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The Coal – Climate Paradox of Finance: An Assessment of Climate-Relevant Equity Holdings and of Climate Finance by Switzerland and Swiss Financial Actors

GEO 511 Master's Thesis

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Foreword and Acknowledgements

This thesis is the result of a long journey that began in October 2019 with the search for supervisors. Now, it ends in December 2020 with the submission of this thesis which was written as part of my studies in human geography at the University of Zurich. As was my great wish, I was able to spend nearly the whole of 2020 working on an incredibly exciting topic, the transition of society to a low-carbon economy. It was incredibly fun to deal with this topic and I am sure that it will stay with me for a long time to come. I have been able to get deeply involved in this transition and with this thesis, I hope to have contributed in some small way to making the world a little better.

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I hope you enjoy reading my Master's thesis and I look forward to any feedback you may have.

Basil S. Gallmann

Structured Abstract

Problem Statement	To achieve the Paris Agreement, efforts are needed in a wide range of areas to limit global warming to 1.5°C to pre-industrial levels. An area of particular interest is the energy sector as it currently is a major threat to the global climate due to its high GHG emissions. A transition must take place in which as much energy as possible is produced sustainably and as little fossil fuels as possible are burned. But financial actors still invest heavily in thermal coal and thus it is still used as an energy source. Concurrently, mitigation and adaptation efforts are taken up by more developed countries, trying to minimize the impact of climate change, revealing a potential paradox between financing both thermal coal and climate finance efforts by the same countries. In this process, the role of Switzerland is examined more closely.
Purpose of this Master's Thesis	The aim of this thesis is to examine how high the investments of Swiss financial actors in thermal coal are and to elaborate on the reasons for this. In addition, a comparison to ongoing climate finance payments is necessary to show the Swiss contribution to the conservation or destruction of nature, demonstrating the current paradox of finance. In addition, renewable energies as substitutes are highlighted and potential solutions to the situation of the financing sector are discussed.
Research Question	*How much mitigation and adaptation measures would the climate finance funds of Swiss financial actors have to enable to compensate for the current investments in coal-fired power plants?*
Theoretical Framework	Various theoretical frameworks are used. The list includes, but is not restricted to: Equity Principles, Stranded Assets Theory, Financialization of Nature
Methodology	Building on a multifaceted literature, a mixed method research (MMR) approach is applied: A new quantitative approach is developed to quantify investments in thermal coal. This is based on the *Total Carbon Emissions* methodology introduced by the TCFD (2017b). The results are then put into context through qualitative interviews with industry experts which were analysed with a qualitative content analysis according to Schreier (2012, 2013) & Mayring (2010, 2014).
Main Findings	Switzerland would have to increase its payments to the GCF by 7 to 9 % p.a. to offset the emissions caused by Swiss investments in thermal coal alone. Furthermore, various reasonings of the financial industry for continued investment in coal are identified, but also reasons for the lack of investment in substitutes, so in renewable energies. Thus, it becomes clear that although a certain change is in sight regarding the integration of environmental risks in investment decisions and problem-solving approaches are within reach, the Swiss financial centre still has difficulties with investments in thermal coal and its limited sustainability considerations.

Content

Abbreviations

CCUS	Carbon Capture, Utilisation, and Storage
CO_2	Carbon Dioxide
COP	Conference of the Parties
CSPP	Coal Share of Power Production
ES	Ecosystem Services
ESG	Environmental, Social & Corporate Governance
ETS	Emission Trading System
EU	European Union
FDFA	Federal Department of Foreign Affairs
FOAG	Federal Office for Agriculture
FDI	Foreign Direct Investment
FOEN	Federal Office for the Environment
GCF	Green Climate Fund
GEF	Global Environment Facility
GDP	Gross Domestic Product
IFI	International Financial Institution
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
LDC	Least Developed Country
MDB	Multilateral Development Bank
MMR	Mixed Method Research
NDC	Nationally Determined Contributions
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
OECD-DAC	OECD Development Assistance Committee
PACTA	Paris Agreement Capital Transition Assessment
PV	Photovoltaic
SDC	Swiss Agency for Development and Cooperation
SDGs	Sustainable Development Goals
SECO	State Secretariat for Economic Affairs
SIDS	Small Island Developing States
SSA	Sub-Saharan Africa
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change

Figures, Maps, Tables & Equations

1 Introduction

Calls for action against global warming have been around for a long time (e.g. IPCC 1990), but multilateral agreements to limit temperature rise and other consequences of increased greenhouse gas emissions had enormous difficulties to include all parties across the world in the last decades. With the Paris Agreement launched in 2015 (UNFCCC 2015), there was real hope that this would change and climate change would finally be tackled. As of November 2020, the Paris Agreement counts 194 signatories and 189 parties that have ratified the agreement (UN 2020a). The ratification of the Paris Agreement holds the countries accountable to limit their emissions of greenhouse gases so that the increase in global average temperature is not exceeding 2°Celsius above preindustrial levels. In addition, efforts are to be pursued to limit the temperature increase to 1.5°Celsius above preindustrial levels (see Article 2.1c in UNFCCC 2015). Despite these targets, set CO_2 emissions have continued to rise, with energy production using thermal coal accounting for an important share of these emissions, without a steep global decline in thermal coal consumption in sight (see IEA 2020a; IEA 2020b).

Especially the sectors where emissions are mainly based in should see a massive cut in emissions, one of them being the energy sector. Countries and their governments should therefore be keen to reform their energy supply to be in accord with the Paris Agreement. But this is not the case with many countries. They even change their energy mix in a way which contradicts these stated efforts: New power plants using thermal coal are being built. And as it is the most polluting energy production technology currently commercially available (Schlömer et al. 2014), this has huge impacts on the emissions of these states. Countries where such new coal-fired power plants are currently under construction include Vietnam, Bangladesh, Egypt, Turkey, and Indonesia (Global Energy Monitor 2020). Investors for these power plants come from all over the world, especially from more developed countries, which themselves pledged for a more sustainable world. This includes actors in the financial sector from the USA, Canada, China, the EU, and Switzerland (RAN et al. 2020). This stays in stark contrast not only to the Paris Agreement, but also to their increased efforts in mitigation and adaptation efforts of these countries since every additional coal-fired power plant takes humanity further away from the 1.5°Celsius target. It therefore is not surprising that fossil fuel investments are still threefold in contrast to the investments in renewable energy sources (Buchner et al. 2019: 19), indicating that a change of heart is necessary and further efforts financing mitigation and adaption measures are needed.

In contrast, instead of limiting climate-damaging investments, there are other ways to stop climate change, for example by promoting climate-friendly activities more strongly. National governments could achieve this in various ways, which would then also bring the goals of the Paris Agreement closer. For example, environmental-friendly ways of life of their citizens could be encouraged and subsidised. Moreover, these countries could also make investments to lessen climate change or even to reduce the effects of climate change. For this, every country has defined nationally determined contributions (NDCs). In addition to these national commitments, transboundary action is also possible: Countries

could support other countries in their efforts by financing projects to support mitigation and adaptation measures addressing climate change to reach the global goal of reducing emissions and increased resilience against climate change. This is also stated in the Paris Agreement: More developed countries are encouraged to support less developed countries with adaption and mitigation measures against climate change (see Article 9 in UNFCCC 2015). However, a distinction must be made between conditional and unconditional objectives, especially when looking at lower developed countries. The unconditional targets are voluntary and should be implemented by each country itself, so without international aid. In addition, there are more ambitious targets, which are conditional on payments or on supporting climate-related legislation from other, more developed countries (Strand 2017: 1f). This local-national or transnational financing, drawn from public, private and alternative sources of financing, seeking to support mitigation as well as adaption actions for addressing climate change, is called climate finance (Padraig et al. 2018; UNFCCC 2020). These efforts are really needed to limit the effects of climate change. It is therefore gratifying that the quantity of climate finance showed an increase over the past five years (Buchner et al. 2019: 19).

Around the financing of climate-friendly or climate-damaging investments, Switzerland with its prominent financial sector plays a decisive role in this issue, as its two biggest banks UBS and Credit Suisse invested USD$109.366 Bn. over the last four years in fossil fuels (RAN et al. 2020: 8f). At the same time, the Swiss government has set a goal regarding financing mitigation and adaptation measures with a funding target of USD$450 to USD$600 Mn. p.a. from 2020 onwards (Federal Council 2017). This reveals a certain paradox: On the one hand, energy production through coal is still being diligently promoted and financed, and on the other hand, financial resources are being raised to combat the effects of climate change. In this thesis, this contradiction is examined in more detail. In particular, the role of Switzerland will be examined more closely.

1.1 Aim of the Thesis & Research Question

The goal of this Master's thesis is to contrast the investments in coal-fired power plants of Swiss financial players with investments in climate finance. Within the framework of climate finance, investments in renewable energies, a potential substitute of thermal coal, are emphasized to highlight the contrast with investments in thermal coal. Thus, a cross-thematic overview of the paradox in the world of finance is presented. All main players in the Swiss financial sector are set to be included to analyse data of as many actors as possible. This includes private and public actors as only in this way a comprehensive overview possible. By analysing the financial flows, the following research question is answered:

"How much mitigation and adaptation measures would the climate finance funds of Swiss financial actors have to enable to compensate for the current investments in coal-fired power plants?"

Thus, answering this research question will reveal how strong the imbalance between climate-friendly and climate-damaging investments by Swiss financial actors really is and what impact this has. It is expected that Swiss investments in coal-fired power plants exceed those of climate finance.

Consequently, a clearly negative environmental impact of the Swiss financial centre is expected, insofar as this analysis "only" examines investments in thermal coal and not in other environmentally harmful fossil energies. However, the aim of this thesis is not to highlight global injustices between different countries and thus the possible need for action in less developed countries, but rather to show the role played by Switzerland and its financial players in the global fight against climate change. In addition, the aim is to make complex interrelationships more transparent as well as the extent of these financial flows. Thus, it is shown where the money goes to and what it is used for. The aim is not to make a final judgement on the role of individual lower developed countries, as this would require other factors to be considered. Rather, the aim should be to shed light on the current situation and state of the Swiss financial centre.

1.2 Structure

This thesis is structured as follows: First, current state of research is displayed, and the theoretical basis is laid in chapter 2. There, the risks of climate change are explained and how these changes affect the planet, the human population, and ultimately the financial world. Afterwards, we take a deep dive into one of the most polluting industries, the thermal coal sector. It is shown how it functions and it operates. Its interactions with climate change are discussed as well as the risks investors face when investing in coal as an energy source. These risks are divided into three groups: physical, transition, and liability risks. This is accompanied with a subchapter on the challenges of a coal phase-out. Subsequently, points that exacerbate the pathway to a low-carbon economy are highlighted where climate finance and investments in renewable energy are at the centre. In this context, renewable energies play a major role as they are an alternative investment option to thermal coal. For investments in thermal coal as well as climate finance, the role of Switzerland is particularly emphasized. A philosophical examination of the valuation of nature is also particularly helpful in its evaluation, critically reflecting the interaction of the financial world with components of our natural environment. This is followed by chapter 3, where the research design is described and critically reflected, the mixed method research is introduced, and the research gap is defined. In chapter 4 and 5, the actual research work of this thesis is carried out: First, in a quantitative analysis, the equity holdings of Swiss financial actors in thermal coal are assessed and also put into context with mitigation and adaptation measures carried out by the Green Climate Fund (GCF). This shows the amount of pollution which Switzerland and its financial actors are responsible for through their investments in thermal coal. In addition, it is shown what amount of investments in climate finance would be necessary to compensate for these emissions. Its findings are put into context with a qualitative analysis: Interviews with stakeholders from the financial industry are conducted so that the reasons for the actions of Switzerland and its financial actors can be better understood. This highlights the current situation why coal is still used as an energy source and what the underlying problems of the transition to a low-carbon future are. This will be concluded by a critical examination in chapter 6, where the findings of the two analyses are combined where the current situation will be critically examined.

Subsequently, potential approaches for solving the problem from the literature are highlighted and critically discussed. The conclusion in chapter 7 then rounds off this thesis.

2 State of Research & Theoretical Basis

Academic research around investments in fossil fuels and particularly in thermal coal is ubiquitous as public debates about climate change and its effects have increased in recent years. The reasons are the climate movement and its mobilization since the UNFCCC summit in Copenhagen in 2009 (see e.g. BBC 2009). In addition, climate finance and its effects are also being increasingly highlighted. However, a linkage of these two topics is rather rare. Existing work on these connections is briefly presented here.

The main academic debate linking climate finance and investments in fossil fuels together is the discussion around the term *net climate finance*, developed by the Rocky Mountain Institute (RMI). The RMI is an independent nonpartisan non-profit organisation, engaged in accelerating the adoption of market-based solutions that make the shift from fossil fuels to efficiency and renewable energy sources as cost-effectively as possible (RMI 2020a). They define the term *net climate finance* as "*the value of climate finance flows minus financial flows to high-emissions and maladaptive activities"* (RMI 2020b). Within the last ten years, the commitment of institutions and initiatives for climate finance payments around the world grew strongly. However, supporting climate-friendly investments only reflects one part of sustainable investment practices: On the other hand, climate-damaging investments should also be minimized in order to be in accord with the Paris Agreement as well as with the transition to a low-carbon economy (RMI 2020b). This makes it imperative linking climate-friendly and climate-damaging investments together. Bodnar et al. (2017) also underline that it should not be forgotten that scaling down financial flows to fossil energy finance or other high-emissions or maladaptive activities is as important as scaling up climate finance payments to meet Article 2.1c of the Paris Agreement (*"making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development"* in UNFCCC 2015). They also find that net climate finance is in the red by almost any measure. Therefore, investments, not only by private institutions but also by public financial actors, point in the wrong direction regarding climate-friendliness (Bodnar et al. 2017). This is also being picked up by other actors, for example the Climate Policy Initiative (CPI), linking climate finance and investments in fossil fuels together. They find that any new finance activities regarding fossil fuels increases the risk of falling even further behind the goals of the Paris Agreement. It is therefore imperative that financial actors should seek full alignment with the Paris Agreement, across all their operations, independently if they contribute in a positive or negative way to *net climate finance* (Buchner et al. 2019).

However, the term of net climate finance is not widespread, as most academic research either focus on (higher) climate finance payments (e.g. Staudenmann 2019, Yeo 2019) or on its mobilization in the private sector (e.g. Stadelmann & Michaelowa 2013), as well as on how to track climate finance (e.g. Clapp et al. 2012, Buchner et al. 2011). For Switzerland in particular, it was found that (i), payments of

certain countries, including Switzerland, are way too low (Staudenmann 2019), and (ii) mobilization and tracking climate finance is quite difficult (SECO, FOEN & SDC 2019).

This is also due to a lack of framework conditions: In Switzerland, only limited direct obligations for the financial sector regarding climate risks are legally binding: As of December 2020, Swiss financial actors cannot be legally held accountable for the impact of their investments on their climate. They are only obliged to assess climate risks under their due diligence (Eggen & Stengel 2019).

