global Change, further provided an succinct overview over Austria's climate policies which were in place 2018 and build a comprehensive framework which policies are needed for Austria to become carbon-neutral (Neyer and Williges, 2018). Currently, 39 climate-

related policies are in place in Austria (Neyer and Wiliges, 2018, 6). The majority thereof concern the economic sectors transportation and buildings (Ibid.). In contrast, *“the sectors agriculture and forestry, waste & F-gases appear to receive little attention from policymakers”* (Ibid.). Moreover, various fossil fuel subsidies are still in place which hinder the transition towards a low-carbon economy (Ibid.).

## 2.2 Voluntary Standards

To analyse corporate climate strategies, also the voluntary standards developed by certain initiatives are key. The Kyoto Protocol and the Paris Agreement are treaties between state actors, measuring territorial CO<sub>2</sub> emissions and require states to set initiatives to achieve the goals of the treaties. These treaties do not include provisions concerning initiatives, or requirements on the corporate level. Nevertheless, in particular large companies have substantial responsibility, when it comes to global CO<sub>2</sub> emissions: They often act on a multinational level, are often substantial emitters of greenhouse gases and do often have the opportunity to act for the better or for the worse. Hence, various initiatives have evolved over the years, which tried to *“fill this gap”* (Hickmann, 2017, 1) for corporations. These initiatives established certain standards - for CO<sub>2</sub> emission accounting, for disclosure of data, for carbon-target setting and for taking action.

There is valid ground to believe that these non-state initiatives do not downplay state-led climate action, but have co-evolved progressively and take part in a form of *“division of labor”* (Hickmann, 2017, 102). These initiatives play an essential role in setting important standards. For instance, there is currently no law in place telling Austrian based large companies how to report on their CO<sub>2</sub> emissions (with the exception of those large, fixed facilities that fall within the scope of the ETS), or how to report on their decarbonisation strategies. Nevertheless, all companies in my case studies disclosed climate related information in one way or the other - mostly based on a voluntary standard that had been established by a non-state initiative. In the following, I describe the four most relevant voluntary initiatives that aim to steer companies towards substantial climate action: GHG-Protocol, the Carbon Disclosure Project (CDP), the Science Based Targets initiative (SBTi), the Taskforce on Climate-related Financial Disclosures (TCFD) and, as a specific Austrian contribution, I describe the Austrian Government’s voluntary network *“Klima:aktiv”*.

## **Green House Gas Protocol (GHG-Protocol)**

The GHG-Protocol has established the current standard for international corporate carbon accounting (see p. 18). The GHG-Protocol was developed by the *World Resource Institute* (WRI), which is based in Washington, and the *World Business Council for Sustainable Development* (WBCSD), which is based in Geneva. The WRI is a research organisation focusing on environmental issues, which was founded in 1982. According to the website the institute is mainly funded by various European Governments and philanthropist foundations (World Resource Institute, 2020a). The WBCSD was founded in 1995 as a “*platform for business to respond to sustainability challenges that were just beginning to break the surface of collective business consciousness*” for large multinational companies (WBCSD, 2020). The GHG-Protocol recommends how to report a company’s CO<sub>2</sub> emissions. The Protocol is voluntary and evolved parallel to international climate negotiations (Hickmann, 2017). Nevertheless, it became the basis for climate reporting. It was therefore also adopted by the Global Reporting Initiative (GRI), which issues the most relevant international standard for corporate sustainability reporting (Global Reporting Initiative, 2016, 4) and by the International Standardisation Organisation regarding CO<sub>2</sub> inventories (ISO 14064) (Brohé, 2016, 81-83). In the “*GHG-Protocol Corporate Standard*” from 2004, the initiative inter alia developed the distinction between Scope 1 (direct emissions), Scope 2 (indirect - emissions from electricity) and Scope 3 (indirect - value chain emissions) (WRI and WBCSD, 2004). Since 2004, the initiative has released various and additional standards - which mainly specified the GHG-Protocol’s general approach.

## **Carbon Disclosure Project (CDP)**

The Carbon Disclosure Project (CDP) was founded in the year 2000 to ask companies to disclose their CO<sub>2</sub> emissions, their climate related risk, their climate related strategy and governance (WWF Germany, 2009, 2). It probably has the largest climate related data-sets in the world (Ibid.). Large companies voluntarily respond to the regular CDP assessment, at least since the CDP has been backed by many of the worlds largest investors (Ibid.), who seek for transparency for their investments. According to the website of the CDP, at least 515 investors holding 106 trillion US Dollars in assets backed the CDP, which lead to 8400 large companies disclosing requested data (CDP, 2020). Moreover, the CDP also ranks companies based on their climate and reporting performance. The collected data is not publicly available and has to be purchased. The project is funded through philanthropist foundations, business partners and governments (WWF Germany, 2009, 5). According to the CDP’s financial statement of

2017/18, its fundings mainly stemmed from “*philanthropic and government grants*” (CDP Worldwide, 2018, 7). Moreover, substantial amounts came from services, sales of data, fees from investors, etc. (Ibid.).

### **Science Based Targets initiative (SBT-initiative)**

The relatively new SBT-initiative was founded by various organisations which are globally active: namely, the World Resource Institute (WRI), the Carbon Disclosure Project (CDP), the UN-Global Compact and the World Wildlife Fund (WWF). As more and more large companies account their carbon emissions and formulate certain reduction targets, the SBT-initiative aims for corporate climate targets to comply with the the 1.5°C and below 2°C goals of the Paris Agreement (World Resource Institute, 2020b). This is done with the help of complex methodologies, which include factors such as a global “carbon budget”, different climate model scenarios, sector specific conditions and forecasting (Ibid.). Moreover, the initiative has established relatively stringent criteria for setting sufficient targets to reach the goals of the Paris Agreement (Science Based Targets, 2020a). If a company’s target complies with the criteria, it may be called a Science Based Target. The SBT-initiative aims to become the new standard for setting corporate climate targets. According to the website of the SBT-initiative, 896 companies applied for a “*Science Based Target*”, and 387 corporate reduction targets have already been approved at the time of access of the website (Science Based Targets, 2020b). According to the website the “*core funding for the Science Based Targets initiative is provided by IKEA Foundation, We Mean Business, The Rockefeller Brothers Fund and The UPS Foundation*” (Science Based Targets, 2020c).

### **Task Force on Climate Related Financial Disclosures (TCFD)**

The TCFD is a task force of the Financial Stability Board (FSB), which was founded by the G20 in the wake of the financial crisis of 2008, consisting of their central banks. The TCFD develops voluntary standards for companies to disclose their climate related risks (TCFD, 2020): The TCFD states in its “recommendations” of 2017 that “*recognizing that climate-related financial reporting is still evolving, the Task Force’s recommendations provide a foundation to improve investors’ and others’ ability to appropriately assess and price climate-related risk and opportunities*” (TCFD, 2017, V). The Task Force aims for company’s assessment and disclosure of various climate related risks, such as “*Transition Risks*”, such as “*Policy and legal Risks*” (e.g. carbon prices, or questions of liability), “*Technology Risks*” (i.e. disruption through low carbon

technologies), “*Market Risk*” (e.g. demand- and supply side changes), “*Reputation Risk*” (bad reputation in the public) and “*Physical Risks*” such as “*Acute Risks*” (i.e. sudden natural catastrophes/irregularities) and “*Chronic Risks*” (e.g. changing overall climate, higher sea levels) (TCFD, 2017, 5-6). The recommendations of the TCFD gained momentum and were the basis of the EU “*Commissions Guidelines on reporting climate-related information*”. The EU Commission even recommended EU companies to use the TCFD’s recommendations (European Commission, 2019, 4).

### **Klima:aktiv**

This voluntary initiative was started in 2004 by the Austrian government (Bundesministerium für Nachhaltigkeit und Tourismus, 2019a). This national initiative is listed here, as it is a particularly relevant initiative for Austrian companies. The initiative organised a successful pact among major Austrian companies to reduce their emissions until 2020 by about 1,4 million tonnes of CO<sub>2</sub> (Ibid. 8). Klima:aktiv established an ambitious low-carbon building certificate, which has been awarded to 818 building projects by 2019 (Ibid. 5), certifies climate active municipalities and, according to the initiative’s report, it has - until 2019 - supported over 12.900 companies to reduce their emissions (Ibid. 4).

### 3. Corporate Climate Strategy and Analysis Criteria

After having analysed the legal context and the most established voluntary standards affecting the development of climate strategies of Austrian companies, I discuss the most essential concepts and questions concerning corporate climate strategy. This chapter constitutes the theoretical basis of my master's thesis. In this chapter, I discuss, how companies may conduct emission inventories, how companies may conduct transparent measurement, reporting and verification of their CO<sub>2</sub> emissions, which targets may be set and which reduction pathways companies could take to reduce their CO<sub>2</sub> emissions. By discussing various concepts and important questions, I define specific analysis criteria, which I use to answer my research questions. Particularly, I apply these analysis criteria to determine, whether the reported climate strategies that I explored in my case studies are on track towards carbon-neutrality.

#### 3.1 Greenhouse Gas Inventory

With the adoption of the UNFCCC in 1992 (see p. 7), the practice of greenhouse gas inventories was established on an international level for the first time: “*A national inventory of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, to the extent its capacities permit, using comparable methodologies to be promoted and agreed upon by the Conference of the Parties*” (UNFCCC, 1992, Art. 12). Since 2004, the GHG Protocol (see p. 14) has aimed to translate the concept of CO<sub>2</sub> emission inventories and reporting to the corporate level (WRI and WBCSD, 2004, 2-4).

The traditional international standard for carbon inventories is based on the *production based* or *territory-based* accounting method. This accounting method is, for example, used for national inventories within the framework of the UNFCCC or for inventories for companies under the EU-ETS (Brohé, 2016, 48-58). Following this method, only emissions are counted, which are released within a nations borders.

However, the Environment Agency Austria points out that, due to today's globalised networks of production and consumption, other accounting approaches might be useful as well - namely a *consumption based* accounting method (Umweltbundesamt, 2019a, 54), also called *carbon footprint* (Brohé 2016, 58-88). This method also accounts for so called embodied emissions of consumed products and services, i.e. CO<sub>2</sub> emissions,

which are directly emitted by someone else, but are related to a country's, an organisation's or product's value chain (Brohé 2016, 2-3, 58-59). With regards to the consumption based approach, much less research is available as it is methodologically and practically more difficult to apply (Brohé 2016, 60).

In order to develop a company's climate strategy, it is firstly indispensable to determine the scope of a company's carbon emissions, i.e. the system boundaries of a company<sup>7</sup>. Moreover, the method of accounting also defines the meaning and effect of a company's emission reduction targets and pathways. Hence, the decision, what to include or not to include in a company's CO<sub>2</sub> inventory should be taken before precise monitoring, reporting or verification<sup>8</sup> begins. As stated above (see p. 17), different accounting methods exist to allocate CO<sub>2</sub> emissions to nations, such as the commonly used territorial *production based method* and supply chain oriented *consumption based methods* (Brohé 2016, 48-68). Similar questions arise with regards to the accounting of emissions on a company level. In this context the idea of a *product based* "carbon footprint" (see p. 23) and life cycle assessments (see p. 23-26) to allocate CO<sub>2</sub> emissions to certain products are also being currently scientifically discussed (Brohé 2016, 68-78).

In this master's thesis, focus will be put on the GHG Protocol (see p. 14), as it is the most established corporate accounting standard for emissions. It includes the most relevant greenhouse gases, according to their global warming potential (see p. 26): CO<sub>2</sub>, N<sub>2</sub>O, SF<sub>6</sub>, CH<sub>4</sub>, HFCs and PFCs (WRI and WBCSD, 2004, 3). The most important contribution of the GHG Protocol is its attempt to standardise the boundaries of a company's carbon accounting. First it defines the "*organisational boundaries*" (Ibid., 16-23) and secondly the "*operational boundaries*" (Ibid., 24-33) of a company's emission accounting.

The *organisational boundaries* of a certain company define, which other affiliated entities, such as subsidiaries, shares, joint ventures, should be included in the company's carbon accounting. The protocol provides two different approaches for defining this organisational scope: According to the "*equity share approach*" (Ibid., 17), the company shall include such emissions generated by an entity, of which it holds shares, in its accounting, which are equivalent to the share of equity the company

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<sup>7</sup> Here the term "system boundary" means the organisational, operational and territorial limits of a company's CO<sub>2</sub> inventory.

<sup>8</sup> Here "*monitoring*" means the measurement of CO<sub>2</sub> emissions; "*reporting*" refers to corporate reporting of CO<sub>2</sub> emissions and "*verification*" refers to the process of auditing measured and reported CO<sub>2</sub> emissions.



holds in that entity (Hickmann, 2017, 98). According to the “*control approach*” (WRI and WBCSD, 2004, 17), emissions of all economic operations that a company has financial or operational control of are fully included in its carbon inventory (Hickmann, 2017, 98).

The GHG-Protocol’s *operational boundaries* define the scope of a company’s accounted emissions with regards to its *organisational boundaries*. First there are “*direct emissions*” (WRI and WBCSD, 2004, 25), which “*occur from sources that are owned or controlled by the company, for example, emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc.; emissions from chemical production in owned or controlled process equipment*” (Ibid.). “*Indirect emissions*” (Ibid.), on the other hand, include all greenhouse gas emissions, which stem from external facilities (e.g. emissions from electricity production, value chain, etc.) (Ibid.). The GHG-Protocol further distinguishes emissions into three scopes: Scope 1 (direct emissions), Scope 2 (external electricity and district heating) and Scope 3 (value chain emissions). Generally, one has to consider that a company might have its lion share of emissions either in Scope 1, Scope 2 or Scope 3. In the following, as these Scopes are key elements for conducting my case studies, I will discuss them in depth:

### **Scope 1**

Scope 1 emissions include all direct GHG emissions of a company. This includes “*generation of electricity, heat, or steam*” on site (WRI and WBCSD, 2004, 27), “*physical or chemical processing*” (Ibid.), “*transportation of materials, products, waste, and employees*” from a company’s transportation fleet (Ibid.) and “*fugitive emissions*” (Ibid.), e.g. leakages of pipelines or mines. For instance, companies with very high Scope 1 emissions are coal fired power plants. In contrast to the accounting method of the EU-ETS that only considers the direct emissions of large stationary facilities, accounting Scope 1 includes all stationary emission sources and all mobile emission sources, which are emitted under the organisational boundaries of a company.

### **Scope 2**

Scope 2 emissions are indirect emissions from purchased electricity or district heating (WRI and WBCSD, 2004, 25 and 27). Here, the energy is directly consumed by a company, but, in contrast to Scope 1, the CO<sub>2</sub> emissions of purchased electricity and district heating are emitted at another source outside the organisational boundaries of the company, e.g. a gas power plant or a waste incinerator (Ibid.). Companies with a

large share of Scope 2 emissions, are usually companies with large office buildings or which are based on electrified infrastructure, such as railway companies.

With regards to purchased electricity, there are two methods to account for CO<sub>2</sub> emissions according to the GHG-Protocol's "Scope 2 Guidance": the "*location based method*" (WRI and WBCSD, 2015, 26) and the "*market based method*" (Ibid.). The *location based* accounting method only takes the average local emission factor of the electricity grid into consideration (Ibid., 25). The rationale behind this method is that all electricity is fed into a mixed grid and consumers actually do not know, where the specific electricity comes from. Physically, the only way to lower a grid's CO<sub>2</sub> emissions per kWh is to increase the overall share of lower or zero carbon energy sources to produce electricity. According to the GHG calculator of the Environment Agency Austria, the emission factor of the Austrian electricity mix in October 2019 was 260g CO<sub>2</sub>/kWh (Umweltbundesamt, 2020). Conveniently, the *location based* approach can be used in any grid considering the grid's respective carbon intensity per kWh electricity produced (WRI and WBCSD, 2015, 26).

The *market based* accounting method includes the possibility for an individual company to lower its Scope 2 CO<sub>2</sub> emissions by purchasing green electricity contracts. The possibility to purchase green electricity certificates can be considered as a form of offsetting (see p. 25). This method is only applicable in countries/areas, where the legal framework enables such a contractual decoupling from the actual electricity grid (WRI and WBCSD, 2015, 26). In the European Union, renewable electricity certificates, so called Guarantees of Origin can be purchased pursuant to the Renewable Energy Directive of 2009: "*A guarantee of origin can be transferred, independently of the energy to which it relates, from one holder to another*" (European Parliament and Council, 2009, Art. 52). In other terms, companies can purchase and use regular "grey" electricity, e.g. from hydropower, coal power, nuclear power, etc. from the grid and additionally purchase renewable certificates to prove that the same "*given share or quantity of energy was produced from renewable sources*" (Ibid.). This legal framework and the according *market based* accounting method of the GHG Protocol, have been criticised by scientists (Brander et al., 2018) and environmental institutions (Umweltbundesamt, 2018a). Their main arguments are as follows: Emission intensive electricity is creatively "greened" without giving any relevant market incentive for increasing renewable energy supply in Europe. Hence, this system does not provide any relevant climate benefit (Brander et al., 2018). First, there is a much larger supply of renewable electricity than there is demand for voluntary certificates. Secondly, many of the certificates are issued from power plants that have already existed and produced green energy before, regardless of the newly introduced possibility to sell certificates

(Ibid., 30). Examples for such power plants are pre-existing Norwegian or Austrian hydropower plants. Hence, the possibility to trade certificates does not create any relevant *additionality*<sup>9</sup> (Ibid., 30). Following this critique, such purchasing of green electricity certificates might not only be irrelevant for decarbonisation but even be counterproductive: Actual CO<sub>2</sub> accounting of companies is made less accurate (Ibid., 31), renewable energy may be counted twice - first, within the local grid without taking the certificate into consideration and secondly anywhere in Europe with the holder of the certificate. Lastly, funds might not be invested productively into new renewable capacity (Ibid.).

Thus, the Environment Agency Austria recommends companies to reduce electricity demand and to install their own renewable energy capacity rather than buying renewable energy certificates. If necessary, only certificates should be purchased from such sellers, who guarantee the non-use of fossil (and nuclear) electricity or who guarantee to invest in new renewable capacities (Umweltbundesamt 2018, 33). Contrarily to that it is, under the current legislation, possible that an energy provider produces 100% of their electricity with fossil fuels, buys Guarantees of Origin corresponding to the generated electricity, thereby making it possible to sell their electricity as 100% renewable (Ibid.).

Brander et al. go even further with their recommendation. They recommend to only use the *location based* method, which calculates emissions on the basis of average grid emission factors, at least until better technologies to precisely count and allocate emissions from the production of electricity may become available in the future (Brander et al., 2018, 32). I find their reasoning and the critique regarding the market based approach convincing and will thus apply their approach for assessing the climate strategies of the companies in my case studies.

### Scope 3

According to the GHG-Protocol, Scope 3 emissions represent nearly all indirect CO<sub>2</sub> emissions, which are not accounted under Scope 1 and Scope 2. Scope 3 includes all emissions from the entire up- and downstream value chain of a company. Upstream emissions might originate from the extraction of resources, processing and

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<sup>9</sup> Gillenwater defines the term *additionality* as “a determination of whether a proposed activity will produce some “extra good” in the future relative to a reference scenario, which we refer to as a baseline. In other words, *additionality* is the process of determining whether a proposed activity is better than a specified baseline. (...) Overall, *additionality* is about assessing causation. It is about deciding if a proposed activity is being caused to happen by a policy intervention.” (Gillenwater, 2012, 3)

transportation of purchased materials and products, business traveling, work related mobility of employees (e.g. commuting), production and construction of capital goods, upstream waste related emissions, etc. (WRI and WBCSD, 2011a, 5). A company's downstream Scope 3 emissions arise from the transportation, distribution, processing, storage, use and life cycle waste management of its products, from franchises, subcontractors and investments (WRI and WBCSD, 2011a, 5).

The GHG-Protocol Corporate Standard of 2004 states that Scope 1 and Scope 2 should be accounted and reported "*at a minimum*" (WRI and WBCSD, 2004, 25), whereas Scope 3 is considered an "*optional reporting category*" (Ibid.). Although Scope 3 emissions are sometimes treated as a kind of "soft" or second class emissions, they represents the lion share of emissions for a vast amount of companies (WRI and WBCSD, 2011a, 5). According to a study published in the journal "Environmental Science & Technology" it is estimated that Scope 3 emissions represent - on average - around 75% of sectorial carbon emissions (Huang et al., 2009). A prominent example would be oil and gas companies, whose Scope 1 emissions might be considerable, but appear dwarfed compared to the down stream use, i.e. the burning, of their product. An example for high agricultural upstream Scope 3 emissions would be a meat processing company, whereas companies in the service sector often have considerable Scope 3 emissions due to their employees' mobility behaviour to and from work (Huang et al., 2009, 8509).

Thinking of global supply chains and specialisation, the concept of accounting for a company's Scope 3 emissions, can be seen in the context of the already established scientific field of *life cycle assessment* (Huang et. al 2009, 8510) (see p. 23) or the emerging *consumption based* carbon accounting method. All these accounting concepts aim to widen the scope towards a more realistic picture of real world interlinkages, networks, use of raw materials, outsourcing and subcontracting. Even more critical scientists - who point towards the complexity of precise Scope 3 accounting - indicate that corporate life-cycle (re-)thinking may foster decarbonisation (Patchell, 2018, 956). Additionally, I would add two arguments to support the integration of Scope 3 emission into carbon accounting: First, only because one company (e.g. a producer of mobile phones) produces displays in-house, whereas a competitor outsources the production of displays, this should theoretically not be an advantage for the outsourcing company's CO<sub>2</sub> performance. Secondly, it should not be forgotten that particularly major companies often have substantial influence over (parts) of their up- and downstream value chain. Based on this, I argue in this thesis that accounting for Scope 3 emissions as a pre-requisite for reducing a company's emissions, is key to developing a convincing climate strategy - at the very least in those cases, in which a

company's emissions substantially stem from Scope 3 sources. In accordance with this view, the EU Guidelines on Climate Related Information clearly state that “*companies should consider their whole value chain, both upstream in the supply-chain and downstream*” (European Commission, 2019, 8).

### **(Avoided) Emissions of a Product or Service**

Scope 1, Scope 2 and Scope 3 emissions account emissions within the organisational and operational boundaries of a company as a whole. In the wake of the question of how to account a company's Scope 3 emissions, the GHG-Protocol also needed to determine, how a single product's CO<sub>2</sub> emissions should be calculated, as major downstream emissions occur through the transport, use or disposal of a company's products. Consequently, the GHG-Protocol published a “*Product Life Cycle Accounting and Reporting Standard*” based on the CO<sub>2</sub> emissions that stem from a specific product during its entire life cycle, i.e. from its cradle to its grave (WRI and WBCSD, 2011b). The goal of such a carbon footprint is to determine the CO<sub>2</sub> emissions arising from a certain product or service independent from the question who is responsible for the respective steps of production, use and disposal over the product's or service's life-cycle (Brohé, 2016, 68-88).

Since it can be said that products and services have a certain carbon footprint, meaning that they, their use, their production and disposal are the cause for additional emissions to the atmosphere, the question arises, whether a specific product or service can also account for so-called *avoided emissions*, i.e. emissions that it helped to reduce compared to a certain defined benchmark (WRI and WBCSD, 2011b, 90-91; Brander, 2017). Many companies claim, to produce products and services, which lead to a reduction of CO<sub>2</sub> emissions compared to other products used on the market. This debate might probably become more intense as it can be expected that in the decades to come, an increasing number of products and services will enter the market, which will at least claim to be “green” in comparison to conventional products. Examples for producers of products and services, which might avoid emissions are producers of wind turbines, solar panels, electric cars, trains, alternative materials, biofuels, electric grid infrastructure, or companies, which build or own zero-energy buildings or renewable infrastructure. Besides these well known “low carbon” examples, essentially any product could be claimed to avoid carbon emissions compared to another competing product, e.g. car parts made out of plastic, which have the potential to make cars lighter and thus more fuel efficient. It can thus be seen that the question of avoided emissions of a product is highly complex.

Not much has yet been published on the assessment of “*avoided emissions*”. However, it has to be noted that sometimes certain products might wrongly appear to avoid emissions, if not all circumstances and consequences are taken into account. This problem has been illustrated by Brander, who used two different methods to calculate the life cycle CO<sub>2</sub> emissions of bioenergy to show that following one method can have an entirely different outcome than following the other one (Brander, 2017). Namely, Brander distinguishes between the *attributional method* and the *consequential method* of life cycle assessment (Brander, 2017, 1401-1414). The *attributional method* accounts for the CO<sub>2</sub> emissions of a product directly caused within its life cycle (e.g. resource extraction, transport, processing, use and disposal of the product), thereby ignoring the emissions potentially caused by the product, which are not directly “attributed” to this life cycle. In contrast, the *consequential method* of life-cycle assessment additionally accounts for possible “*unintended consequences*”, such as CO<sub>2</sub> emissions that come with the product, but lie outside the immediate emissions caused by the product (Brander, 2017, 1410) and might produce overall CO<sub>2</sub> emissions much higher than expected at first (Brander, 2017, 1401-1402). As an example, Brander stresses the importance of using the *consequential method* when assessing the overall emissions-outcome for energy production from biomass, as otherwise in some cases, in which biomass is used as a substitute for fossil fuels, it might wrongly seem as if its use leads to net-zero CO<sub>2</sub> emissions, when in fact in the specific case the use of biomass even leads to an increase in emissions, when looking at the broader consequences in the entire system (Brander, 2017, 1401-1414). For example this might be the case, if farm land is suddenly used to grow crops for energy production, making it necessary to import fodder from cleared rainforests rather than growing it locally. This example shows that, although a product might at first appear to lead to avoided emissions, this may not be true under all circumstances - or rather only under very specific circumstances.

The GHG-Protocol makes clear that “*avoided emissions*” in general are outside a product’s or service’s LCA boundary and should thus not be subtracted from a company’s emissions (WRI and WBCSD, 2011b, 90-91). The GHG-Protocol has not released a respective standard by its own with regards to the avoidance of emissions by certain products, but refers to a publication of one of its two founding institutes, the World Resource Institute (WRI). This working paper by Russell (“*Estimating and Reporting the Comparative Emission Impacts of Products*”), makes clear that for calculating a product’s or a service’s “*avoided emissions*” in the system, the *consequential method* should be the method of choice (Russell, 2019, 1). Moreover the study points out that companies should refrain from cherry-picking: They should not

only account for products, which have a system-wide CO<sub>2</sub> reducing effect, but also give account of such products, which have an increasing effect on emissions when compared to competitive products (Russell, 2019, 2).

Based on this discussion it can be argued that declarations of “*avoided emissions*” need to be treated with caution. To give a complete and authentic image, a product’s avoided CO<sub>2</sub> emissions should be calculated according to the consequential method. Even when the calculation proves the product’s net-positive effect on emissions, I would agree with the aforementioned working paper of Russell that avoided emission should not simply be subtracted from a company’s emission inventory, as this would lead to a wrong depiction of a company’s emissions. Moreover, a company, which claims its products avoided emissions, should also account for emissions of other products within its portfolio. However, when these criteria are met, I think it is reasonable that companies, which offer products or services that avoid emissions, may report them and consider it part of their climate strategy to promote these products and services. It should be noted positively, that these products might contribute considerably to the decarbonisation of the economy and hence they should be taken into consideration when assessing a company’s efforts and contributions to reduce emissions.

### **3.2 Monitoring, Reporting and Verification of Emissions**

The question of corporate transparency has been increasingly discussed in the years after the financial crises, when trust in institutions was widely lost (Lessig, 2018, 173). Transparency is broadly seen as a way to overcome this public loss of trust (Ibid.). According to Lessig’s theory of “*institutional corruption*”, transparency, however, only contributes to better outcomes for society, when the transparent information is also interpreted for the public in a qualified way (Lessig, 2018, 175-176), when the public’s reaction to the published information “*addresses the underlying problem*” (Lessig, 2018, 176).

In this master’s thesis, I argue that transparency regarding a company’s climate performance plays an important role in the common fight against the climate crises - provided that Lessig’s conditions for beneficial transparency are met.

Currently, various corporate actors shy away from “too much” disclosure exactly because they object critical interpretation of their data, as they fear damage to their

reputation (TCFD, 2017, 5-6) or even future liability risks (World Economic Forum, 2018, 16).