Thus, it is no surprise that research around net climate finance, linking investments in fossil fuels and payments in climate finance together, is non-existent for the example of Switzerland. This gap is intended to be (partly) closed with this thesis. Also, an in-depth examination of the geographic distribution of Swiss investments in thermal coal is non-existent, which will be provided in this thesis. In addition, this thesis introduces another method of monetary accounting for investments and their emissions, which differs from the methodologies of other actors and shows a different point of view (see Greenpeace 2020a, Spuler et al. 2020). With this, it can be calculated which emissions the Swiss financial sector is responsible for and which mitigation measures are necessary. This thesis underlines the existing literature in the calls for greater climate alignment of the financial sector and substantially expands the line of argumentation, also with the developed context through discussions with sector representatives.

This chapter presents a theoretical basis according to the **CARS** model (**C**reate **A R**esearch **S**pace) (see Swales 1990). Thus, different fields of research are shown and what conclusions scholars come to. These are used to show the research gap as well as the need for a precise illumination of this problem. This is structured as follows: First, climate change and its effects on the global economy are addressed. This is followed by a deeper examination of one of the major drivers of climate change, namely the energy sector, and thermal coal in particular. First, the physical and chemical properties of thermal coal are presented in detail, followed by the coal business, its risks, and ongoing problems with the phase out. This is followed by a discussion of the problems of mitigation and adaptation measures against climate change. Special attention is paid to the financing of renewable energies as a counterpart. Thus, the thesis first presents the current situation, followed by the target situation. Afterwards, Switzerland's current state and efforts regarding climate finance is examined in more detail. The final subchapter is a critical examination of the philosophical dilemma of mixing nature and finance to question previous chapters. This forms a comprehensive picture and thus, the research gap of this thesis becomes apparent.

2.1 Climate Risks

2.1.1 Current State of Climate Change Science

Global-scale observations about the climate have started nearly 200 years ago in the 19th century for temperature and other variables. Together with paleoclimate reconstructions, these records provide a comprehensive view of long-term changes in nature and its variability over the years. These findings show that the warming of the earth’s climate system is unequivocal. Observed changes since the 1950s are unprecedented over decades, and even millennia. The atmosphere and earth’s water bodies have

warmed, snow and ice cover have diminished, and the concentrations of greenhouse gases have increased (IPCC 2018; The Economist Intelligence Unit 2015: 13). The atmosphere's temperature is rising steadily, and it is virtually certain that globally, the troposphere has warmed since the mid-20th century. This leads to an increased number of weather events, such as warmer and/or fewer cold days and nights over most land areas, the increase of intensity and/or duration of droughts, and increased numbers of intense precipitation events (IPCC 2018). At the same time, permafrost temperatures have increased in most regions of the world. Carbon dioxide concentrations, in comparison to pre-industrial times, have increased by 40% which is primarily retraceable to fossil fuel emissions (IPCC 2018).

The driver of these changes of the earth's climate is the positive total radiative forcing which has led to an uptake of energy by the climate system. And *"the largest contribution to total radiative forcing is caused by the increase in the atmospheric concentration of CO_2 since 1750"* (IPCC 2013:13). While other greenhouse gases, such as methane or halo-carbons, also have a positive effect on this change, CO_2 remains by far the main driver of radiative forcing. Human influence on the climate system is therefore not in question anymore as its effect can be proven by linking together the increasing emissions of greenhouse gases and their concentrations, positive radiative forcing, and the observed warming of the earth in combination with the understanding of the climate system (IPCC 2013: 14f; Cook et al. 2016). The continuation of emitting greenhouse gases to the atmosphere will cause further warming and changes in all parts of the climate system. This is also quite unevenly distributed across the globe, leading to effects that are difficult to cope with due to their complexity (Tang et al. 2017). Also, precipitation patterns will change between wet and dry regions, where the resulting effects cannot be predicted for sure (IPCC 2013: 19f). If the described climate change wants to be stopped, a substantial decrease of the emissions of greenhouse gases is needed. The described effects will persist for many centuries, even if emissions of CO_2 are stopped, since emissions decompose only slowly. This shows a substantial linkage between commitments of decreasing CO_2 emissions with our past, present, and future regarding climate change (IPCC 2018: 6). It therefore is needed, as we have already reached a warming of 1°C (IPCC 2018), that decarbonisation of our current society is being accelerated to tackle climate change. As energy systems are the focus of this thesis, the decarbonisation of the energy sector will be discussed more deeply in further chapters.

2.1.2 Impact of Climate Change on the Global Economy

The changing of the environment has implications on how we live, how we interact and how we do business. Since some factors that were stable several decades ago are now fluctuating, decreasing or increasing over time, doing business has become more uncertain in recent decades. The amount of factors that have to be considered for a business decision is rising drastically for various sectors. Specifically, the asset management industry possibly faces significant losses that result from the effects of climate change through physical damages (The Economist Intelligence Unit 2015: 4).

These losses are avoidable if mitigation and adaption measures against climate change are taken soon. But asset managers may struggle to act against climate change as these losses are primarily on the

macroeconomic level. This potentially leads to a certain unwillingness of some actors to address these issues. The globalized nature and interconnectedness of the problem will likely lead to reduced returns even though individual investments will not be damaged physically. Asset managers will face challenges diversifying against these risks. This also requires government action: Impacts of climate change, at least for moderate levels, will probably concentrate in sectors of the economy that are sensitive to weather events, which includes energy, forestry, and agriculture. These sectors are interconnected with the whole economy through value chains, which will ultimately have lasting effects on the whole economy. Since these risks are expected to be more severe the higher the temperature rises due to climate change, climate change must be considered as a systemic risk. This risk could result in weaker growth and/or lower asset returns affecting the entire market (The Economist Intelligence Unit 2015: 11f). And unsurprisingly, these losses are expected to be higher with a warming of 5° or 6°Celsius. The Stern Review outlined that *"benefits of strong and early action far outweigh the economic costs of not acting"* (Stern 2007: vi). Also, overall GDP loss p.a. due to climate change is expected to be at least 5%. This damage could even expand to 20% if a wider range of risks and impacts is considered. Action is costly, coming in at around 1% of global GDP p.a., but outweighs the costs to pay for risks by far. While there is still time to avoid the worst impacts, action needs to be taken as soon as possible (Stern 2007).

More specifically, climate change can increase defaults that will also trigger adverse effects on bank leverage and could cause an asset price deflation process. The growth-reducing effects of climate change are reinforced by the climate-induced financial stability. This also has an effect on public actors: Battiston & Monasterolo (2018) show that central banks' portfolios could be at risk as these portfolios are quite heavy on carbon-intensive economic sectors. In addition, central banks mostly perceive climate-related risks from the perspective of financial stability (Schoenmaker 2019), which could be a danger to economic stability. And although there are potential solutions available, for example the quantitative easing (QE) approach by Dafermos et al. (2018) or the introduction of a low-carbon collateral by Schoenmaker (2019), it is visible that climate change has various impacts not only on the private sector but also on public actors, which makes countermeasures absolutely necessary to prevent these losses.

Additionally, the displacement of millions of people is triggered and reinforced by sea level rise, increased frequency of severe storms and flooding, and results in increased migration flows that can potentially have severe effects on the global economy (Piguet et al. 2011). In addition, increased problems with food security are occurring as nature is changing, making the food production more difficult (Mbow et al. 2019). This is just a limited list of effect of climate change on the human population. It is visible that there is a lot at risk if climate change mitigation and adaptation measures are not taken seriously. The financial market will potentially not react timely since these risks are only expected to happen in the far future (although some small effects can already be observed today). As traditional horizons in the economy are much more short-sighted, such as the business and political cycles as well as the horizon for technocratic authorities, they do not have a direct incentive to fix problems that will only affect future generations. Mark Carney denoted this as the Tragedy of the Horizon: *"Once climate change becomes*

a defining issue for financial stability, it may already be too late" (Carney 2015: 3). Incentives to incorporate these risks already in business strategies today must be provided as effects of climate change will emerge sooner or later. At least for Switzerland, these developments finally caught up in recent years, at least in some parts of the Swiss financial sector, as the amount of sustainable investments in Switzerland rose by double-digit numbers (62%) from 2018 to 2019. Also, it is expected that this market will grow significantly over the next years as well (Dettwiler et al. 2020). Nevertheless, there is still much to be done to mitigate the enormous negative effects of the climate on the economy and vice versa.

This illustrates the macroeconomic impacts climate change will have. And while the "call for action" of the Stern Review is nearly 15 years old, public policy finally starts to acknowledge the problem in recent years, as seen with the Sustainable Development Goals and the Paris Agreement in 2015. And Switzerland will have to play an important role in this issue. However, there are still a lot of investments being done in fossil fuels, including thermal coal. As it is one of the most prominent and most polluting resources, investments in thermal coal pose significant risks for the investors. Details are outlined below.

2.2 Thermal Coal

This chapter takes a closer look at thermal coal. First, the different types of coal and their usages are discussed in more detail, also showing why the focus of this thesis is on thermal coal. Afterwards, the current situation of mining and use of thermal coal around the world is explained.

2.2.1 Thermal Coal Explained

There are a variety of different types of coal which are internationally standardized. These can be categorized in various groups (see ISO 2020). Most importantly, it must be distinguished between thermal coal and metallurgical coal. This classification is generally based on the different chemical compositions which ultimately defines the optimal use of the commodity (Baker 2013). While metallurgical coal is mostly used for steel production (see WCA 2020), thermal coal is primarily used for generating heat and energy. These different options for use lead to a clear distinction between these two commodities, as they supply entirely different industries. They have very different volume trajectories going forward and they have different values on the commodity market where prices of both assets are not necessarily tied together (Buckley & Nicholas 2019).

It is expected that the use of thermal coal as an energy source will be declining until 2050 as renewable alternatives are expected to replace thermal coal. But metallurgical coal will presumably be used much longer, as there is no real alternative. For Australia, for example, Buckley & Nicholas (2019) conclude that no technology is commercialized enough to take its place as an important component for steel production, yet. But its usage is highly questioned as reproaches are made loud that the expansive usage of metallurgical coal is hindering the development of commercially viable and cleaner alternatives for steel production (Greenpeace 2017: 3). Metallurgical coal is certainly not to be neglected when looking at CO_2 emissions, as on average, the emissions from burning one tonne of either thermal or metallurgical coal is the same, producing around 2.5 tonnes of CO_2 (Greenpeace 2017: 5). Steel production therefore

plays a crucial role for the transition to a low carbon future, as the construction of our surroundings is a central part of modern society (Worldsteel Association 2015). However, the energy sector is the largest contributor to global greenhouse gas emissions (GHG) and thus the most important sector to achieve the goals of the Paris Agreement. This means that the decline in use of thermal coal is more crucial and urgent than other types of coal to limit global warming to well below 2°Celsius (Truckner et al. 2014: 516), as effects of substitution would be far greater. This conclusion is also reached by Thomä et al. (2017) in the PACTA report from 2017. The authors stated that coal power has an alternative, whereas steel production has not (Thomä et al. 2017: 18). This ultimately means that it is easier to substitute emitters with alternatives and these should therefore be made a priority as a considerable amount of reduction of emissions can be achieved in a single sector. This approach is followed throughout this thesis, so that only investments of Swiss financial actors in companies that can be associated with thermal coal, are analysed.

2.2.2 Development & Current Situation

Thermal coal is still widely used as an energy source around the world. Although its global share in primary energy fell to its lowest level in 16 years, it is still quite high, making up more than a quarter of global primary energy (27%) (BP 2020). Shearer et al. (2020) report that for the fourth year in a row, coal saw a decline in its most leading indicators, such as start of construction or amount of capacity for construction. But although the decline in coal plant development, the total number of coal-fired power plants grew again in 2019, mostly because of an increase in plants going into operation in China. World coal production increased by 3.3% in 2019 (IEA 2020), with global coal-fired power plants now operating during only around half of their available operating hours (Shearer et al. 2020: 3). While members of the Organization for Economic Co-operation and Development (OECD) are turning their backs to coal as their coal power capacity has been declining since 2011, there are other regions trying to meet their energy demands with thermal coal. Japan, China, and India are still leading actors (Shearer et al. 2020: 4), but Turkey, Vietnam, Indonesia, and Bangladesh also have considerable capacity in pre-construction development (Shearer et al. 2020: 8). This geographical shift in coal power production has existed for several decades: In 1971, the OECD countries were responsible for 56.6% of global thermal coal production. This percentage has fallen to only 22.0% in 2018 (IEA 2020: 4). This is also shown with the global energy related CO_2 emissions: In the last 30 years, the emissions of more developed countries stayed the same, while the emissions of the less developed countries more than doubled (IEA 2020b). Countries that had a low capacity so far are increasing their production, illustrating a "renaissance" of thermal coal in less developed countries. Since the increases in coal power production in certain regions offset the efforts in other regions to phase out coal, the door to the well below 2°Celsius target of the Paris Agreement is closing progressively. But it would be premature to solely blame less developed countries for this development. Like many other sectors, the coal business has become highly globalized in the last few decades. This is evident through the enormous financial flows through which these power plants are financed (see EndCoal 2020). Action needs to be taken quickly, since current

power generation put in place all over the world is far exceeding the Paris Agreement benchmarks. Thus, plans on reducing coal dependency and building up alternatives are urgent (Ganti 2020).

2.3 Climate Change-Related Financial Risks of Thermal Coal

The mining industry, including coal extraction companies and its linked industries, will phase increasing physical challenges due to climate change, manifesting, for example, through increased intensity and/or frequency of hazards. This includes heavy precipitation, droughts, and heats. As big parts of the industry are operating in inhospitable conditions, climate change is a serious threat to coal mining and coal power production. In addition, it is expected that the mining sector will also face pressure from other actors, be it governments, investors, or society. Since the mining industry is currently responsible for four to seven percent of greenhouse-gas (GHG) emissions directly (scopes 1 & 2) and for 28 percent through indirect emissions (scope 3) (Delevingne et al. 2020: 2), policy changes regarding the reduction of CO_2 emissions should be considered as likely and could have lasting effects on the industry.

Climate change-related risks of the mining industry and its investors are diverse. These risks affecting operators in the mining industry as well as their investors alike, as both potentially face costs and economic losses because of climate change. This chapter introduces these risks and divides them into physical, transition and liability risks. In addition, psychological aspects and problems with the coal phase-out are included to highlight other potential risks to investors and operators.

2.3.1 Physical Risks

Physical Risks include all potential economic losses from natural disasters which can be either driven by events (acute) or by long-term shifts (chronic) in the pattern of the climate (TCFD 2017a). And in recent years, these events are all over the news. For example, 2019 has been a year of climate disaster: The year started with a record-breaking heatwave in southern Australia, where around 3% of the state of Tasmania burned down due to a long-term trend of less rainfall. At the same time, North America was freezing because of a disruption of the polar vortex which is potentially linked to the warming of Arctic waters. Spring was filled with the reporting of cyclones around South(east) Asia and North America and flooding in Iran, amongst other places. The summer of 2019 broke various temperature records, for example in France with the highest ever recorded temperature of 45.9°Celsius. North America was also heating up where the heat caused several bush fires. In the fall, Japan was hit by the costliest Pacific typhoon in recorded history. Another Cyclone displaced millions again in South Asia and Eastern Africa. Finally, the year ended with devastating bush fires in Australia (Goldrick 2019). And the impacts of such events are enormous: Natural disasters were responsible for a total economic loss of USD$155 Bn. and a total of 9800 deaths in 2018 alone. These numbers show how big the impact of such events is on the economy and the human population (Swiss Re Institute 2019: 3). Although economic losses and number of victims fluctuated heavily during the last 50 years and do not show a significant trend upwards (Bevere et al. 2019), a big increase in both coefficients can be expected as the frequency and/or the intensity of such natural disasters is expected to increase a lot in the forthcoming decades.

More and more investors are concerned about these physical risks of their investments. However, their mitigation is quite complicated. As poor corporate disclosure makes it difficult even for investors to exactly know where physical locations of the companies are (Weber et al. 2017), they cannot certainly say which amount of physical risks their portfolio is exposed to. Most importantly, the knowledge in the finance industry about climate change is missing to some extent, so that vulnerability of corporate production or retail sites cannot be measured effectively by the investors themselves. This is especially the case as various sectors react differently to the different types of climate risk. For example, while energy and water intensive industries are more directly affected by extreme heat and water scarcity, other sectors, such as construction or tourism, will be far more affected by daily weather fluctuations (Lewis & Birt 2017: 3). This knowledge gap is being closed now, most importantly by insurance companies where physical risks always played a role. This is also taking place in Switzerland, as the re-assessment of portfolios and the market around more sustainable investments is recording high growth rates (see Dettwiler et al. 2020). However, such investments still account for rather a small share of the total market.

Thus, investors should be clear about the impact of climate change on individual sectors. Some sectors are influenced by climate change by a larger extent than others. One of sectors influenced to a higher degree by climate change is the mining industry, ultimately including the coal sector: As the mining industry is deeply linked with nature, they are accordingly in danger as the environment changes due to climate change. This is because most infrastructure in the mining sector was built based on the presumption that the climate is stable over time and is thus not adapted to climate change. Despite that climate change is perceived as a threat by many actors, companies are only slowly beginning to plan for future climate change impacts (Ford et al. 2010). Even though this threat must be taken seriously: Delevingne et al. (2020: 2ff) point out that it can be expected that climate change will cause more frequent droughts, altering the possible water supply to mining sites and therefore disrupting operations. This stress caused by water shortages are geographically unevenly distributed which makes planning even more difficult and costly (Odell et al. 2018).

Thus, improved resilience is needed. Water intensity of the mining processes must be reduced. In the long term, capital-intensive approaches, such as new water infrastructure (dams and desalination plants) are needed. Securing water rights is becoming more difficult as water shortage is also an issue for other industries and local communities, resulting in tensions between residents and operators (Delevingne et al. 2020: 3). Contrastingly, in other parts of the world, flooding from extreme rains could also be the cause of operational disruptions, ranging from a temporary closure of the mine, washed-out roads, and unsafe water levels in tailing dams. As weather tends to become more extreme, the problem of flooding is expected to get worse with time, affecting an enormous part of the mining locations around the world. Therefore, water risks have a huge impact on the mining sector, and hence also on the coal extracting sector: The extractives sector suffered under a negative impact of over USD$20 Bn. in 2018 alone, just because of water-related damages (WWF 2020). Alexis Morgan from the WWF Global Water Stewardship Lead concludes that *"some mining companies have taken significant steps to assess and address*

their specific water risks, but the sector has not done nearly enough to collectively respond to water risks" (Morgan in WWF 2020). Therefore, investors cannot turn a blind eye anymore on the water risks their investments could be exposed to. So, more sound assessments of water risks from extractive companies must be carried out (WWF 2020; Morgan & Dobson 2020).

In addition, the mining industry will have to face additional climate factors including sea-level rise, damaging processing or transportation infrastructure near shore, or extreme heat, resulting in decreased productivity, raising cooling costs and increased health costs from mining workers. Additional interdependencies could be triggered: Spontaneous mass movements of rock material, triggered by weather events, are potentially increasing the risks to the failure of tailings dams and other more general earth movements in mining areas (Phillips 2016). This ultimately shows the diverse threat of climate change to the mining industry. And the mentioned events already take place: An example from Chile showed that already now, substantial hydrological changes have been observed, which will affect the mining industry in the region and the whole economy tremendously, as the mining sector is the driving force of Chile's economy (Odell et al. 2018: 202f). Similar patterns can be expected in other arid and semi-arid regions with a lively mining sector, including northern Mexico, the Southwest of the United States, Peru, southern Africa, and western Australia (Bury et al. 2013). Additionally, bushfires could cause coal mines to catch alight, as it was shown by massive fires in 2006 and 2014 where coal mines caught fire in Australia (The Age 2006; Kolovos & Hope 2019). In 2014, it took weeks to control the fire and caused losses in time, assets, equipment, and production (Kolovos & Hope 2019). Such coal mine fires have impacts on the local community and their workers as it worsens air quality and increases the probability of exposure to high concentration of known toxins, for example airborne particles, as well as products of incomplete combustion, leading to short-term adverse respiratory impacts. This is linked to adverse cardiovascular outcomes as well as to an increase in mortality, depending on the magnitude of exposure. In this context, vulnerable and disadvantaged communities are likely to be struck more frequently and severely (Melody & Johnston 2015), due to their location in rural areas in less developed countries. Also, health concerns for workers themselves are more and more becoming an issue: Caused by climate change, heat waves and the possibility of heat fatigue reduces productivity and could potentially decrease the decision making validity and increases chances for accidents or even heat-related strokes (Leveritt 1999). Heavy physical workload for a longer period coupled with increasing heat exposure in the mining industry is heavily influencing the health and safety, the productive capacity, and the well-being of workers. Heat stress management is therefore very important to the mining industry. It should also focus on workers and must be subject to further debates to increase safety in mining activities (Nunfam et al. 2019). And all these factors are heavily dependent on climate change and its local effects.

It was shown that substantial parts of the changes in the climate caused by climate change and increasing temperatures, such as more extreme weather events or temperature rise, exacerbate mining and the coal business considerably. It will likely make the thermal coal business more and more difficult.

2.3.2 Transition Risks

It is obvious that with the vulnerability of the mining sector to climate impacts, these business activities should be reduced as much as possible. Combined with the fact that the sector itself accelerates the drivers of climate change and ultimately its own demise, it produces a vicious cycle which ends in increased dangers for the whole world and the global economy. The need for government intervention is ubiquitous. These intercessions are not done completely by the state alone, as the financial market increasingly uses climate and environment factors for assessments of financial assets, where the results are most of the times overwhelmingly negative. For example, ExGen Texas Power LLC, a power production company mostly using gas, was downgraded by S&P in 2016 as gas prices were low and competition from renewable energy sources was getting stronger. The company filed for bankruptcy in 2016. Conversely, Sweden's Vattenfall, also a fossil fuel company, received an upgrade in its outlook rating from S&P after selling its brown coal powered stations in Germany (Mathiesen 2018: 454). These rating changes are a clear sign of the incorporation of climate risks into the financial sector and that certain sectors will be better off than others when transitioning to a low-carbon economy. This seems, increasingly also in the financial world, to be an inevitable path without losing to many assets, as one example shows: After the devastating heatwave "Lucifer" was responsible for numerous deaths, fires, and disruption in southern Europe, it was found that such an event is now likely to happen more frequently, even up to every ten years, whereas without climate change, such an event would have been very rare (Otto in Mathiesen 2018: 455; Taylor 2017). Therefore, climate change has firstly immediate effects through physical risks, but also slower changing risks that are not directly due to climate change, but the changes it triggers in the economy (The Economist Intelligence Unit 2015: 20). Conversely to risks triggering such a transition, risks that are arising with or during the transition to a low-carbon economy are called **Transition Risks** (Schmidt et al. 2019) which will be introduced and discussed now.

2.3.2.1 Government Policy Risks & Stranded Assets

One of the most prominent risk groups that arise due to environmental changes are the risks of changes in government policy. As policy makers are beginning to restrict GHG emissions and increase deployment of low-carbon technologies, investors and other stakeholders start to question whether loans or investments in carbon-intensive assets could be at risk (Alova 2018). From the perspective of an investor, the risk of a loss increases when a company's profit falls. This could manifest itself in loans not being repaid or in investments not performing as expected due to policy, technology, market, economic or even social trends that could emerge in a world economy that is constrained by its greenhouse gas (GHG) emissions. At the same time, governments have an incentive to regulate sectors that are responsible for a lot of GHG emissions since they are aware of the public interest in a more sustainable future as well as of the financial long-term implications if they do not do so now. Remembering the financial crisis in 2008, they are incentivized to create a more sustainable financial world. It is therefore little surprise that regulations regarding financial services have increased significantly since the financial crisis in 2008. Although national regulations even went sometimes further, the baseline is always

represented by the Basel III regulatory framework where capital requirements were raised, liquidity ratios were lessened, and regulatory and supervisory review processes were broadened. While these efforts have reshaped wide swaths of the financial services sector to more sustainable and balanced global growth (The Economist Intelligence Unit 2015: 24), efforts could go further to introduce even more "greener" rules. This could also have an impact on investments in the coal sector. Although systemic risks are reduced by the introduction of reforms, actual regulations do not go far enough. For now, regulation has mostly failed to address climate change risks, especially in the long-term aspect. This is also the case for Switzerland where there are no regulations regarding the environmental impacts of investments yet, only voluntary propositions (FOEN 2020a).

But changes are emerging: Firstly, the Federal Council of Switzerland is aiming to make Switzerland a leading location for sustainable financial services (FOEN 2020b) and the Federal Council even presented proposals for contingent regulatory changes at the end of 2020 (see Federal Council 2020c). This could potentially also lead to further measures in restricting non-sustainable investments. Additionally, the European Union is pursuing a development and implementation of a series of regulatory measures regarding sustainable finance. This will, because of the interlinkages of the European Union and the Swiss financial centre as well as with other parts of the world economy, have implications to a larger extent for the Swiss, but most importantly also for the entire world economy (Webber et al. 2019: 1). Such regulations will probably target especially heavily polluting industries, including energy production from fossil fuels. Additionally, the electricity from wind turbines and solar photovoltaics has become cost-competitive with other more traditional energy sources in markets around the globe. Since hundreds of billions of dollars are flowing into renewables as a result, there seems to be no doubt that technological innovation is moving the energy sector into a cleaner energy system. It will be only a matter of time when grid parity (point of economic indifference between the cost of on-site renewable energy and the cost of conventional supply) for most parts of the country/world is achieved. This is already a reality for a lot residential consumers, regardless of their country of residence (Karneyeva & Wüstenhagen 2017). As more and more customers will be self-sustaining, this will have enormous impact on the energy market we know today, and especially on energy producers, relying on steady prices and burning fossil fuels. The points mentioned above show that the financing of coal is becoming more and more difficult. On the one hand, it is becoming less attractive for the investor due to the restrictions, on the other hand also for the producer who now finds it much more difficult to obtain financing.

And the producers face additional transition risks: Although fossil fuels will need to remain part of the energy mix of the world for some time to make sure that the transition is steadily taking place, they are expected to vanish in some time (see e.g. Meier 2019). However, it is to note that there is a difference between different fossil fuels: Tanaka et al. (2019) even propose a substitution of coal to gas as an energy source as this could help stabilizing climate change and the transition to a low-carbon economy. Thus, the most prominent fossil fuel that is under question for policy intervention is thermal coal as it is the most polluting energy source currently used. To reach the environmental policy goals from the Paris

Agreement and absent of carbon capture and sequestration or other technological solutions to manage these GHG emissions, it is essential that a significant quantity of today's coal resource remain in the ground (Fulton & Weber 2015: 6), as the use of coal and its ecological effects are well known. Especially the non-use of this energy source, caused by political demands, has strong economic effects. This is explained in more detail in the theory of ***stranded assets***. Stranded assets are defined as *"[…] assets that have suffered from unanticipated or premature write-downs, devaluations, or conversion to liabilities"* (Caldecott et al. 2013: 7). Thus, stranded assets are assets, for example non-renewable energy sources, that are potentially exposed to a transition risk due to future climate policy decisions (Caldecott et al. 2017). This trend is accelerating as the risk factors related to the environment will be stranding more and more assets soon (Caldecott et al. 2015).

This is manifested by an example: As of 2018, 40% of the world's electricity is provided by coal (Energy Agency 2019). Out of this capacity, Caldecott et al. (2015) define 75% of it as ***subcritical*** which is *"the least efficient and most polluting form of coal-fired energy generation – it requires more fuel and water to generate the same amount of power and creates more pollution as a result*" (Caldecott et al. 2015: 8). To reach the goal of the Paris Agreement, considerable amounts of subcritical coal generation world-wide need to be shut down. Besides being vulnerable to climate policy changes, these powerplants are also prone to other policies, such as the regulations of other harmful emissions including PM, NO_x, SO_x and mercury. Thus, it is less and less attractive for governments to use such energy sources. This will result in large-scale value destruction. As some technologies will not be demanded for anymore, certain assets will have to face big re-evaluation waves, potentially making some of them close to worthless. This is also affecting coal deposits, as a substantial portion of known coal, oil and gas reserves will have to remain unburned if climate change is to be limited (The Economist Intelligence Unit 2015: 16).

However, this risk of assets losing value could also arise in a much less complicated and faster way: As governments want to correct for market failures, for example that companies are not incorporating their caused externalities (here GHG emissions), the implementation of carbon pricing is reasonable. But besides being harmful to humanity, GHG emissions are also associated with the activity that creates economic value. Thus, governments around the world should evaluate which amount of pollution is worth the damages it causes. With the right amount of information, governments can estimate how much GHG emissions are the best for society. And it was empirically shown that such carbon market implementations have a positive impact on the innovation efforts of companies (Martin et al. 2011). In addition, there exists a certain double dividend when taxing carbon. Firstly, emissions are reduced through the taxing system and secondly, more environmentally friendly projects can be supported, making such advances certainly attractive for a lot of public actors (Narassimhan et al. 2018). And as thermal coal is emitting large quantities of GHG, it will face disproportionally large negative effects of such policy implementations, making regulations regarding restricting thermal coal quite attractive for governments.

Since governments made pledges to reach certain milestones of reducing emissions in the future (see Paris Agreement), it is expected that some governments will introduce even stricter carbon pricing

measures as they are in place today. Companies should therefore expect higher prices they have to pay for emitting GHG, as the allowed overall amount of GHG is potentially being lowered by governments. For example, they could issue less emission allowances in a cap-and-trade-system (Muûls et al. 2016), or use other mechanisms, such as carbon taxation or hybrid mechanisms, that combine elements of both.