It can be argued that the three underlying problems causing collective inaction towards climate change are the “*tragedy of the horizon*”, meaning that the disaster is not fully unfolding today and will mainly impact the more distant future, (Carney, 2015); the “*tragedy of the commons*” - i.e. the atmosphere, as a common good, is polluted collectively, whereas collective action to reduce the pollution is complicated by individual free riding (Patt, 2015, 99-110); and the problems to overcome barriers that block a technological transition (Patt, 2015). I would reason that - together with policies, which also address these underlying problems - transparency is an important element for supporting collective action, as downplaying climate risks and climate impact of one’s actions, as well as free riding, is made more difficult for all stakeholders, when under scrutiny of the educated public and - of course - science. After all, this master’s thesis itself shows that transparency is key, since the case studies could not have been conducted, had the twelve companies not disclosed at least certain climate-related information in their reports, albeit the fact that most of the examined companies still have - to a different extent - room for improvement regarding their climate-related transparency (see p. 41 and 111-112). Hence, I would argue that transparency of climate-related information would be even more beneficial, if uniform and mandatory standards for all large companies regarding the measurement, inventory, reporting of emissions and the verification by external auditors existed (see p. 28), as this would facilitate proper interpretation of disclosed information for the public (see p. 25).

In the following, I will therefore discuss, how the monitoring and reporting of CO<sub>2</sub> emission data might be conducted and how this data might be verified.

### **Monitoring and Reporting**

There is a need to briefly discuss the most important concepts of how to practically monitor a company’s CO<sub>2</sub> emissions. First, science defines a certain *global warming potential* (GWP) for the different greenhouse gases (e.g. CO<sub>2</sub>, N<sub>2</sub>O, SF<sub>6</sub>, CH<sub>4</sub> etc.). In determining these numbers the IPCC mostly sets - and also changes - the standards (Brohé, 2016, 26-29). One unit of CO<sub>2</sub> (GWP=1), multiplied with the GWP of the respective gas, is called a CO<sub>2</sub>-equivalent. For the purposes of this master’s thesis I will refer to “CO<sub>2</sub>-equivalents” most of the times simply as “CO<sub>2</sub>”. To monitor a company’s CO<sub>2</sub> emissions, two approaches are possible: *direct measurement* or



*calculation*. Direct measurement might be carried out by sensors, which measure CO<sub>2</sub> concentration at the smoke stack, combined with methods such as mass balance calculations (WRI and WBCSD, 2004, 42). Due to high costs, such methods might rather be used in facilities with large point source emissions (Ibid.). According to the GHG-Protocol, calculating emissions is the most commonly used method (Ibid.). This appears to be reasonable, as it is difficult to directly measure all emission sources - especially when they are distributed, such as with regards to transport fleets for example (Brohé, 2016, 35). To calculate a company's CO<sub>2</sub> emissions, characteristic *activity data* (e.g. the consumption of 100 litres of gasoline) is multiplied with the "*emission factors*" of the respective activities - in the example the result would therefore be kg CO<sub>2</sub> per litre gasoline used (Brohé, 2016, 35-37). These emission factors are determined and published by institutions, such as the IPCC, the EU, the EPA or the IEA and are constantly subject to change (Ibid.). Actually, these emission factors are based on assumptions and have high uncertainty - particularly when the activities or products are more complex (Ibid.). Practically, most companies calculate their Scope 1 emissions based on the fossil fuels they bought - e.g. coal, gasoline, diesel, natural gas etc. (WRI and WBCSD, 2004, 42). To calculate a company's CO<sub>2</sub> emissions, often also secondary data is used that does not reflect the concrete emissions made during use, but gives an average value, e.g. average emission factors of a house built in a certain year, which is multiplied with its square meters. (Brohé, 2016, 37-40). The problem is that emission calculations could potentially be manipulated downwards through using favourable (e.g. older and less elaborated) emission factors or (favourable) secondary data. Therefore, the latest and most fitting emission factors should be used (Brohé, 2016, 37).

After having set a company's systemic boundaries and after having monitored one's CO<sub>2</sub> emissions within these scopes, the question arises, which of this data needs to be reported. The GHG-Protocol offers five "*GHG Accounting and Reporting Principles*" to this question (WRI and WBCSD, 2004, 6): "*Relevance*" meaning that the accounting should depict the company's emissions for enabling others to use the information; "*completeness*", meaning all emissions should be reported, and when emissions are not reported, this has to be explained; "*consistency*" meaning the information should be comparable over time and every change in accounting methods needs an explanation; "*transparency*", i.e. the applied methods should be made transparent; "*accuracy*", i.e. the disclosed emission data should be as accurate as possible (WRI and WBCSD, 2004, 6). The EU's "*Monitoring and Reporting Directive*" of 2012 lays down nearly the same principles for the companies' reporting under the EU-ETS (European Parliament and Council, 2012, Art. 4-10).

Moreover, according to the GHG-Protocol, implementing corporate climate strategy *“also requires establishing an internal accountability and incentive system and providing adequate resources to achieve the target. This will be difficult, if not impossible, without senior management commitment”* (WRI and WBCSD, 2004, 76). This means that also questions of climate-related corporate governance should be reported, such as (board-) responsibilities, internal incentives or educational programs (World Economic Forum, 2018).

Apart from facilities, which fall under the EU-ETS, the monitoring and reporting of climate-related information is currently not mandatory for Austrian-based companies - neither according to European law nor Austrian law. Until today, climate related information has mainly been voluntarily provided in a yearly sustainability report and in the company’s financial- or annual report. Today, it has become increasingly common that companies provide their data within one integrated report - without the superficial division between sustainability topics and general reporting (Schoenmaker and Schramade, 2019, 150-151). In recent years, there has been a trend towards requesting more climate related information of companies by the public and investors, such as the CDP (see p. 14). Increasingly, not only the emissions data is being requested, but also the disclosure of climate related risks and opportunities of companies, e.g. by the TFCO (see p. 15) and the EU-Climate Reporting Guidelines (see p. 11) or the scientific foundation of the companies’ emission reduction targets, e.g. by the SBT-initiative (see p. 15) and by the CDP. According to Schoenmaker and Schramade, one core issue of corporate reports that still remains is that corporate reporting tends to be *“backward looking”* (Schoenmaker and Schramade, 2019, 152), whereas investors need to look ahead (Ibid.).

## **Verification**

Verification of the disclosed information is another important factor for assessing a company’s climate strategy. According to the GHG-Protocol (see p. 14) *“the primary aim of verification is to provide confidence to users that the reported information and associated statements represent a faithful, true, and fair account of a company’s GHG emissions”* (WRI and WBCSD, 2004, 69). The verification of the data and information might be organised *internally* or *externally* (WRI and WBCSD, 2004, 69), whereas external audits may often be seen more trustworthy than an internal ones (Ibid.). An example for a relatively strict mandatory verification regime is the EU-ETS system (see p. 9). For participants in the EU-ETS, a certified external verification process is mandatory (European Commission, 2015, 82). The verifiers themselves need to be

certified according to the EU's *"Accreditation and Verification Regulation"* (Ibid.). There are also specifications in place on the extent to which it is tolerable that the results of the verification process deviate from a company's calculations. According to the GHG-Protocol, a deviation of 5% or higher from a company's measurement must be considered as *"materially misleading"* (WRI and WBCSD, 2004, 69). The EU-ETS provides that the accuracy of measurements needs to be higher, the larger the annual emissions of the facility are (European Commission, 2015, 87). According to this "Tier"-approach very large facilities, which emit the largest amounts, may only deviate (+/-) 1,5%, whereas the smallest installations might even deviate by (+/-) 7,5% (Ibid.). According to Haque and Islam, *"Effective monitoring and auditing mechanisms are essential to eliminate misreporting of carbon emissions (...) and should at least be in place to limit carbon emissions fraud"* (Haque and Islam, 2015, 255).

### 3.3 Emission Targets

As already mentioned above, the practice of formulating - more or less - binding CO<sub>2</sub> emission targets was first established under the Kyoto Protocol (see p. 7). In concrete terms, formulating an emission target means committing to a certain reduction of CO<sub>2</sub> emissions within a specific timeframe (see p. 43). According to a critique by Patt, the practice of setting such emission targets became the *"basic policy instrument"* under the UNFCCC (Patt, 2015, 112), which *"forces countries to commit to results, rather than actions, in an environment where results are difficult to anticipate"* (Patt, 2015, 113). Setting emission targets, however, has become an essential part of international climate policy and has been adopted by the Paris Agreement (see p. 8) or European Union climate policy (see p. 8-12). Consequently, CO<sub>2</sub> emission targets became also a defining part of corporate climate strategy (WRI and WBCSD, 2004, 75). Furthermore, there is some hope that setting clear emission targets already not only reduce risk and costs of not complying with future regulations, but also spurs innovation, increases purpose, leadership and corporate identity (WRI and WBCSD, 2004, 75-76). Until now, little research has been conducted, whether emission targets effectively spur actual CO<sub>2</sub> emission reductions. However, there is some evidence that setting ambitious emission targets might be linked to stronger and more effective decarbonisation efforts (Dahmann et. al, 2017). As the practice of setting emission targets has become so widely spread, I included it in my case studies.

## Absolute target or intensity target

According to the GHG-Protocol, there are two different ways how an emission reduction target might be defined: an “*absolute target*” or an “*intensity target*” (WRI and WBCSD, 2004, 76). An *absolute target* aims at bringing a company’s total emissions down (e.g. from 2 million tonnes CO<sub>2</sub> to 1 million tonnes). In contrast, an *intensity target* is a relative value, which is defined by the Global Reporting Initiative (GRI) as follows: “*GHG emissions intensity expresses the amount of GHG emissions per unit of activity, output, or any other organization-specific metric*” (Global Reporting Initiative, 2016, 13). Examples for such *intensity targets* might be to reduce carbon intensity per square meter shopping space by 30%, reduce CO<sub>2</sub> intensity per tonne of a product by 98%. As one can see, *absolute targets* are more straight forward than *intensity targets*. The SBT-Initiative differentiates further *physical intensity targets* (e.g. CO<sub>2</sub> per tonne of fertiliser) and *economic intensity targets* (e.g. CO<sub>2</sub> per Euro turnover), which might be suited best for different companies and sectors (Science Based Targets, 2020d, 26). Arguments in favour of using *intensity targets* are that they work independently from growth or decrease in production and might be better suitable to compare the numbers with competitors (WRI and WBCSD, 2004, 76). A company’s absolute emissions might rise, whereas its emissions intensity decreases or vice versa (Ibid.). It is theoretically even possible that, overall, a whole sector achieves to reduce its emissions intensity per unit, but due to economic growth the overall emissions in this sector nevertheless grow. That is why it is indispensable to formulate clear *absolute targets* to achieve radical decarbonisation. Hence, the SBT-initiative defines that an “*intensity target should only be set if it leads to absolute reductions in line with climate science*” (Science Based Targets, 2020d, 6).

## Timeframe of the Target

According to the EU’s Guidelines on Climate-Related informations “*companies should consider a longer-term time horizon than is traditionally the case for financial information*” (European Commission, 2019, 8). To determine the timeframe of an emission reduction target, most commonly, a base year is set first (WRI and WBCSD, 2004, 79). Generally said, the time frame can either be *long term* or *short term* (WRI and WBCSD, 2004, 80). The advantage of a *long term target* is the long term predictability for company planning and investment (Ibid.), the disadvantages of long term targets are that they encourage to delay decarbonisation efforts, and that they also entail uncertainty for the company, as unforeseen developments in the future might render the fulfilment of the target moot or not appropriate anymore - e.g. from a

company's or from a scientific perspective (Ibid.). On the contrary, setting - more predictable - short-term targets might stress a company's commitment and accountability for reducing emissions, particularly within sectors, in which long-term planning is not common (WRI and WBCSD, 2004, 80-81).

The SBT-initiative tries to define these categories more precisely and requires that a company defines *mid-term targets*. It further recommends formulating *long term-targets* until 2050 (Science Based Targets, 2020a, 6). More precisely, for setting a target's timeframe the SBT-initiative recommends choosing the company's latest GHG accounting as the base year and requires that "*targets must cover a minimum of 5 years and a maximum of 15 years from the date (...)*", in which a company applies for an approval of their targets by the initiative (Science Based Targets, 2020a, 6). This means that, following the approach of the SBT-initiative the date for a required *mid-term* decarbonisation target, determined in 2020, should neither be earlier than 2025, nor later than 2035.

All in all, setting long term targets until 2050 provides orientation and strategic commitment for a company, defining ambitious short- and mid-term targets emphasises a company's commitment and accountability and reduces the risks of uncertainty and procrastination regarding the taking of measures. For the purpose of this master's thesis, both, short- and long term targets are an essential part for a climate strategy.

### **Carbon-Neutrality**

Given the complexity of the required climate action throughout the whole economy, it is not that easy to determine, which ambition is the right one for a specific company or which contribution to solving the problem of global warming can reasonably be demanded from that company. Nevertheless, it remains a fact that, in the end, every tonne of CO<sub>2</sub> is too much, as it accumulates in our atmosphere for long timeframes and brings humanity constantly nearer towards dangerous tipping points. As we do not know exactly, where these tipping points are, the Paris Agreement defined them as a rise in temperature of +1,5°C or below +2°C compared to pre-industrial times. For complying to these targets, near-zero carbon emissions or even negative emissions within the decades to come, are vital (IPCC, 2018a, 7). In order to achieve this goal, ambitious emission reduction targets will be needed, which ultimately aim for carbon-neutrality.

The IPCC defines carbon-neutrality as follows: *“To stabilize global temperature at any level, ‘net’ CO<sub>2</sub> emissions would need to be reduced to zero. This means the amount of CO<sub>2</sub> entering the atmosphere must equal the amount that is removed. Achieving a balance between CO<sub>2</sub> ‘sources’ and ‘sinks’ is often referred to as ‘net zero’ emissions or ‘carbon neutrality’”* (IPCC, 2018b, 161). In its climate strategy of 2019, the climate strategy of Austria formulates more precisely that for achieving carbon-neutrality, CO<sub>2</sub> emissions need to be *“near zero”* (Bundesministerium für Nachhaltigkeit und Tourismus, 2019b, 21; translation by J.S<sup>10</sup>). The remaining emissions should be *“compensated”* by carbon storage in trees, humus, products or with technological means (Ibid.).

What this new paradigm exactly means for climate targets on a corporate level, has not yet been defined. Does it entail the possibility of compensation through reforestation, or through carbon credits? Do the emissions of most companies need to be absolute zero? To what extent will companies have to reduce their emissions, so that working compensation measures might balance them out? Which sector(s), in an assumed “carbon-neutral” world, should still be allowed to emit which amount of CO<sub>2</sub>? Who pays for the compensation of these emissions? All these questions will need to be answered in the not so distant future.

### **Paris-Alignment**

Additionally to the open definition of carbon-neutrality, the question arises, whether the target of (corporate) carbon-neutrality is aligned with the goals of the Paris Agreement or not. According to the calculations of the IPCC, only certain *“carbon budgets”* are left, until the global target temperatures of either +1,5°C or +2°C are reached (IPCC, 2018b, 104-107). In other terms, even when - hypothetically - all nations and thus all companies become carbon-neutral in 2050, accumulated emissions until then might have already dramatically exceeded the remaining safe global CO<sub>2</sub> emission budget for stabilising temperatures at +1,5°C. This might happen, if too much accumulative greenhouse gas is emitted between now and 2050. Regarding the corporate level, the SBT-initiative is one attempt to determine how companies’ climate targets could be aligned with the goals of the Paris Agreement - for different climate scenarios (Science Based Targets, 2019, 7). The SBT-initiative developed methods to determine, whether a company’s targets (at any rate those concerning Scope 1 and Scope 2 emissions) are in line with - at least - the 2°C target (Ibid.). Moreover, if a company’s Scope 3 emissions represent more than 40% of its total CO<sub>2</sub> emissions, a Scope 3 target that

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<sup>10</sup> Original: *“(…) nahe bei null (...)”* (Bundesministerium für Nachhaltigkeit und Tourismus, 2019b, 21)

covers two thirds of these emissions is required as well (Science Based Targets, 2020a, 10).

This discussion shows that it is high time that clear and definitions for the concept of “carbon-neutrality” be stipulated. Particularly, for the corporate level a common standard for sufficient emission targets needs to be established (e.g. the methodology of the SBT-initiative).

In this master’s thesis I argue - in line with the Austrian climate strategy (see p. 32) - that near-zero CO<sub>2</sub> emissions will be necessary in all economic sectors and companies to achieve carbon-neutrality until 2050 (for Austria until 2040). When assessing the climate strategies of the twelve companies, carbon-neutrality will thus be understood as near-zero CO<sub>2</sub> emissions until 2050 (for Austria until 2040). In order to reduce uncertainty and to increase a company’s accountability and “Paris-alignment”, substantial and absolute short- or midterm targets should be formulated as well.

### **3.4 Reduction Pathways**

In order to achieve certain emission reduction targets, countries and companies need to get active. The IPCC (see p. 7) uses the concept of pathways to provide different theoretical global roadmaps to achieve the goals of the Paris Agreement (IPCC, 2018a). The Paris Agreement itself speaks about a “*pathway towards low greenhouse gas emissions and climate resilient development*” (Paris Agreement, 2015, Art. 2c). One of the most comprehensive scientific contributions about different pathways to reduce CO<sub>2</sub> emissions is provided by the IPCC (IPCC, 2014a). In the following, I differentiate between two widely spread approaches among which companies may choose for lowering their CO<sub>2</sub> emissions: emission mitigation and emission offsetting.

#### **Emission Mitigation**

Mitigation means actually reducing the emissions within the boundaries of the company (see p. 18-19). Depending on the respective economic sector various different ways exist to mitigate CO<sub>2</sub> emissions. Frondel distinguishes between three types of environmental innovations: process innovations, product innovations and organisational innovations (Frondel, 2006).

With regards to *process innovations* technological changes could be made<sup>11</sup> in order to produce the same output with environmentally less harmful input (Ibid. 3). Here, two technological pathways exist (Ibid.): cleaner processes or end-of-pipe measures (Ibid.). On the one hand, technological improvements could aim at achieving *cleaner processes*, such as the use of heat pumps instead of gas heaters, better building insulation and energy efficiency, installing own solar capacity, electrifying production processes or using a bike- or electric car fleet instead of diesel cars, etc. In many cases such technological improvements might even have other co-benefits besides the mitigation of CO<sub>2</sub> emissions, such as better overall air quality, less need for maintenance, energy-cost savings, independence of fossil fuel imports etc. (see inter alia Bollen et. al, 2009). Moreover, switching fuels can be a measure to reduce emissions substantially, without using zero-carbon technology. An example would be burning natural gas instead of oil or coal which have more carbon intensive emission factors per energy output (Juhrich, 2016, 45-47).

On the other hand, CO<sub>2</sub> emissions could also be mitigated through *end-of-pipe measures*<sup>12</sup> (For a comparison of general theory and practice of clean processes and end-of-pipe measures in OECD countries see (Frondel, 2006). Regarding end-of-pipe mitigation of CO<sub>2</sub> emissions, currently carbon capture and storage (CCS), i.e. the final disposal of CO<sub>2</sub>, and carbon capture and utilisation (CCU), i.e. the use of captured CO<sub>2</sub> are discussed. CCS is a highly disputed technology with various barriers in place (Bui M. et al., 2018; Patt, 2015, 185-187). In Austria, the application of CCS technologies is currently prohibited: On the one hand CCS technologies raise public safety concerns, on the other hand current CCS final disposal methods would use up the limited storage space underground, which is already needed for the energy transition, e.g. for gas, energy- or hydrogen storage (Bundesministerium für Nachhaltigkeit und Tourismus, 2015). This renders it unlikely that CCS will become a practical mitigation strategy in the near future - at least in Austria. CCU on the other hand does not aim for final disposal of CO<sub>2</sub>, but at using CO<sub>2</sub> as a chemical feedstock for products (Al-Mamoori et al., 2017, 834), According to Al-Mamoori et al. "*converting CO<sub>2</sub> and utilizing it in chemical reactions is very challenging mainly because of the thermodynamically stable nature of CO<sub>2</sub> itself*" (Ibid.). Thus, most CCU technologies currently only exist in scientific laboratories with little real life application (Al-Mamoori et al., 2017, 845).

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<sup>11</sup> With regards to the various ways in which CO<sub>2</sub> emissions can be mitigated by means of technological change of processes see inter alia (Hawken, 2017) or (IPCC, 2014a).

<sup>12</sup> End-of-pipe technologies do not make the process itself cleaner, but aim to control the pollution at the end of the process, such as a catalytic converter in cars or SO<sub>2</sub> scrubbers for certain industries' off gas (Source: Frondel, 2006.)



Moreover, for a lasting positive effect on the climate, a CCU process must guarantee that the used CO<sub>2</sub> will not eventually be released (back) into the atmosphere.

Apart from technological changes of the processes, carbon emissions could also be reduced by innovating a company's products or services (Frondele, 2006, 2), or, putting it differently, a company's *business model* could become low-carbon or carbon-neutral. A company could switch to offering services instead of products: A car company, for example, could provide car-sharing rather than car-selling; a fossil fuel selling company could switch from selling coal and oil towards natural gas or even to building and maintaining renewable energy infrastructure. Also *organisational innovations* can be implemented (Frondele, 2006, 2), such as new management tools (Ibid.) or as transferring offices to locations with good public transport infrastructure or offering more plant-based meals in a company's cafeteria.

All of the above mentioned possible changes could lead to a mitigation of a company's Scope 1 (see p. 19) CO<sub>2</sub> emissions: from cleaner processes, end-of-pipe measures, business model changes to organisational reforms<sup>13</sup>. In order to reduce a company's Scope 2 emissions, which mainly stem from generating electricity (see p. 19), following the *location based method* (see p. 19-21), only energy efficiency measures, own renewable energy projects or decarbonisation of the general electrical grid are conceivable. With regards to Scope 3 emissions (see p. 21), possible corporate mitigation policies range from steering work related commuting and traveling practices towards less carbon intensive alternatives, to decarbonising a company's up- and downstream value chain, e.g. through business model change, supplier engagement or new product designs (WRI and WBCSD, 2011a, 110-111).

### **Emission Offsetting**

Another corporate climate policy, which is widely practiced by many companies is *carbon offsetting*, which has been started in the context of the Kyoto Protocol (Brohé, 2016, 113-141). Instead of mitigating one's carbon emissions, companies buy verified certificates about a reduction of an equivalent amount of CO<sub>2</sub> somewhere else. On the product-level even regular carbon-intensive products might be marketed as "*carbon*

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<sup>13</sup> Moreover, outsourcing or the use of subcontractors could be used for lowering one's Scope 1 emissions, however, these outsourced CO<sub>2</sub> emissions would still fall within a company's Scope 3 emissions.

*neutral*” or as “*climate-neutral*” products, if the selling company offsets the emissions linked to the product<sup>14</sup>.

The basic idea of offsetting takes advantage of the fact that with regards to greenhouse gases, the atmosphere is a global sink. Hence, it is irrelevant, where the specific emission source is located and mitigation might be achieved cheaper at an entirely different location around the globe and/or by taking different measures. Generally two different types of offsets can be distinguished: paying somebody else to reduce a certain amount of their emissions (e.g. by disposing refrigerant gases properly or by replacing polluting infrastructure with cleaner alternatives), or paying somebody else to remove a certain amount of carbon from the atmosphere (e.g. by planting trees, by protecting existing forests). In any case, offsetting can only serve as a measure of reducing emissions, if it meets the requirement of additionality (see p. 21). In order to determine, whether this is the case, the offsetting-measure has to be compared to a baseline scenario (see p. 21) (WRI and WBCSD, 2004, 58-61; Science Based Targets, 2020d, 32). The problem is that, according to the GHG-Protocol, determining the baseline scenario, which is a prediction of the future, always carries the risk of not being correct (WRI and WBCSD, 2004, 60). Moreover, even adequate emission trading and offsetting can only concern CO<sub>2</sub> emissions which are released and reduced by market participants. Such market-based systems do not include “external” natural feedback-loops and tipping points, such as higher temperatures through melting of ice shields, or desertification of forests (for such tipping points see inter alia Lenton, 2011). Moreover, there are more fundamental ethical arguments which are brought up against the trading of CO<sub>2</sub> emissions. One argument is that the atmosphere should not be “commodified”, another argument is that the future consequences of a tonne of CO<sub>2</sub> emissions can not be represented through prices adequately and that paying others to become cleaner while further polluting the atmosphere oneself is immoral (Aldred, 2011). Others claim that its a matter of how carbon markets are designed whether they function from an environmental point of view and lead to just outcomes (Dirix et al., 2016). With regards to historical evidence, there is some reason to believe that putting prices on CO<sub>2</sub> emissions through market-based measures, e.g. offsetting or carbon taxes, are no silver bullet for substantial emission reductions, particularly as the goal is to eliminate CO<sub>2</sub> emissions entirely (Patt, 2015, 55-97).

However, there are two different “offsetting” regimes: *mandatory offsets and voluntary offsets* (Brohé, 2016, 105-135). *Mandatory offsets*, also called allowances, are required

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<sup>14</sup> According to the standards of the International Standardisation Organisation (ISO), such offsetting practices, which take place somewhere else rather than in the “*product system*” itself, are not allowed (Brohé 2016, 83).

to be purchased by a company for its carbon emissions in order to comply with a legal regime (Ibid.). A prominent example for such a mandatory offset regime is the EU-ETS (see p. 9), in which CO<sub>2</sub> certificates have to be purchased from other participants within Europe, who emitted less than it had been assumed in a certain baseline scenario. The effectiveness of the EU-ETS mandatory offset carbon market regarding decarbonisation should in theory be ensured, as the number of certificates issued by authorities decreases annually (the “cap”). However, the degree of effectiveness of the EU-ETS still remains a matter of discussion (see p. 10).

In contrast, *voluntary offset* certificates can - as the name implies - be purchased voluntarily by companies, individuals or even states and are created by various certified carbon offsetting projects (Brohé, 2016, 105-135). A voluntary offset regime introduced by the European Union is the so-called Guarantee of Origin certificate for renewable electricity with its flaws regarding the criterion of additionality that have already been discussed above. The most prominent example for a voluntary offset mechanism is the CDM between developed and developing countries under the Kyoto Protocol (Brohé, 2016, 117-121) (see p. 7).

The certified projects made under the CDM were criticised heavily, as it is highly questionable, whether their additionality can be guaranteed. In 2014 the IPCC noted critically that *“the CDM’s environmental effectiveness has been mixed due to concerns about the limited additionality of projects, the validity of baselines, the possibility of emissions leakage, and recent credit price decreases”* (IPCC, 2014a, 104). A study by the German Öko-Institut even concludes that the *“CDM still has fundamental flaws in terms of overall environmental integrity. It is likely that the large majority of the projects registered and CERs issued under the CDM are not providing real, measurable and additional emission reductions”* (Cames et. al, 2016, 11). Until today, most CERs were issued in China, India, South Korea and Brazil focusing mostly on projects regarding the reduction of HFC and N<sub>2</sub>O emissions and on the construction of big hydropower plants (Brohé, 2016, 120-121). Reacting to their questionable environmental effect, these projects are - amongst others - now prohibited from being included in the trading under the EU-ETS (Brohé, 2016, 130).

Apart from the problem of additionality, two other, more fundamental, questions concerning voluntary offsetting need to be mentioned: Firstly, according to Anderson, CO<sub>2</sub> offsets need to be guaranteed for at least 100 years in order to draw down overall atmospheric CO<sub>2</sub> effectively, as the CO<sub>2</sub> that has been emitted in the first place, will remain in the atmosphere for very long periods of time (Anderson, 2012). Secondly,

potential unintended effects caused by the offsetting projects might even increase atmospheric CO<sub>2</sub> in the long run (Ibid.).

On the other hand, supporters claim that voluntary offsetting, nevertheless, raises awareness among stakeholders and internalises costs by putting a price on carbon emissions (Brohé, 2016, 139-141). Moreover and on another note, many offsetting projects might well be regarded as development aid, regardless of their possible effect on emissions.

Taking these arguments and the scientific evidence into account, it seems indicated to be highly critical, when companies strive to neutralise their emissions by means of alleged CO<sub>2</sub> reducing effects of voluntary certificates. Various attempts exist, to bring quality and standardisation into the voluntary offset market so as to reduce its current flaws at least to a certain extent, e.g. the *“Gold Standard”* by the WWF et al., or the *“Verified Carbon Standard”* by the World Economic Forum (Brohé, 2016, 136-137). According to the GHG-Protocol offsets cannot reduce a company’s obligation to actually reduce its own CO<sub>2</sub> emissions. Hence, offsets shall thus not be subtracted from a company’s actual emissions, but rather be reported separately (WRI and WBCSD, 2004, 58-61). Thus, in this master’s thesis, offsetting will not be regarded as a credible pathway for a company to achieve carbon neutrality (see p. 31).

### 3.5 Analysis Criteria

From my previous discussion of the most relevant concepts and questions of corporate climate strategy in the chapter before, six analysis criteria arise, which I write up in the following. These analysis criteria should help to assess, whether the climate strategies of companies are on track towards carbon-neutrality.

First, a comprehensive and transparent emission inventory is key. All relevant CO<sub>2</sub> emission sources should be reported - no matter where they arise with regards to a company’s organisational<sup>15</sup> and operational<sup>16</sup> boundaries (see p. 18-19). Only based on such a comprehensive and transparent emission inventory is it possible to

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<sup>15</sup> With regards to the organisational boundaries (see p. 18-19) of the emission inventory it has to be noted that some corporate reports define them quite well and in a transparent way, whereas in other cases it is difficult to determine the organisational boundaries that were applied for the inventories in some of the corporate reports. Thus, although organisational boundaries are a relevant aspect of an emission inventory, they are not included when assessing the climate strategies, since this would exceed the means of this master’s thesis.

<sup>16</sup> These include Scope 1, Scope 2 and Scope 3 emissions (see p. 19-23).

determine which emission sources are the most relevant and whether they are sufficiently tackled by a company's climate strategy.

Second, Scope 2 emissions should be accounted for only on the basis of the location based method (see p. 20), which is based on grid emission factors, and not on the market based method (see p. 20). The market based method, which enables a company to reduce its accounted emissions by purchasing green electricity certificates, does currently not guarantee any actual decrease in CO<sub>2</sub> emissions and thus does not reflect a company's emissions caused by the use of electricity properly (see p. 21).

Third, company's emission targets that are in line with carbon-neutrality, need to aim for near-zero emissions in the long run. For activities in Austria, long run means until 2040, for the rest of the European Union it means 2050 at the latest. However, in order to avoid uncertainty about the future and to be more aligned with the +1,5°C and +2°C goals of the Paris Agreement, ambitious absolute short- and mid-term emission targets are also crucial (see p. 33).

Fourth, voluntary offsetting practices are a highly questionable and problematic means to achieve emission reductions, as there is no guarantee that current offsetting practices lead to an actual reduction of CO<sub>2</sub> emissions. Hence, for an emission reduction pathway to be credible, measures for CO<sub>2</sub> mitigation rather than offsetting need to be in the very centre of a company's climate strategy. Offsetting measures should not be used to be subtracted from a company's CO<sub>2</sub> emission inventory (see p. 38). Moreover, end-of-pipe mitigation technologies such as CCS and CCU are currently no option for companies to count on - at least not in Austria (see p. 34-35).

Fifth, it can be considered beneficial for a company's climate strategy, when a company's products or services, help to substantially avoid CO<sub>2</sub> emissions of its customers. However, this only holds true, if the claimed CO<sub>2</sub> reduction stands a consequential life-cycle analysis, if the amount of emission reduction is not subtracted from the company's emission inventory and if the company accounts for all of its product related emissions and not only those which avoid CO<sub>2</sub> emissions, i.e. no cherrypicking (see p. 25).

Sixth, it can be considered beneficial, if a company's emission intensity and absolute CO<sub>2</sub> emissions have already been decreasing over the past years, as this emphasises a company's commitment to reduce emissions and its knowhow as to how to implement climate-related measures.

## 4. Methodology of the Case Studies

In order to answer my research questions, I applied the well established case study methodology (see e.g. Baxter and Jack, 2008). In the following, I describe the way I collected and analysed the data of my qualitative empirical research.

To select the companies that should be covered by my research, I used the method of theoretical sampling in the general way as described by Mason (Mason, 2002, 124-125). In this master's thesis, I conducted twelve qualitative case studies on the publicly communicated climate strategies of twelve major Austrian-based companies covering Austria's most emission relevant sectors. For the purpose of this master's thesis the term "major" was understood in terms of a company's market capitalisation, number of employees, CO<sub>2</sub> emissions and/or Austrian-wide activities.

I only included companies, which are headquartered in Austria in the case studies, as they all fall under comparable legislation, the same jurisdiction and are facing - at least to a large extend - similar social and political conditions. Nearly all Austrian companies selected for this master's thesis can be either considered as global or at least as major regional players (e.g. in Central-, Eastern-, and South-Eastern Europe) within their sectors and are therefore a good proxy indicator for a substantial share of multinational companies.

The companies I selected, represent a variety of economic sectors: energy, heavy industry, industry related to agriculture and forestry, buildings and construction, mobility and logistics, and retail. The reason, why I selected companies from these specific sectors is that they quite well represent Austrian CO<sub>2</sub> emissions according to two different emission accounting methods: the *production-* and *consumption based* accounting method (see p. 17).

Applying the *production based* accounting method, the most recent Austrian CO<sub>2</sub> emissions data is calculated and published in the official Climate Protection Report 2019 ("Klimaschutzbericht 2019") by the Environment Agency Austria ("Umweltbundesamt"). According to this sectoral Austrian CO<sub>2</sub> emissions inventory, the Agency accounted 44% of emissions for energy and industrial production (37,1% under EU-ETS plus 7,8% Non-EU-ETS), 28,8% of CO<sub>2</sub> emissions for transportation, 10,1% for heating of buildings, 10% for agriculture, and 3,5% for waste management and 2,6% for fluorinated gases (Umweltbundesamt, 2019a, 58). According to this

accounting method, sectors, such as electricity- and steel production emitted the most (Ibid., 54).

However, following the reasoning of the Environment Agency Austria, the *consumption based* accounting method is useful as well (see p. 17) (Umweltbundesamt, 2019a, 54). According to the Environment Agency Austria, Austrian *consumption based* emissions lay 50% to 60% above its *production based* CO<sub>2</sub> emissions (Ibid., 54). Based on these numbers, one can see that upstream value chain emissions are highly relevant for many Austrian companies' overall emissions.

Although consumption based approaches are practically more difficult to apply (Brohé, 2016, 60), a consumption based approach might offer a more complete picture of Austrian CO<sub>2</sub> emissions. Following this accounting method, the Austrian sectors emitting most in 2011, were the construction sector, public healthcare, the retail sector and transportation/car production (Umweltbundesamt, 2019a, 54). This is the reason, why I did not only include the sectors energy, (heavy-) industry, mobility and logistics, residential heating and agriculture/forestry in my case studies, but also the construction- and retail sector.

In my case studies, I examined the reported climate strategies of two - quite different - energy providers, the largest Austrian electricity provider Verbund AG, and the oil and gas company OMV AG, as energy lies at the heart of any decarbonisation efforts. Secondly, I chose two energy and emission intensive industrial companies - namely, the steel producer Voestalpine AG and the petrochemical company Borealis Group. At the intersection between the three emission sources agriculture, forestry and industry, I chose the Lenzing AG, a producer of wood based fibres for textiles and AGRANA AG, which processes agricultural products. For the - according to the *production based* method - second largest Austrian source of emissions, i.e. emissions from transportation, I examine the reported climate strategies of the logistics- and transportation companies Post AG and ÖBB Holding. I chose the Post AG, due to its substantial logistics fleet and the ÖBB Holding, as rail is broadly considered as a climate friendly alternative to individual (auto-)mobility and road freight transport. I examine the two major Austrian retailers, REWE AG and Spar AG, since they are prominent examples for *consumption based* emitters, selling food and consumer products, and for emitting fluorinated greenhouse gases. Finally, direct and indirect CO<sub>2</sub> emissions from buildings and construction are found substantial according to both carbon emission accounting methods. Hence, I chose the BIG ("Bundesimmobiliengesellschaft"), as one of the largest Austrian building owners and the STRABAG SE as the largest Austrian construction company.

In order to identify and subsequently analyse the reported climate strategies of the companies I chose, I extracted the climate-related information in their most recent annual reports, sustainability reports or special reports that were available in March 2020. As these reports are key for public evaluation of a company's financial and non-financial data, strategy and potential future development, the relevance of the information given or not given in these key documents, should not be understated. Various stakeholders, such as investors, partners, policy makers, scientists, citizens, journalists and consumers depend on the information given in these reports for their critical assessment and decision making. The main difficulty that I encountered, when assessing the companies' reports, was that, unfortunately, in the majority of cases the relevant information on climate related issues was not provided in a comprehensive and structured way. I had to find and extrapolate the relevant information and sometimes even deduce it from other operating numbers. I built on the information given in the reports, but I also critically considered that certain relevant climate related company data might not have been included in the reports.

It is important to mention that most of the corporate reports, I base my case studies on, were issued between 2018 and 2019. At this time the "European Green Deal" (see p. 13) and the Austrian government's agreement (see p. 13) had not been announced yet, which is why these companies could - of course - not yet have taken these more recent developments on the European and Austrian level into consideration when issuing their reports. The Paris Agreement, under which all signatories committed to the goal of carbon-neutrality by the middle of the 21st century (Paris Agreement, 2015, Art. 4), had, however already ratified by the Republic of Austria on the 5th of October 2016 (United Nations, 2020) and could be taken into account by all of the analysed reports.

Once, I had gathered the relevant information for each case study from the reports, I clustered it into three categories: *emission inventory*, *emission target* and *reduction pathway* (see below). I selected these categories, as I identified them to be building blocks and common terminology of the international climate regime under the UNFCCC, the Paris Agreement and the IPCC. For the purpose of my master thesis, these three categories constituted a climate strategy. I considered these concepts to be useful for the corporate level as well.

Since the adoption of the UNFCCC in 1992, the practice of compiling an "*emission inventory*" has become standard of international climate policy, creating the basis for bringing global CO<sub>2</sub> emissions down (see p. 17). In 2004, the GHG Protocol Corporate Standard tried to establish this concept on the corporate-level (WRI and WBCSD,



2004, 10). Hence, for the purpose of this master's thesis, "emission inventory" was understood in accordance with the GHG Protocol.

Since the adoption of the Kyoto Protocol in 1997, the practice of setting binding CO<sub>2</sub> emission targets has become a corner stone of international climate policy (see p. 29)<sup>17</sup>. Since then, emission targets have increasingly been implemented on the corporate-level as well<sup>18</sup>. Thus, I included the category "*emission target*" for conducting my case studies. For the purpose of this master's thesis, emission target was understood as a commitment to a certain reduction of relative or absolute overall CO<sub>2</sub> emissions of a company within a specific timeframe.

The third category that I used for clustering my case studies is the category "*reduction pathway*". As already discussed above, the concept of formulating reduction pathways to reduce CO<sub>2</sub> emissions, is used by the IPCC, i.e. "*Mitigation Pathways*" (IPCC, 2018b), and the Paris Agreement (Paris Agreement, 2015, Art. 2c). For the purpose of this master's thesis, reduction pathway was understood as a roadmap for decarbonisation on the corporate-level. To be more precise: A pathway referred to credible measures, which are applied in a systematic way in order to decarbonise a company's business activities.

After having extracted and systemised the twelve reported climate strategies of the companies chosen for my case studies, I also assessed the collected data using the analysis criteria developed earlier (see p. 38), to answer the question whether these reported climate strategies are on track towards carbon-neutrality or not. As described above, I derived these criteria by critically reviewing official documents, such as reports by the IPCC, voluntary standards, such as the GHG Protocol and from scientific research.

Finally, the results of the case studies allowed me to compare the companies' reported climate strategies and to draw a general conclusion and to make recommendations for future research and for policies on the state- and corporate-level.

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<sup>17</sup> I integrated the practice of setting emission targets in my case studies as it is a widely used practice used by the entire global climate regime under the UNFCCC (see p. 29). However, as reasonable critique concerning the effectiveness of this approach exists (Ibid. and p. 106), I will discuss this question in my master's thesis' "Findings and Recommendations".

<sup>18</sup> See inter alia (WRI and WBCSD, 2004, 74-85) or the establishment of the SBT-initiative (see p. 15).

## 5. Case Studies

In each of the following case studies, I included all the information provided by the respective company, that was relevant for answering my research questions (see p. 4), and interpreted it according to my analysis criteria (see p. 38). To make the twelve case studies comparable and better readable, I edited them in a standardised way:

First, I provided the most important facts about the respective company in a succinct way: Starting from the company's core business model, products or provided services, to its structure of ownership, to its number of employees and its amount of CO<sub>2</sub> emissions. I further mentioned, whether facilities of the companies fall under the EU-ETS registry.

Secondly, I provided information about the sources I used for the respective case study and how helpful these sources were for my research with regards to their quality.

Thirdly, building on my methodology (see p. 40), I arranged the extracted information about the companies' reported climate strategy around the three elements of climate strategy: emission inventory, emission target and reduction pathway.

Fourthly, I gave a conclusion at the end of every case study, which sums up the most important findings about the company's reported climate strategy.

### 5.1 Verbund AG

Verbund AG is Austria's largest electricity provider and one of the largest hydropower producers in Europe (Verbund, 2019, 16). The company produces its electricity mainly from hydropower (92%) and wind (3%) and also directly deploys fossil thermal power plants (5%) (Ibid.). The majority of the company (51%) is held by the Republic of Austria (Ibid.) and another 30% by Austrian state near entities and electricity providers (EVN, Wiener Stadtwerke and TIWAG). Moreover, the provider of the Austrian transmission grid (Austrian Power Grid) (Ibid., 87) is a subsidiary of Verbund AG, as well as the company holds substantial shares from Kelag AG, the main energy provider of Carinthia (Austria) (Ibid., 101). In 2019, some facilities of the Verbund AG, such as

coal power plants and district heating plants were part of the EU-ETS (Umweltbundesamt, 2018b). In 2019, the company's turnover was around 3.895 million Euro and employed 2772 people (Verbund, 2019, 1-2). Verbund AG's CO<sub>2</sub> emissions amounted to around 1,742 million tonnes of CO<sub>2</sub>e in 2019 (Ibid.).

I found most information, relevant for my case study, in the company's integrated report of 2019 ("*Integrierter Geschäftsbericht 2019*") (Verbund, 2019). Furthermore, some information was found in the company's "*Disclosures on Management Approach*"-report (Verbund, 2019a), which was also provided by the company in 2019.

### **Verbund AG's emission inventory**

Concerning Verbund AG's reported *operational boundaries* (see p. 19), the company reports that, in 2019, 65% of its emissions stemmed from Scope 1, while 18% and 21% of emissions arose from Scope 2 and Scope 3, respectively (Verbund, 2019, 142).

First, the Austrian electricity provider accounts for its Scope 1 emissions, which amounted to 1,07 million tonnes of CO<sub>2</sub> in 2019. Here, Verbund AG accounts for its CO<sub>2</sub> and SF<sub>6</sub> emissions (Verbund, 2019a, 141). These CO<sub>2</sub> emissions mainly stem from the combustion of fossil fuels by the company's thermal power plants (Ibid.). According to Verbund AG, these emissions accounted for 99% of the company's Scope 1 CO<sub>2</sub> emissions in 2019 (Ibid.).

Secondly, Verbund AG accounts its Scope 2 emissions according to the GHG Protocol's *market based* method (see p. 20), which amounted to 0,31 million tonnes CO<sub>2</sub> in 2019 (Verbund, 2019a, 141). The company also provides a calculation applying the *location based* method (see p. 20), which counts 0,39 million tonnes of CO<sub>2</sub> (Ibid.). According to the company's *Disclosures on Management Approach*, the reported Scope 2 emissions also cover the electricity purchased for its pumped-storage hydro-power plants and the transmission losses (Verbund, 2019b, 35).

According to the company's accounting, Scope 3 emissions account for 0,36 million tonnes of CO<sub>2</sub> (Verbund, 2019a, 141). These Scope 3 emissions cover upstream activities, such as the production and transportation of fossil fuels, business-related travelling and downstream activities, such as the natural gas, which is burned by customers (Verbund, 2019b, 35).

Finally, Verbund AG prominently claims being a key provider of a product, which contributes to *avoided emissions* (see p. 23), i.e. electricity from renewable sources. According to the Verbund AG, the electricity provided by the company lead to an overall emission reduction of roughly 24 million tonnes of CO<sub>2</sub> in 2019<sup>19</sup> (Verbund, 2019a, 141). According to Verbund AG's reporting, the company reduced its overall carbon emissions from 2,04 million tonnes of CO<sub>2</sub> in 2017, to 1,74 million tonnes of CO<sub>2</sub> in 2019 (Ibid.).

### **Verbund AG's emission target**

According to Verbund AG's integrated report, the company did not explicitly formulated the target of carbon-neutrality. Instead, the company reported the goal to decarbonise its electricity production to zero CO<sub>2</sub> in the long run, without naming a particular year (Verbund, 2019a, 16) and reported an extraordinarily ambitious short-term emission targets until 2021.

Moreover, the company set ambitious short-time targets between 2011 and 2021 - but they did not formulate a mid-term target for thereafter or formulated an overall emission target to achieve carbon-neutrality (see p. 33). More specifically, the Verbund AG set the ambitious short-term target, to reduce its overall CO<sub>2</sub> emissions by 90% by the year 2021, compared to the base year of 2011. This target includes Scope 1, Scope 2 (applying the *market-based method*) and parts of the company's Scope 3 emissions, such as all energy related emissions and business related flights (Verbund, 2019a, 140). Verbund AG aims that the *emission intensity* of electricity produced should account for 10g CO<sub>2</sub>e/kWh in 2021, which would be less than one third compared to 32g CO<sub>2</sub>e/kWh in 2019 (Ibid. 142). Notably, the target of Verbund AG was approved by the SBT-initiative (Ibid.).

### **Verbund AG's reduction pathway**

According to the company's report, The Verbund AG aims to *mitigate* emissions mostly trough technological change (see p. 34), but also by certain *offsetting* activities (see p. 36). In order to reduce its Scope 1 emissions, the company plans to scale up its renewable electricity production, while decommissioning its remaining coal fired power plants (Verbund, 2019a, 142). According to Verbund AG's reported strategy, the

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<sup>19</sup> The company calculates its alleged avoided CO<sub>2</sub> emissions by comparing Verbund AG's carbon intensity (see p. 30) to the carbon intensity of Europe's ENTSO-E-Mix (Ibid. 141).

company plans that 20-25% of its electricity production originate from new onshore wind turbines and photovoltaic cells by 2030, while it aims at at least keeping electricity production from hydropower at today's level (Ibid., 19). Thus, the relative share of emissions stemming from the Verbund AG's thermal power plants, might become smaller over time. Moreover, Verbund AG invests in various innovative projects regarding green hydrogen, energy storage technologies, smart grids and e-mobility (Ibid., 95-97). Although, the company reports to use natural gas instead of coal in its thermal power plants, the current report provides no explicit pathway to eliminate these emissions in the future.

In order to reduce Verbund AG's *market-based* Scope 2 emissions, the company partly purchases renewable *Guarantees of Origin* (Ibid.) (see p. 20).

In order to reduce its Scope 3 emissions, Verbund AG offsets the emissions from natural gas it sells to parts of its customers. For this purpose the company invests in certified renewable energy projects under the CDM (see p. 37) in countries such as Albania, Turkey and Georgia. The TÜV-Nord verified the projects and Verbund AG's projects can publicly be seen on the TÜV-Nord's website (TÜV, 2020).

### **Conclusion Verbund AG**

Verbund AG is already in the process of transforming its business model towards carbon-neutrality and might, under certain conditions<sup>20</sup>, even help its customer's to avoid CO<sub>2</sub> emissions (see p. 23). Unfortunately, the companies' report does not explicitly formulate the target of carbon-neutrality for the company's entire activities, but Verbund AG reports to strive for an emission free electricity production in the long run and has reported a very ambitious short and long term CO<sub>2</sub> reduction target. The company aims to reduce 90% of its Scope 1, Scope 2 and Scope 3 CO<sub>2</sub> emissions by 2021 (compared to 2011).

A drawback of Verbund AG's climate strategy is, that in its report, the company does not report an explicit pathway to decarbonise its gas-fired thermal power plants completely to reduce its Scope 1 emissions to zero. On the other hand, Verbund AG, shut down its coal fired power plants and plans for new renewable energy infrastructure until 2030, which might reduce its *emissions intensity* further.

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<sup>20</sup> As shown above, it is quite difficult to determine if and to what extent companies truly help to avoid emissions by selling their products or services (see p. 23).

After 2021, a new substantial emission reduction target will be necessary for the company. Stating this, one has to bear in mind that - following the analysis criteria (see p. 38) - offsetting by buying renewable *Guarantees of Origin* to reduce Scope 2 emissions and by buying certified credits under the CDM to reduce Scope 3 emissions, *does not necessarily lead to carbon-neutrality* and are, based on the analysis criteria (see p. 38) no credible pathway to reduce a company's emissions (see p. 21).

Finally, Verbund AG considers itself a key provider of renewable energy systems and as a key-seller of a product, which helps to avoid CO<sub>2</sub> emissions of its customer's - compared to other electricity providers. As counting the exact amount of avoided emissions proves to be rather complicated (see p. 23), it cannot easily be determined, whether the Verbund AG's claim to actively reduce the very specific number of 24 million tonnes of CO<sub>2</sub> yearly by selling renewable electricity, is actually correct. As various hydropower plants have already been in use for many decades, it is difficult to qualify all of the electricity produced by Verbund AG as CO<sub>2</sub> reduction that *additionally* (see p. 21) replaces current carbon intensive electricity. This does not mean that older hydropower dams should not be counted as valuable source of renewable electricity. However, in order to actually contribute to the political CO<sub>2</sub> reduction targets, decarbonisation of the current grid is necessary. This entails actively replacing the share of electricity that is based on fossil fuels. Moreover, Verbund AG's newly built renewable infrastructure, such as wind-, solar- or hydro power or hydrogen technology, which replaces fossil fuels, might very well be considered *avoiding emissions* under certain criteria (see p. 23-25). It is, however, out of the scope of this master's thesis to determine the scope of such avoidance comprehensively.

Last but not least, Verbund AG provided some information on the structural implementation of Verbund AG's climate strategy on the corporate-level (Verbund, 2019b, 36).

## 5.2 OMV AG

OMV AG is an internationally active and vertically integrated oil and gas producer, whose headquarter is located in Vienna (OMV, 2019b, 7-11). In 2019, the company's turnover amounted to 23.461 million Euro and it employed 19.845 people globally (OMV, 2019a, I). In 2019, the company's reported CO<sub>2</sub> emissions account for 137 million tonnes of CO<sub>2</sub>e, which include Scope 1, Scope 2 and Scope 3 emissions (OMV,

2019b, 126), plus 1,53 million tonnes of biogenic<sup>21</sup> CO<sub>2</sub>e emissions (Ibid., 128). These reported numbers might increase in the near future, as OMV AG became the majority shareholder of the petrochemical company *Borealis AG* in March 2020 (Strobl, 2020). The largest shareholders of OMV AG are the ÖBAG, a holding owned by the Republic of Austria that owns 31,5 % of OMV AG's shares, institutional investors, mainly from the U.S. and the U.K., holding 29% of the shares and the Mubadala Petroleum and Petrochemicals Holding Company (MPPH) from Abu Dhabi, holding 25% of the shares (OMV, 2019a, 38). Some of OMV AG's facilities, such as the refinery in Schwechat near Vienna, are part of the EU-ETS regime (EU-ETS Registry).

The information on OMV AG's climate strategy was found in OMV AG's sustainability report of 2019 (OMV, 2019b) and to some extent in the company's annual report of 2019 (OMV, 2019a).

### **OMV AG's emission inventory**

OMV AG lists the greenhouse gases CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O in its reports, as they consider them the relevant gases for its operations (OMV, 2019b, 126). The company calculates its CO<sub>2</sub> emissions according to the *emission factors* (see p. 27) provided by IPCC's 4th Assessment Report (OMV, 2019b, 126).

OMV AG lists its Scope 1, Scope 2 and Scope 3 emissions. In 2019, the company's Scope 1 emissions amounted to 10,6 million tonnes of CO<sub>2</sub> (Ibid., 126) and its Scope 2 emissions accounted for 0,4 million tonnes of CO<sub>2</sub> (Ibid.). The company's Scope 3 emissions constituted the company's largest source of CO<sub>2</sub> emissions by far. According to OMV AG's accounting, Scope 3 emissions represented 92% of the company's CO<sub>2</sub> emissions in 2019, which amounted to 126 million tonnes of CO<sub>2</sub> (OMV, 2019b, 64). According to OMV AG, these Scope 3 emissions include the use of products by customers (downstream) and the company's purchasing of goods, services and capital goods (upstream) (Ibid.). Only "*pure 'trading margin' sales as well as intercompany sales are excluded*" (Ibid., 126). In other words, Scope 3 emissions regarding products were only included in the inventory, if the entity that sells the product to end users, is under control of OMV AG. Moreover OMV AG discloses its "*Biogenic CO<sub>2</sub> emissions*" - which accounted for 1,53 million tonnes of CO<sub>2</sub> in 2019 (Ibid., 128), which OMV AG - in line with the GHG-Protocol - counted separately, since they are CO<sub>2</sub> emissions stemming from the source of renewable biomass.

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<sup>21</sup> CO<sub>2</sub> emissions stemming from biomass

According to OMV AG's report, the emission intensity (see p. 30) from business operations has been reduced by 22% since 2010 (OMV, 2019b, 33). The total number of OMV AG's greenhouse gas emissions cannot be found anywhere in the sustainability report or annual report. Thus, the development of OMV AG's total emissions could not be easily compared over the years. Only the emissions from the respective emission scopes were reported by the company. From these numbers I could derive the total number of OMV AG's emissions in 2019.

Interestingly, OMV AG disclosed its potential overall CO<sub>2</sub> emissions regarding its complete proven fossil fuel reserves<sup>22</sup>, which amounted to 2.17 Gt (Giga tonnes) of CO<sub>2</sub>, which would constitute a 0,5% share of the remaining total global carbon budget (see p. 32), according to OMV AG's report (OMV, 2019b, 23).

### **OMV AG's emission target**

According to OMV AG's reports, OMV AG did not set a target to become carbon-neutral on the long run. OMV AG had the target to reduce its production's (Scope 1) *carbon intensity*<sup>23</sup> by 19% by 2025 and its product portfolio's (Scope 3) *carbon intensity*<sup>24</sup> by 4% by 2025 compared to the year 2010 (OMV, 2019b, 65). OMV AG reports to have already achieved these goals in the first half of 2020 (Ibid.). OMV AG has not yet set a new emission target. OMV AG did not report an absolute carbon emission target and also the past intensity targets appear to be arbitrarily set, as the report does not provide any reasoning in this regard. OMV AG's total carbon emissions have even increased since 2015, as the additional emissions from larger sales (Ibid., 64) outweighed the decrease of OMV AG's production related CO<sub>2</sub> emissions (Ibid., 60). The company promotes the goal of "*carbon efficiency*" (Ibid., 56) instead of carbon reduction.

### **OMV AG's reduction pathway**

As OMV AG did not set any substantial emission targets (see p. 38), the company does not provide a CO<sub>2</sub> reduction pathway either. Nevertheless, the company reports to have

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<sup>22</sup> OMV AG's report based this estimation on their 2019 portfolio and proven reserves (OMV, 2019b, 23).

<sup>23</sup> OMV AG uses different indicators for different processes for calculating its carbon intensity: e.g. upstream carbon intensity (t CO<sub>2</sub>e/t oil equivalent produced), carbon intensity of refinement (t CO<sub>2</sub>e/t throughput) or carbon intensity of power (t CO<sub>2</sub>e/MWh produced) (OMV, 2019b, 65).

<sup>24</sup> The indicator for the carbon intensity of OMV AG's product portfolio is: t CO<sub>2</sub>e/t oil equivalent sold (OMV, 2019b, 65).



set some activities to reduce emissions. According to OMV AG's report, the company's carbon intensity under Scope 1 was reduced mainly by reducing "*flaring and venting*"<sup>25</sup> at its production sites (OMV, 2019b, 61). The company wants to further reduce these emissions (OMV, 2019b, 57). Moreover, OMV tries to establish projects to use carbon capture and storage (CCS) (see p. 34) as a way of CO<sub>2</sub> emission mitigation for its facilities (OMV, 2019b, 58)<sup>26</sup>.