In Switzerland, there is already now a quite substantial system of taxing carbon in place as it is the country with the highest percentages of emissions covered by a carbon tax of at least USD$30 per CO_2 tonne. Therefore, Switzerland leads the world on this aspect, although it also still has gaping holes (Hintermann & Zarkovic 2020, OECD 2018: 50). Such loopholes are being closed though, as Switzerland and other countries are extending the number of sectors and gases that are being covered by a carbon price. Additionally, thresholds are being lowered to regulate more companies (Quant et al. 2020). With a trend to a more sustainable future with more stringent taxes regarding environmental issues where more parts of society are restricted by a carbon tax (see e.g. flight travel in swissinfo.ch 2020), taxing carbon could restrict the Swiss economy even more and more. Therefore, policy changes regarding unsustainable investments are within the realms of possibility. This poses a threat to the part of the financial industry not willing to switch to more sustainable investment practices. And as the share of global emissions covered by carbon pricing initiatives is increasing steadily (Quant et al. 2020: 11), financial actors will also be affected through their assets, as for example companies in the thermal coal sector will have a harder time making a profit as carbon taxes severely affect their businesses.

The risk of policy changes and stranded assets is certainly not considered by many investors, even though it should. Although these losses are unevenly distributed across the globe, investors around the world will have potential losses if prices of certain assets were to experience a correction. These losses are expected to be triggered by (i) the market which incorporates external costs and climate change into its valuation process, but most importantly by (ii) the public sector, restricting certain amounts of emissions or certain power generation techniques (e.g thermal coal), to limit emissions to a certain degree (The Economist Intelligence Unit 2015). Investors should pay close attention to this problem as there is no guarantee that climate change as well as valuation of assets will happen gradually or linearly. Therefore, a "wait-and-see" approach is not viable as it potentially presents more risk to portfolios. This leaves investors with just two choices: Either they reduce their holdings in fossil fuel companies to not be exposed to the risk of stranded assets in a part of their portfolio and therefore also no longer support fossil fuels, or either they will experience significant losses across their entire portfolio since climate change will reduce the value of all manageable assets. This restricted range of possibilities should be a strong incentive for long-term investors to choose the simple way of de-investing in fossil fuels and follow the pathway of a profitable, low-carbon future (The Economist Intelligence Unit 2015: 17).

2.3.2.2 Opportunities

Credit rating agencies place mining activities as one of the top sectors at emerging risks due to climate change. And especially the unregulated power sector (including coal) and gas market are at risk (Lou & Dallos 2016). One of the most prominent transition risks of the coal industry are shifting demands for

minerals, as low-carbon technologies emerge. As companies will start to cut their emissions according to the Paris Agreement, the demand for less carbon-intensive sources will rise, which will put additional pressure on fossil fuels. This is also linked with the development of more efficient wind turbines, photovoltaics, hydrogen fuel cells and carbon capture and storage technologies. This development is already visible now, with capital investments in coal mines becoming more difficult. Some banks are already pulling away from the industry in certain regions (Delevingne et al. 2020: 5). Also, Odell et al. (2018: 201) showed that possible policy restrictions are approaching, restricting mining activities. The most prominent example here is El Salvador which passed a law in 2017, banning metal mining in the country, as the mining industry threatens to reinforce the country's vulnerability to water scarcity. And although there are some attempts to save coal and make it more efficient (see the Coalbed Methane Outreach Program (CMOP) in EPA (2020)), this probably is destined for failure: These technological advances seem to be very costly and will certainly not be available or applicable in all parts of the world. It seems to be an attempt to save the coal industry in the US, completely ignoring other energy sources and the shift in the energy market away from fossil fuels to renewable energy sources. This is also visible through the staggering number of coal companies declaring bankruptcy in the United States (Jones 2019). These examples also show how bad things really are for thermal coal.

In contrast, this transition has some real opportunities to offer: For example, concern over the build-up of plastic waste in water bodies could drive more investment into renewables, for example biofuels. And small decisions for a more sustainable future could lead to various effects in other parts of the economy. The transition to a low-carbon economy is a huge chance for entrepreneurs, changing the world for the better and at the same time making a good profit for themselves. Therefore, there certainly are winners *and* losers in a lower carbon economy. It is just a question which actors are articulating opportunities for new value creation correctly. Thus, financial actors should not find it difficult to pick a side when looking at the results of an analysis by FTSE Russell (2018): The greening of the economy is a *"[…] large investment opportunity, backed by global efforts to combat climate change and broader environmental challenges"* (FTSE Russell 2018: 2). As the green economy represented 6% of market capitalization of global listed companies, it is a significant investment opportunity with approximately the same size of the fossil fuel sector. Said sector is even expected to grow substantially in the next years. As the green economy is represented in nearly all parts of society and therefore diversified across various ICB2 sectors, investments in the transition to a low-carbon economy are diversified as well. And the diversification does not stop there: These opportunities are also geographically diversified as these changes happen all around the world. And the biggest argument for a change of thinking is the outperformance of such green companies. FTSE Russells' broadest green indexes were outperforming their parent benchmarks over the last five years (FTSE Russell 2018).

It was estimated that there will be a need for an additional USD$1.6 to 3.8 Trn. p.a. of investments globally in clean energy through 2050 so that global temperature rise will not exceed 1.5°Celsius (and USD$3 Trn. for a 2°Celsius pathway) (de Coninck et al. 2018: 321). As this goal must be met via policy

and other interventions to meet the Paris Agreement, investors can expect a huge increase in investment opportunities in the clean energy sector in the future (Foster et al. 2018). This transition is a chance for financial actors, not only to act more ethically, but also to generate higher monetary gains. It should be obvious for investors as well as actors in the mining sector that transition risks should not be neglected, where triggered changes could also lead to better business opportunities.

2.3.2.3 Subsidization

Taxing fossil fuel use or carbon emissions is very likely and will transform the market accordingly. One of the instruments used for this is the Pigouvian tax which assumes that private and social marginal cost functions are both perfectly observable to a policy maker. Thus, the environmental and social externalities are internalized. Such a tax ensures that the new optimal level of production ends at a specific level which was defined as the optimal level for society. In the same manner, a Pigouvian subsidy could be implemented, trying to establish the same incentive to reduce production or abatement of a certain activity, taxing the same magnitude per unit of production. At the sectoral level, a tax results in reduction of both profitability and amount of emissions as an emission tax will decrease marginal and average benefits. Subsidies, on the other hand, induce and facilitate the entry of new companies in the sector, attracted by increased profits which will result in an increase in output supply, potentially resulting in an increase in pollution (Chesney et al. 2013).

With such instruments, policy makers could easily try to govern carbon emissions as renewable energy production could be subsidized, and non-renewables could be taxed. However, in the case of the energy sector, numbers are currently quite different for various energy sources. Taylor (2020) states that in 2017, USD$634 Bn. were used as subsidies in the energy sector of which 70% are used as subsidies of fossil fuels (USD$447 Bn.), while renewable energy only accounted for around 20% of total energy sector subsidies (USD$128 Bn.). With the combination of data from the Organisation for Economic Co-operation and Development (OECD) and the International Energy Agency (IEA), another analysis finds that out of the subsidies of non-renewable energy sources, USD$128 Bn. were attributed to the energy-based support to fossil fuels, and the extraction of coal was subsidized by USD$17 Bn. in 2017. With renewables, the European Union is by far the strongest driver with a total of USD$90 Bn. which is more than half of global subsidies (Taylor 2020: 8).

Also, Coady et al. (2019) conclude that the underpricing of fossil fuels remain pervasive and substantial. Country-level coal prices were typically well below half of their fully efficient levels in 2015. Undercharging for road fuels is also pervasive as prices frequently fall short of their efficient levels by over 20%. Especially the damages of local air pollution are not included in the price of fossil fuels where also global warming and broader environmental costs of road fuels are not reflected in prices either. With this, they come to a total of USD$4.7 trillion of energy subsidies at the global level in 2015 and USD$5.2 trillion in 2017 (6.3% and 6.5% of world GDP) (Coady et al. 2019), making it a far higher estimate than the one of Taylor (2020). One distinctive difference is the price of carbon used: Coady et al. (2019) used

a price of USD$40 per tonne of CO_2. This is not a very high estimate, as other studies even suggest a perfect price of USD$50-100 by 2030 per tonne of CO_2 (see e.g. Kachi 2017, World Bank et al. 2017).

When we again look at post-tax subsidization, it gets rather interesting, as coal is the largest source of subsidies with 44% in 2017, which followed an upwards trend beginning in 2013 (Coady et al. 2019: 21). While we have seen before that coal is not subject to direct subsidies across the world, it is the major recipient for indirect subsidies, as its effects are far larger than the ones from other fossil fuels. If fuel prices had been at fully efficient levels in 2015, the estimated global CO_2 emissions had been 28% lower. The death count caused by fossil fuel air pollution would have fallen by 46%, and tax revenues higher by 3.8% of global GDP. Net economic benefits, calculated by environmental benefits in addition to the less economic costs, would have amount to 1.7% of global GDP (Coady et al. 2019), highlighting the big impact an exit from coal and other fossil fuels had on the human population.

In the future, Taylor (2020: 10f) predict that direct subsidies of fossil fuels will fall significantly to USD$165 Bn. in 2030 and to USD$139 Bn. in 2050. Existing subsidy programs will have to be reduced and by 2050, over 90% of these subsidies will support carbon-dioxide capture and storage (CSS) in industrial applications. The share of subsidies of renewables will rise significantly to 44% of total subsidization in 2050 (from 26% in 2017). All these measures will have to take place to reach the goals of a more sustainable future. And it is highly likely that the appropriate value on carbon emissions will rise as countries ramp up their Paris mitigation pledges. Underpricing for air pollution could be declining with policies to reduce local air emission rates. However, these effects will vary geographically, as some countries will not be willing and/or able to raise fossil fuel prices, depending on national circumstances. Some countries could mimic many of the behavioural responses of higher fuel prices but without a first-order tax burden on energy users, or some could have some competitiveness concerns and therefore be constrained by the actions of comparator countries (Coady et al. 2019: 29). A mire decisive global agreement on the abandonment of fossil fuels could therefore help to secure such a result which could lead to a stronger and faster abatement process of fossil fuels.

This highlights the dangers for investors in thermal coal and other mining activities, as well as the actors active in these sectors: If subsidization were to decline as sharply as projected, this would increase the costs for energy production through coal dramatically. Additionally, if subsidization of substitutes, such as renewable energy, would increase as projected, cost-benefit-analyses could increasingly conclude that renewable energy is the preferred option. Such decisions would have decisive impacts on investments in fossil fuels where significant losses could be expected. Matsuo & Schmidt (2017) show that a "hybrid" policy package of fossil fuel subsidies with the combination of low-carbon technology deployment policy could lead to potential mitigation activities that achieve environmental impacts as well as long-term structural change. Therefore, a combination of a cut of subsidies as well as implementation of new promotion attempts of low-carbon technologies could lead to a potential change in the future. Thus, if governments were to follow the path to a more sustainable future, which is very likely, this will

even mean additional dangers to the fossil fuel industry. Such potential changes should not be neglected by actors from the financial and mining sector alike.

2.3.3 Liability Risks

2.3.3.1 Company-Level Liability Risks

In previous chapters, risks were discussed that are already manifesting now and are recognized by a lot of companies. Now, risks which will affect companies mostly in the future must be recognized as well for a long-term assessment of the risk of a sector/company. One major group of such risks are the **Liability Risks** which result from people or businesses seeking compensation for losses they may have suffered from. These losses were created by the physical or transition risks from climate change outlined above. The question about who will be held responsible if future generations suffer from severe climate change must be answered. This risk could manifest in insurance cases about losses due to climate-related events (e.g. droughts) (Bank of England 2015). As climate change is already affecting politics (i.e. Paris Agreement) and law-making, an increase in such lawsuits is highly likely. As other sectors also faced a wave of lawsuits because of liability issues, for example the tobacco industry in the 20th century (regarding health issues), the energy sector using fossil fuels could face the same dangers, now with climate change and its effects as the subject matter. This trend is building moment in various countries, be it the United States, Canada, or countries in the European Union. For example, various cities in the US started suing fossil fuel companies as they created a public nuisance, referring to an activity that impairs the use of a public good through damage, which could result in hazards and reduce comfort. The key argument there is that fossil fuels companies have known for a long time that their products are damaging the planet and in turn harms public interest. As some cities or counties will have to pay for adaption measures against climate change, they will certainly look for the reasons why such measures are necessary (Irfan 2019). And fossil fuel companies take such lawsuits extremely seriously, as the case for Exxon Mobil shows: While the company is lobbying for a carbon tax in the US, they want a clause that gives them and other fossil fuel companies immunity from climate-related lawsuits (Irfan 2018). Therefore, they anticipate that such liability issues will cost them more than the transition to a low-carbon economy, underlining the high impact liability risks can have. As thermal coal is a major component of global fuel supplies, accounting for 27% of all energy used worldwide and making up 38% of electricity generation in 2018 (IEA 2020c), there is a high possibility for the companies in the coal industry to become subject to similar lawsuits as well. As coal combustion is more carbon intensive than burning natural gas or petroleum for electricity, as it accounts for about 65.8% of CO_2 emissions from the energy sector (EPA 2020), this emphasizes the high impact it has on the environment. With this, the thermal coal industry will likely be prone to be the main subject of environmentally inspired lawsuits.

2.3.3.2 Country-Level Liability Risks

On a country level, when discussing mitigation and adaptation efforts to climate change, it must be discussed which share of responsibility each country has to undertake. This again could have effects on individual companies through the passing on of obligations.

Generally, global climate agreements across countries that define the share of each country of total financing of mitigation and adaptation efforts is very difficult to achieve as costs and benefits vary greatly across actors (Bretschger 2013: 517, Bretschger 2017: 4).

For potential calculation efforts, two points are central. First, the different adaptation costs must be considered. In addition, the full costs must be minimised by comparing marginal costs and marginal benefits. An agreeable treaty must be found which is acceptable to all parties (Bretschger 2013: 520). The principles set out by Bretschger (2013, 2017) help in this process: In the context of this thesis, however, two principles are central:

- *Ability to Pay Principle*: The more purchasing power a country has, the more it should do to implement a global climate plan.
- *Polluter Pays Principle*: This principle assigns the burden of a policy proportionally to actual pollution (Bretschger 2013: 525ff)

At the local level, companies that emit a lot could be held accountable for the impact of their emissions with these capital adequacy principles. Also, big emitters could be held responsible for big environmental changes, if such laws are becoming global. Unfortunately, on the international stage, we are not yet ready to make their application mandatory. The Paris Agreement does not contain any definitive pledges by individual countries, but rather follows a bottom-up approach (Bretschger 2017). As a result of the fact that countries are thus able to set their own targets, many are far away from a fair share of the mitigation and adaptation measures (Peters et al. 2015: 8). This means that globally such lawsuits are not really feasible yet, but potentially in the future. Companies in carbon-intensive sectors will therefore have to include this risk into their risk analysis. In the case of Switzerland, the financial sector really needs to evaluate if such a long-term risk should be borne since it is now likely that in the future, large issuers will be held accountable for their effects in the domestic market as well as on the global scale.