OMV AG does not provide a pathway to reduce the company's comparably small Scope 2 emissions (0,5%); the only activity they are currently engaged in this regard is partaking in the installation of a comparably large solar farm in Lower Austria (OMV, 2019b, 63).

In order to reduce OMV AG's Scope 3 emissions, the company first and foremost aims to reduce the *emission intensity* of its product portfolio. This was mainly achieved by increasing the company's gas-to-oil ratio, as natural gas (CH<sub>4</sub>) is less carbon intensive than oil (see p. 34)<sup>27</sup>. In 2019, natural gas accounted for 57% of OMV AG's upstream production<sup>28</sup> compared to 46% in 2010 (OMV, 2019b, 65). The company aims to shift their product portfolio towards natural gas, LNG (Liquified Natural Gas), CNG (Compressed Natural Gas). Also the production and sale of hydrogen gas is seen by OMV AG as an opportunity to reduce the company's relative Scope 3 carbon footprint (Ibid., 57). Secondly, OMV AG aims to substantially increase its petrochemical portfolio<sup>29</sup> (Ibid.). In 2019, OMV AG started to sell "*climate-neutral gas*" to interested customers (OMV, 2019b, 71), by selling regular natural gas, while trying to offset its emissions by purchasing voluntary carbon credits (Ibid.). Furthermore the company conducts research with regards to chemical feedstock recycling of plastics with a project named "ReOil" which might increase recyclability of plastic products (OMV, 2019b, 74-75).

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<sup>25</sup> I.e. burning associated gas from oil drilling (OMV, 2019b, 61).

<sup>26</sup> This reported approach is stressed by OMV AG's advocacy to change corresponding environmental laws in Austria (Siebenhaar, 2019).

<sup>27</sup> This reported strategy to increasingly replace its traditional oil-based portfolio with non-oil alternatives, was underpinned by the OMV AG's decision to sell substantial shares of its gasoline filling stations in 2020 (Die Presse, 2019)

<sup>28</sup> OMV AG's production and processing of oil and gas products is measured in barrels of oil equivalents (OMV, 2019b, 65)

<sup>29</sup> This was emphasised by OMV AG purchasing a substantial share of 15% from the large petrochemical company ADNOC in Abu Dhabi (OMV, 2019c) and by purchasing 75% of the petrochemical Borealis Group's (see p. 57) stocks in March 2020 (Strobl, 2020).

## Conclusion OMV AG

Being an oil-, gas- and petrochemical company, one can expect that questions of climate change and the political goals of carbon-neutrality are an increasingly important topic for OMV AG. OMV AG acknowledges in its report that a policy-, market- and society driven clean energy transition (OMV, 2019b, 57) poses substantial *transition risks* (see p. 16) for the future of the company's current business model (OMV, 2019b, 22-27).

Consequently, the company seems to be on the way of transforming its business model from being an integrated oil company - based on selling fuels for combustion engines - towards being a natural gas- and petrochemical company. Although the company adapts its business model, the company's reported strategy is by no means on track towards carbon-neutrality (see p. 31), with respect to my analysis criteria (see p. 38). Although OMV AG seems to set new priorities, they did neither formulate the target of carbon-neutrality, nor did they develop any reasonable pathway towards decarbonisation (p. 38). The company's carbon intensity goals seem arbitrarily set and - although the targets in this regard have been overachieved - OMV AG's total CO<sub>2</sub> emissions have even increased between 2015 and 2019 (see above).

Burning natural gas, as well as petrochemical products - given their current lifecycle (IEA, 2018) - emit large amounts of CO<sub>2</sub> into the atmosphere. Natural gas might emit less CO<sub>2</sub> than oil (see p. 34), but it is all but zero-carbon. In order for OMV AG's climate strategy to comply with the goal of carbon-neutrality, clear emission targets and a substantial mitigation pathway are needed. This need is even more pressing, considering that large investments are made by the company today (OMV, 2019a, 47), which ought to be in line with the political target of carbon-neutrality. Finally, the strategy of mitigating the company's CO<sub>2</sub> emissions by using highly contested and, at least in Austria, prohibited methods of CCS is at least questionable (see p. 34).

Last but not least, the sustainability report does give some information about the implementation of OMV AG's climate strategy on the corporate level (e.g. OMV, 2019b, 47, 59 and 23) (see p. 28).

## 5.3 Voestalpine AG

Voestalpine AG is an internationally active Austrian steel producer, whose headquarter is located in the Austrian city of Linz (Voestalpine, 2019a, 6-9). The company focuses

on manufacturing steel products for the car-, the rail-, energy-, construction and space industry (Ibid.). The company's facilities are mainly located in Austria, but it also deploys facilities and locations in 50 countries around the world (Ibid.). The company's facilities are among Austria's largest emitters of greenhouse gases (Umweltbundesamt, 2018b). In 2019, Voestalpine AG's turnover, amounted to 13,6 billion Euro and it employed 52.000 people globally (Voestalpine, 2019a, 2). According to the company's annual report of 2018/2019, 44% of shareholders stem from Austria, 14,8% of shares are held by the employee shareholding scheme and 15% are held in North America (Voestalpine, 2019a, 20). The company's major individual shareholders are the Raiffeisenlandesbank Oberösterreich Invest GmbH & Co OG (15%), the employee shareholding scheme (14,8%) and the Oberbank AG (8,1%) (Ibid.). According to the report, the company's CO<sub>2</sub> emissions accounted for about 23,8 million tonnes of CO<sub>2e</sub> (all Scopes combined) (Voestalpine, 2019, 62). According to the company, 85% of these emissions stemmed from two Austrian facilities in 2019 (Ibid.). These and other facilities of Voestalpine AG fall under the EU-ETS (Umweltbundesamt, 2018b).

The information about Voestalpine AG's climate strategy was found in the company's Corporate Responsibility Report of 2019 (Voestalpine, 2019).

### **Voestalpine AG emission inventory**

Voestalpine AG accounts in its report for its Scope 1, Scope 2 and Scope 3 emissions (Voestalpine, 2019, 62). According to the report, the largest share of absolute emissions arises from the company's Scope 1 emissions, with 12,7 million CO<sub>2</sub> emissions stemming from 130 production facilities (Ibid.). Compared to these numbers, the company's reported Scope 2 emissions are relatively small accounting for 0,8 million tonnes CO<sub>2</sub> (Ibid.). Furthermore, the company's reported Scope 3 emissions are substantial, accounting for at least 10,3 million tonnes of CO<sub>2</sub> emissions (Ibid.). According to the Voestalpine AG, the company's Scope 3 emissions consist mainly of the upstream supply chain of raw materials (Ibid.): i.e. the "*key materials*" iron ore, coal and scrap, "*alloys*" and "*aggregates*" and their up- and downstream logistics (Ibid., 37). Voestalpine AG discloses its entire carbon emissions and its progress. The company even reports its annual costs for EU-ETS allowances (about 100 million/yr) (Ibid., 31), which means that Voestalpine AG purchased around one third of its CO<sub>2</sub> emission allowances in 2019 additionally (Ibid.). No precise information is given in the report about the Voestalpine AG's emission performance in recent years.

### **Voestalpine AG's emission target**

Although the company reports an ambitious long-term target (see p. 30) until 2050 with regards to its CO<sub>2</sub> emissions, complete carbon-neutrality has not been reported as a target yet. In its report, Voestalpine AG defined no clear mid-term targets (see p. 30), but aims to continuously reduce emissions. Moreover, the company did not report a target with regards to reducing its Scope 3 (see p. 22) emissions.

According to Voestalpine AG's Corporate Responsibility Report, the company aims to reduce its CO<sub>2</sub> emissions by more than 80% by 2050 (Voestalpine, 2019, 34). Until 2050, the report states, emissions should be reduced continuously (Ibid.). This target seems to include the company's Scope 1 emissions (mainly from steel production processes) and the company's substantial future indirect emissions from electricity and hydrogen consumption, as Voestalpine AG reports to plan switching technologies (see below) (Ibid.). The provided information in the report is inconclusive as to whether and how the roughly remaining 20% of emissions will be tackled.

### **Voestalpine AG's reduction pathway**

Voestalpine AG, clearly aims to reduce its CO<sub>2</sub> emissions by means of *mitigation* through *cleaner processes* (see p. 34). The company reports a clear pathway to achieve its target to reduce emissions by 80% by 2050: To reduce the company's Scope 1 emissions, as a first step, Voestalpine AG reports to increase the use of natural gas as a chemical reduction agent instead of coal (Voestalpine, 2019, 34). Secondly, the company reports to plan to replace its coal fired blast furnace technology with an electrically driven arc furnace technology (Ibid.). Building on this new technology, the reducing agents will be natural gas, which in turn will be increasingly replaced by green hydrogen so as to achieve even higher emission reductions (Voestalpine, 2019, 32-34). According to Voestalpine AG, a sufficient supply of green hydrogen<sup>30</sup>, natural gas, as well as a successful transition of the electrical grid towards renewable electricity are key for effective decarbonisation (Ibid., 34). Voestalpine AG acknowledges in its report that some technologies, which are fundamental to make this pathway a success, such as green hydrogen, are, however, not available on a large scale yet (Ibid., 33). In order to change this, Voestalpine AG reports to invest into upscaling, research and development of new technologies (Ibid., 33). Outstanding in this regard is the "H2FUTURE" project, which aims to deploy green hydrogen on an

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<sup>30</sup> I.e. hydrogen gas that is produced from water using renewable electricity.

industrial scale, and which is supported by the European Union (Ibid.). According to the report, Voestalpine AG also reports to conduct research on carbon capture and usage (CCU) (Ibid., 34) (see p. 34).

Voestalpine AG's substantial reported Scope 3 emissions, which mainly result from mining and transporting ores and coal (Voestalpine, 2019, 62), are only partially addressed by the report by the planned reduction of coal use and higher scrap recycling rates (Ibid., 27). A more comprehensive pathway to decarbonise the company's supply chain of resources, is not mentioned by the company's report. Without a strategy to decarbonise Voestalpine AG's energy intensive feedstock, the company's steel might be "green" only according to Austria's territorial CO<sub>2</sub> accounting.

### **Conclusion Voestalpine AG**

Although the energy and resource intensive steel producer Voestalpine AG has reported a clear and ambitious pathway for decarbonising its direct emissions (see p. 19) by 80% by 2050, carbon-neutrality is not in sight yet - based on my analysis criteria (see p. 38). As an emission intensive industry, which uses coal and gas not only as an energy source but also as a chemical reduction agent, radical technological transformation of Voestalpine AG's production processes is indispensable in order to approximate to zero emissions.

Remarkable and problematic about Voestalpine AG's reported climate strategy is that it heavily relies on a mix of internal and external factors: It can be assumed that the reported strategy will only succeed, if Voestalpine AG conducts large scale technological changes within the company itself in combination with an economy-wide energy transition, which has yet to happen. Basically, the company aims to reduce most of its large coal-based Scope 1 emissions, by shifting its energy-consumption towards the electrical grid and supply of green hydrogen. The report does not state, how much renewable electricity or hydrogen that is required for the company's processes, will be produced by the company itself. However, Voestalpine AG at least reports to conduct research and promotes innovation itself.

Even if Voestalpine AG will be successful in implementing their climate strategy as depicted in its report, the company will still be emitting about 20% of its current Scope 1 and Scope 2 emissions by 2050 - given that there will not be a technological breakthrough that will make it possible to produce steel with zero-carbon emissions in the meantime (Voestalpine, 2019, 34). In concrete terms, it seems plausible that

Voestalpine AG would still emit 2,54 million tonnes of CO<sub>2</sub> each year within Scope 1 and Scope 2 even by 2050. Thus, carbon-neutrality as defined by my analysis criteria is not yet in sight for 2050 and even less so for 2040. Moreover, the company's reported substantial Scope 3 emissions (see p. 22), such as mining and global transportation of raw materials, are not comprehensively addressed by Voestalpine AG's reported climate strategy, but rather partially e.g. by reducing coal use and more recycling of steel.

The report does not give much information on the implementation of its climate strategy on the corporate level (see p. 28).

## **5.4 Borealis Group**

Borealis Group is a large petrochemical company, which is headquartered in Vienna. The multinational company is a global player with regards to the production of polyolefins (Borealis, 2019, 4). It further produces various base chemicals and fertilisers (Ibid.). Since March 2020, 75% of its shares are held by OMV AG (see p. 48). In 2019, Borealis Group's turnover amounted to 8.103 million Euro and it employed more than 6900 people (Borealis, 2019, 4-5). In 2019, according to the company's reporting, its disclosed CO<sub>2</sub> emissions for its facilities falling under the EU-ETS regime, amounted to 4,63 million tonnes of CO<sub>2e</sub> (Ibid., 5).

The climate relevant information was mainly found in the company's combined report of the year 2019 (Borealis, 2019). Borealis Group's climate-related strategy was quite difficult to analyse as it was presented in a rather unstructured way.

### **Borealis Group's emission inventory**

Borealis Group's emissions amounted to 4,63 million tonnes of CO<sub>2</sub> in 2019<sup>31</sup> (Borealis, 2019, 7). The company's emissions have risen moderately compared to 4,27 million tonnes of CO<sub>2</sub> in 2015 (Ibid.).

According to Borealis Group's report, the use of energy contributed to 55% of the company's CO<sub>2</sub> emissions in 2019 (Ibid., 58), followed by ammonia-related processes (34%) (Ibid.), flaring and N<sub>2</sub>O emissions (10%) (Ibid.). With regards to the company's

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<sup>31</sup> Borealis Group reports its "EU ETS CO<sub>2</sub> emissions" (Borealis, 2019, 5)

rising consumption of energy (Ibid., 7), the largest share is attributed to the production of hydrocarbons (44%) (Ibid., 58), followed by the production of melamine and fertilisers (32%), the production of polyolefins (21%) and, finally, to the company's infrastructure and research activities (6%) (Ibid.). The company does not provide any specific data with regards to emissions from ammonia-related processes, which constitute the second largest emission source in 2019.

Borealis Group does not disclose Scope 2 emissions in its report separately, although the company reports that 34% of its overall energy consumption stem from electricity use (Ibid. 59). As the report discloses that Borealis Group's total energy consumption amounted to 25.831 GWh (Giga Watt hours) (Ibid.), based on this it can be deduced that 8.782 GWh stem from the use of electricity ( $25.831 \times 34 / 100$ ). The company, however, does not account for Scope 2 emissions and thus does not disclose its indirect CO<sub>2</sub> emissions arising from electricity production, which - based on the provided numbers - seem very likely to be substantial.

The company does not explicitly report on its Scope 3 emissions, neither with regards to upstream nor to downstream activities. Considering Borealis Group's purchased raw materials and end-products (Ibid., 22), Scope 3 emissions can be expected to be considerably high: from likely emissions arising from extracting and transporting the raw materials oil and natural gas, to refinement and production to likely end-of-life emissions arising from incinerating plastic waste or from using fertilisers on farms. These - probably quite substantial - up- and downstream emissions might, however only roughly and indirectly, be derived from the company's reported sales (Ibid., 123, 153).

In sharp contrast to this, the company claims in its report to sell various low-carbon products, which - according to the company - help to avoid CO<sub>2</sub> emissions (see p. 23), from "*lightweight plastics*" for making cars lighter (Borealis, 2019, 44) to chemicals used for renewable energy solutions and accurate fertiliser dosing in farming (Ibid., 58).

### **Borealis Group's emission target**

Borealis Group reports to acknowledge the targets of the EU-Commission's *European Green Deal* (see p. 11) and stresses that "*transformation in technology is necessary to meet the EU's goal to be climate neutral by 2050*" (Borealis, 2019, 34). According to its combined report "*Borealis is actively scouting for industry alliances to prepare for a carbon neutral future*" (Ibid., 84).

Nevertheless, Borealis Group has neither reported to set a long term target to achieve carbon-neutrality (see p. 31), nor reported a substantial mid-term emission target. Moreover, the company does not explicitly report to aim for reducing its Scope 3 (see p. 22) CO<sub>2</sub> emissions. In 2019, the company renewed its climate-related goals<sup>32</sup>: Borealis aims to make its operations 20% more energy efficient until 2030 - compared to 2015 (Borealis, 2019, 58), and aims to use 50% renewable energy for the company's "Hydrocarbons & Energy and Polyolefins business" in 2030 (Ibid.).

### **Borealis Group's reduction pathway**

Borealis Group's report does not communicate a reasonable pathway to decarbonise its business activities towards carbon-neutrality. The company's reported CO<sub>2</sub> reduction pathway builds on emission mitigation (see p. 34) and appears fragmented and vague.

In order to bring the company's CO<sub>2</sub> emissions substantially down, its energy use, which accounts for 55% of emissions, and "ammonia related processes", which account for 34% of emissions (Borealis, 2019, 58), need to be decarbonised. Furthermore, flaring and N<sub>2</sub>O emissions, which account for 10% of the emissions, need to be mitigated. There is no pathway reported, how to reach the goal of 20% energy efficiency increase and the increase of renewable energy to 50% in two of the company's branches. Based on the report, it is non-transparent whether the company aims to deploy the desired 50% renewable capacity in 2030 by itself, or if the company plans to achieve its goal by purchasing renewable electricity certificates (see p. 21) . The company's report states that the renewable energy will stem "(...) from renewable sources such as wind, solar, biomass or hydro, and connected directly to our internal grids or sourced on the European markets through power purchase agreements (PPAs), always covered by guarantees of origin" (Borealis, 2019, 218)

Furthermore, Borealis Group did not report a pathway for reducing the company's ammonia-related CO<sub>2</sub> emissions, which are, for example, related to the steam processing of natural gas to gain hydrogen (Borealis, 2019, 83). The company aims at reducing its emissions from flaring by 50% in 2020 compared to the base year of 2013 - according to the company's report, 32% thereof have already been reduced until 2019 (Ibid., 58).

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<sup>32</sup> These goals do not qualify as emission targets, as they do not aim to reduce a specific amount of CO<sub>2</sub> emissions within a specific timeframe (see p. 29), but rather aim for increasing energy efficiency and renewable energy use.



Borealis Group's reported plan to increase energy efficiency and deployment of renewable energy in two of its three branches might also reduce Borealis Group's Scope 2 emissions.

In order to reduce the company's most likely Scope 3 emissions, some potentially innovative concepts are implicitly listed by the company, such as changing feedstocks for hydrocarbons (Ibid., 83), improving the recyclability of plastics (Ibid., 44), searching for alternative feedstocks for melamine and fertilisers (Ibid.) and contributing to the development of precision farming technologies (Ibid., 58). Although the company's report describes various innovative solutions, which are related to climate change, no comprehensive pathway is reported to scale them up. According to Borealis Group, a team was set up in order *"to create a roadmap to reduce fossil fuel CO<sub>2</sub> emissions, resulting from industrial activities. The team will prepare to guide the Group to 2050 in relation to CO<sub>2</sub> emissions and will evaluate technologies, business challenges and innovation"* (Ibid., 62).

### **Conclusion Borealis Group**

Based on my analysis criteria (see p. 38), Borealis Group's reported climate strategy is currently not on track towards carbon-neutrality, although the company seems to recognise the necessity of radical innovation in the foreseeable future (Borealis, 2019, 34). At least the company reports that a *"roadmap"* for decarbonising Borealis Group's processes is to be developed (Ibid., 62).

Regarding its plastics- and hydrocarbons branches, Borealis Group reports energy related targets, which might reduce CO<sub>2</sub> emissions until 2030 or at least the company's *emission intensity* (see p. 30) (Borealis, 2019, 84). A substantial decrease in emission intensity until 2030 seems only possible, if the company's share of 50% renewable energy for its production processes will not be achieved by means of purchased renewable certificates (see p. 20), but from actual renewable energy capacities. However, as stated above, the company does not report a transparent pathway on how to achieve its goals. As far as the production of fertilisers is concerned, the company did not report any targets.

Borealis Group's report does not explicitly disclose any Scope 2 and Scope 3 emissions, which can be expected to be considerable sources of indirect emissions.

Considering that electricity accounts for 34% of the company's energy consumption, a large indirect source of CO<sub>2</sub> emissions<sup>33</sup> is not accounted for by the company's report.

The same holds true for the Scope 3 emissions that the company most likely has. First, the company uses an emission intensive oil and natural gas feedstock (Borealis, 2019, 9 and 197) and, secondly, it produces large amounts of emission intensive products (IEA, 2018). Borealis Group's disclosed sales in 2019 consist of 3,8 million tonnes plastics (Borealis, 2019, 153), 5 million tonnes of fertilisers and other products based on nitrogen, melamine and hydrocarbons (Ibid., 43). One can imagine that substantial CO<sub>2</sub> emissions may arise from incinerating these plastic products, i.e. end-of-life-emissions, and from using these fertilisers and hydrocarbons, i.e. use-phase-emissions. The company did not report in a coherent way on these indirect emission sources along its value chain. On the other hand, the company's report prominently points out the positive effect of some of its products with regards to their potentially CO<sub>2</sub> avoiding effects within the value chain (see above). This can be regarded as a form of cherrypicking (see p. 23).

On the positive side the company's report depicts some vague innovation pathways towards a low-carbon future (see inter alia Borealis, 2019, 44, 84, 58).

## 5.5 Lenzing Group

Lenzing Group is a globally active company with its headquarter in the Austrian city Lenzing. The company mainly produces wood-based fibres, which are used in the textile industry. Furthermore, the company develops sustainable production methods and applications and holds 1274 patents in 49 countries (Lenzing, 2019a). The majority shareholder of Lenzing Group is the B&C Group, with 50% and two shares, further 46% are held by Austrian and international investors (Lenzing, 2019b, 62). Some production facilities of the Lenzing Group, are part of the EU-ETS (Umweltbundesamt, 2018b). The company's turnover in 2019 amounted to 2.105 million Euro and it employed 7.036 people (Lenzing, 2019a, II). According to the Lenzing Group, its CO<sub>2</sub> emissions amounted to 1,64 million tonnes of CO<sub>2</sub>e, including Scope 1 and Scope 2 emissions (Lenzing, 2019a, 65).

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<sup>33</sup> These emissions are only considered indirect, if the electricity is purchased from the grid or from other companies rather than being produced by the company itself. If the latter were the case, emissions from electricity production would fall under Scope 1. Borealis Group does not disclose its sources of electricity.

Most information on the company's climate strategy was found in Lenzing Group's sustainability report, which extensively covered the issue of climate change and Lenzing Group's commitment to achieve carbon-neutrality by 2050.

### **Lenzing Group's emission inventory**

According to Lenzing Group's reported calculations, the share of GHG emissions per Scope is as follows: 32% within Scope 1, 17% within Scope 2 and 51% within Scope 3 (Lenzing, 2019a, 65). In absolute terms, the company emitted 1,64 million tonnes of CO<sub>2</sub> in 2019, which is less compared to 1,80 million tonnes emitted in 2014 (Lenzing, 2019a, 67). According to the report, also Lenzing Group's *emissions intensity*<sup>34</sup> (see p. 30) in 2019 has decreased by 8% compared to 2014 levels (Ibid.). The company's Scope 1 emissions are calculated applying EU-ETS *emission factors* (see p. 27) (Ibid.).

According to Lenzing Group's report, its Scope 1 emissions stem from combustion of fossil fuels to gain process heat or in-house electricity and from mobile sources such as vehicles (Lenzing, 2019a, 65). In 2019, Scope 1 emissions amounted to 1,1 million tonnes of CO<sub>2</sub>.

Lenzing Group calculates its Scope 2 emissions with the *market based* method (see p. 20). They amounted to 0,53 million tonnes of CO<sub>2</sub> in 2019 (Lenzing, 2019a, 67). Moreover, the Lenzing Group mentions that, applying the *location based* method (see p. 20), the company's indirect Scope 2 emissions would account for 0,63 million tonnes of CO<sub>2</sub> emissions (Lenzing, 2019a, 67).

Although Scope 3 emissions are the company's reported largest emission source, Lenzing Group only reports the percentage that falls under Scope 3, but does not calculate the specific amount of CO<sub>2</sub> emissions under Scope 3. According to Lenzing Group's report, Scope 3 emissions include "*purchased goods and services, upstream and downstream transport, and fuels and energy related activities*" (Lenzing, 2019a, 33). The company does not include the use-phase emissions<sup>35</sup>, e.g. from washing the

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<sup>34</sup> Lenzing Group's emission intensity indicator: CO<sub>2</sub> emissions / tonne of fibres sold (Lenzing, 2019, 16)

<sup>35</sup> Use-phase emissions arise when consumers make use of the product.

textiles or end-of life emissions<sup>36</sup>, e.g. from burning the fibre products, in its reported Scope 3 inventory.

Besides this, Lenzing Group claims that the wood-based products it sells, might indirectly avoid customers' carbon emissions (see p. 23) by replacing synthetic and cotton based textiles, which - according to the company - are more carbon intensive (Lenzing, 2019a, 69).

### **Lenzing Group's emission target**

According to Lenzing Group, the company aims at becoming carbon-neutral (see p. 31) by 2050. The company has set substantial mid-term intensity targets until 2030 and also includes its Scope 3 emissions into these targets (see p. 22).

More specifically, the company announces to reduce the emission intensity per tonne of its products by 50% by 2030 compared to 2017 (Lenzing, 2019a, 33). This reported target includes all three Scopes (Ibid.). Lenzing Group commits to reducing its CO<sub>2</sub> emissions to zero in 2050 (Ibid., 64). This reduction target includes the company's Scope 1, Scope 2 and Scope 3 emissions (Ibid.). Moreover, the company's reported targets were approved by the SBT-initiative (see p. 15) (Lenzing, 2019a, 64).

### **Lenzing Group's reduction pathway**

According to Lenzing Group's report, the targets should be reached by *mitigation* (see p. 34) activities and explicitly not through offsetting (see p. 36). More precisely, the company strives to reach its targets via technological and organisational innovation. Lenzing Group also considers itself as a sustainable technology leader (Lenzing, 2019a, 4), which develops cleaner production processes (Lenzing, 2019a, 16).

According to the report, Lenzing Group aims to reduce its Scope 1 emissions from process heat, by means of energy efficiency measures, by conducting a fuel switch (see p. 34) to less or zero carbon fuels, by a concentration of production locations and by replacing production heat derived from fossil fuels by renewable electrification and hydrogen (Lenzing, 2019a, 68).

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<sup>36</sup> End-of-life emissions are emissions that arise from waste management.

The company reports that, in order to reduce its Scope 2 emissions, a shift towards renewable energy will be required (Ibid.), but does not specify, whether the renewable electricity should come from its own production, a future “greener” grid or the purchase of certificates (Ibid.) (see p. 20). Currently, Lenzing Group also reports to purchase a certain amount of renewable certificates to lower its market-based emissions.

Lenzing Group declares to seek dialog and cooperation with its supply chain, mainly consisting of cellulose fibre- and chemicals producers, and transport services in order to reduce its reported Scope 3 (see p. 22) emissions. Lenzing Group announces to monitor their suppliers’ targets and progress (Lenzing, 2019a, 68-69). With regards to Lenzing Group’s primary raw material, wood, the company claims to only purchase wood from sustainably managed forests in Europe (Ibid., 53-59). Concerning its raw materials, the company reports having increased its efforts during recent years (Ibid.). CO<sub>2</sub> offsetting, such as reforestation offsets (see p. 34), is explicitly no pillar of Lenzing Group’s reduction pathway (Lenzing, 2019a, 66): *“Lenzing’s decarbonization strategy is based on reduction of its emissions rather than offsetting them”* (Ibid., 61).

### **Conclusion Lenzing Group**

Lenzing Group has set up an ambitious climate strategy towards carbon-neutrality. Lenzing Group aims to be seen as a producer of wood-based fibres that puts sustainability and climate protection in the heart of its business model (Lenzing, 2019a, 63) - in contrast to other participants in the garment sector (Ibid., 69). However, there are also some drawbacks with regards Lenzing AG’s reported climate strategy.

Interestingly, even Lenzing Group’s ambitious plan to become carbon-neutral by 2050 can be considered as too slow for complying with the Austrian government’s announcement to become carbon-neutral by 2040 (see p. 12) - at least with regards to Lenzing Group’s activities on Austrian territory. Critically, it must be mentioned that Lenzing Group only defined a target to reduce its *emission intensity* by 2030 and not an absolute emissions target, as will ultimately be required in order to achieve zero emissions.

An open question regarding Lenzing Group’s strategy to reduce its Scope 1 and Scope 2 emissions via the use of biomass is, whether bioenergy can actually be considered as carbon-neutral. Although this classification is international standard (Brohé, 2016, 32-33), it is strongly debated within the scientific community, under which circumstances this assumption holds true (e.g. Brander M., 2017; Berndes et al.

(2016). It is remarkable, that - according to Lenzing Group's report - all of the company's wood based raw materials stem from sustainably managed forests in Europe, which might improve its overall carbon-performance (Brohé, 2016, 32).

As it is always the case with regards to claims to avoid emissions, one has to be careful about Lenzing Group's reported claim to help customers avoiding emissions compared to alternative products on the market, as this claim only holds true under certain circumstances (see p. 23).

The company does not account for its downstream Scope 3 emissions comprehensively within its climate-related reporting. Nevertheless, Lenzing Group covers various solutions in its report to tackle Scope 3 emissions, such as re-using and recycling of textiles (Lenzing, 2019a, 36-49).

All in all, Lenzing Group's reported ambition to substantially reduce emissions, is underpinned by it working together with the SBT-initiative. Moreover, the company provides plenty of additional information about how the company's climate strategy is implemented on the corporate level (Ibid., 64) (see p. 28).

## **5.6 AGRANA Beteiligungs-AG\***

\*(Here short: AGRANA AG)

The AGRANA AG is a globally active industrial processor of agricultural products, whose headquarter is located in Vienna. The company generates fruit products, starch products, sugar and bioethanol (AGRANA, 2019/2020, 32). AGRANA AG currently deploys 57 factories in 25 countries, on all continents (Ibid., 31). Geographically, its main market is Europe (Ibid., 31). In 2019, the company processed 8,4 million tonnes of agricultural products (Ibid., 42). In 2019, the company's turnover, was 2,48 billion Euro and it employed 9342 people (Ibid., 10). In 2019, the company was mainly owned by the Z&S (78,3%) which itself is a subsidiary of the "AGRANA Zucker, Stärke und Frucht Holding AG" (Ibid., 99). Various fixed industrial installations of the company fall under the regime of the EU-ETS (Umweltbundesamt, 2018b). According to the report, the company's CO<sub>2</sub> emissions amounted to 0,93 million tonnes CO<sub>2e</sub> in 2019, taking into account Scope 1 and Scope 2 emissions (Ibid., 10).

The information about AGRANA AG's climate strategy was found in its integrated annual report ("*Integrierter Geschäftsbericht*") 2019/2020 (AGRANA, 2019/2020).

## AGRANA AG's emission inventory

It is not entirely transparent from the report whether non-stationary sources of Scope 1 emissions, i.e. transportation, were included in the reports inventory (Ibid., 47).

According to AGRANA AG's operational boundaries (see p. 19), the company's inventory includes Scope 1 and Scope 2 emissions (AGRANA, 2019/2020, 44). The company does not further specify the respective amount of CO<sub>2</sub> emissions stemming from Scope 1 and Scope 2 in its report.

Furthermore, the company, reports its *emissions intensity*<sup>37</sup> (Ibid., 47) (see p. 30): It amounted to 223 kg CO<sub>2</sub> per tonne output in 2019/2020 (AGRANA, 2019/2020, 47). Moreover, AGRANA AG differentiates in its report between the emissions of its three product categories in its portfolio: sugar, starch and fruit. It can be derived from the report that the share of emissions stemming from sugar production has decreased in recent years, whereas the CO<sub>2</sub> emissions related to starch production have increased: In 2019, 427.000 tonnes of CO<sub>2</sub> are reported to be emitted by the production of starch (Ibid., 47), 349.000 tonnes of CO<sub>2</sub> by the sugar sector (Ibid.) and 154.000 tonnes of CO<sub>2</sub> stem from food processing (Ibid.).

According to the report, the company's *absolute emissions* (see p. 30) accounted for 0,97 million tonnes of CO<sub>2</sub> in 2014/2015 and have sunk slightly to 0,93 million tonnes CO<sub>2</sub>e until 2019/2020 (AGRANA, 2019/2020, 47). On the other hand, the company's reported *emissions intensity* has increased slightly from 213 kg CO<sub>2</sub>/tonne output in 2014/2015 to 223 kg CO<sub>2</sub>/tonne output in 2019/2020 (Ibid.).

Due to the way the company reports, it was not easy to comprehend, how these overall emissions are calculated. Based on AGRANA AG's report, it can only be assumed that the lion share of its CO<sub>2</sub> emissions arise from direct Scope 1 emissions - mainly from using natural gas (59%), "steam"<sup>38</sup> (14%) and coal (8%) (Ibid. 46).

Regarding Scope 2 emissions, it can be derived from AGRANA AG's reported energy mix that about 11% of the energy it uses is electricity, which - most probably - is purchased from the grid, as it is treated as an energy source in the report (Ibid., 46).

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<sup>37</sup> AGRANA AG's emission intensity indicator: kg CO<sub>2</sub> / tonne output (AGRANA, 2019/2020, 47)

<sup>38</sup> AGRANA AG's report mentions "steam" as a source in its energy mix, next to biomass, natural gas and coal (AGRANA, 2019/2020, 46), even though steam is not a source of energy.

According to AGRANA AG, the emissions originating from this purchased electricity are calculated according to the *location based* method (see p. 20) and according to the different regional grid emission factors (AGRANA, 2019/2020, 198).

According to AGRANA AG, the company does not report its Scope 3 emissions, as the supply chain emissions originating from the agricultural products are too “*difficult to determine*” (AGRANA, 2019/2020, 47; translation by J.S.<sup>39</sup>), or have a “*comparably small CO<sub>2</sub>-footprint*” (Ibid.; translation by J.S.<sup>40</sup>), such as business related traveling. According to the report, about 9.400 contracted farmers are in the company’s supply chain (Ibid., 46).

On the other hand, AGRANA AG reports and accounts very well and detailed for producing *low carbon* products, which might avoid CO<sub>2</sub> emissions of customers (Ibid., 51) (see p. 23). According to the company’s own calculations, 57% of its product portfolio can be considered positive for climate protection with regards to the EU-Taxonomy for sustainable investments (see p. 11). First and foremost, the company communicates its considerable production of bioethanol, which is used as a substitute for fossil fuels, and its production of starch based alternatives for oil based plastics, adhesives and cosmetics (AGRANA, 2019/2020, 51). According to AGRANA AG’s calculation, 400.000 tonnes of CO<sub>2</sub> are therefore reduced on a yearly base by the company’s production of bioethanol, compared to the use of pure gasoline (Ibid., 14).

### **AGRANA AG’s emission target**

According to the AGRANA AG’s CEO, the emission target of the company is “*climate-neutrality until 2040*” (AGRANA, 2019/2020, 12; translation by J.S.<sup>41</sup>). However, the company has not formulated any substantial short-term or mid-term targets yet and did not set any targets with regards to its Scope 3 emissions.

According to AGRANA AG itself, the company has no sufficient strategy yet, to comply with the carbon-neutrality targets of the Republic of Austria (see p. 12) and the European Union (see p. 11) (AGRANA, 2019/2020, 47-48). Thus, AGRANA AG will issue a “*decarbonisation strategy*” in 2020/2021 (Ibid., 47; translation by J.S.<sup>42</sup>). The

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<sup>39</sup> Original: “(...) *da Daten zu Scope 3, z. B. die agrarische Lieferkette betreffend, schwierig zu ermitteln sind (...)*” (AGRANA, 2019/2020, 47).

<sup>40</sup> Original: “(...) *teilweise (z. B. Geschäfts- reisen) auch nur einen vergleichsweise kleinen CO<sub>2</sub>-Fuß- abdruck gegenüber Scope 1 und 2 auslösen (...)*” (AGRANA, 2019/2020, 47).

<sup>41</sup> Original: “(...) *Ziel der Klimaneutralität bis 2040 (...)*” (AGRANA, 2019/2020, 12).

<sup>42</sup> Original: “(...) *Dekarbonisierungsstrategie (...)*” (AGRANA, 2019/2020, 47).



goal of AGRANA AG is to develop a strategy with precise steps (Ibid., 102). Furthermore, the company already elaborates on probable targets and steps towards decarbonisation in its report (Ibid., 48).

### **AGRANA AG's reduction pathway**

As AGRANA AG itself acknowledges, there is no pathway towards carbon-neutrality available yet. Nevertheless, the company outlines some basic ideas towards future decarbonisation of its Scope 1 and Scope 2 emissions.

According to the annual report, the company does not regard increasing energy efficiency of its technologies as a sufficient way to decarbonise its activities substantially (Ibid., 48). Instead, AGRANA AG considers producing energy from biomass by itself and from purchasing renewable electricity. Whether the electricity will be purchased in the form of power purchase agreements with renewable energy producers, from a future 100% renewable grid or in form of renewable certificates, is not specified in the report (Ibid.). According to the annual report, biogasification of production residues is already applied in a Hungarian plant in Kaposvár (Ibid.). According to AGRANA AG, the company will make a *“swift complete withdrawal from the use of coal and coke”* (Ibid, 48; translation by J.S.<sup>43</sup>) and increase its use of biomass (Ibid.). AGRANA AG thus made a clear statement to stop the use of coal and coke, this primary energy carrier, however, represents only 8% of the company's energy mix (Ibid., 46). AGRANA AG's largest fossil energy source, which has to be replaced in order to achieve carbon neutrality is - by far - natural gas (59%) (Ibid.). According to AGRANA AG, the company's transportation of agricultural raw materials and processed products accounts for less than 10% of emissions of the production process (Ibid., 49). With regards to transportation, the company claims to already make its logistics as sustainable as possible, e.g. with a 17,8% share of rail transportation, but without giving a pathway to increase this share in the future (Ibid.).

Concerning AGRANA AG's Scope 3 emissions (see p. 22), presumably the largest source of CO<sub>2</sub> emissions is its supply chain and more precisely the production, harvesting and transportation of agricultural raw materials, reaching from fruits to sugar- and starch containing plants. AGRANA AG acknowledges in its report that the company *“indirectly (...) contributes to potentially negative impacts of the production of raw materials”* by means of its supply chain decisions (AGRANA, 2019/2020, 45;

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<sup>43</sup> Original: *“(…) zügigen Totalausstieg aus der Kohle- und Koksnutzung (...)”* (AGRANA, 2019/2020, 48).

translation by J.S.<sup>44</sup>). Subsequently, the company mentions various environmental impacts of its supply chain, some of which directly contribute to climate change, such as land use, soil depletion and use of chemicals in agriculture<sup>45</sup> (Ibid.). AGRANA AG, hence, discloses its potential contribution to climate change via its supply chain; the company generally seems to feel responsible for its supply chain to a certain extent, as it mentions various non-climate related activities towards making it more sustainable and ethical (Ibid., 45). However, AGRANA AG does not communicate a pathway to tackle the emissions stemming from it.

### **Conclusion AGRANA AG**

Based on my analysis criteria (see p. 38), AGRANA AG's reported climate strategy is currently not on track towards carbon-neutrality. The company did not report a comprehensive climate strategy to bring its CO<sub>2</sub> emissions down yet and its reported emissions intensity has even risen slightly compared to the base year 2014/2015.

On the other hand, the company itself problematises its lack of a comprehensive climate strategy in its report. Even more, AGRANA AG has explicitly committed itself to decarbonise its business activities until 2040 entirely. A coherent pathway for achieving this target will eventually be presented in 2020/2021 according to its report (AGRANA, 2019/2020, 48). Some potential future activities have already been touched by the analysed report (Ibid.).

From the report, it is not clear whether the reported 10% CO<sub>2</sub> emissions, stemming from its own transportation of raw materials and products, are included in the company's Scope 1 CO<sub>2</sub> inventory or not, or where the "steam" originates from, which the company uses according to its energy mix in the report.

Last but not least, the company's reporting is inconsistent with respect to its likely Scope 3 emissions. The company claims in its report to avoid roughly 400.000 tonnes of CO<sub>2</sub> per year by producing bioethanol products. This is a claim one has to be careful about, as it holds true only under certain circumstances<sup>46</sup> (see p. 23). One has to be

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<sup>44</sup> Original: "(...) trägt AGRANA im Rahmen ihrer Rohstoff- beschaffung indirekt zu potenziell negativen Aus- wirkungen des Rohstoffanbaus bei (...)" (AGRANA, 2019/2020, 45).

<sup>45</sup> Regarding the climate impact of different economic activities, such as agriculture or energy production, see (IPCC, 2014b).

<sup>46</sup> As shown above, it is quite difficult to determine if and to what extent companies truly help to avoid emissions by selling their products or services (see p. 23).

particularly cautious with regards to this claim in this specific case, since AGRANA AG on the one hand reported downstream emissions, which might be avoided by using some of the company's products, but did - on the other hand - not estimate CO<sub>2</sub> emissions arising upstream from its agricultural production in its report. This seems like a form of cherry-picking. For an industry, which processes agricultural products, it might be relevant for any future decarbonisation strategy to acknowledge and tackle its potential influence on its upstream supply chain by including its impact into its climate-related reporting.

## 5.7 SPAR AG

Spar AG is an internationally active retail corporation, whose headquarter is located in the Austrian state of Salzburg. Major revenues come from retailing food but also sports ware (the retailer Hervis) and the operation of shopping malls (SPAR, 2018, 7). In 2018 the company operated 3200 facilities in eight countries (Ibid.). In Austria, 40% of the company's turnover results from its own brands (Ibid., 8). SPAR AG is lead and entirely owned by two Austrian families (Ibid., 7). In 2018, the turnover of the company amounted to 15 billion Euro and the company employed 85.000 people (Ibid., 5). The company's reported CO<sub>2</sub> emissions account for 0,36 million tonnes of CO<sub>2</sub>e (SPAR, 2018, 78; see p. 71). However, it has to be noted that the sustainability report of 2018 only accounts for SPAR AG's Scope 1 emissions and Scope 2 emissions and not for its Scope 3 emissions.

The information regarding SPAR AG's climate strategy was found in SPAR AG's Sustainability Report ("Nachhaltigkeitsbericht") of 2018, which was only available in German language (SPAR, 2018). Shortly after I had finished the case study on SPAR AG, SPAR AG released its sustainability report for the year 2019, which could therefore not be considered for this master's thesis. On the the one hand, a lot of information, data and climate relevant projects were reported, on the other hand, this information was was scattered all over the report and was - at least in some occations - incomplete<sup>47</sup> and inconclusive.

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<sup>47</sup>For example, SPAR AG's report mentioned various innovative projects (SPAR, 2018, 30-48), which likely also entail an emission reduction component, however, the climate related implications of these projects were not reported.

## SPAR AG's emission inventory

According to SPAR AG's 2018 report, the company accounts for its absolute Scope 1 emissions, which amount to 0,21 million tonnes of CO<sub>2</sub> and its absolute Scope 2 emissions, which amount to 0,15 million tonnes of CO<sub>2</sub> (SPAR, 2018, 78). It also compares the *emission intensity*<sup>48</sup> per square meter over time and region (Ibid., 79).

The company only accounts for its emissions related to electricity, heating and cooling their shopping space as well as for emissions stemming from transport (Ibid., 77). Also SPAR AG's CO<sub>2</sub> intensity indicator only refers to shopping space (SPAR, 2018, 79). More precisely, SPAR AG reports that its electricity consumption under Scope 2, is its main CO<sub>2</sub> emission source, amounting to 38% (Ibid., 76). From the report it can only be assumed that hydrofluorocarbons (i.e. R404A), which have been used as refrigerants by the retailer and can be qualified as Scope 1 emissions, represent the second largest emission source of the company and account for 34% of CO<sub>2</sub>e emissions (Ibid., 76-77). Emissions from heating under Scope 1 amount to 18%, whereas emissions from transportation under Scope 1 to 10% of the company's reported emissions. (Ibid.).

From the report, it can be inferred that the retail company does not account for its indirect up- and downstream emissions, which fall under Scope 3 (see p. 22). Spar AG does not account for any of their conceivable Scope 3 emissions: Most importantly, while the company explicitly acknowledges in its report that the largest climate impact stems from its sold products (SPAR, 2018, 67) (including its own brands), it does nevertheless not report on the emissions related to their products, stating that value-chain emission regarding their products, which would fall under Scope 3, "*cannot be quantified exactly*" (SPAR, 2018, 76; translation by J.S.<sup>49</sup>), as the company sells "*hundreds of thousands of products*" (Ibid.; translation by J.S.<sup>50</sup>). SPAR AG appears to consider emissions stemming from most of its own brands to fall under Scope 3. Moreover, other Scope 3 emissions that are very likely, such as work-related commuting by SPAR AG's 85.000 employees, are not included into the company's reported emission inventory.

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<sup>48</sup> SPAR AG's emission intensity indicator: kg CO<sub>2</sub>e/per m<sup>2</sup> shopping space (SPAR, 2018, 79)

<sup>49</sup> Original: "*Nicht genauer bezifferbar ist die Treibhaus- gas-Emission von SPAR in der vor- und nach- gelagerten Lieferkette*" (SPAR, 2018, 76).

<sup>50</sup> Original: "*Bei Hunderttausenden Produkten und entsprechend vielen Rohstoff- quellen ist eine genauere Bezifferung der Scope 3-Emissionen nahezu unmöglich*" (SPAR, 2018, 76).

## SPAR AG's emission target

SPAR AG did not formulate a long term carbon-neutrality target in its report. However, it reported a long term goal to reduce its *emission intensity* in Austria substantially until 2050 (SPAR, 2018, 68). Moreover, SPAR AG does not report any substantial mid-term targets and it did not set a target regarding central parts of their emissions, i.e. regarding emissions related to their own brands and for their Scope 3 emissions, since - as shown above - they do not report these emissions.

According to its report, SPAR AG aims to reduce its reported Scope 1 and Scope 2 *emission intensity* by 90% in 2050 compared to the base year 2009 (SPAR, 2018, 68)<sup>51</sup>. In order to reach this target by 2050, SPAR AG aims to reduce its greenhouse gas emissions yearly by 2% to 5% (SPAR, 2018, 76). In 2009, the company's reported *carbon intensity* amounted to 130 kg CO<sub>2</sub> emissions per m<sup>2</sup> (Ibid., 77), whereas in 2018, it amounted to 94 kg CO<sub>2</sub> emissions per m<sup>2</sup> (Ibid., 79). Within the same time, the company's reported *energy intensity*<sup>52</sup>, should be reduced to 50% (SPAR, 2018, 68). In 2050, energy should - almost exclusively - stem from renewable sources (Ibid.). It has to be noted, however, that it is not made sufficiently transparent in the report, if these targets only refer to Austrian activities or also to the other countries, in which SPAR AG is active. It seems, nevertheless, far more plausible that the former is the case as the report states "...with regards to Austrian energy policy" (SPAR, 2018, 68; translation by J.S.<sup>53</sup>).

## SPAR AG's reduction pathway

The company's reduction pathway aims at *mitigating* the retailer's actual emissions mostly by means of technological change (see p. 34). In order to reduce the company's reported Scope 1 emissions the company plans to only install such refrigerators in newly erected buildings that use CO<sub>2</sub> as a natural cooling agent rather than the highly climate active HFCs (SPAR, 2018, 68). However, there does not seem to be a pathway in place to immediately replace all HFC emitting refrigerators that are currently in use with new cooling systems (Ibid.). Secondly, SPAR AG reports to plan to eradicate the use of fossil fuels for transportation and logistics in the long run, but they acknowledge

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<sup>51</sup> As SPAR AG's reported emission indicator only refers to shopping space it seems highly likely that this target also only refers to the company's shopping facilities.

<sup>52</sup> SPAR AG's energy intensity: energy use / m<sup>2</sup> shopping space (SPAR, 2018, 72)

<sup>53</sup> Original: "*in der österreichischen Energiepolitik*" (SPAR, 2018, 68).

that currently practicable technologies for heavy duty vehicles do not yet exist (Ibid., 75). According to its report, SPAR AG seems to be engaged to promote and support such innovation - they are currently even testing one electrical truck (Ibid.). In order to reduce emissions from heating, new efficient heating systems are increasingly deployed. Based on the report, SPAR AG does not follow a coherent pathway to replace classic heating systems (Ibid., 69).

In order to reduce SPAR AG's Scope 2 emissions, i. e. electricity, and to achieve their target to cut energy use per square meter by 50%, SPAR AG reports energy efficiency to be key: According to the report, this goal should be achieved by applying new heating technology for buildings, cooling and lighting, i. e. the application of LEDs (SPAR, 2018, 68-70). In order to reduce SPAR AG's grid electricity consumption, SPAR also reports to invest into photovoltaic infrastructure on its facilities' roofs. According to the company a total of 92 solar constructions have been installed on roofs until 2018 (76 of them in Austria) (Ibid., 73). However, SPAR AG does not report to which extent these measures contribute to reach their emission target.

SPAR AG's report does not provide a comprehensive pathway to reduce its likely Scope 3 CO<sub>2</sub> emissions (it did not report a corresponding inventory or target either, as analysed above). Nevertheless, single projects concerning the reduction of Scope 3 emissions are mentioned in their report: SPAR AG installed 123 electrical charging stations for electrical cars and e-bikes for costumers or employees (SPAR, 2018, 76), they reduced packaging of products (Ibid., 80) and reduced food waste (Ibid., 81-84). Moreover, SPAR AG reports on certain product-related topics, such as refraining from using palm oil in its own brands' products and offering a greater range of vegetarian and vegan products (Ibid., 34-36).

### **Conclusion SPAR AG**

According to the 2018 report, SPAR AG set ambitious CO<sub>2</sub> emissions reduction targets which for Austria, but their reported climate strategy is, nevertheless, currently not on track to achieve carbon-neutrality (see p. 31) by 2050 or even 2040, with regards to the analysis criteria (see p. 38). The goal of reducing the company's *emission intensity* by 90% in 2050, is neither an *absolute target* (see p. 30), nor does it aim for carbon-neutrality. Notwithstanding, it seems plausible that such an emission intensity target, overall, will eventually lead to substantial absolute emission reductions in the long-term, as a minus 90% intensity target is quite ambitious. Unfortunately, it is not entirely clear whether this target only refers to SPAR AG's activities in Austria or beyond.

Moreover, the company's likely Scope 3 emissions (see p. 22) are not accounted for in the report and SPAR AG does not have a systematic approach to reduce the company's indirect climate impact within Scope 3 yet, which - given their business model - can be expected to be quite substantial. In this context, it has to be mentioned that a retailer's supply chain, for example, can be expected to be - by far - its largest emission source: e.g. 90% of the CO<sub>2</sub> emissions of the U.S. retail giant "Walmart" stem from its supply chain, which they do not only to account for, but they also aim at reducing them (Walmart, 2018, 127). SPAR AG, is an employee- and thus very likely commuting intensive company. Even though, considerable amounts of CO<sub>2</sub> emissions can be expected to stem from this Scope 3 source, emissions from commuting are not tackled by SPAR AG's reported climate strategy. Overall, according to the report, there are some projects in place tackling part of the company's assumed Scope 3 emissions, but only in a fragmented and non-holistic way.

Finally, there is no information given by the company's report on the structural implementation of its climate strategy on a corporate level (see p. 28).

## **5.8 REWE INTERNATIONAL AG\***

\*(Here short: REWE AG)

The internationally active REWE AG is the largest foods retailer of Austria (REWE, 2018a, 6). REWE AG's headquarter is located in Wiener Neudorf, Austria. REWE AG is a subsidiary of the German REWE Group. REWE AG itself is the holding of various large Austrian retailers such as BILLA, MERKUR, BIPA, PENNY and ADEG (Ibid.). The company is commercially active in 10 countries and sells various own brands, traveling offers and even magazines (Ibid. 6-9). In 2018, the company's turnover amounted to 16,87 billion Euro and it employed 91.875 people (Ibid., 6). According to the report, REWE AG's CO<sub>2</sub> emissions of 2018 amounted to 0,32 tonnes CO<sub>2</sub>e. The company is part of the Austrian government's "Klima:aktiv Pakt" that aims at reducing emissions of several large Austrian companies (see p. 16) (Ibid., 12).

The information on the company's climate strategy was found in the sustainability report ("Nachhaltigkeitsbericht") of "*REWE Group in Austria 2018*" (REWE, 2018a).

## REWE AG's emission inventory

REWE AG's report accounts for the company's Scope 1, Scope 2 and some of its Scope 3 emissions (REWE, 2018a, 89). According to the reporting, the company emitted 0,32 million tonnes of CO<sub>2</sub> in 2018 (Ibid., 89). The report provides the shares of the respective emissions sources (Ibid.):

The company's report lists its main Scope 1 CO<sub>2</sub> emission sources, i.e. refrigerants (18%), logistics (16%), natural gas heating (12%), oil heating (2%) and cars owned by the company (3%) (Ibid.). These reported emissions amounted to about 0,16 million tonnes CO<sub>2</sub>.

According to REWE AG's accounting, the largest single emission source, i.e. electricity use, accounts for 34% of the company's CO<sub>2</sub> emissions and is to be qualified as a Scope 2 emission - together with indirect emissions from district heating (4%) (Ibid.). These reported emissions amounted to about 0,12 million tonnes CO<sub>2</sub>.

In its report, the company also counts for some of its Scope 3 emission sources, such as paper usage (9%) and business related flights (1%) (Ibid.). These emissions amounted to about 0,03 million tonnes CO<sub>2</sub>. Apart from these two Scope 3 emission sources, REWE AG does not include any other very likely up- and downstream emissions in its reported inventory, such as e.g. supply chain emissions from its products, or work related commuting of its 91.875 employees.

## REWE AG's emission target

REWE AG has not reported a long-term carbon-neutrality (see p. 31) target yet. A substantial short-term *emission intensity* (see p. 30) target was reported by the company for 2022. Unfortunately, according to the companies' report, REWE AG's emission reduction target seems only to be only formulated for activities on the Austrian market (REWE, 2018a, 79 and 7).

More specifically, in 2013, Austria's REWE AG and the German REWE Group set the target to half its CO<sub>2</sub> *emission intensity*<sup>54</sup> by 2022, compared to the base year 2006 (REWE, 2018a, 88). The company has not reported any further target for the future yet.

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<sup>54</sup> REWE AG's emission intensity indicator: kg CO<sub>2</sub>e / m<sup>2</sup> shopping space (REWE, 2018a, 89)



## REWE AG's reduction pathway

REWE AG's reported reduction pathway aims to *mitigate* the retailer's actual emissions by means of organisational and mostly technological change. Moreover, the company reports to engage in a few offsetting activities.

According to REWE AG's report, the company has been taking various steps in order to achieve the target of cutting its emission intensity by 50% until 2022. According to REWE AG, the company has reduced its emission intensity by -36,5% until 2018, compared to 2006 (REWE, 2018a, 90). In spite of these substantial reductions of carbon intensity, the company's reported *absolute emissions* (see p. 30) have decreased only moderately by -6% since 2006 (REWE, 2018a, 88), namely from 0,344 million tonnes of CO<sub>2</sub> to 0,322 million tonnes of CO<sub>2</sub> (Ibid., 90). The divergence between REWE AG's moderate reduction in terms of absolute emissions and its simultaneously substantial reduction with regard to emission intensity may point to a substantial increase in shopping space.

In order to reduce its reported Scope 1 emissions, REWE AG replaces HFC refrigerants with the cooling agents CO<sub>2</sub> and Propan, which are gases with far less Global Warming Potential (GWP) (see p. 27) (REWE, 2018a, 89).<sup>55</sup> So as to reduce its CO<sub>2</sub> emissions stemming from transport and logistics, the company reports to replace its fleet of heavy-duty vehicles over time with a higher share of vehicles complying to the Euro VI emission standard (REWE, 2018a, 86). Furthermore, REWE AG currently tests heavy-duty vehicles with alternative drives (Ibid.).