Mentioned liability risks vary geographically: Ritchie & Roser (2020) show that global emissions vary widely between income groups. The richest 16% of the world's population are responsible for 38% of global greenhouse gas emissions. It should be these emitters who are now funding the countermeasures. Although the Swiss government wants to make a larger contribution to the Green Climate Fund and other climate finance projects from 2020 onwards (see FOEN 2020a), this is by no means sufficient to offset the emissions caused. And to get the funds needed to increase such payments, it is also not unlikely that large private emitters will be asked to pay increased taxes/renumeration payments. Instead of or additional to this, Switzerland could also opt for a reduction of its own emissions, and this strategy could be a challenge for major emitters. Future liability risks must clearly be taken seriously by companies.

2.3.4 Biased Risk Management

As seen before, investments in the energy generation with thermal coal is exposed to a lot of short- and long-term climate risks, posing real threat to the substantial operations of the companies in question. Countless companies are financing these technologies and their value chain. One must ask why this is

the case: One reason for this is that the risk of stranded assets is not considered as a risk factor because it is not based on historical data (Silver 2017), such as in the Modern Portfolio Theory (see Turner 2012).

Silver (2017: 109) concludes that the financial community has a very specific picture of risk, into which such forward-looking risks do not fit, and are therefore ignored and not included in the analyses. As a result, entire institutions are effectively blind to this risk (Silver 2017: 112). Leins (2020) emphasizes that the financial sector underestimates the environmental impact of an investment by financial actors. It is shown that in one case study, financial analysts instrumentalised Environmental, Social & Corporate Governance (ESG) ratings and only consulted them if they supported their decisions regarding new investments (Leins 2020: 85). This separation inevitably leads to other effects, such as the slow process of standardising emission trading systems (Lovell 2014). It is clear that these actors blindly separated the financial world from its environmental aspects, which also underlines the danger of stranded assets. This blind spot is also found in the characteristics of some mining operators. A lot of industry stake-holders in mining view climate change as a minor concern. This manifests in most mining infrastructure not being designed nor built for a changing environment. This situation is not changing anytime soon as there is only limited adaption planning for future climate change (Pearce et al. 2011). This underlines that the operations of a mining company is hugely linked to personal believes. Ford et al. (2010) found in another study that current impacts are being managed, but future risks are not really considered. This shows the near-sighted action plans of companies where current effects are dealt with, however no plans for further adaptation are arranged. There, cost and uncertainty are the biggest barriers for adapting to climate change and its future impacts.

But this view is also changing, as in recent times, there exists increasing recognition of the need for further adaption actions also in the mining industry, although the development of frameworks for risk assessments are still in the fledgling stage. However, backwards oriented temporality of pro-mine coa-litions obscures emergent topologies from their view. This is potentially dangerous since such tensions could destabilize national and supra-national politics heavily (see Mavrommatis et al. 2019). Also, a study from Germany found that actors are still forming coalitions with traditional allies and cling to the established lines of reasoning (Leipprand & Flachsland 2018). But such pro-mine coalitions are facing increasing hurdles as anti-mine coalitions are much more adept at negotiating topologies that are shaping social worlds nowadays, as shown with an example of the Adani mine controversy in Australia. Such controversies also show the opportunity to reshape and rebuild social and political orders (Jolley & Rickards 2020), showing a potential shift of mining operators in their personal view to risk, as well as a shift in political coalitions (Leipprand & Flachsland 2018).

Since some government-owned companies in several countries (i.e. Germany, China and India) have invested in portfolios which include investments in subcritical coal-powered energy production, it is also generally thought that these countries would be less likely to introduce policies which would harm their own investments although China and India introduced such policy changes in the mid-2010s (Caldecott et al. 2015). Kalkuhl et al. (2020) find that the timing of such a change in the law is strongly

linked to the various lobbying activities, with the lobbying power of the owners of fixed factors (land / fossil resources) being particularly strong. But some countries will have to close their subcritical coal production either way since other environmental problems (e.g. water scarcity) will arise soon or have already been detected (Caldecott et al. 2015: 9f). Risk perception has changed in recent years because of increased operational costs and disrupted production due to natural hazards. This however mostly took place on the side of investors which are asking companies to disclose these risks also with the fear that the physical consequences of climate change become financially material (Goldstein et al. 2019). But disclosure quality is a major problem as it is still quite low. Although this varies a lot with a positive relationship to firm size, financial performance and country origin and negative associations with level of indebtedness (Kouloukoui et al. 2019), there are still significant blind spots in companies' assessments of climate change impacts as well as in their development of strategies to cope with it (Goldstein et al. 2019). Especially in the coal sector, disclosure is important to inform investors about the state of a company, whether it is at risk of stranding assets or if it falls under the category of sub-critical coal.

Mentioned psychological aspects present in the mining and coal industry enlarge the risk associated with operational losses as no precaution measures are taken since the risk of hazards is not taken seriously. This also underlines the problem of the potential of stranded assets, as these questions will be used to discuss the reasoning for the examined investments and its future (disinvestment, etc.).

2.3.5 Problems with the Coal Phase-Out

Innovation, new technologies and new business opportunities around renewable energy sources are essential parts of the transition to a low-carbon economy. The phasing-out of old technologies such as coal is certainly to be welcomed, as it is also a key element for our ambition to create a low-carbon society, although these efforts are quite less exciting. Nevertheless, the efforts of phasing out coal are enormous around the globe as more and more countries have formulated policies to phase-out unabated coal-based power generation. For illustration, 34 national governments have joined the "Powering Past Coal Alliance" (Markard 2020), a coalition to advance the transition from unabated coal power generation to energy generation through clean energy sources (PPCA 2020). Although there certainly are a lot of risks associated with the continuing usage of coal as energy source as outlined above, the phasing-out also has some challenges that need to be overcome. These are now illustrated here.

One of the most important challenges is the huge dependency the world still has on thermal coal as an energy source: In 2019, nearly 44,000 TWh were generated with the burning of thermal coal, more than 27% of the world's total primary energy consumption (Ritchie 2020). If the world wants to exit thermal coal, other energy sources really need to be promoted and expanded rigorously. A problem that is linked with the coal phase-out and the huge dependency is the fact that a phase-out could lead, at least at the beginning, to an increment in electricity prices, as a lot of new investments need to be done to substitute the "lost" energy (Green & Staffell 2016). This effect could also be magnified by the fact that some countries do not produce enough energy nationally and will need to import energy from elsewhere (Yilmaz et al. 2016). Another big hurdle for the coal phase-out is employment. From an employee's

perspective working in coal industry, the phase-out certainly is not desirable and leads them to oppose any measures that put their industry under investigation (Heinrichs et al. 2017). This is also underlined by the study of Tvinnereim & Ivarsflaten (2016): They concluded that people and companies in the fossil fuel industry will likely oppose the measures of a phase-out unless they have a stronger alternative. This effect is also visible on a national political level: Cragg & Kahn (2009) were able to observe that the voting schemes members of the US Congress were related to the existence of fossil fuel industries in state of the respective Congress member. This certainly means that also for employees in the coal industry, real alternatives need to be formed, since without perspective, the backlash of plans about a phase-out will cause a wild backlash.

2.3.6 Interim Discussion

Climate change is critically important to the coal mining industry and its future, as well as through its impacts on surrounding communities and environments (Odell et al. 2018). Thermal coal and the whole mining industry are particularly susceptible to climate change risks as they have the characteristics of high substitution, exposure, and sensitivity. There is a clear correlation between financial performance of mining companies and impacts of climate change (Sun et al. 2020). The pressure of substitution will probably increase in the future through reduced costs of renewable energy, making operations for mining companies extracting coal increasingly difficult (Alova 2018). And although there is a mining and metals boom to be expected in the next decades, as metals demand is likely to grow up to 10-fold, thermal coals' demand is likely to drop significantly as alternatives will be less carbon-intensive and cheaper (Hodgkinson & Smith 2018). This shows that the mining needs to shift significantly away from these resources. This could mean a major contribution to advancing the climate objectives. The transition to a low-carbon economy will require large devaluation of certain physical capital assets which will induce large-scale impact on the assets of upstream and downstream sectors of affected sectors, such as the thermal coal sector. Right now, the extractive sector can be found at the bottom of an "inverted pyramid" of interconnections between these companies and the financial sector as well as other parts of the real economy. If investors do not want to be trapped in a "cascade of asset stranding", a disinvestment from all coal-related companies and activities is needed, at least to the degree where companies can face considerable devaluation from their non-sustainable business practices (Campiglio et al. 2017).

Currently, a lot of coal companies still find investors with ease and operate without harsh restrictions. From the view of this analysis, this is not viable: Macroeconomic shifts are neglected and the question on why investors still invest in such companies should be raised. This potentially also is linked to the fact that there is a limited amount of academic discussion around climate change and mining (Odell et al. 2018). Nevertheless, a report from McKinsey puts out an interesting recommendation with their report on climate risk and decarbonization: Delevingne et al. (2020: 11) mention the mining sector should move to renewable energy sources, although a big part of it lives of non-renewable energy. They therefore implicitly say that non-renewable energy sources do not have a future.

The conclusion of Odell et al. (2018: 205) is even clearer where they describe a closed circle: The impact of climate change has an impact on the mining activity which again influences climate change. It is a vicious cycle where climate change and coal extraction worsen each other. This cycle should be broken as soon as possible with the limitation of coal extraction to a common agreed minimum. And investors should be aware of the regulatory risk they are placed in currently: While the regulatory risk was quite low a few years ago (see e.g. Christensen et al. 2011; Münstermann 2012), this has been increasing quite fast in recent years. This is highly dependent on the perception of public, private, and civil societies in which climate change and mining interact and what consequences this relationship has on the environment (Odell et al. 2018: 211). Additionally, it depends on the reporting standards, which are currently very poor (see Mathiesen 2018: 455). But this is potentially about to change in 2021 with the implementation of stricter disclosure rules by the EU (Webber et al. 2019: 1). A shift away from fossil fuels could also be beneficial for the extraction companies themselves: Low-carbon technologies must be implemented as well as better disclosure of emission information. This could potentially improve brand value and create new competitive advantages for a long-term development of the companies (Sun et al. 2020).

In this chapter, it was shown that the extraction of thermal coal as well as its financing is highly dangerous and faces many risks, from physical, transition to liability risks for the coal companies themselves as well as their investors. It therefore should be consequential to not finance thermal coal, also when looking at the performance of sustainable investments as an alternative which seem to outperform non-sustainable investments in a lot of ways (see e.g. de Souza Cunha 2020). However, this wishful thinking is not reality: Still, a lot of investors, among them also a substantial amount of Swiss investors, are financing thermal coal extraction and the energy production with thermal coal. How large these investments from Swiss financial players exactly are will be outlined in the quantitative analysis of this thesis.

2.4 Climate Finance

After the last chapter highlighted the business with thermal coal and its dangers, the focus is now on the financing of mitigation and adaptation measures. These serve to reduce climate change itself, but also its effects on humanity. The focus of this chapter is on climate finance, with a special emphasis on renewable energies as energy production from thermal coal can only be substituted with such renewable energy sources. At first, this chapter introduces climate finance payments and shows why they are needed and how they are defined. The role of renewable energy sources as climate finance is highlighted. This shows how investments that flow into thermal coal could/should be used to finance renewable energies. In addition, potential policy changes for inducing renewable energy investments are outlined.

2.4.1 Investment Gap for Climate Measures

Over the next twenty years, emerging markets will play a decisive role in global growth as global consumption is forecasted to reach USD$62 Trn. by 2025, doubling the global consumption of the year 2013. Half of this increase will come from emerging markets. By 2025, around 65 percent of global manufactured goods will be sold in emerging markets (Mancini et al. 2017). Emerging markets are

defined by the IMF' World Economic Outlook as countries that are not classified as more developed economies. The difference is dependent on (1) per capita level, (2) export diversifications, and (3) degree of integration into the global financial system. A total of 155 countries are belonging to this group (IMF 2020). These global trends are creating new markets and therefore new business opportunities, but also new challenges, as not only manufactured goods will be consumed more, but also energy.

Every year, around USD$1.5 trillion are moved across international borders, mostly as foreign direct investment with the aim of accelerated innovation and growth in the receiving country. However, most of it goes to just 10 countries, and not even one percent is invested in countries where needs for investments are greatest since they are affected by conflict and instability. This investment gap is also visible in climate mitigation and adaptation measures. Private investors highlight the risk of it as a key reason. So, to invest in these countries, barriers of risk need to be reduced to unlock significant private capital (IFC 2016). In July 2015, the international community agreed to the Addis Ababa Action Agenda (AAAA), launching a "new development finance paradigm" where Multilateral Development Banks (MDBs) and the International Monetary Fund (IMF) committed to leverage billions in international development finance, aids, grants as well as loans and guarantees, to attract trillions in further investments. These include public, private, national, and global investments (UN 2015). The upcoming *decade of action* (2020 – 2030) will need to see a significant increase in funding of these sources to fulfil the Sustainable Development Goals (SDGs) and the goals of the Paris Agreement. Thus, additional investments in less developed countries are necessary to reduce climate change and its effects. However, financing is already available if size, scale, and level of the global system is respected – with global gross financial assets of USD$200 trillion and a gross world product of USD$80 trillion (World Bank 2020b). But these monetary amounts are not used to finance sustainable development practices at the requested speed and scale: The financing gap is estimated to be around USD$2.5 to 3 trillion p.a. to achieve the SDGs (UN 2019). As one of the SDGs, *Goal 13: Climate Action*, urges global problem solving, there is a need for more funding, from public, but also from private sources against climate change. And most of that money is not needed in developed countries but in emerging markets and less developed economies, as resilience against climate change is lowest in Africa, Latin America, and the Middle East, followed by Eastern Europe and the Asia-Pacific (The Economist Intelligence Unit 2019). Climate finance has an important role to play in closing this gap. In following chapters, climate finance is introduced, why it is needed, and its problems are presented using the example of renewable energies.