In order to reduce its reported Scope 2 emissions, the company aims at improving energy efficiency. REWE AG's measures for improving energy efficiency particularly concern its electricity use, which constitutes, with 59%, the largest share of the company's reported energy consumption (Ibid., 82-86). According to REWE AG, energy efficiency should be achieved through LED lightning, energy efficient cooling systems and improved logistics (Ibid.). The company's total reported energy consumption has remained nearly constant from 2016 to 2018 (Ibid., 84), while electricity consumption per square meter selling space has been reduced by 10,8% since 2012 (Ibid., p.82). Furthermore, REWE reported to have installed photovoltaic panels on 48 locations in Austria (Ibid.). The company does, however, not report a comprehensive pathway to

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<sup>55</sup> This reported pathway is emphasised by the the company's communication to have already replaced natural gas heating with heat recovery technologies in 405 branches, with 355 branches currently being heated solely by this technology (REWE, 2018b).

further improve energy efficiency or for installing additional photovoltaic panels in the future. Apart from these measures to mitigate Scope 2 emissions, REWE AG reports to purchase only “*green electricity*” (Ibid., 89; translation by J.S.<sup>56</sup>). This claim refers to green certificates, which are purchased by a German subsidiary of REWE Group (Ibid., 89). These certificates, however, only lower the company’s emissions according to the GHG Protocols (see p. 14) *market based* accounting method (see p. 20), and are no credible reduction pathway according to the analysis criteria (see. 38).

The company does not report a comprehensive pathway to reduce REWE AG’s likely Scope 3 emissions (see p. 22). The report, however, mentions single projects, which I would qualify as tackling some of REWE AG’s Scope 3 emissions, such as the installation of electrical charging stations for electric vehicles for customers at 56 branches (REWE, 2018a, 89), supporting sustainable work-related mobility behaviour (Ibid., 86) or using alternative oils instead of palm oil, when it comes to the company’s own organic brand (Ibid., 45).

### **Conclusion REWE AG**

REWE AG has set relatively ambitious short-term CO<sub>2</sub> emission intensity targets, but has not reported a climate strategy to achieve carbon-neutrality by 2050 or even by 2040 yet. In spite of the company’s reported substantial progress with regards to its reported *emission intensity* (-37% since 2006), its absolute emissions have decreased only moderately (-6% since 2006). Although, one can consider it as a remarkable achievement, to (probably) increase selling space substantially while still reducing absolute emissions, substantial absolute emission reductions will indeed be necessary to be on track towards carbon-neutrality (see p. 31), based on the analysis criteria (see. p. 38). Soon, the company will need to formulate new targets beyond 2022.

With regards to the reported climate strategy’s operational boundaries, the climate strategy did not include some CO<sub>2</sub> emission sources which can expected to be substantial.

Moreover, REWE AG only accounted for two Scope 3-related emission sources, i.e. paper use and work related traveling. The company has not reported a comprehensive strategy to reduce its Scope 3 emissions yet. With this in mind, it is important to mention that a retailer’s supply chain of products can be expected to be - by far - its

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<sup>56</sup> Original: “(...) *Grünstrom* (...)” (REWE, 2018a, 89).

largest emission source (see also SPAR AG above)<sup>57</sup>. As a retailer, REWE AG is further an employee- and thus very likely commuting intensive company: Although considerable amounts of CO<sub>2</sub> emissions can be expected to stem from this Scope 3 source, only little is mentioned in the reported climate strategy in this regard.

## 5.9 Österreichische Post AG\*

\*(Here: Post AG)

Post AG is Austria's largest postal- and logistics service company headquartered in Vienna. The company delivers items such as letters, packages and print media (Post, 2019a, I). The Austrian Post Group<sup>58</sup> is commercially active in 8 European countries (Ibid., 3-5). The holder of a majority of shares is the ÖBAG, a holding owned by the Republic of Austria. In 2019, Post AG's turnover was 2,17 billion Euro and it employed 20.524 people (Ibid., III). According to the company's report of 2019, Post AG's CO<sub>2</sub> emissions amounted to 97.275 tonnes of CO<sub>2</sub>e, which included Scope 1 and Scope 2 and some Scope 3 emissions (Post, 2019b, 108).

The information about Post AG's climate strategy was found in its annual report of 2019 (Post, 2019a), and its sustainability report of 2019 (Post, 2019b), which not only provide information about the "Österreichische Post AG", but also about the "Austrian Post Group". As most of the climate related information provided by the reports concerned the climate strategy of the "Österreichische Post AG", I therefore always considered "Österreichische Post AG" for this thesis. Sometimes it was difficult based on the reports to determine, whether the reporting concerned the "Österreichische Post AG" or the "Austrian Post Group".

### Post AG's emission inventory

In 2019, Post AG accounts and reports for its Scope 1, Scope 2 and parts of its Scope 3 emissions (Post, 2019a, 62). According to the company's accounting-methods a total of 76.946 tonnes of CO<sub>2</sub> were emitted in 2019 (Ibid.). According to Post AG's report,

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<sup>57</sup> e.g. 90% of the CO<sub>2</sub> emissions of the American retail giant "Walmart" stem from its supply chain, which they do not only to account for, but they also aim at reducing them (Walmart, 2018, 127)

<sup>58</sup> The "Austrian Post Group" includes all entities and activities, which are located outside of Austria (Post, 2019a, 4-5).

the company's total Scope 1 emissions amounted to 50.764 tonnes of CO<sub>2</sub>, which stemmed from heating its buildings, using natural gas and heating oil (12,701 tonnes of CO<sub>2</sub>) and from its own delivering fleet (38.063 tonnes of CO<sub>2</sub>) (Ibid.). In order to calculate Post AG's emissions, mostly *emission factors* (see p. 27) provided by the database of the Environment Agency Austria are applied (Post, 2019a, 62).

Post AG accounts for its Scope 2 emissions (electricity and district heating) applying the *marked-based* method (Ibid.) (see p. 20). According to this way of accounting, Post AG's reported Scope 2 emissions amounted only to 358 tonnes of CO<sub>2</sub> in 2019 and 5.105 of tonnes of CO<sub>2</sub> emissions due to district heating (Post, 2019a, 62). The company discloses that, by using the *location based* method (see p. 20), its Scope 2 emissions would amount to 20.625 tonnes CO<sub>2</sub> in 2019.

Finally, the company reports parts of its Scope 3 (see p. 22) emissions, which stem from its subcontractors' fleets, i.e. 26.182 tonnes of CO<sub>2</sub> (Ibid.). Likely Scope 3 emissions are only partially mentioned or accounted for by the company. Post AG does not report on any CO<sub>2</sub> emissions from international upstream activities, such as shipping, aviation or long distance road traffic (Post, 2019a, 132), as well as work-related commuting of its 20.524 employees. Environmental impacts from packaging material, such as cardboard and plastics, are mentioned in the report, but not in terms of their climate-related impact. In this respect the company reports to work on greener alternatives (Post, 2019b, 62). Post AG's total emissions have increased by 9,3% since 2013 (Post, 2019a, 62). According to the company's report its *emission intensity*<sup>59</sup> (see p. 30) has decreased slightly from 419 in 2018 to 414 in 2019 (Post, 2019a, 62).

### **Post AG's emission target**

Post AG did not explicitly report the target to actually become carbon-neutral (see p. 31) in the long run. Furthermore, the company set ambitious short-term targets.

Interestingly, Post AG claims in its report to already deliver its items in a carbon-neutral way, by offsetting emissions stemming from Post AG's delivery services for the "last mile" (Post, 2019a, 58). Notwithstanding this, the Post AG has set the target to reduce its *absolute emissions* (see p. 30) by 14% until 2025, relative to the base year 2013 (Post, 2019a, 56). In 2016, this reduction target was approved by the *SBT-initiative* (see p. 15) (Post, 2019a, 58). Nevertheless, the company's total emissions have risen,

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<sup>59</sup> Post AG's emission intensity indicator: t CO<sub>2</sub>e / million km

as the amount of parcel deliveries has skyrocketed in recent years by plus 82,5% since 2013 (Ibid., 58). Therefore, the company reports the need to reformulate its emission reduction targets for staying in line with the *SBT-initiative* and to still comply with the goals of the Paris Agreement (Ibid.).

### **Post AG's reduction pathway**

Post AG's pathway and current practice relies on *mitigation* (see p. 34) and *offsetting* (see p. 36) its CO<sub>2</sub> emissions. First, the Post AG reports a pathway to actually decarbonise substantial parts of the company's business activities. Secondly, the company tries to offset a large part of its current CO<sub>2</sub> emissions by purchasing renewable electricity certificates and international carbon credits, which - according to the analysis criteria (see p. 38) represents no credible reduction pathway.

First, the company's reported pathway to actually decarbonise its Scope 1 emissions is focused on energy efficiency in their buildings (Post, 2019b, 60-61), and in electrifying its own fleet, which seems to be the focus of Post AG's mitigation efforts (Ibid., 56). Until 2030, the Post AG set the goal to electrify 100% of the company's delivery vehicles, which are used for the "*last mile*" of delivery to its customers (Ibid., 56). In 2019, 1.750 of the company's 9.510 vehicles were already electric, i.e 649 e-bicycles, 428 e-mopeds and 673 electric-cars up to 3,5 tonnes (Ibid., 63). The company does not report how many vehicles of its fleet are not used for "*last mile*" delivery and thus not included in the electrification efforts. For Post AG's 163 trucks (Ibid., 63) the company proposes to renew parts of the truck fleet to meet the current Euro VI emission standard and to train drivers saving fuel (Post, 2019b, 59). According to the company's reports, its absolute emissions within Scope 1 have grown corresponding to the increase in parcel deliveries (Post, 2019a, 61).

Post AG does not report a comprehensive pathway to decarbonise the company's Scope 2 emissions from electricity and district heating, but it aims at switching to LED lightning, more efficient heating systems (Post, 2019a, 60) and at building new buildings in a "*sustainable and efficient manner*" (Ibid.). Furthermore, Post AG produced 1,3 kWh with its own photovoltaic panels in 2019 (Ibid., 61). All in all, reported absolute CO<sub>2</sub> emissions from Post AG's buildings from electricity use and heating have grown by 3% in 2019 (Post, 2019a, 62) - according to the company, this rise is also due to the increase in packaging delivery (Ibid.).

Post AG mentions to reduce its reported Scope 3 emissions by “*collaborating*” (Post, 2019b, 58) with its subcontractors in order to reduce their fleet emissions (Ibid.). No reduction pathway is reported with regards to Post AG’s likely upstream emissions from international transport and logistics, or working-related commuting.

Apart from its reported mitigation efforts, the company reports to offset existing emissions (Post, 2019b, 57). According to its report, Post AG purchased renewable certificates for the grid electricity it used. Moreover, the company offsets CO<sub>2</sub> emissions from its diesel-burning car fleet, by buying voluntary offsets in Austria and abroad. These voluntary offsets contain international forestry measures, renewable energy projects, e.g. in India, or cleaner stoves for cooking in Kenya and Honduras (Ibid., 58). Based on these offsetting practices, Post AG issued 500 certificates for certain customers in 2019, which indicate its delivery service to be carbon-neutral (Ibid., 57).

### **Conclusion Post AG**

In 2019, Post AG’s climate strategy was not on track towards carbon-neutrality, based on my analysis criteria. Due to the sharp rise in parcel delivery caused by online shopping, Post AG’s absolute emissions have even substantially increased in recent years.

With regards to CO<sub>2</sub> mitigation, the company reported the ambitious goal to electrify its urban fleet for the “last mile” of delivery by 100% in 2030. According to the company’s report, Post AG’s electric fleet was already the largest in Austria in 2019 (Post, 2019b, 59), which might contribute to public awareness for electric vehicles. On the other hand, the company does not provide information in its reports with regards to decarbonising its longer distance logistics beyond the “last mile”. No comprehensive pathway towards carbon-neutrality is reported with regards to Post AG’s building-infrastructure.

Although Post AG’s logistics chain can be expected to be internationally interlinked, upstream or downstream Scope 3 emissions, such as aviation, shipping or road transport towards Austria are not mentioned by the company’s report. Moreover, Post AG does not report a credible pathway to reduce reported emissions from its subcontractors, or very likely work-related commuting by its employees.

Interestingly, the company claims to be already delivering letters and packages in a carbon-neutral way, by offsetting its fossil fuel emissions. As discussed above, neither

renewable electricity certificates (see p. 20), nor international carbon credits (see p. 36) do necessarily lower overall CO<sub>2</sub> emissions and are thus no credible pathway with regards to my analysis criteria (see p. 38). In spite of its reported claim to deliver in a carbon-neutral way, Post AG acknowledges in its report the necessity to reformulate parts of its climate strategy to stay in line with the standards of the SBT-initiative, which emphasises the company's ambition to achieve zero emissions in the long run. The company, is still determined to comply with the 1.5°C target of the Paris Agreement - even in the light of the soaring parcel delivering segment (Post, 2019b, 59).

The reports does not include information on the structural implementation (see p. 28) of the company's reported climate strategy on the corporate level.

## **5.10 ÖBB Holding-AG\***

\*(Here short: ÖBB Holding)

ÖBB Holding is the holding of three interconnected companies: the "ÖBB-Personenverkehr AG", the "Rail Cargo Austria AG" and the "ÖBB-Infrastruktur AG" (Geschäftsbericht 2019, 52). The ÖBB Holding is Austria's main railway provider for public transport and for transportation of goods and is owned entirely by the Republic of Austria (Ibid., 3-5). Moreover, the company is responsible for Austria's rail- and railway station infrastructure. In 2019, the ÖBB Holding's turnover amounted to 6,9 billion Euro and it employed about 43.000 people (Ibid., 64). According to the ÖBB Holding, its CO<sub>2</sub> emissions accounted for 0,37 million tonnes of CO<sub>2</sub>e in 2017 (Scope 1 and Scope 2 - not including its buildings) (ÖBB, 2019b, 14).

The climate-related information was found in the company's sustainability report of 2017-2018 ("*Nachhaltigkeitsbericht 2017/18*"), the annual report of 2019 ("*Geschäftsbericht 2019*") and in the "*ÖBB Climate Protection Strategy 2030*"<sup>60</sup>. Overall, ÖBB Holding provided a lot of climate-related information.

### **ÖBB Holding's emission inventory**

According to ÖBB Holding's report, the company's reported inventory accounts for its absolute Scope 1 and Scope 2 emissions, which amounted to about 0,37 million

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<sup>60</sup> The ÖBB Holding provided its sustainability report of 2017/18 and its annual report of 2019 only in German language, whereas it issued the "ÖBB Climate Protection Strategy 2030" in German and English.

tonnes CO<sub>2</sub> in 2017 (ÖBB, 2019b, 14). There is no clear reporting on how this absolute number of emissions is composited<sup>61</sup>.

On the basis of the information provided in the reports, one can only guess that ÖBB's reported Scope 1 emissions occur from non-electrified drives, such as diesel trains, diesel busses and the company's car fleet (Ibid., 20).

ÖBB Holding calculates large parts of its reported Scope 2 emissions applying the *market based* accounting method (see p. 20). Problematically, the company, does not provide a calculation based on the location based method in its report. Based on the reports, it can be assumed that the company's Scope 2 emissions probably stem from purchased grid electricity, which is not produced by ÖBB Holding's own hydropower plants (ÖBB, 2019b, 22).

ÖBB Holding itself does not report to account any Scope 3 emissions and does not specify, which emission sources fall under Scope 3. Most likely, substantial Scope 3 emissions of the company inter alia stem from the construction phase, from the production of materials used in buildings and railway infrastructure (Geschäftsbericht 2019, 28-30). Furthermore, emissions may arise from the production of materials for and the construction of ÖBB Holdings trains and busses. Moreover, considerable CO<sub>2</sub> emissions might arise from daily work-related mobility and commuting of its 43.000 employees.

ÖBB Holding highlights throughout its reports that it sells low-carbon services, i.e. public transport by rail and bus, which avoids emissions (see p. 23) from customers compared to other means of transportation, such as cars or planes for passengers or transport of goods. According to ÖBB Holding, its services saved 3,5 million tonnes of CO<sub>2</sub> in 2019 (Ibid., 2).

### **ÖBB Holding's emission target**

ÖBB Holding reports the target to become completely carbon-neutral (see p. 31) by 2050. The company has reported substantial mid term targets and apparently also aims to decarbonise its Scope 3 emissions between 2040 and 2050, without defining these emissions in its report.

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<sup>61</sup> Moreover, this emission accounting only concerns ÖBB Holding's transportation services without buildings (ÖBB, 2019b, 14). According to annual report of the ÖBB-INFRASTRUKTUR AG, 96,522 tonnes of CO<sub>2</sub> emissions stem from infrastructure in 2019 (ÖBB, 2019c, 43).



ÖBB Holding aims to become carbon-neutral with regards to reported Scope 1 and Scope 2 emissions only from its transportation services by 2030 (ÖBB, 2019a, 11). The company does, moreover not include Scope 1 emissions that stem from its buildings in this target (Ibid.). Secondly, ÖBB Holding wants to achieve complete carbon-neutrality regarding all of its Scope 1, Scope 2 and Scope 3 emissions between 2040 and 2050 (Ibid.). It is not explained in the report, why the different emission sources are planned to be tackled in two steps.

Moreover, the railway company aims to substantially avoid CO<sub>2</sub> emissions of the overall Austrian transport sector by increasing its share within the Austrian modal split<sup>62</sup> (Ibid., 56). In concrete terms, the company aims to further avoid about 1,9 million tonnes of CO<sub>2</sub> annually (Ibid., 72).

### **ÖBB Holding's reduction pathway**

According to ÖBB Holding's reports, the company's reduction pathway consists of *mitigation* (see p. 34) via deployment of clean technologies on the one hand and *offsetting* (see p. 36) measures on the other hand.

ÖBB Holding reports six steps, to achieve its targets: increasing its share of electrified railway routes from 75% in 2018 to 89% by 2035 (ÖBB, 2019b, 13); deploying trains with alternative engines on routes which are not electrified, such as battery- or fuel cell trains (Ibid.); deploying alternative engines for road transport, such as battery- or fuel cell buses (Ibid.); using renewable electricity from the company's own renewable power capacity and purchasing renewable certificates (see p. 20) (ÖBB, 2019b, 14) and taking measures to use energy more efficiently, such as installing LED lighting and increasing efficiency of its buildings (Ibid.). Furthermore, ÖBB Holding hopes for policies, which support a transition from car and plane towards public transport to reduce the Austrian transport sector's overall emissions. It is an important part of the company's reported climate strategy to increase the company's share within the Austrian transport sector (Ibid.).

ÖBB Holding aims to replace all its diesel trains (Ibid., 20) and busses (Ibid., 34) until 2030, so as to reduce the reported Scope 1 emissions of the company's mobility

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<sup>62</sup> The term modal split describes the relative share of different forms of mobility within the population, such as the share of people walking, bicycling, car-driving, using public transport over the day/month/year.

segment. The company aims to achieve this by electrification of routes and by applying new technologies, such as battery- and fuel cell technology (ÖBB, 2019b, 26-39). The company does not report a comprehensive pathway to achieve carbon-neutrality with regards to its buildings, such as its railway stations and offices.

With regards to ÖBB Holding's Scope 2 emissions the company claims in its report to have already been running on "100% renewable electricity"<sup>63</sup> since 2018 (Ibid., 40). According to the reports, the company produces about 33% of its needs for traction current<sup>64</sup> in Austria by deploying eight hydropower plants itself, around 25% of ÖBB Holding's electricity needs are covered by other hydropower plants - the rest, about 42%, is purchased from the grid (Ibid., 43). According to ÖBB Holding's report, these specific numbers only concern traction current (Ibid.), hence, it seems likely that ÖBB Holding purchases the electricity needs for everything else, such as office buildings and railway stations, from the electricity grid. ÖBB Holding purchases *renewable certificates* for the entire amount of grid electricity that it uses (Ibid.). The company aims for a share of 40% renewable energy stemming from the company's own capacity in the future (Ibid., 40). To this end the ÖBB currently tests a solar plant concept in Wilfleinsdorf in Lower Austria and plans to scale it up (Ibid.), Moreover, ÖBB Holding tests wind power (Ibid., 43), plans to install further photovoltaic capacity and a pump storage hydropower plant for storing renewable electricity (Ibid.).

ÖBB Holding's reported target to achieve carbon-neutrality between 2030-2050 also includes Scope 3 emissions (Ibid., 11). However, ÖBB Holding does not define in its report what the company considers to be its Scope 3 emissions are and it does not report a comprehensive pathway to achieve this target.

### **Conclusion ÖBB Holding**

ÖBB Holding set up ambitious emission targets. Nevertheless, the company has provided comprehensive pathway towards carbon-neutrality for their transport services only<sup>65</sup>. However, the company plans to decarbonise all its other emission sources until

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<sup>63</sup> ÖBB Holding's report claims that the company it uses 100% renewable electricity refers to the company's 16,7 Hz traction current for its rail segment and the regular 50 Hz current for its buildings, offices, cranes etc. (ÖBB, 2019b, 40).

<sup>64</sup> The term traction current describes the electricity used for moving electrified trains, which has a frequency of only 16,7 Hz

<sup>65</sup> However, it has to be born in mind that this strategy depends on the decarbonisation of the Austrian grid by 2030 (see p. 20), as electricity certificates are no credible pathway (see. p 38)

2050 and will, under certain conditions<sup>66</sup>, help its customer's to avoid CO<sub>2</sub> emissions (see p. 23).

Unfortunately, ÖBB Holding does not account for its Scope 1, Scope 2 and Scope 3 emission inventory in a somehow non-transparent manner - in the annual report, in the sustainability report and in its "*Climate Protection Strategy for 2030*". This renders the analysis of the reports rather difficult. Due to the ÖBB Holding's non-transparent reported emission inventory (e.g. with regards to the market-based and location-based accounting method and with regards to Scope 3), there remains a lot of uncertainty with regards to the answer whether the company's reported strategy is on track towards carbon-neutrality. For instance, from the data provided by the report it can not be derived, whether the ÖBB Holding's emissions are actually increasing or decreasing, based on my analysis criteria (see p. 38).

However, the company set ambitious targets and provided a pathway for decarbonising its transport services in its reports, i.e. its trains and busses, until 2030. ÖBB Holding does, however, not report a comparable pathway to eliminate its emissions from its buildings, such as heating and electricity use and only considers this as a second step in its reported climate strategy, which will be tackled in the future between 2040-2050 (ÖBB, 2019b, 11).

Regarding the company's Scope 2 emissions - which are not reported separately - it has to be noted that purchasing "green" certificates for "grey" grid electricity does not necessarily reduce CO<sub>2</sub> emissions (see p. 20). Based on my analysis criteria (see p. 38), such offsetting measures are no credible pathway to achieve carbon-neutrality (see p. 38). Hence, the company's reported plan to decarbonise its transportation services will only work, if the grid is fully decarbonised by 2030 (see p. 12). On the other hand, it is worth mentioning that ÖBB Holding continuously develops ways to improve their own renewable energy capacities, such as hydro-, solar- and wind power and actively develops, tests and deploys innovative low carbon technologies to power its trains and busses.

Although ÖBB Holding states that it wants to also make their Scope 3 emissions "*in full*" carbon neutral (Ibid., 2), the report does not provide any explicit information regarding the emission sources concerned. Furthermore, ÖBB Holding does not depict a comprehensive pathway in its report to reach its ambitious Scope 3 emission target yet. Considering the likely substantial amounts of building- and construction materials

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<sup>66</sup> As shown above, it is quite difficult to determine, if and to what extent companies truly help to avoid emissions by selling their products or services (see p. 23).

the company needs, such as steel, concrete and aluminium, and the large number of commuting employees, these indirect emissions are probably quite substantial.

ÖBB Holding considers itself as “*Austria’s biggest climate protection company*” (ÖBB, 2019b, 2), since public transport is broadly seen as a key measure to mitigate climate change, compared to transport by car, truck or plane. Consequently, the rail company claims to help avoiding 3,5 million tonnes of CO<sub>2</sub> annually, when compared to the use of average cars that are moved by internal combustion engines<sup>67</sup>. Furthermore, ÖBB Holding aims to increase its share within the Austrian modal split, which might *additionally* (see p. 21) reduce the Austrian transport sector’s emissions. Concerning ÖBB Holding’s reported precise numbers of avoided CO<sub>2</sub> emissions, however, one has to be cautious, as a consequential life cycle analysis is needed, which is quite difficult to conduct precisely (see p. 23).

No information is provided by the company with regards to climate-related governance on the corporate-level (see p. 28).

## 5.11 STRABAG SE

STRABAG SE is a building- and construction company, whose headquarter is based in Vienna. STRABAG SE is internationally active with its focus on Central-, Eastern- and South-Eastern Europe (STRABAG, 2019, 34). The company’s portfolio includes architecture and design, production of construction materials, construction, service and deconstruction of buildings and infrastructure. Most revenue is created by “*building construction and civil engineering*” (38%) (Ibid., 35), and “*transportation infrastructures*” (38%) (Ibid.), international activities 7% (Ibid.), “*construction materials*” (6%) (Ibid.) and “*services*” (6%) (Ibid.). In 2019, according to STRABAG SE, the lion share (61%) of customers were public entities, whereas 39% were private (Ibid., 33). In 2019, the company’s main owners are Raiffaisen/UNIQA (27,5%), the Haselsteiner family (26,4%) and MKAO „Rasperia Trading Limited“ (25,9%) (Ibid., 46). In 2019, STRABAG SE’s turnover was 15,67 billion Euro and it employed 75.000 people (Ibid., 1). According

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<sup>67</sup> This claim is supported by the research of the Verkehrsclub Österreich (VCO) (mobility club Austria) which says that ÖBB Holding’s railway transportation emits less CO<sub>2</sub> than all Austrian long-distance alternatives, such as electric cars, buses, diesel cars and planes (VCO, 2017, 19). Hence, in this case, the company’s claim to be *avoiding emissions* seems rather plausible, as more carbon-intensive forms of mobility might be used, were it not for ÖBB Holding’s services.

to the company's reporting, STRABAG SE emitted 1,01 million tonnes CO<sub>2</sub>e in 2019 (Scope 1 and Scope 2 in 2019; not including Scope 3 emissions) (Ibid., 131).

The information regarding the company's climate strategy was found in its annual report of 2019 (STRABAG, 2019).

### **STRABAG SE's emission inventory**

STRABAG SE accounted for its Scope 1 emissions, which amounted to 833.816 tonnes of CO<sub>2</sub> in 2019 (STRABAG, 2019, 131) and for its Scope 2 emissions, which amounted to 177.387 tonnes of CO<sub>2</sub> (Ibid.). According to the company's inventory, the absolute number of CO<sub>2</sub> emissions of STRABAG SE amounted to 1,01 million tonnes in 2019 (Ibid.). According to the reporting of STRABAG SE, only 24% of emission data is accounted via mass calculations (see p. 27), whereas the rest is accounted for by using the respective prices for energy payed by the company. According to STRABAG SE, this method is less precise, as the precise amount of fossil fuels used is not known (STRABAG, 2019, 131). STRABAG SE provided some information about how their calculations were conducted and on which *emission factors* (see p. 27) their inventory (STRABAG, 2019, 131).

In its annual report, the company breaks down, which specific emission sources under Scope 1 and Scope 2 emitted the most CO<sub>2</sub> in 2019 and in which geographic area the emissions arose. According to STRABAG SE, 52% of CO<sub>2</sub> emissions were emitted by "*fuels*" (STRABAG, 2019, 132), further 17% stem from "*pulverised lignite*" (Ibid.), 16% from electricity (Ibid.) and 15% of emissions stem from gas, heating oil and district heating (Ibid.). With regards to geography, 36% of CO<sub>2</sub> was emitted in Germany (Ibid.), 33% in "*other*" countries (Ibid.), 15% in Poland (Ibid.) and 8% in Austria and in the Czech Republic, respectively (Ibid.). In order to derive its Scope 2 emissions, the company uses the *location based method* (see p. 20) (Ibid.,131).

The existence of the reporting category Scope 3 emissions (see p. 22) is mentioned in the report, nevertheless Scope 3 emissions are not accounted for or estimated in the report (STRABAG, 2019, 131). Presumably, STRABAG SE's most relevant Scope 3 emissions are greenhouse gases stemming from construction materials used, starting with extraction and processing to transportation (Ibid., 127-128), emissions from subcontractors (Ibid., 38), and downstream emissions from operational emissions (Ibid., 129) of the infrastructure built by STRABAG SE, such as from energy use of buildings, emissions from motorways, airports and power plants. According to

STRABAG SE, 58% of its “*building construction and civil engineering*” orders (Ibid., 38) and 31% of “*transportation infrastructure*” orders are carried out by subcontractors (Ibid.), whose CO<sub>2</sub> emissions are not accounted for by STRABAG SE.

According to the report, STRABAG SE reduced its absolute Scope 1 and Scope 2 emissions from 1.09 million tonnes of CO<sub>2</sub> in 2015 to 1,01 million tonnes of CO<sub>2</sub> in 2019 (Ibid., 33). Interpreting these absolute numbers renders difficult, since the report does not provide values for the company’s overall *emission intensity* (see p. 30).

### **STRABAG SE’s emission target**

Based on the report, STRABAG SE did not set any long-term targets towards carbon-neutrality (see p. 31). Furthermore, the company does not communicate substantial short-term or mid-term targets and it does not set targets concerning the company’s Scope 3 emissions. Only very vague and fragmented goals exist. In its annual report, STRABAG SE mentions its climate-related target (STRABAG, 2019, 129) to raise the energy efficiency of its fleet by 1% per year in Germany and Austria (Ibid.), which, geographically, only includes 44% of the company’s activities (see p. 89-90). Further, the company aims at decreasing energy demand of “*asphalt mixing plants in Germany*” (STRABAG, 2019, 130).

### **STRABAG SE’s reduction pathway**

As the company did not formulate any targets in their report, they did not report any pathway to reach certain targets either. According to its report the company does neither aim at mitigating (see p. 34) its emissions, nor to offset (see p. 35) them. Nevertheless, some measures towards decarbonisation are mentioned by STRABAG SE. In order to reduce its Scope 1 emissions, the company strives for fairly small incremental fuel efficiency improvements of its fleet (STRABAG, 2019, 129). Moreover, the scope of the target only includes Germany and Austria (Ibid., 129). Besides recycling some construction materials (Ibid., 128), the report does not mention any pathway in order to decarbonise CO<sub>2</sub> emissions stemming from STRABAG SE’s probably substantial in house construction materials production branch (Ibid., 39). The company does not report any clear measures to reduce the company’s Scope 2 emissions either.

Regarding STRABAG SE's Scope 3 emissions, there is neither a pathway reported to reduce emissions from purchased construction materials, nor to reduce emissions from its subcontractors, not to mention likely emissions from daily work related mobility of its 75.000 employees or let alone assumed indirect CO<sub>2</sub> emissions from mobility and transportation on built motorways.

### **Conclusion STRABAG SE**

STRABAG SE acknowledges that the overall buildings- and construction industry is one of the major contributors of greenhouse gases und that the sector has a large leverage to reduce CO<sub>2</sub> emissions (STRABAG, 2019, 129). Nevertheless, based on its report, STRABAG SE does not consider to address the sector's overall emissions adequately yet. The company's reported climate strategy is in no terms on track towards carbon-neutrality with respect to the analysis criteria applied (see p. 38). Although the reported absolute Scope 1 and Scope 2 emissions of the STRABAG SE have sunk slightly in recent years, there is no substantial climate strategy towards carbon-neutrality can be derived from the report.

Unfortunately, not even a pathway towards any substantial emission reduction can be derived from STRABAG SE's annual report: neither with regards to emissions of the company's Scope 1, Scope 2 nor its Scope 3 emissions.

STRABAG SE did disclose at least some information on climate- and energy related governance on the corporate level (STRABAG, 2019, 132) (see p. 28).

## **5.12 BIG - Bundesimmobiliengesellschaft m.b.H\***

\*(Here short: BIG)

BIG is one of the largest Austrian real estate companies; it owned 2.012 immovables in 2019 BIG (BIG, 2019b, 18). The BIG plans, owns and manages Austrian school- and university buildings, and other *special buildings* (BIG, 2019b, 32), such as prisons. Generally, the BIG's lessees are Austrian ministries (BIG, 2018, 25). The company's 100% subsidiary ARE (Austrian Real Estate) plans and owns buildings for business- and residential purposes (Ibid., I-II). Since 2019, the BIG has been owned by the ÖBAG ("Österreichische Beteiligungs AG"), which manages financial interests of the

Republic of Austria (Ibid. 4). In 2019, the BIG's turnover amounted to 1,13 billion Euro (Ibid.) and it employed 937 employees (Ibid., 89). The BIG does not disclose any CO<sub>2</sub> emissions in its reports.

The relevant information about BIG's climate strategy was found in the company's non-financial report of 2018 (BIG, 2018), the non-financial report (BIG, 2019a) of 2019 and the annual report of 2019 (BIG, 2019b).

### **BIG's emission inventory**

BIG does not report on its CO<sub>2</sub> emissions or any emission "Scopes". Nevertheless, much information can be derived from interpreting the company's annual report of 2019.

Interestingly, according to the regular GHG-Protocol's accounting standards, BIG would probably only have to account for the emissions that stem from their own office buildings within Scope 1 and Scope 2, not however, for the emissions caused by the vast amount of public buildings that it plans, builds and manages. These emissions would only have to be accounted for under Scope 3. The reason for this is that the BIG is a lessor of these buildings and does not use them on its own. This qualification, however, ignores the virtual influence that the BIG has on all of these activities. The GHG Protocol specifies that it depends on the legal status of the relationship between the lessor and the lessee, whether the building's emissions are accounted under Scope 1, 2, or 3 of the lessor (WRI and WBCSD, 2011a, 124-125). It is, however, firstly out of the scope of this master's thesis to determine the respective legal status between the BIG and its lessees. Secondly, the exact qualification, i.e. whether the emissions from the buildings that the BIG plans, builds and manages fall under Scope 1 and 2 or under Scope 3, is not relevant, as it is proposed in this thesis that material Scope 3 emissions should be accounted for in any case (see p. 22).

Although BIG does report on climate related activities in its own offices (BIG, 2018, 8), the focus of its climate-related reporting lies undoubtedly on planning, constructing and managing its building portfolio in order to reduce CO<sub>2</sub> emissions. The company included all its leased buildings in its reported climate strategy. As the BIG does not follow international reporting standards and does not disclose any specific emissions, no ranking of emission sources was possible.



Interpreting BIG's report, heating with fossil heating systems can be considered as one of the most important emission sources from its buildings (BIG, 2018, 17). Secondly, the most relevant indirect emissions arising from the company's buildings, very likely originate from the use of grid electricity and district heating (Ibid.).

BIG's buildings' value-chain CO<sub>2</sub> emissions are, most probably, caused by the production of building materials, such as concrete, steel, glass etc. (Ibid., 17), the buildings' construction phase, users' mobility needs (Ibid., 7) and by soil sealing (Ibid.). These indirect emission sources can mostly be derived from BIG's economic, environmental and social "Materiality Matrix" concerning its activities (Ibid.).

### **BIG's emission target**

BIG does not explicitly formulate a long-term emission target, which aims for carbon-neutrality (see p. 31) and covers all relevant emission sources. The company, however, aims to achieve near-zero direct CO<sub>2</sub> emissions by 2025. Moreover, the company formulates "*concrete, measurable and practicable*" (BIG, 2019a, 3; translation by J.S.<sup>68</sup>) near term measures which aim to mitigate CO<sub>2</sub> emissions from all of the company's substantial emission sources.

Although no explicit overall carbon-neutrality target is formulated by BIG itself, the company supports "*the target of the government to make Austria climate neutral*" (BIG, 2019b, 4; translation by J.S.<sup>69</sup>). Moreover, BIG aims to set new climate-standards for the whole building sector (Ibid.). The company implicitly reports various goals that might substantially decarbonise their buildings, such as achieving zero direct emissions by 2025 (Ibid. 3), installing 50.000 m<sup>2</sup> rooftop PV panels per year until 2023 (Ibid., 26) and applying high "Klima:aktiv" (see p. 16) building standards (see below) for all future buildings and general renovations from 2020 onwards (BIG, 2019b, 4).

### **BIG's reduction pathway**

Even though, BIG did not formulate an explicit carbon-neutrality target regarding all emission sources in its report, a comprehensive pathway seems to exist for widely decarbonising BIG's activities. This pathway does not only include BIG's likely Scope 1

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<sup>68</sup> Original: "*Die Maßnahmen sind konkret, messbar und praktikabel*" (BIG, 2019a, 3).

<sup>69</sup> Original: "*Das von der Regierung angestrebte Ziel, Österreich klimaneutral zu machen, verfolgen wir in der BIG seit einigen Jahren*" (BIG, 2019b, 4).

emissions, but also its likely Scope 2 and Scope 3 emissions. The company builds its pathway on *mitigating* (see p. 34) CO<sub>2</sub> emissions by using low-carbon technologies.

Firstly, the company reports having established a general “*minimum standard*” for all its future new building projects and general renovations, which has to be applied from 2020 onwards (BIG, 2019a, 3): All new and fundamentally renovated buildings have to reach “*at least silver status*” (Ibid.; translation by J.S.<sup>70</sup>) under the “Klima:aktiv” building- and renovation program<sup>71</sup>. This standard represents a relatively stringent climate related building standard in terms of climate-relevant topics, such as energy efficiency and building materials, which “*exceeds legal requirements*” (BIG, 2019a, 3; translation by J.S.<sup>72</sup>).<sup>73</sup>

Secondly, BIG reports to replace all of its heating systems, which run on fossil fuels with renewable heating systems or district heating by 2025 (BIG, 2019a, 3). In 2019, 75% of the BIG’s heating requirements were met by district heating and 20,4% were supplied by oil or gas based heating systems (Ibid., 25), thus, 20,4% of BIG’s facilities will probably be affected by this plan.

Thirdly, between 2020 to 2023, the company reports to install photovoltaic panels on at least 50.000 m<sup>2</sup> of its buildings’ rooftops every year (Ibid., 26). BIG wants to equip 90% of its buildings with new measurement-, control- and regulation technology by 2024 to improve energy efficiency (Ibid., 25). Furthermore, the company already reports to deploy efficiency contracting<sup>74</sup> in 36% of its facilities (Ibid., 25).

Concerning other indirect likely Scope 3 emissions, the BIG’s reports mention reduction pathways, such as using less carbon-intensive building materials: The BIG reports that using sustainably forested wood and sustainable minerals are “*increasingly considered*

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<sup>70</sup> Original: “*Jedes der kommenden Projekte muss zumindest klimaaktiv Silber erreichen*” (BIG, 2019a, 3).

<sup>71</sup> which is coordinated by the Austrian Society for Environment and Technology (ÖGUT) (Klimaaktiv, 2019)

<sup>72</sup> Original: “*Dafür wurde für alle Neu- bauten und Generalsanierungen 2019 ein konzernweiter Nachhaltiger Mindeststandard definiert, der über die gesetzlichen Anforderungen hinausgeht*” (BIG, 2019a, 3).

<sup>73</sup> this reported standard apparently reduces heating demand between 33% and 75%, compared to buildings which only comply to current legislation (Klimaaktiv, 2020).

<sup>74</sup> Energy efficiency contracting refers to an agreement between a building owner and an external company, which carries out energy efficiency measures in the buildings. This contractor gets payed according to his guaranteed and achieved cost savings from using less energy (BIG, 2019a, 25).

*in the planning*” (Ibid., 26; translation by J.S.<sup>75</sup>), as is the recycling of building materials (Ibid., 26-27), but does not report a coherent pathway for doing so<sup>76</sup>. In order to reduce soil sealing, the BIG wants to increase the number of green spaces and trees within their projects (Ibid., 29-30). In order to reduce mobility related emissions, car-sharing projects were tested by the company (Ibid., 31). The BIG does not report to have taken any measures to reduce CO<sub>2</sub> emissions arising during the construction phase of the company’s buildings.

## Conclusion BIG

This case study of the BIG shows the limitations of current practices of how companies approach decarbonisation, i.e. creating a CO<sub>2</sub> inventory, setting an emission target and proposing a reduction pathway to reach this target: BIG did neither disclose any of its CO<sub>2</sub> emissions, nor did the company explicitly formulate an overall CO<sub>2</sub> emission reduction target, apart from its ambitious short-term target to bring its direct emissions down to zero. Yet, the company proposes “*concrete, measurable and practicable*” (BIG, 2019a, 3; translation by J.S.<sup>77</sup>) near-term mitigation measures for all of its probably major emission sources. Although the BIG does not follow the depicted current international practices, the company formulated an ambitious and immediate reduction pathway, which is, at least, more on track towards carbon-neutrality than many other other companies in my case studies.

The company set a decisive short-term target regarding its direct emissions, i.e. near-zero emissions until 2025, and set ambitious activities to reduce likely indirect emissions from Scope 2 and Scope 3. To support the Austrian governments target to become carbon-neutral is one of the declared goals of the company’s climate strategy (see above). BIG formulated a pathway to - at least substantially - decarbonise the company’s largest climate related impact: its buildings portfolio. By establishing highly energy efficient building- and general renovation standards, by reporting to use more climate friendly construction materials, such as timber, by entirely phasing out its fossil heating systems, by using efficiency contracting for a large number of its facilities and

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<sup>75</sup> Original: “*Dabei werden der nachwachsende Rohstoff Holz und mineralische Baustoffe, die sich durch nachhaltige Rohstoffgewinnung auszeichnen, verstärkt in der Planung mitberücksichtigt*” (BIG, 2019a, 26).

<sup>76</sup> BIG reports to establish the “*general ecological assessment of buildings (O13-assessment)*” (Ibid., 22; translation by J.S.), which apparently includes construction materials.

<sup>77</sup> Original: “*Die Maßnahmen sind konkret, messbar und praktikabel*” (BIG, 2019, 3).

by increasing its capacity of rooftop photovoltaic panels, BIG might<sup>78</sup> substantially decarbonise its business model over time.

BIG reports on some measures and projects (BIG, 2019a, 22-29) to reduce carbon intensive construction materials, such as steel and concrete. However, it is not possible within the scope of this master's thesis to assess, whether the company's new building standards, such as the OI3 assessment, or the BIG's announcement to use more timber and recycled materials, are sufficient to reduce indirect value chain CO<sub>2</sub> emissions from its buildings substantially.

BIG does not claim to *avoid* (see p. 23) its customers' CO<sub>2</sub> emissions, but implementing the company's reported climate strategy would indeed contribute to avoid emissions of its lessees, e.g. with regard to heating.

However, considering the lack of corporate CO<sub>2</sub> data and the fact that BIG does not follow reporting standards, there, unfortunately, remains some uncertainty with regards to the BIG's strategy. It would also underline the company's climate-related ambitions, if BIG's climate-related reporting would be more transparent. Furthermore, the company's reported strategy could be better analysed and verified by external stakeholders, if there were more transparency in particular regarding the company's CO<sub>2</sub> emissions (see p. 25).

Moreover, there are some other relevant deficiencies regarding BIG's reported climate strategy besides the lack of transparency. First, the company does not formulate a systematic pathway to deal with its existing energy-inefficient building stock in the medium term - i.e. before general renovations will become necessary - and apart from using energy efficiency contracting to improve some of its existing buildings. Second, the company's plan to make its heating systems free of fossil fuels, counts on the future decarbonisation of Austrian district heating networks, as district heating is currently mostly produced in a carbon intensive way (Umweltbundesamt, 2019a, 83-84). Third, besides efficiency contracting and increasing photovoltaic capacity, the BIG does not systematically addresses the reduction of its buildings' grid electricity use in its reporting.

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<sup>78</sup> It is outside the scope of this master's thesis to assess in detail, whether the reported measures will suffice and will be successful.

## **6. Findings and Recommendations**

The relevance of the twelve Austrian companies in my case studies should not be underestimated in terms of their key position within the economy and with regards to their contribution to green house gas emissions. In 2019, more than 414.445 people were employed by all twelve companies combined. The amount of accumulated CO<sub>2</sub> emissions of these companies in 2019 is even more staggering: According to the companies' own accounting, those emissions amount to about 174 million tonnes of CO<sub>2</sub> around the globe. The lion share of these enormous emissions stemmed from one company: the OMV AG with total reported value chain emissions of 137 million tonnes (see p. 48). The Voestalpine AG also reported to contribute a considerable amount of annual CO<sub>2</sub> emissions, i.e. about 24 million tonnes with regards to its entire value chain (see p. 53). It can, however, be assumed that the actual emissions arising from the business activities of the twelve companies combined is actually even higher than the reported 137 million tonnes, since the above calculation is based on the data voluntarily provided by the companies: Since, the BIG did not provide an emission inventory, its emissions, for example, could not at all be included in the above figure. Borealis Group's, STRABAG SE's, REWE AG's, SPAR AG's and AGRANA AG's potential Scope 3 emissions, which were not disclosed by the companies' reports either, might also increase the number of total emissions considerably. Still, even regardless of this lack of comprehensiveness, the reported emissions of these twelve companies around the globe are substantial: In comparison, in 2017 Austria's absolute territorial emissions accounted for 82,3 million tonnes of CO<sub>2</sub>, which is not even half of the twelve companies' reported emissions (Umweltbundesamt, 2019a, 6).

In this chapter, I compared my case studies again along their emission inventories, emission targets, reduction pathways and reporting, measurement and verification. Based on this comparison, I made some recommendations for research, companies and policy-making. At the end of this chapter, I gave an overall conclusion about the findings of the comparison.

### **Comparison of the companies' emission inventories**

All companies, with the exception of the BIG, account and disclose their CO<sub>2</sub> emissions to a certain extent in their reports. However, substantial differences exist with regards to the companies' CO<sub>2</sub> accounting.

First, it has to be noted that - at least some - facilities of the Lenzing Group, Verbund AG, Voestalpine AG, OMV AG, Borealis Group, AGRANA AG and presumably also the STRABAG SE fall under the regime of the EU-ETS (see p. 9). These companies are thus under this regime legally obliged to account for at least some of their direct emission sources. With regards to the other companies, i.e. Post AG, SPAR AG, REWE AG, the ÖBB and the BIG, accounting for and reporting on their emissions is completely voluntarily. However, climate-related reporting has indeed become international standard and is recommended by the EU's Guidelines on Climate-Related Information for large corporations (see p. 11).

Secondly, substantial differences exist also with regards to the companies' reported *operational boundaries*.

Direct Scope 1 is the most reported category. Nearly all companies reported on them. One might think that accounting of direct Scope 1 emissions is relatively straight forward but there are some differences. Borealis Group, however, provides information about its stationary emission sources in its report that fall under the EU-ETS. AGRANA AG reports emissions from most of its large production facilities. ÖBB Holding includes Scope 1 emissions of its transport services in its reported inventory. BIG did not report any Scope 1 emissions at all.

Interestingly, Scope 2 emission inventory from electricity and district heating purchased are also relatively straight forward, as the lion share of companies report them. 10 companies in my case study reported on them. Only Borealis Group and BIG did not. ÖBB Holding and AGRANA AG do not report Scope 1 and Scope 2 in a differentiated way.

In contrast, the most discussed category are Scope 3 emissions. In my case studies, it varies widely, how the companies deal with emissions that fall under this Scope in their reports. 7 of the companies in my case study, included - at least - some of these emissions in their reported CO<sub>2</sub> inventory or mitigation activities, i.e. Lenzing Group, Verbund AG, Voestalpine AG, Post AG, OMV AG, BIG and REWE AG<sup>79</sup>. The case studies demonstrated that there is a tendency amongst companies to ignore Scope 3 emissions entirely or material parts thereof in their reports, even in cases, in which these Scope 3 emissions are probably a company's major emission source, such as the Borealis Group, SPAR AG, REWE AG, AGRANA AG or STRABAG SE. Six

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<sup>79</sup> REWE AG does only accounts for marginal parts of their likely Scope 3 emissions in their report, i.e. paper consumption and business flights (see p. 75)

companies' reports include - at least some - of their substantial value chain emissions in their inventory: The most striking and positive example are the OMV AG's report, which actually accounts for the burning of OMV AG's fossil fuel products, the Voestalpine AG, which inter alia account for emissions from mining in its report and the Verbund AG, which inter alia reports to account for emissions from selling of natural gas. Moreover, Lenzing Group does not report concrete numbers concerning its Scope 3 emissions, but calculates, which percentage of its overall emissions is made up by Scope 3 emissions, such as purchases of chemicals and transportation of raw materials. Post AG partially reports and calculates on its Scope 3 emissions, such as emissions of the fleet of its subcontractors. On the other hand, six companies do not account for relevant Scope 3 emissions in their report, i.e. SPAR AG, REWE AG, AGRANA AG, STRABAG SE, Borealis Group and ÖBB Holding, even though there is reason to believe that their Scope 3 emissions are quite substantial: Concerning SPAR AG and REWE AG, Scope 3 emissions may probably be considered as their largest emission category, inter alia likely stemming from their product portfolio, daily commuting of their combined 177.000 employees and from subcontractors. It is highly likely that Scope 3 emissions are also material for the AGRANA AG, i.e. emissions from agricultural practices, STRABAG SE, i.e. from used materials, commuting of employees and emissions from subcontractors, Borealis Group, i.e. life-cycle emissions of plastics, fertilisers and hydrocarbons and the ÖBB Holding, e.g. from built infrastructure, construction of trains, commuting of employees. BIG does not provide an emission inventory in its report at all, hence it does not disclose Scope 3 emissions either.<sup>80</sup>

No real pattern can be derived, as to which companies tend to include Scope 3 emissions in or exclude them from their reporting. Generally, it can be said, that the GHG-Protocol suggests a kind of hierarchy between the three Scopes - beginning with Scope 1 emissions, which have to be accounted for as a minimum requirement, and ending with Scope 3 emissions, regarding which accounting is only for the very ambitious. This is actually misleading. Concerning different sectors, different emission sources are most relevant. Viewing the OMV AG as a mere middleman between nature, which provides the raw material and millions of CO<sub>2</sub> emitting customers, with relatively small emissions arising from OMV AG's own activities, does - obviously - not depict reality in its full scope. Or imagine BIG only considering itself responsible for its Viennese office building and small car fleet, while not being held responsible for its 7,3 million m<sup>2</sup> of built, hired out and managed building space (BIG, 2019b, 18). The argument that Scope 1 emissions are under one's influence, whereas Scope 3 emissions are not, does not withstand a reality check.

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<sup>80</sup> BIG, however, undertakes measures to reduce substantial Scope 3 emissions.

The question, which emissions are accounted for is not only relevant on the company-level, but also for the economy as a whole. The discussion about *consumption based* accounting or *territorial based* accounting on the national level goes into the same direction. Integrating consumption based CO<sub>2</sub> accounting (see p. 17) has the potential to draw a more realistic picture that shows complexity and interdependencies and may help making the most economical mitigation decisions on a system level. If more information is disclosed, the CO<sub>2</sub> emissions of certain interdependent carbon-clusters, i.e. emission intensive, highly interconnected economic networks, can be quantified, and can be tackled in a more precise manner.

One criterion I derived in this master's thesis is that a comprehensive and transparent emission inventory is key for determining and analysing a company's climate strategy. In terms of comprehensive and transparent reporting about their Scope 1, Scope 2 and Scope 3 emissions, Voestalpine AG, Lenzing Group, OMV AG and Verbund AG are the most positive examples, which included CO<sub>2</sub> emissions from all three Scopes and even calculated them. Moreover, to a lesser extend, the Post AG and the REWE AG reported in a more comprehensive manner that also calculated some of their Scope 3 emissions. Voestalpine AG, Verbund AG, OMV AG and Lenzing Group conducted and reported their emission inventory in a comprehensive manner. An overview over all reported CO<sub>2</sub> emissions in my twelve case studies is attached in the Annex of this master's thesis (see p. 128).

**Table 1: Companies that conducted their inventory in a comprehensive way**

Yes	No
4	8

**Table 2: Number of companies that include Scope 3 in CO<sub>2</sub> inventory**

Yes	No
6	6

All in all, it can be said, that the introduction of voluntary reporting standards, such as the GHG Protocol, lead to a certain extent of standardisation and thus transparency and comparability of companies' climate data and strategy. Nevertheless, as my case studies showed, there are material differences between companies' accounting methods, their methods of measurement and their emission inventory, which still



renders it difficult to compare their emission-related information. Particularly the respective emission inventory's organisational and operational boundaries render it difficult to determine which specific approaches have been applied. Hence, I would recommend that climate-related reporting should not only be recommended by the European Union or the Republic of Austria, but that it should rather become mandatory for all large corporations<sup>81</sup> headquartered in the EU or, at least, in Austria. These required reporting standards should be as precisely defined as possible, and the reported data should be mandatorily verified by external auditors. Clear requirements with regards to a company's methods of measurement, the design and scope of its emission inventory and probably even the options for reporting about its reduction pathway should be defined. Although it sometimes represent a challenge to define and measure a company's most relevant Scope 3 emissions, they should be included in such reporting requirements. This would provide a level playing field and transparency for all stakeholders.

### *Avoided Emissions*

Another interesting finding of my master's thesis is that 5 companies claim to supply products or services which help to reduce CO<sub>2</sub> emissions of their customers, i.e. Lenzing Group, which compares, in its report, the carbon intensity its wood based fibres with synthetic or cotton textiles (see p. 65); Verbund AG, which compares its produced electricity to the European grid emission factors (see p. 46); ÖBB Holding, which compares CO<sub>2</sub> emissions through its rail transport services with regular cars and trucks (see p. 85); Post AG, which reports to offset its emissions and even reports to issues certificates for providing "carbon-neutral delivery" services (see p. 82); Borealis Group, which cherry-picks some products in its reports, such as lightweight plastics that might reduce fuel use of cars (see p. 58); and AGRANA AG, which claims in its report to reduce CO<sub>2</sub> emissions through its production of the fuel additive bioethanol (see p. 67). As I discussed in this master's thesis, it is difficult to determine whether such claims hold true (see p. 23). According to my criteria, such as no cherry-picking (see p. 39) and no offsetting of emissions (see p. 39) only Verbund AG, ÖBB Holding and - probably - Lenzing Group arguably avoid CO<sub>2</sub> emissions.

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<sup>81</sup> The threshold for a company's climate reporting to be mandatorily could be defined as having a certain number of employees or a certain turnover.

**Table 3: Companies which arguably avoid CO2 emissions**

Yes	No
3	9

### **Comparison of the companies' emission targets**

In one way or another, all selected companies, with the exception of AGRANA AG, announced in its reports climate-related targets for the future. However, these declared targets do not necessarily aim at reducing a company's total CO<sub>2</sub> emissions.

First, eight out of the twelve companies have reported explicit targets to reduce their companies' overall *absolute* or *specific* CO<sub>2</sub> emissions within a certain timeframe, i.e. Lenzing AG, Verbund AG, Voestalpine AG, Post AG, OMV AG<sup>82</sup>, SPAR AG, REWE AG and ÖBB Holding. Secondly, four companies did not report to have any CO<sub>2</sub> emission target, i.e. Borealis Group, STRABAG SE and BIG<sup>83</sup> but rather proposed concrete measures which aim to reduce CO<sub>2</sub> emissions in their reports. AGRANA AG, has not reported any emission target yet. However, considerable differences nevertheless exist within these two groups.

With regards to the reported specific CO<sub>2</sub> reduction targets there is a great variation between the companies. The following companies reported *long term* emission targets to substantially reduce CO<sub>2</sub> emissions: Lenzing Group, ÖBB Holding reported to be committed to the target of carbon-neutrality until 2050, AGRANA AG reported to be committed to carbon-neutrality even in 2040. SPAR AG aims in its report for a reduction of -90% CO<sub>2</sub> intensity by 2050 regarding Scope 1 and Scope 2, Voestalpine AG set the target of -80% CO<sub>2</sub> Scope 1 emissions by 2050. *Mid-term emission targets* were defined by the following companies: Verbund AG strives for -90% CO<sub>2</sub> emissions by 2021, REWE AG aims at a reduction of -50% CO<sub>2</sub> intensity regarding Scope 1 and 2 by 2022 (apparently only with regards to the Austrian market), Lenzing Group wants to achieve a CO<sub>2</sub> reduction of -50% regarding Scope 1, 2 and 3 emissions by 2030, Post AG wants to reduce its Scope 1 and 2 emissions by -14% by 2025 and finally OMV AG reported to have already achieved its target to reduce its portfolio emission intensity by -4% and its production emission intensity by -19% CO<sub>2</sub> intensity by 2025 - the company did not report any new emission targets.