2.4.2 Defining Climate Finance

The United Nations Framework Convention Climate Change UNFCCC defines climate finance *as "[…] local, national or transnational financing — drawn from public, private and alternative sources of financing – that seeks to support mitigation and adaptation actions that will address climate change"* (UNFCCC 2020). While mitigation measures for reducing the effects of climate change on the human population worldwide is important, as large-scale investments are needed to significantly reduce emissions, adaptation measures are equally important, since a significant amount of financial capital is

needed to adapt to the impacts and to the adverse effects of a changing climate (UNFCCC 2020). The UNFCCC also defined the actors which should mainly fund these financial flows: With its principle called *Common but Differentiated Responsibilities and Respective Capabilities* (CBDR-RC), it acknowledges the different capabilities and different responsibilities of individual countries in addressing the effects of climate change (Climatenexus 2020). In the ratified UNFCCC treaty from 1992, the principles of the CBDR-RC were outlined for the first time: *"The global nature of climate change calls for the widest possible cooperation by all countries and their participation in an effective and appropriate international response, in accordance with their common but differentiated responsibilities and respective capabilities and their social and economic conditions"* (UN 1992: 2). It outlines the responsibilities of different countries regarding actions against climate change and also builds on equity principles (as in 2.3.3.2). While reflecting the CBDR-RC, the countries were divided into two groups: *Annex I* and *non-Annex I*. Belonging to either of these groups should indicate the measures a country should implement to fight climate change. While countries that were formerly referred to as more developed countries are to be found in the first group, less developed countries were assigned to the second group. Under the convention of the UNFCCC, countries in Annex I have a greater role to play in mitigation than countries belonging to non-Annex I. However, since 1992, the capabilities of certain countries grew heavily (see China and India) while still being part of the non-Annex I group of countries, creating tensions between these two groups. This also lead to the absence of the ratification of the Kyoto protocol through the US, primary concern being that middle-income countries were not required to act against their GHG emissions despite their growing economic capabilities. However, the CBDR-RC remain a sticking point (Climatenexus 2020), and with a not less strict and mandatory amount of emission mitigation, it was possible to reach to a wide-ranging conclusion, the Paris Agreement in 2015. This agreement reaffirms the obligations more advanced countries have, as they should provide financial resources to assist less developed countries/parties in implementing the objectives of the UNFCCC. Additionally, it encourages voluntary contributions by other parties as well, as more developed countries should also continue to mobilize even more climate finance from a variety of sources, instruments, and other channels. This underlines the significant role of public funds, as they should support country-driven strategies and take the needs and priorities of less developed countries into account, which should ultimately represent a progression beyond previous efforts in the field of climate finance (UNFCCC 2020).

The Paris Agreement underlines the need for making financial flows consistent with the pathway to a low-carbon economy, meaning low greenhouse gas emissions and climate-resilient development. A global stocktake is used to assess the progress of provisioning and mobilising support of measures against climate change where emphasis is placed on transparency and enhanced predictability of this financial support. For this, the Global Environment Facility (GEF) was established in 1994, serving as an operating entity of the financial mechanism. And in 2010, several Parties founded the Green Climate Fund (GCF), which was designated in 2011 as an operating entity of the financial mechanism which is accountable to the Conference of the Parties (COP). The COP decides on the policies, priorities, and the eligibility criteria of the GCF, monitoring its funding. These two entities will help to achieve the defined

goal in the Cancun Agreements from 2010 to mobilize USD$100 Bn. per year by 2020 to address the needs of less developed countries (UNFCCC 2020).

2.4.3 Renewable Energy as Climate Finance

As it was described before where the money for climate finance should come from, it is even more important to highlight what the money should be used for. Since in this thesis the investments in energy production through thermal coal are highlighted, investments in cleaner energy production in less developed countries as an example for climate finance, are shown.

The 17 sustainable development goals by the UN, designed to develop a *"blueprint to achieve a better and more sustainable future for all"* (UN 2020b), were set up in 2015 and are intended to be achieved by 2030 (UN 2015). One of them, *Goal 7: Affordable and Clean Energy*, calls for *"ensured access to affordable, reliable, sustainable and modern energy for all"* (SDGF 2020). Although the number of people that have access to electricity has been increasing a lot (SDGF 2020), there is still a growing demand for energy sources, attributable to population growth, economic growth, and urbanization as well (Huang et al. 2018: 11). This is particularly important when looking at population growth in less developed nations: For example, the International Energy Agency (IEA) estimates that another one billion people are added to Africa's urban population by 2040 (IEA 2019a). This is even much higher than the growth China had in its urban population between 1990 and 2010, a period where China had enormous increases in production of industrial materials such as steel and cement. In combination with the fact that energy-related emissions hit another record high in 2018, although scientific evidence point at the need for an ever-more-rapid cut in GHG emissions (Rogelj et al. 2018), the role of financing renewable energy systems is becoming even more evident and urgent.

2.4.3.1 Financing Gap in Renewable Energy Production

The financing of renewable energy projects is distributed differently around the world. While Europe, North America and Asia (mostly China & India) see a steep increase in renewable energy production, this looks differently in less developed countries and/or emerging markets: Africa as well as Central/ South-eastern Asia mostly trail behind other parts of the world in energy production with renewables, namely hydropower, solar panels, wind energy, as well as bioenergy and geothermal (BP 2020), even though especially Africa is rich in these resources (Karekezi & Afrepren 2003). To exhaust that potential, a lot of investments need to be done. As the expansion of renewable energy production is also of interest to the whole world, the financing of such countries should be distributed worldwide.

In the light of climate financing, investing in renewable energy systems in less developed countries seem to be the way to go, as current estimations show that in 2040, Africa's oil consumption will be larger than of the one China, as the continent also will expand its consumption in natural gas, being attributed to recent discoveries. And Africa, the content with the biggest solar resources in the world has installed only around 5 gigawatts (GW) of photovoltaic (PV), which is less than 1% of global total. Solar PV even is the cheapest energy source for many of the 600 Mn. people across the continent currently without

electricity access (IEA 2019a: 3f). In combination with the fact that the African urbanisation trends will mean that additionally half a billion people will need air conditioning or other cooling devices by 2040 (IEA 2019a: 17), this highlights the huge potential renewable energy sources have in Africa, potentially also in other parts of the world, to be an economically efficient and clean source of energy. Thus, this could be a huge positive step towards fighting global emissions and climate change.

However, although modern and affordable energy and energy services are regarded as catalysts for economic development and promoting a sustainable development as well as for improving the livelihoods of various people, the access to such technologies is still lacking in many less developed countries (Chirambo 2016: 794). The World Bank estimated in 2019, that despite *"more sustained and stepped-up actions, 650 million people will still be left without access to electricity in 2030. Nine out of 10 of them will be living in sub-Saharan Africa"* (World Bank 2019). This emphasizes the need for further policy measures in the energy sector to improve people's access to modern energy and energy services. However, this is not a new phenomenon. In the past, such initiatives, programmes, and reforms were most of the times highly defective. They had issues with lack of technological knowledge, limited capital investments, constricted power generation planning and low rates of electrification (Suberu et al. 2013). While the higher electrification rate could also mean higher emissions from energy-related activities (Chung Lau et al. 2012), the implementation for sustainable energy source seems to be a big potential for regions such as Sub-Saharan Africa (SSA) for an easy pathway to a sustainable future. However, attracting investments is not easily achievable for countries in SSA. But there are certain mechanisms, such as a guarantees of power purchase, for example Feed-in Tariffs, that have shown to attract energy sector investments, even though they are experiencing slow market growth in less developed countries. This is caused by a broad range of technical, regulatory, and financial barriers which can be overcome with an integration and usage of a combination of (adapted) price guarantee schemes, cross subsidies, and environmental taxes (Chirambo 2016). Such an approach would also exclude the risk that Africa will be using the cheapest source of energy available in the short-term, which would be fossil fuels. As the latter strategy would disregard the social cost of fossil fuels, this is not desirable and should be avoided (Schwerhoff & Sy 2017). The potential of Africa in renewable energy usage, for example with Solar PVs, is accompanied with a global trend towards renewable energy anyway, as cost reduction in renewables and advances in digital technologies are opportunities for energy transitions. This will result in, according to predictions, solar PV to become the largest component of global installed capacity, and with the help of wind, renewables will overtake coal in the power generation mix in the mid-2020s. By 2040, they will provide more than half of total electricity generations, where also hydropower (15%) and nuclear (8%) will pay a role. However, this will be largely depending on the battery costs, as this will be a critical value for power markets to make renewable energy even cheaper (IEA 2019a).

In contrast to Africa, Asia has similar issues regarding low usage of renewable energy sources, as it was the major hub for newly built coal-fired capacity in the last 20 years. These power plants have potentially a long operational period ahead of them, as the average coal-fired power plant in Asia is only 12 years

old, highlighting the problem of potential stranded assets in the power production with coal. While there are various options available for these plants, for example retrofitting them with carbon capture, utilisation, and storage (CCUS) or biomass co-firing equipment, in the Sustainable Development Scenario, most of the existing capacity will be affected by either the two options above or retiring them early (IEA 2020b), which will be not an easy task to carry. In addition, as gas is a fuel for industry, the demand for natural gas has been growing fast which led to a wave of investment in new liquefied natural gas (LNG) supply and pipeline connections. (IEA 2019b). Gas grids are a crucial part of the mechanism to bring energy to the consumers, as they typically deliver more energy than electricity networks and providing a valuable source of flexibility. Pipelines can potentially carry low- or zero-carbon energy sources, for example hydrogen or biomethane. And from an energy transitions perspective, natural gas can provide even faster benefits when replacing more polluting fuels (IEA 2020b, IEA 2019b). The IEA (2019: 4) estimates that 1.2 gigatons of CO_2 could be saved in the short-term by just switching from coal to existing gas-fired plants, but only if relative prices and regulation are supportive. This would bring down the emissions of the global energy sector by 10% and energy-related CO_2 emissions by 4%. While the establishing of new gas power plants is controversial from an environmental point of view, it nevertheless could play a huge role in retiring even more carbon-intensive energy systems in China and potentially in India as well. Tanaka et al. (2019) also show that the shift from coal to natural gas will be a key strategy to support pathways to climate stabilization. However, this is depending on the resilience and stability of the built infrastructure: Only under certain methane leakage amounts and other uncertainties, natural gas will have a net benefit on the energy transition. With stable infrastructure and small uncertainties, coming from a more stringent approach on maintenance, this calls for an even faster coal-phase out (Tanaka et al. 2019). Therefore, while the energy production using other fossil fuels (such as thermal coal) must be terminated as soon as possible, natural gas is here to stay – at least for now.

2.4.3.2 Sources of Financing for the Energy Transition & Innovation

The usage of climate finance could therefore trigger an enormous amount of emission savings as well as an energy transition in various countries, which is already done now: The GCF is helping to accelerate the energy transition. However, they also highlight that a supportive policy framework is needed, providing a stable mechanism to transfer the renewable power to the main electricity grids. They are active in Egypt and Kazakhstan, financing the energy transition with solar power projects. It is planned to encourage Kazakhstan's private sector to invest heavily in renewables with concessional, long-tenor loans over a time of five years. With the help of GCF, transmission and distribution projects are financed, ensuring that consumers have access to the energy generated by renewables. Seen by the example of Kazakhstan, the help from outside is needed, as currently, the country is one of Central Asia's largest emitters of GHG, as coal accounts for 72 percent of its energy needs (GCF 2018). 90 percent of recent renewable energy projects is financed by the private sector where public investments played a key role, as they established regulatory instruments and fiscal incentives to do so (IRENA & CPI 2018: 11). This highlights the key role public investments played in facilitating private investments (GCF 2018).

This is underlined by Haščič et al. (2015) who showed the effect of public investments to facilitate the engagement of the private sector: They looked at public policies (Feed-in-Tariffs & Renewable Energy Quotas (REQ)) and their effects on mobilization of private funds in the renewable energy sector. There was no big difference between domestic and cross-border sources of finance, whereas North-North financing accounted for two thirds of investments in their examined time frame of 2000 to 2015. Also, multilateral actors played an important role in North-South financing, as it was eight times higher than South-South financing. They find a significant mobilization effect of private funds by public finance, and this effect also is applicable to multilateral public finance, although the effect is lower in the global South. Therefore, public investments play an important role for both the investment decision and the volume of the investment, also potentially creating possible spillover effects due to institutional and legal reforms. This underlines the importance climate finance has for developing renewable energy production facilities (Haščič et al. 2015). Mazzucato & Semieniuk (2016) additionally found that risk is an important factor in deciding where to invest: however, public actors tend to invest in portfolios with riskier technologies, potentially creating positive spillover effects for the affected technologies. To facilitate that also private funds are used for riskier investments, de-risking programmes should be put in place as changes in the resulting financing schemes could even outweigh the impact of technology learning. And with ambitious climate policies in place, reducing the costs of financing of renewable energy sources could be an efficient way to lower GHG emissions (Sweerts et al. 2019).

Mobilizing finance for low-carbon energy is necessary and a key challenge for climate change mitigation (Dangerman & Schellnhuber 2012). Mentioned works above show the importance climate finance payments have in reaching the goals of the Paris Agreement. However, it is striking that these advancements are coming with still existing investments from the same countries (or companies within the respective country) in dirty energy sources such as coal, leaving a sour taste in one's mouth.

2.4.3.3 The Challenges of Investments in Renewable Energy

In addition to already mentioned challenges, there are several barriers to the potential of renewable energy finance through private actors. There is not a shortage of potential investment in renewable energy, but rather there seems to be a shortage of opportunities at a certain price and at a certain risk level that governments as well as energy consumers and (institutional) investors are willing to pay for. Here, institutional investors play a crucial role as they have distinctive risk/return requirements and longer-term objectives. They are more likely to invest in renewable energy with lower returns than other investors that are seeking gains in the shorter term. Institutional investors have several options: Investments in corporations, direct investments and pooled investment vehicles or investment funds, which could also eliminate both the liquidity and size constraints of other investments. This could be linked to potential climate finance projects of a MDB or a bilateral agreement. However, there are key barriers to achieve this potential: Energy policy, financial regulation and investment practices within institutional investors constrain their ability to invest in renewable energy projects (Nelson & Pierpont 2013: i), and therefore ultimately also in climate finance. And while energy policy always has a significant policy

element, institutional investors are themselves subject to their own set of regulations which could discourage them from renewable-energy related investments (see Nelson & Pierpont 2013: ii). In addition, to provide their main services, such as in life insurances or pension funds, they need appropriate levels of liquidity, transparency, diversification, and risk to maintain a minimal security which could limit the attractiveness of direct renewable energy investment. To overcome this, **policy barriers** that discourage institutional investors or investments funds to invest in renewable energy need to be reduced, without damaging other parts of a regulatory framework. The meaning and purpose of (financial) standards inside institutional investors must also occasionally be critically questioned (Nelson & Pierpont 2013: iif).