<sup>82</sup> OMV AG reported to already having achieved their targets and did not report any new targets

<sup>83</sup> BIG reported an emission target only with regards to its buildings direct heating emissions (see p. 94)

**Table 4: Companies that aim to become carbon-neutral by 2050 or 2040**

Yes	No
3	9

Regarding the companies, which did not report specific CO<sub>2</sub> reduction targets there exist material differences: In its report, AGRANA AG committed to laying down a strategy for achieving carbon neutrality by 2040 soon, but did not report any concrete reduction target yet. Borealis Group, at least, reports to recognise the necessity to become carbon-neutral in the future and lays down certain targets, i.e. +20% energy efficiency and +50% renewable energy by 2030 regarding two of its three branches, whereas STRABAG SE only reported the target for Austria and Germany to make its fleet slightly more fuel efficient over time. Completely different is the case of BIG, which did not announce high flying overall CO<sub>2</sub> emission reduction targets for the far future in its report, but reported to commit itself to support the Austrian government's goal to achieve carbon-neutrality and scheduled credible and ambitious projects to reduce its CO<sub>2</sub> emissions<sup>84</sup>.

Moreover, there are the interesting cases of the ÖBB Holding, the BIG and the Post AG and Verbund AG which reported targets to make substantial parts of their company carbon-neutral in the short- or medium run. Based on their reports, ÖBB Holding aims to make its transportation services carbon-neutral until 2030, Post AG aims to decarbonise its entire "last mile" delivery fleet until 2030, BIG aims to reduce its fossil fuel based heating systems to zero by 2025, and Verbund AG reports to aim for decarbonising its electricity production in the long run.

All in all, according to my target-related criteria, Lenzing Group, and ÖBB Holding set the most ambitious emission targets, as they reported to commit to the target of carbon-neutrality by 2050 and reported relatively substantial emission targets for the short- and medium run<sup>85</sup>. Verbund AG did not report an overall carbon-neutrality target for the whole company but a highly ambitious short term emission target. Moreover, AGRANA AG committed itself to carbon-neutrality by 2040. Based on my analysis

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<sup>84</sup> Projects such as reducing to zero fossil fuel heating by 2025, applying stringent and comprehensive building- and general renovation standards from the near future onwards, installing 50.000 m<sup>2</sup> solar panels per year until 2023 (see p. 92).

<sup>85</sup> with the exception that the mid-term target that was reported by ÖBB Holding is not an overall emission target for the whole company but for its - probably most relevant - transportation services.

criteria (see p. 38) the reported emission targets of other companies such as Voestalpine AG, SPAR AG, Post AG, REWE AG or OMV AG are not sufficient to achieve carbon-neutrality in the long run. BIG did not report any overall CO<sub>2</sub> emission targets, although it might reduce its emissions considerably due to its reported climate strategy.

It is worth mentioning that, besides the companies which reported to commit to achieve carbon-neutrality, no reasoning was given why specific CO<sub>2</sub> emission targets were set by companies<sup>86</sup>. In doing so, it seems that most reported CO<sub>2</sub> targets are rather arbitrarily set. For these cases, and all others, a more standardised target setting approach would be best to provide companies with more orientation, support and accountability. More comparable standards could be set by law or by initiatives, which amount of emission reduction should be considered to be substantial or which timeframe and which emission sources need to be included. Initiatives, such as the *Science Based Targets-initiative* try to fill this gap and might establish new standards to clarify which emission targets and which timeframes are scientifically appropriate with regards to the dynamics of anthropogenic climate change. From this perspective, corporate emission targets founded on scientific reasoning appear to be an important supplement to the GHG Protocol's accounting and reporting standards (see p. 27).

Nevertheless, my case studies also gives way to another interpretation about the common practice of setting CO<sub>2</sub> emission targets. The peculiar cases of the BIG's reported climate strategy on the one hand, which did not include an overall emission target but formulated ambitious, concrete and immediate projects to reduce CO<sub>2</sub>, and of the Post AG's (see p. 79) reported climate strategy on the other hand, which includes ambitious targets that are approved by the SBT-initiative, but still reports rising emissions due to the unforeseen rise of online shopping, indicate that the setting of overall CO<sub>2</sub> targets should not be overrated. In the end, only the radical and successful reduction to near-zero absolute CO<sub>2</sub> emissions counts on the long run (see p. 31). Ambitious emission targets might support a company's transition but are no guarantee for success. This fits perfectly well with the critique by Patt and others with regards to the architecture of the international climate regime since the adoption of the Kyoto Protocol (see p. 7). This critique questions how important emission targets are as a policy instrument, since they formulate relatively uncertain future emission results rather than committing to predictable and measurable immediate activities which, in

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<sup>86</sup> For instance, the SPAR AG does not report why it chose -90% emission intensity in 2050 to be their goal, or the OMV AG did not reason in their report why it decided to reduce CO<sub>2</sub> intensity of their portfolio exactly by -4%.

turn, support new zero-emission technologies<sup>87</sup> (Patt 2015, 113). Such a predictable, activity-oriented approach might also reduce the reluctance of states and companies to commit to starting ambitious activities (Patt 2015, 112) and to formulating binding targets to achieve them. In the process of this master’s thesis, these arguments have become increasingly plausible for me and I think it is worth asking whether the established practice of committing to future emission targets is the most efficient way to reduce overall CO<sub>2</sub> emissions. Nevertheless, all companies of my case studies, which formulated the most ambitious climate strategies in their reports, with the exception of the BIG, such as Lenzing Group, Verbund AG and the ÖBB Holding, reported certain emission targets, whereas the companies which reported the least ambitious climate strategies covered by my case studies, such as STRABAG SE or the Borealis Group did not report any such target. This finding emphasises that formulating and reporting corporate emission targets might at least not hindering companies’ communicated ambition.

### **Comparison of the companies’ CO<sub>2</sub> reduction pathways**

All twelve reported climate strategies in my case studies aim to take measures in order to - at least - reduce their CO<sub>2</sub> emissions in one way ore another. All companies report do this by setting<sup>88</sup> activities to mitigate (see p. 34) their emissions, but half of the companies’ reported climate strategies additionally try to offset (see p. 35) parts of their emissions in one way or another.

**Tables 5: Companies that aim to mitigate their CO<sub>2</sub> emissions**

Yes	No
12	0

**Table 6: Companies that offset CO<sub>2</sub> emissions**

Yes	No
6	6

<sup>87</sup> Instead of emission targets, the Austrian companies’ climate strategies in my case study could contain an “activity” target to install solar panels on their entire roofs within the next 5 years, or the commitment to only purchase electrical cars from now on.

<sup>88</sup> Many reported mitigation measures are not yet started by the companies but are planned to be set, such as the reduction pathways of Voestalpine AG or AGRANA AG

With regards to emission mitigation, the reported reduction pathways are, indeed, very diverse and will not be repeated here. All companies' reported climate strategies try to deploy integrated measures to make their processes cleaner (see p. 34), such as improving energy efficiency, investing in clean technologies etc. Only two companies' reported climate strategies also suggest taking *end-of-pipe* measures (see p. 34), such as Carbon Capture and Sequestration (OMV AG), and Carbon Capture and Utilisation (Voestalpine AG). Nearly all companies report to deploy and invest in certain low-carbon innovations: Voestalpine AG conducts research concerning deploying hydrogen-electrolysis on industrial scale ("*H2Future*") (see p. 55), SPAR AG and REWE AG test electric heavy duty vehicles (see p. 73 and p. 77), OMV AG conducts research with regards to chemical feedstock recycling ("*ReOil*") (see p. 52), ÖBB Holding developed its own 16,7 Hz solar farms (see p. 87), etc. Only the STRABAG SE did not report to actively do research on, or deploy climate related innovations.

All of the analysed companies, at least aim, to set activities to mitigate parts of their Scope 1 emissions according to their reports, i.e. by setting measures to decarbonise production processes, transportation, heating and cooling.

Most companies, at least aim, to reduce some of their Scope 2 emissions. To achieve this, most companies build on improving their company's energy efficiency and/or plan to increase the use of renewables. An exception from OMV AG, Verbund AG and Voestalpine AG. Whereas STRABAG SE does not report a comprehensive approach towards the reduction of its Scope 2 emissions at all, Verbund AG tries to offset (see p. 47) some of its Scope 2 emissions. Voestalpine AG is the most interesting case, as it aims to shift its energy source from mainly coal and gas, which are burned on site, towards mainly electricity and hydrogen, which might be externally purchased with potential emissions arising elsewhere. In this case it can be expected that Voestalpine AG's potential Scope 2 emissions will even rise substantially - unless the used electricity and hydrogen will be produced with zero emissions. This, however, depends on external factors, as Voestalpine AG will most likely purchase large amounts of the electricity and green hydrogen from external producers and grids. This effect will most likely occur concerning all processes, transportation, machinery or heating systems, which will be electrified or will use hydrogen technology.

Scope 3 emissions are also tackled in a wide range of ways by the twelve companies. In one way or another all companies report to set activities regarding some Scope 3 emission sources<sup>89</sup>, e.g. SPAR AG refrains from the use of palm oil in their own brands

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<sup>89</sup> However, only some company's report to tackle their Scope 3 emissions explicitly

(see p. 74), Voestalpine AG plans to increase steel scrap recycling (see p. 56), AGRANA AG plans to apply minimum standards with regards to agricultural practices (see p. 69) and Lenzing Group already fully applies sustainability standards with regard to forestry (see p. 65), etc. This, however, does not mean that these activities are carried out in a systematic manner by the companies.

My case studies showed that six companies' pathways rely on the offsetting of some emissions, i.e. Lenzing Group, Verbund AG, Post AG, REWE AG, ÖBB Holding and the OMV AG. All of these six companies, with the exception of OMV AG, purchase renewable certificates for all of, or parts of the grid electricity they consumed: According to the reports, REWE AG purchased renewable certificates for all of the electricity that it used (see p. 78), ÖBB Holding did the same for the electricity it does not produce itself (see p. 86), Verbund AG purchased certificates for the grid electricity purchased for its pump storage hydropower plants (see p. 47) and Lenzing Group (see p. 61) as well as Post AG (see p. 79) did this for some parts of their purchases, which are not exactly defined.

Moreover, three companies do purchase international offset credits, i.e. Verbund AG, OMV AG & Post AG. Verbund AG purchases these certificates to compensate for the natural gas that it sells to customers, OMV AG compensates for natural gas sold to interested customers and the Post AG compensates for its diesel fleet so as to conduct its deliveries in a carbon-neutral way. As I have already pointed out above (see p. 20 and 35), such practices cannot be considered as an adequate strategy to achieve net zero CO<sub>2</sub> emissions.

Another criterion in my master's thesis is, whether a company's CO<sub>2</sub> emissions are already sinking. With regards to the progress that the twelve companies already have made in reducing their CO<sub>2</sub> emissions, large differences exist as well. In the following, I will compare the development of the reported *absolute emissions* (see p. 30) of the companies over the past years, as emissions will have to be reduced to zero in absolute terms so as to achieve carbon neutrality. To make this comparison, I had to rely on the respective timeframes the companies provided in their reports. Absolute CO<sub>2</sub> emissions of six companies, i.e. Verbund AG, Lenzing Group, REWE AG, SPAR AG, AGRANA AG, STRABAG SE, have decreased compared to their respective base year, the emissions of three companies, i.e. OMV AG, Borealis Group, Post AG have risen since their base year, and, finally, three companies, i.e. Voestalpine AG, ÖBB Holding and BIG, did not give sufficient information - at least not with regards to recent years and based on my analysis criteria (see p. 38). It is, nevertheless, relevant to also look at the trend of a company's *emission intensity* (see p. 30) in addition to analysing

the development of its *absolute emissions* over time. If a company's *intensity*- as well as *absolute emissions* sink, this indicates that a fall in absolute emissions did not only occur due to smaller sales or business downsizing, but rather due to an actual reduction of emissions, by applying less carbon intensive production methods or by providing less carbon intensive services. Judging from the information given in the disclosed emissions over time, this only holds true for Lenzing Group, REWE AG, SPAR AG and Verbund AG.

**Table 7: Companies that already reduced absolute and relative CO2 emissions**

Yes	No	No information given
4	5	3

One crucial finding of this master's thesis is that, although the companies in my case studies represent some of the largest corporations of the Austrian economy, individual companies' climate strategies are often very limited in their ability to achieve carbon-neutrality on their own. Many of the twelve company's strategies heavily depend on the decarbonisation of certain public goods<sup>90</sup>, such as a decarbonised infrastructure and affordable and reliable clean technologies, which are not available or not competitive to conventional technologies by today. These zero-carbon goods constitute the building blocks of a carbon neutral economy, which cannot be developed and deployed by single actors alone. Voestalpine AG has built its climate strategy entirely on the assumption that enormous amounts of renewable electricity and green hydrogen will be provided in the future, the same holds true for ÖBB Holding's reported climate strategy, which would need zero-carbon grid electricity to succeed. The same is true for SPAR AG, REWE AG, Post AG, BIG or even the Verbund AG, whose current climate strategies will ultimately require an Austrian or even multinational grid with near zero CO<sub>2</sub> emissions to achieve carbon-neutrality. Another example for a necessary public good is a decarbonised transport system which could supports the companies' total of 414.445 employees to commute to work every day in a carbon-neutral way. Moreover, the BIG builds its climate strategy on the decarbonisation of district heating. Also the STRABAG SE's strategy might depend on the supply of clean(er) vehicles and technology for construction and on vast amounts of sustainably produced building materials. At least SPAR AG's, REWE AG's and Post AG's climate strategies depend on the availability fossil-fuel free heavy duty vehicles (or any respective alternative logistics infrastructure) for long distance transport. Lenzing Group and Borealis Group might depend on infrastructure for reuse- and recycling of fibres and plastics. Most of

<sup>90</sup> A public good is nonexcludable and nonrivalrous for all stakeholders



these green infrastructures need to be initiated and sometimes provided by public actors, which can then be used by the companies that in turn invest in using these infrastructures and pay taxes to the public in return. Furthermore, a supporting network for companies, such as the Austrian government's initiative "klima:aktiv" (see p. 16) might have positive effects for sharing knowhow and raising ambition to realise common decarbonisation efforts.

### **Conclusion of the Case Studies**

Based on the analysis criteria I derived (see p. 38), no major Austrian company's reported climate strategy covered by my case studies is 100% on track towards carbon neutrality (see p. 31). There is still some room for improvement for all of the assessed reported climate strategies in order to be in line with the carbon-neutrality goals of the Paris Agreement (see p. 8), the European Green Deal (see p. 11) or the ambitious goals of the Austrian government (see p. 12). However, as I have already demonstrated, large differences exist with regards to how far the twelve reported climate strategies are away from being fully on track towards carbon-neutrality<sup>91</sup>.

Based on my analysis criteria, there is little doubt that Verbund AG's (see p. 44) and Lenzing Group's (see p. 61) reported climate strategies are close to being on track towards carbon-neutrality. Verbund AG (see p. 44) strives to decarbonise its electricity production in the long run and formulated a highly ambitious short-term emission target. Lenzing Group, committed to the target of carbon-neutrality by 2050 and set substantial mid-term targets. Moreover, both companies have already been reducing their emissions and their products arguably avoid CO<sub>2</sub> emissions (see p. 23) of their costumers. Nevertheless, there remains some room for improvement for both company's reported climate strategies. Verbund AG has not reported to have set the overall goal of carbon-neutrality for its entire company, its current reported climate strategy relies on some offsetting measures and there is no explicit pathway reported yet to eliminate the CO<sub>2</sub> emissions of its now gas-fired thermal power plants. Lenzing Group, has not yet provided a climate strategy to become carbon-neutral by 2040<sup>92</sup> in its report, did not formulate a mid-term target to reduce its absolute CO<sub>2</sub> emissions but

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<sup>91</sup> As mentioned above (see p. 38) and below (p. 119) the aspect of organisational boundaries was not considered in the case studies, as the different approaches of the companies were often too difficult to determine and would exceed the means of this master's thesis.

<sup>92</sup> Lenzing Group formulated the target to become carbon-neutral by 2050. According to the new Austrian Governments announcements of spring 2020, this target might now need to be achieved by the country even in 2040 - at least for its facilities based in Austria (see p. 12).

set an emission intensity target (see p. 30) and its reported reduction pathway relies to some extent on the use of bio-energy, which is disputed to actually be carbon-neutral (see p. 64). In this case more research is needed to assess the effect of Lenzing Group's climate strategy on its net-greenhouse gas emissions.

Based on my analysis criteria, ÖBB Holding's (see p. 84) and the BIG's (see p. 93) reported climate strategies do not seriously lag behind and can also be considered quite close to being on track towards carbon-neutrality, but these reported climate strategies do not include comprehensive emission inventories. ÖBB Holding partially mingled its reported emission data with the purchase of green electricity certificates and did not report on its Scope 3 emissions, while the BIG does not conduct a CO<sub>2</sub> emission inventory at all in their report. These facts, made it difficult to analyse the reported strategies and some uncertainty remains with regards to their climate strategies and also whether actual CO<sub>2</sub> emissions have increased or decreased in recent years. On the other hand, ÖBB Holding's services very likely avoid (see. p. 23) substantial amounts of CO<sub>2</sub> emissions of its customers. ÖBB Holding's reported climate strategy aims for carbon-neutrality by 2050<sup>93</sup> and plans to decarbonise its transportation services by 2030. Unfortunately no reasonable pathway is reported to achieve its goal of carbon-neutrality of its entire operations and Scope 3 by 2050. BIG states in its report that it strives to become fossil-free by 2025 and they commit themselves to applying highly ambitious building- and energy efficiency standards. If the BIG or the ÖBB Holding had conducted more reliable emission inventories in their reports, their reported climate-strategies could likely become examples of best practice. Moreover, both companies' reported climate strategies heavily depend on a decarbonised public infrastructure, such as zero-carbon grid electricity and district heating.

Based on my analysis criteria (see p. 38), three companies reported ambitious climate strategies, which are nevertheless clearly lagging behind: SPAR AG's (see p. 70), REWE AG's (see p. 75) and Voestalpine AG's (see p. 53) reported climate strategies set emission targets but do not aim for carbon-neutrality yet and left out to provide a pathway for tackling substantial emission sources. However, these companies reported substantial mid- or long term CO<sub>2</sub> mitigation strategies. Moreover, reported CO<sub>2</sub> emissions from REWE AG and SPAR AG have already decreased in recent years.

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<sup>93</sup> ÖBB Holding formulated the target to become carbon-neutral by 2050. According to the new Austrian Governments announcements of spring 2020, this goal might now need to be achieved by the country even by 2040 - at least for its facilities based in Austria (see p. 12).

Based on my analysis criteria (see. p. 38), the reported climate strategies of Post AG (see p. 79) and AGRANA AG (see p. 65) are currently not on track yet, as their CO<sub>2</sub> emissions are still rising and as they left out likely substantial emission sources. Post AG did not report any explicit carbon-neutrality target but formulated a short-term emission target. Moreover, its reported climate strategy relies to a large extent on offsetting practices and its emissions have risen considerably in recent years due to increasing parcel delivery. On the other hand, the two companies acknowledge their the need for changes with regards to their climate strategy in their reports and report to be committed to the goal of carbon-neutrality by 2040 (AGRANA AG) or the goals of the Paris Agreement respectively (Post AG) and are currently developing new climate strategies for achieving these goals. It will be interesting to see, whether these two companies' revised climate strategies will be on track towards carbon-neutrality.

Based on my analysis criteria (see. p. 38), three companies in my case studies, which - on top - are heavy emitters, did not report any substantial climate strategy: First, OMV AG (see p. 49) did conduct a comprehensive emission inventory considering all Scopes. Second, the company's climate strategy currently aims to transform its product portfolio from oil based fuels towards natural gas and petrochemical products, but lacks any substantial reported climate strategy for bringing its overall CO<sub>2</sub> emissions actually down. Borealis Group's (see p. 57) reported inventory left out material emission sources, its climate strategy does not to aim for carbon-neutrality and the company did not provide a transparent pathway for achieving its targets in its report. Borealis Group currently aims to develop a new climate roadmap. STRABAG SE's (see p. 89) reported climate strategy is, frankly said, negligible, as the company formulates no adequate emission targets and provides no credible pathway for decarbonising its businesses.

**Table 8: Number of climate strategies on track towards carbon-neutrality**

On track	0
Close	4
Lagging behind	3
Not on track but developing new strategies	2
Not on track	3

## 7. Limitations

First, my research (see p. 4) is based on the climate strategies which are publicly communicated by the twelve companies. Thus, my research relied on the information, which the companies provided in their annual- or sustainability reports. On some occasions I could, however, draw conclusions concerning some of the missing relevant climate-related information based on information given somewhere else in the reports. Moreover, some omissions of relevant information were rather obvious and the gap could be easily filled, requiring little knowledge about the specific sector. Whenever this was the case, I disclosed the fact in my thesis that I had relied on information that was not provided directly in the companies' reports themselves.

Second, it is not subject of this master's thesis to answer the question, whether the reported climate strategies will actually be (successfully) implemented by the twelve companies - research and the public will be needed to assess the companies' future performance.

Third, it is not within the scope of this master's thesis, to determine, why certain reported climate strategies were chosen by the companies and what the interests behind these decisions were.

Fourth, it is not subject of this master's thesis to assess and calculate in detail, whether the measures, the companies report to take, are technically feasible. I cannot - for example - determine to which extent Voestalpine AG's electric arc furnace technology (see p. 55) may reduce CO<sub>2</sub> emissions exactly and where the limitations of this technology lie.

Fifth, it would go beyond the scope of this master's theses to determine for each of the twelve companies' reports, whether the companies' reported climate strategies go at all beyond the requirements that current legislation imposes on them anyways. For example, I do not assess whether SPAR AG's or REWE AG's reported activities to reduce HFC refrigerants (see p. 73 and p. 77) do simply fulfil existing legal requirements (see p. 7-13), or whether their reported climate strategies go beyond that.

Sixth, one has to consider that my twelve case studies are no comprehensive stock-taking, covering all companies contributing to Austria's CO<sub>2</sub> emissions. However, I based my sampling of the twelve case studies on careful and reasoned selection in order to get meaningful and representative results.

Seventh, as mentioned above (see p. 38), although organisational boundaries (see p. 18-19) are a relevant aspect of emission inventories, they are not included in this master's thesis, since this would exceed the means of this master's thesis.

## 8. Conclusion

Climate change is one of the defining issues of my generation and maybe also the generations to come, with potential large scale consequences on the earth's systems and thus on human civilisation. In order to limit the impact, society must radically and swiftly reduce greenhouse gas emissions to zero.

I demonstrated in this master's thesis that - after an all too long time - ambitious and far reaching policies were passed on an international and national level: starting with the goals of the Paris Agreement in 2015, which subsequently led to the announcement of the European Green Deal and finally to the Austrian government's commitment to make Austria climate-neutral by 2040. I analysed, how ever more stringent laws and policies, increasingly influence the corporate sector and how voluntary initiatives evolved in order to design international standards and raise climate ambition among companies. I demonstrated that, although there is currently no law in place that obliges companies to reduce their CO<sub>2</sub> emissions to zero, companies are well advised to develop adequate climate strategies to achieve carbon-neutrality until 2050, or with regards to Austria by 2040 so that countries will be able to meet their ambitious reduction goals.

In this master's thesis, I discussed how to account CO<sub>2</sub> for corporate emission inventories, how to set emission targets and how to define reduction pathways. Based on this discussion, I derived analysis criteria which I applied in my case studies in order to assess the companies' reported climate strategies. I developed my analysis criteria on the basis of a review of official documents, voluntary standards and current scientific research. These criteria include a comprehensive emission inventory, adequate targets, no offsetting and end-of-pipe technologies, and they consider a company's avoided and decreasing emissions. I assessed the twelve climate strategies, as they are provided in the companies' annual and sustainability reports that were available in March 2020. By conducting the case studies, I answered my research questions, which climate strategies major Austrian companies report to follow and whether these

reported strategies are on track to achieve this goal. In 2019, the twelve companies covered by my case studies represented all major emitting sectors of Austria, i.e. energy, heavy industry, transport, retail, buildings, agriculture and forestry. More specifically, I looked at OMV AG, Verbund AG, Voestalpine AG, Borealis Group, Lenzing Group, AGRANA AG, SPAR AG, REWE AG, Post AG, ÖBB Holding, STRABAG SE and BIG. Most of these companies are Austrian based multinationals, which are in particular active in Central-, Eastern-, and South-Eastern Europe, but also beyond. In 2019, these twelve companies combined employed more than 414.000 people and emitted, at the very least, more than twice the annual territorial CO<sub>2</sub> emissions of Austria.

Based on my analysis criteria, it turned out, that none of the twelve Austrian companies has communicated a climate strategy in their reports, which is fully on track towards the goal of carbon-neutrality, yet - in particular not by the year 2040, which is the declared goal of the Austrian government. However, enormous differences exist with regards to the twelve companies' ambition. By applying my analysis criteria, I derived that four companies have already reported ambitious strategies, which are close to being on track towards carbon-neutrality, i.e. Verbund AG, Lenzing Group, ÖBB Holding and BIG. Following my criteria, three companies have already reported relatively ambitious climate strategies but, all in all, they are lagging behind considerably, i.e. Voestalpine AG, REWE AG and SPAR AG. Two companies' reported climate strategies are not on track, but or are planning to issue strategies towards carbon-neutrality soon, i.e. AGRANA AG and Post AG. Based on my analysis criteria, three companies do not report any substantial climate strategy towards carbon-neutrality, i.e. OMV AG, Borealis Group and STRABAG SE. All twelve companies' reported climate strategies build on the deployment of lower- or zero carbon technologies in one way or another and comparably little on offsetting practices. It will be interesting to see, whether the companies - especially those, which had at the time of writing of this master's thesis issued their latest reports before 2020 - will make adaptations to their climate strategies in their upcoming reports, taking into account the recent political climate-related announcements, such as the European Green Deal and the Austrian government's agreement, as these had not been in place at the time of the issuing of these reports.

Based on the findings I derived from my case studies, I also formulated recommendations for supporting companies' in becoming carbon-neutral. First, the goal of carbon-neutrality itself has to be defined, as the term leaves too much room for interpretation. Secondly, national as well as corporate CO<sub>2</sub> emissions inventories and mitigation activities should include substantial value chain emissions as well, as this would provide a more realistic picture, particularly before the background of emission

intensive (global) supply chains. Thirdly, a decarbonised public infrastructure, such as a clean electrical grid and transport infrastructure, is indispensable for most companies in order to become carbon neutral - this includes the availability and affordability of zero-carbon technologies. Finally, I would recommend, making comprehensive and standardised climate-related reporting mandatory for all large companies within the European Union or, as a first step, for all companies that are headquartered in Austria, in order to enhance transparency and comparability and provide a level playing field for all large companies.

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## Annex

### Absolute CO<sub>2</sub> emissions in million tonnes as disclosed by the companies in their latest report\*

	Scope 1	Scope 2	Scope 3	disclosed in
<b>Verbund AG</b>	1,07	0,39	0,36	Verbund, 2019
<b>OMV AG</b>	10,6	0,4	126	OMV, 2019a
<b>Voestalpine AG</b>	12,7	0,8	10,3	Voestalpine, 2019
<b>Borealis Group</b>	4,63	-	-	Borealis, 2019
<b>Lenzing Group</b>	1,1	0,63	**	Lenzing, 2019
<b>AGRANA AG</b>	0,93		-	AGRANA, 2019/2020
<b>SPAR AG</b>	0,21	0,15	-	SPAR, 2018
<b>REWE AG</b>	0,17	0,12	0,03	REWE, 2018
<b>Post AG</b>	0,05	0,02	0,03	Post, 2019
<b>ÖBB Holding</b>	0,37		-	ÖBB, 2019a
<b>STRABAG SE</b>	0,83	0,18	-	STRABAG, 2019
<b>BIG</b>	-	-	-	BIG, 2019a

\*This chart only depicts the amount of CO<sub>2</sub> emissions that the companies themselves disclosed in their reports. The comparability of these figures, as depicted in this chart, is highly limited, as the applied carbon accounting methods vary between the companies (e.g. regarding the organisational, operational and territorial boundaries). For a detailed analysis of the respective accounting methods and interpretation of these figures, refer to the respective case studies (see. p. 44-97).

\*\* only disclosed in percent: i.e. 51% of total emissions.