Even though Foreign direct investments (FDIs) in renewable energy (RE) increased over the last years, it must also be examined which **policy instruments** could attract more investments**. Feed-in-tariffs** build the most significant policy instrument that attracts FDIs in the RE sector globally (Ragosa & Warren 2019). **Fiscal measures**, for example **tax incentives**, show a significant as well as a positive impact on such RE project, financed through foreign investors, particularly in the solar energy industry. **Carbon pricing instruments**, for example **carbon taxation** and **emission trading**, also proved to attract extensive amounts of FDIs in OECD as well as non-OECD countries (Grafakos & Wall 2018). But carbon pricing alone is unlikely to be sufficient to achieve high shares of RE sources in the power sector if capital costs are high. Additional measures are needed to decrease investors' capital costs for example by either policy de-risking, meaning that underlying sources of investment risks are addressed, or financial de-risking, where risk is shifted away from private sector investor on the domestic as well on the international level (Steckel & Jakob 2018). **Public investments**, for example government funds, were not seen to be as attractive by foreign investors. They attribute this to the perceived unstableness of public funds in the long run (Grafakos & Wall 2018). However, this builds on exactly the problem which has been addressed before: the policy risk. **Regulatory and policy risks** play a major role for investors when evaluating investments in RE as it can strongly impact risk/return profiles. But **cross-country diversification effects** can considerably decrease the overall investment risk for investors (Gatzert & Vogl 2016). Uncertainty, induced through policy risks, affect the cost of capital of RE power plants greatly. **Auction design** is highly important and can help to lower the costs of such RE projects considerably (Botta 2019). Therefore, the implementation of domestic renewable energy policies, the provision of international public finance as well as the wider environment are crucial to trigger more investments in RE. The provision of public finance, regulatory measures, coupled with feed-in tariffs and political stability are strong drivers of cross-border investment in RE in less developed countries. However, these effects can vary across the source of finance (Ragosa & Warren 2019). Hasčič et al. (2015) even underlined the untapped potential of domestic public policies to increase mobilisation, emphasizing the importance of climate finance as well as energy policy to enable investments in RE more effectively. It must therefore be of great interest to reduce political risks in less developed countries to facilitate investment by private investors. However, this has not only to do with energy policy, but unfortunately also with the overall political stability of a country, which cannot and should not – because of neocolonial concerns – be easily influenced.

One major additional concern are the high upfront costs which underline the solid financial conditions that are highly relevant for a project around RE technologies. This also made it difficult for investors to invest in RE projects over the last years. However, these costs are falling, and financing conditions have strongly improved which can be allocated to macroeconomic conditions (interest rates and the experience effects within the RE finance industry). These experience effects contributed greatly to the reductions in levelized costs of electricity (LCOEs) (Egli et al. 2018). But this does not mean that nowadays financing of a RE project is simple, as it is also highly dependent on capital costs, as well as on the structure of ways of financing: One major problem of RE is the importance of project finance for renewable energy projects. Although renewables have much lower risks than fossil fuels, they still use more project finance. The key reason for this are the small balance sheets of new players in the industry (Steffen 2018). This could potentially be solved by state intervention that decline the financing costs (Egli et al. 2018), for example state investment banks, that could lead to a significant increase in investments in renewable energy. Besides capital provision and de-risking roles, such state investment banks could be used as entity for educational purposes, as entity with a signalling role as well as a financial actor that is taking on the role of a first or at least early mover (Geddes et al. 2018). This underlines that especially the financing conditions for renewable energy matter a lot. Lowering such financing costs could play a role in strengthening the growth of renewables where state investment banks, as already introduced in Germany (see Geddes et al. 2018), could be one of the key factors for achieving this goal.

Steckel et al. (2016) also added another challenge: They argue that too little attention has been paid on the spending side of climate finance. In their review, they find many advantages to spending climate finance in support of price-based national policies in contrast to project-based finance. While the support for international climate cooperation is improved along the efforts of successively increasing domestic carbon pricing, they also see that carbon pricing sets incentives for least cost mitigation. Additionally, *"investing domestic revenues from emission pricing schemes could advance a country's individual development goals and ensure the recipient's 'ownership' of climate policies"* (Steckel et al. 2016: 1).

To sum up: There are a lot of open questions regarding the financing of RE projects in less and more developed countries. Policy risks as well as capital costs play major roles. Only multiple de-risking methods may lead to more investments in RE because one instrument alone is not enough. Institutional investors could play a major role in financing the transition to a low-carbon economy, but this can only happen if accompanied by the right policy implementation alongside it. One potential solution are the introduction of state development banks, as they could effectively de-risk investments for private investor and thus attract more funding towards RE projects.

2.5 The Case of Switzerland

This chapter revisits points raised previously and shows the current situation of Switzerland as an example of one single country. It first looks in more detail at Switzerland's effects on the global climate, and then at current efforts to reduce these effects. The first chapter shows which obligations Switzerland

has to assume due to its global importance. Then, difficulties within this process will be examined in more detail. Thus, also more general problems of climate finance are addressed.

2.5.1 Switzerland's Effects on the Climate

On a country level, different countries have different effects on the climate. Switzerland, for example, has a bigger impact than other countries on an absolute, but certainly on a per capita-level. Though there are a lot of countries having a higher per-capita emission amount, emissions of a Swiss person are still substantial with an annual amount of 4.8 tons of CO_2 per capita in 2018 (World Bank 2020a). But these figures should be treated with caution, as these measurements do not capture all emissions a population is responsible for, as it is a production-based accounting, calculating emissions produced in a certain area (see Liptrot et al. 2008), thus only accounting for emissions being emitted within Swiss borders. International linkages with investments in coal companies are not attributed to the country the money comes from, but where the emissions are produced, putting an additional burden on these countries. If such relationships were to be traced down and the emissions attributed to the equity holders, global emissions would look different. In the case of Switzerland, its emissions (per capita) would skyrocket.

When examining the amounts of climate finance Switzerland should provide, equity principles are essential: They outline which entity should try to mitigate or finance these mitigation efforts to which extent (see also 2.3.3.2). As countries decide themselves what they want to do with their resources in their territory, it is even more difficult to establish such an allocation system internationally. And with the increasing availability of carbon-efficient technologies, the right to pollute the same as other countries did before does not seem imminent for the well-being of a countries' citizens (Bretschger 2013: 524). Therefore, other principles must be used: The *Ability to Pay Principle* "*requires the future allocation of carbon emissions to be inversely related to the ability to pay for emission reduction"* (Bretschger 2013: 525). This is being linked with the *Polluter Pays Principle* which generally puts the obligation to finance mitigation and adaptation measures to the countries responsible for them (Bretschger 2013: 525). Together, these principles outline a comprehensive and reasonable approach to financing measures against climate change: On the one hand, the ones that are responsible for it should be held responsible, on the other hand, countries that have more funds available for climate financing should do more than those with less financing capabilities. Together with the *Cost Sharing Principle*, reflecting the distribution of these abatement costs (Bretschger 2013: 525), it should show what Switzerland and other countries need to finance to reduce their negative impact they have/had on the climate. Concurrently, other countries should also be encouraged not to work against these activities where technology exchange plays an important role as well. Another mechanism is introduced by Egli & Stünzi (2019), which reflects the *Burden Sharing Principle*. Alongside the conventional pillars of *Emission Responsibility* and *Ability to Pay*, *Dynamic Principles* are added so countries are encouraged to define more ambitious targets. In addition, countries with a high climate vulnerability are relieved (Egli & Stünzi 2019). Although there are different methods of calculating which country has to raise exactly how much money to achieve a consensus, these are not binding under the Paris Climate Agreement (UN 2015).

Nevertheless, they provide an indicator of how much should be paid by the individual countries and regions, and thus also by Switzerland.

But it must also be defined who should receive the financing. This is especially important as most vulnerable countries often face a double burden regarding climate change: First, they are at high risk when it comes to damages of climate change. Secondly, they are not as well equipped as other countries to adapt to climate change. Although more vulnerable countries should, logically, get more help from outside, the vulnerability of a country, measured by standard metrics, does not seem to be the primary factor for explaining the distribution of available (bilateral) adaptation assistance. This is also in contrast to the political narrative that is emerging in climate finance architecture. Instead, other factors, such as perceived capacity to manage and implement project as well as the commitment given to climate change and other political priorities play a major role in the allocation mechanism. Together with strong institutional capacity of the receiving country, these were the most prominent points when attracting funding for adaptation measures and therefore climate finance. This underlines the practical and political challenges of a vulnerability-oriented prioritization of funding distribution as well as the problems with countries' capacities to attract and to manage this international adaptation support. Especially the differences between the needs of donors' requirements of high fiduciary standards and the access to the most vulnerable countries need to be addressed (Doshi & Garschagen 2020). The questions regarding who pays how much and which country should receive which amount is crucial in reaching the climate mitigation and adaptation targets of the SDGs as well as the Paris Agreement.

As Switzerland is responsible for a disproportionally larger amount in comparison to its size, and as the country has a lot of financing available, measures against climate change should be financed heavily to fulfil its obligation to reduce its impact on the climate globally. The Swiss government has identified this problem and started to finance development and cooperation activities in the field of climate change mitigation of adaptation. Its current state is demonstrated in the following chapters.

2.5.2 Activities of Switzerland: Development and Cooperation

The Swiss Agency for Development and Cooperation (SDC) underlines that funding climate protection is crucial as people in less developed countries are particularly affected by climate change and their livelihoods depend heavily on natural resources. Therefore, the government of Switzerland engages actively in climate change mitigation and adaption strategies worldwide and tries to use its funding for less developed countries as effectively as possible. But these actions are not solely limited to climate change-related actions. They create synergies between climate protection and improving food security and governance. The focus is put on the poorest countries and their needs. In order to achieve its goal, the government of Switzerland and particularly the Swiss Agency for Development and Cooperation (SDC), the State Secretariat for Economic Affairs (SECO) and the Federal Office for the Environment (FOEN) are actively involved in various multilateral cooperation associations, such as the Green Climate Fund. The SDC, SECO and FOEN are supporting these associations financially (SDC 2020).

Especially the SDC highlights that Switzerland works to ensure that the funding is used where it has the largest impact and that adaption measures that are needed receive sufficient funding. For this, it is tried to increase awareness at the international level to boost the funding for climate finance (SDC 2020). Under the United Nations Framework Convention on Climate Change (UNFCCC), the international community and Switzerland have committed to mobilising public and private funds (United Nations, 1992). It is expected by government agencies that Swiss funding of mitigation and adaption measures is sufficient and in accord with equity principles. Although there is no quantified amount of climate finance that is legally binding for Switzerland, the Swiss government concluded that a fair share of Switzerland is around USD$450 to 600 Mn. in climate finance p.a., when two criteria, *Economic Capability* and *Fair Burden Sharing* are considered (Federal Council 2017: 2). See Table 1 for details.

However, how high such a fair share of climate finance in the international context is, seems to be highly debatable. The Federal Council of Switzerland supports a method of calculation, whereby the *Polluter Pays Principle* should be weighted at least as strongly as *Performance*. This efficiency is measured by the global gross domestic product (GDP), which was then compared with other industrialized countries, which came to 0.9% of the total GDP around 2012. In contrast, the *Polluter Pays Principle* describes the amount of direct greenhouse gas emissions caused within the country's own borders in a climate context. In 2012, the year that Switzerland took as the basis for its calculation, Switzerland was responsible for 0.3% of the greenhouse gas emissions of the industrialized countries. If these two principles are now weighted differently, Switzerland's fair share of the collective financing target of USD$100 Bn. has been calculated as USD$450 to 600 Mn. p.a.. The more weight is given to economic performance, the higher the Swiss share gets as Switzerland is very wealthy compared to other countries and has an economy that produces relatively few greenhouse gas emissions (Federal Council 2017: 13).

Table 1: Fair Amount of Climate Finance of Switzerland (see the Federal Council (2017))

Criteria and Weighting	*75% Polluter Pays Principle + 25% Economic Capability*	*50% Polluter Pays Principle + 50% Economic Capability*
Fair Share of Switzerland	**USD$450 Mn. /year**	**USD$600 Mn. /year**

This financing can come from private and public funds. For more developed countries, in the medium term, the private funds mobilized for climate-related measures should increase significantly. Cumulatively, these should then clearly exceed the contributions of the public sector. But currently, public contributions clearly predominate. The mobilization of private funds clearly depends on other factors, such as the economic situation, the regulation of the financial sector and the risk perception of investors. This can be counteracted with favourable framework conditions and other appropriate measures which can encourage companies to invest in less developed countries. Switzerland thus plans to generate a significant portion of its climate financing by mobilizing private funds (Federal Council 2017: 14).

There are various options for meeting this financing target, some of which must be combined. New development cooperation payments are possible, but this is linked to political and financial hurdles. In addition, the opening of new sources of financing at the national level and the greater consideration of climate change in development cooperation would also be an issue. The latter builds on the fact that climate protection and poverty reduction cannot be separated. However, the increased mobilization of private funds is regarded as a promising approach (Federal Council 2017).

2.5.3 Mobilization of Private and Public Funding of Climate Finance

2.5.3.1 Quantification of Climate Investments

Since Switzerland intends to make a significant proportion of its fair contribution by mobilising private funds, it is important to define which payments can and cannot be included. Bilateral climate financing contributions of SECO, FOAG, FOEN and SDC are calculated based on climate indicators, the so-called Rio-markers, for mitigation and adaptation measures of the OECD Development Assistance Committee (OECD-DAC) (SECO, FOEN and SDC 2019: 1). These markers are used with the OECD-DAC to monitor financial flows for development targeting the objectives of the Rio Conventions on biodiversity, climate change, desertification, and climate change adaptation. So, OECD-DAC members are requested to indicate which goal all of their bilateral official development assistance (ODA) flows are working towards, if there is an environmental objective (OECD-DAC 2016: 2). Financial flows can only be attributed to climate financing if they are flowing from Switzerland, directly or through a multilateral development bank (MDB), into a least developed country (LDC). Especially the allowance of financial flows as climate financing through MDBs is difficult since MDBs finance also countries not defined as LDCs. Looking at mobilized financial flows from the private sector, a **plausible causality** must be given between Swiss government action and the climate investment from the private sector. Thus. calculating Swiss contributions to climate finance activities is quite difficult, especially given the fact that it must be distinguished between public and private funding (SECO, FOEN and SDC 2019: 2)

2.5.3.2 Instruments for Enabling Mobilization of Private Funds

Generally, OECD distinguishes two different types of mobilization of private funds. When governments invest in a climate-relevant project together with private actors, the financial flows from the private sector are considered **directly mobilized**. Direct instruments are specifically designed by one of the international financial institutions (IFIs) to give rise to financial support for climate finance from other financial actors, for example green bonds. The key point is that other financial activities are induced. An example would be the co-financing of a mitigation project by an IFI which helps to increase the rate of return of other investors, thus making the financing of the project more attractive to private sector investors (Anbumozhi et a. 2018: 326). A good example was the Green Climate Fund's (GCF) equity investment of USD$20 Mn. in a fund for renewable energy in East Africa at the end of 2015 to promote investments in decentralized solar energy solutions in Kenya and Rwanda. The GCF's goal was to attract an additional USD$100 Mn. in debt capital for the fund, thereby mobilizing a total of 600 Mn. investments directly in projects. If this mobilization succeeds, the donor states of the GCF can have the

mobilized private funds credited to their international climate financing on a pro-rata basis (Federal Council 2017: 17). If governments support public actors in LDCs to develop and implement suitable measures with the goal of promoting private investments in climate-friendly sectors, for example technologies or infrastructure, the financial flows are considered **indirectly mobilized** (Federal Council 2017). State actors, for example, support governments in less developed countries in the development and implementation of appropriate measures (e.g. CO_2 taxes, emissions trading systems, cost-covering feed-in tariffs, tax breaks for investments in renewable energies, etc.). with the aim of encouraging private investment in climate-friendly sectors, technologies, or infrastructures (Federal Council 2017). However, the quantification of the indirectly mobilized private investments is very complex and controversial, since a causal relationship is in many cases hard to prove (SECO, FOEN and SDC 2019: 2).

The definitions of the OECD-DAC still have leaks and are not fully well-engineered. As the Swiss Agency for Development and Cooperation (SDC) mostly provides international development aid through technical assistance or capacity building, it is important that these methodical gaps are closed to fairly account for the indirect mobilization of private financial flows from Switzerland. But influential developed countries have already signalled that a clear causal relationship must be given. This condition makes it difficult for many projects supported by Switzerland to be fully eligible. Especially the so-called catalytic effect of public measures remains controversial (SECO, FOEN and SDC 2019: 3). On the other hand, there is further research being done on how these catalytic effects can be maximized (see e.g. Meeks 2018), indicating that indirect mobilization seem to be an eligible way of climate finance.

2.5.3.3 Additional Hurdles for Efficient Allocation and Quantification

Although the described measures are comprehensible and desirable, there are various problems coming with it, data collection being one of them. Even though MDBs are part of the process of development of methods of the OECD-DAC, they developed own statistical standards which are solely counting their efforts, and not the ones of other public actors, leading to double counting of payments. This is problematic, especially in the context of the goal of USD$100 Bn. in climate finance. Switzerland's most prominent problem with these actions is the identification of new possibilities of stronger mobilization of the private sector, which is hindered by the divergent methods of the MDBs (Benn & Sangare 2018).

Additionally, there are difficulties between different Swiss public agencies as the SECO and SDC do not gather data about mobilization of private funds through climate-relevant projects that are identified with Rio Makers. Although efforts are ongoing to fill this gap, they most likely will not be complete as such a detection of possible mobilization is retroactively nearly impossible. It must also be weighed up whether the benefits or costs of such data collection are higher. Additionally, private actors play a key role as some of them are unwilling to make their data available for reasons for confidentiality, which is also a problem regarding data transfer with MDBs. This ultimately means that Switzerland is unable to accurately measure its exact share of mobilization of private funds (SECO, FOEN and SDC 2019: 4). It is striking, however, that these problems have been elaborated for a long time, as Stadelmann & Michaelowa (2013) already found such a lack of information reporting in climate-related finance, as well as a

lack of clear definitions of key terms on an international level. This illustrates the slow pace climate finance is evolving with, although fast actions are required.

2.5.4 Current State and Critique

2.5.4.1 Limited Climate Finance Contributions

In case of Switzerland, there are various possible outcomes being discussed for attaining the climate finance goal. In 2017 alone, Switzerland spent a total of USD$346 Mn. public funds for climate mitigation and adaptation measures in less developed nations. In comparison, the gathered mobilized private funds through all federal bureaus directly is only around USD$20 Mn.. And through multilateral organizations, SECO, FOEN and SDC estimate to have mobilized around USD$100 Mn. at least. Both of this mobilization of private funds can be expected to be much higher as there currently is no systemic acquisition of this data through the various channels (SECO, FOEN and SDC 2019). This showcases that the goal of the Federal Council from 2015, to increasingly rely on the catalytic role of official development assistance, could not be achieved. The Federal Council however underlined that in a liberal economic environment, the state cannot dictate to the private sector where and how it should invest (see Federal Council 2017). Nonetheless, it is expected that the attempted goal of mobilization by Switzerland from 2020 onwards will be achieved. But these monetary amounts could also be much higher, as data collection is not sufficient yet (SECO, FOEN and SDC 2019: 13ff). This is also illustrated by various allowability problems (see 2.5.3). In comparison, Stadelmann & Michaelowa (2013) estimated that private climate finance mobilized by Switzerland at around CHF 0.5 to 2.7 Bn. p.a.. This underlines the narrow definition of mobilized climate finance payments and with what level of suspicion estimates and actual reported climate finance pledges to the goal of USD$450 to USD$600 Mn. p.a. must be considered.

Although the goal of climate financing was thus achieved, the weak mobilization of the private sector is a criticism of the current situation. The Federal Council (2017) had already made a certain assumption a few years ago: Since the investment behaviour of companies and investors is largely determined by the investment climate prevailing in a less developed country, greater participation of the private sector in international climate financing is generally easier to achieve in less developed countries that benefit from favourable framework conditions and positive development prospects. This is also associated with higher risks, for example political, regulatory, currency and liquidity risks. This calls for instruments that effectively reduce these risks and thus make these private investments possible in the first place. It was also discussed that part of the public contributions should in future be in the form of credits, loans and guarantees to demonstrate a higher mobilization potential through these financing instruments (Federal Council 2017). Together with the difficulty of creditability, this represented the biggest hurdle for climate financing. These were only partially overcome, as private funds were only partially mobilized.

Additionally, it seems that this pledge of USD$450 to USD$600 Mn. p.a. is considered as a fixed point by many governmental actors. While it is true that also regarding international political relations, this goal must be achieved with the rules (and difficulties) that come with it, and it should certainly be a goal at first to at least achieve this amount of climate finance, Switzerland and its government should also

question the decision on such a fixed amount. For example, Alliance Sud demands to increase the pledge of climate-relevant investments to USD$1 Bn. p.a. from 2020 onwards as this would be a proportionally fair share of financial support according to global economic activity and emission amounts of Switzerland. And this amount of climate finance should certainly not reduce other parts of development assistance already being paid for other kinds of projects (Staudenmann 2019: 3). Egli & Stünzi (2019) also showed that, when using their introduced equity principles (see 2.5.1), Switzerland would need to increase its yearly pledge by USD$339 Mn., reaching a total of USD$789 Mn. p.a..

This demand is even more important in the context that the federal government is still not spending the promised 0.7% of gross domestic product on ODA either. Thus, Switzerland needs to make sure to fulfil its obligations in both aspects (Staudenmann 2019: 3). But improvement is not in sight. This only just became apparent again with the replenishment of the GCF in 2020, where Switzerland alienated USD$150 Mn. from the development cooperation framework credit. This violates both the Paris Agreement and the principles of effective development cooperation. Moreover, this increase in the contribution to the GCF is too small to begin with, which once again underlines the problematic nature of the issue. And since this money is drawn from the development cooperation framework credit, the money is no longer available for reducing poverty and inequality without a linkage to climate change (Staudenmann 2020). This thus shows the ambivalence of the Swiss government. It seems that funds are only being shifted for publicity purposes in order to look good on the important issue of climate change. Rather, new and additional funds should be mobilised for the fulfilment of the Paris Agreement, instead of withdrawing them from development cooperation (Staudenmann 2020). Brunner et al. (2019) have already shown that such additional financing would be well possible by levying certain steering levies on environmental issues. In addition, it is important to use these funds effectively and where they are really needed: Lottje (2020) has shown that Swiss climate financing does not benefit the poorest countries and people, nor those countries and people most severely affected by the climate crisis. This is because these funds would be used primarily for middle-income countries or via the so-called global or regional programmes. This thus shows that the argument that development projects are at the same time fully-fledged climate protection and adaptation measures in the sense of the Paris Accord does not hold either as they are not used for LDCs. Although emission reductions are best achieved in middle-income countries, climate finance should not take place in these alone, as adaptation is all the more important in LDCs. So, poorer countries should be the main target of development cooperation. This shows that development cooperation cannot be equated with climate mitigation and adaptation measures (Lottje 2020). This is because climate finance is primarily geared towards overcoming future climate risks and is not per se aimed at directly improving current living conditions. Thus, the core task of development cooperation is ignored in most climate projects and this shift has dire consequences for existing development cooperation, making additional funds imperative (Staudenmann 2020). For this, Kollmuss (2018) points out financing possibilities so that climate finance can be adequately funded without jeopardising existing development cooperation.

2.5.4.2 Regulatory Framework regarding Carbon Risks of the Swiss Financial Market

In addition to limited climate finance payments of the Swiss government, the Swiss financial market has ongoing problems with its compatibility with the Paris Agreement and the transition to a low-carbon economy. Current problems of its financial centre are outlined here.

The financial centre of Switzerland is of high importance to the country, as around 10% of the country's GDP is generated by the financial sector, making it a pillar of the Swiss economy. The large amounts of banks and insurance providers in the country are managing around one quarter of the world's cross-border assets. Also, the FDFA claims that Switzerland is setting global standards around taxation, combating money laundering and even terrorist financing, as well as around the financial market stability, while being able to set the legal and regulatory conditions so that financial actors can provide high-quality products and services and remaining innovative (FDFA 2020). While some of these points certainly are not under question, as for example the Swiss franc is considered by many to be a safe-haven currency for decades, indicating low volatility (Janssen & Studer 2017, Baltensperger & Kugler 2016), other claims seem to be outdated. Although innovation is regarded highly important for official institutions, as 2016 various barriers regarding market entry for fintech firms were defined (FDF 2016), efforts regarding sustainability in the financial sector paint a different picture. A few years ago, Switzerland was trying to be a pioneer in sustainability in financial matters and position itself as a hub for "green" finance, building on the presence of international organisations, NGOs and think thanks in Geneva and elsewhere in the country, making the country well suited to international exchanges on sustainability issues. However, Swiss institutions were slow to define a clear position on sustainable finance, and even if they did, their stands were superficial at best (Dupraz-Dobias 2019). This lead to a backdropping of the financial centre in sustainability issues, although it is being tried to minimize that backlog in recent years. For changing the fact that Switzerland is currently not an international leader in terms of sustainable finance, more high-level endorsement, leadership, and decisive action by all major players in the Swiss financial industry is needed (Krauss et al. 2016).

Already in 2015, south pole group and CSSP worked out the carbon risks for the Swiss financial centre and its players. In the process, recommendations were made for both investors and Swiss politicians. For the latter, they particularly recommended the introduction of a law that makes it mandatory to include climate targets and to have them regularly monitored by investors. In addition, the most comprehensive regulatory option that has been elaborated is the pricing of external climate costs to influence private investment decisions to redirect capital flows to more climate-friendly alternatives. On the real economy side, this implies that Swiss companies should be obliged to disclose their climate strategies to make investment targets easier for financial actors, whereby pricing mechanisms would increase the cost of capital for CO_2-intensive companies (see south pole group & CSSP 2015). By the end of 2020, all these measures have not been implemented, at least not in a binding form, since it can be assumed that individual actors will raise the referendum against the new CO_2 law, passed in September 2020.

In 2017, the first PACTA (Paris Agreement Capital Transition Assessment) report was published which conducted an in-depth (voluntary) assessment of the alignment of Swiss pension funds and insurance portfolios with the 2°Celsius climate goal of the Paris Agreement. They found that the financial flows underlying the corporate bonds and listed equity portfolios of Swiss pension funds are far away from a 2° Celsius compatibility – rather, they support a 6°Celsius pathway, although there are significant differences across actors (Thomä et al. 2017). An enhanced PACTA report was published in November 2020 (see Spuler et al. 2020). Although many of the financial players have made changes in their portfolio because of the 2017 test, the Swiss financial sector is still not aligned with the Paris Agreement. This is also evident from the fact that no single financial institution sets climate-related targets in all business areas. Thus, this report finds that investments are still being made in energy production with oil and coal. The share invested in high-carbon power capacity is still four times higher than the share invested in renewable energies. For example, there is a significant gap between differentiated climate strategies and their communication on paper and the realised portfolio allocation. In particular, the coal sector (coal mining and coal power) is clearly behind the Business-as-Usual scenario of the IEA. This underlines the fact that although awareness has increased, the actual actions still lag (Spuler et al. 2020). Other NGO reports also show that the Swiss financial centre is highly environmentally unfriendly. Greenpeace calculated the billions of US dollars that Credit Suisse and UBS invest in the fossil energy business by examining the debt financing of 1010 companies in the coal, oil and gas sectors. They concluded that this enabled more CO_2 emissions to be generated in the years 2016 to 2019 than were produced within Switzerland (Greenpeace 2020a). At the same time, ways to make the Swiss financial centre climate-friendly were also identified: These include the immediate phase-out of extremely harmful fuels, the successive phase-out of all fossil fuels and the transformation to finance a 1.5°Celsius economy (Greenpeace 2020b). PwC and WWF make similar recommendations in two reports, which focus on both climate change and biodiversity loss: They even recommend declaring a state of emergency with regard to biodiversity loss (PwC & WWF 2020a), but also that Switzerland should clearly commit to a target of net zero GHG emissions by 2050. Additionally, clearer guidelines for the integration of environmental risks in financial decisions should be introduced (PwC & WWF 2020b).

This makes it clear that the Swiss financial centre is already being attacked from various sides for its weak commitment to combating climate change. However, there potentially is light at the end of the tunnel: In absence of laws for sustainability in the financial sector, other market players found ways to promote sustainability issues in the financial sector as sustainable investments grew from CHF32.4 Bn. in 2009 to CHF1,163.3 Bn. in 2019, with high growth numbers especially in recent years, as investments grew by 62% from 2018 to 2019. The investments by private investors grew heavily by 185% (Dettwiler et al. 2020). The demand from institutional investors were especially important for asset managers to become active in sustainable finance, only followed by legislative pressure. Also, stable growth rates are expected for the next few years, indicating further steps to a more sustainable financial centre (Dettwiler et al. 2020: 11). Also, the fact that Swiss market players manage around a third of global microfinance funds of the world seems promising (Harp et al. 2019). In June 2020, the Federal Council of

Switzerland even issued an analysis of sustainability in Switzerland's financial sector, where sustainability is defined as key to financial market policy. It is acknowledged that efficient and risk-appropriate pricing should be possible, mentioning environmental policy instruments to achieve environmental policy goals, e.g. internalising external costs when harming the environment (Federal Council 2020a).

But these numbers and guidelines are deceptive: The Federal Council still has no concrete rules and/or laws, only principles and guidelines. Although the Federal Council issued further steps to make the Swiss financial centre sustainable in December 2020, no concrete measures will be implemented before autumn 2021 (see Federal Council 2020c). This underlines the general problem of sustainable finance in Switzerland: As there are no rules and/or laws what exactly sustainable is, it varies heavily how sustainable a certain investment is perceived to be (Dupraz-Dobias 2019). This could dampen the positive image depicted by Swiss Sustainable Finance, as in their market study investments seem to be already labelled as "sustainable" when there are certain exclusion criteria met (see Dettwiler et al. 2020: 9), indicating a weak or at least broad definition of sustainability. This underlines the rather weak efforts of Switzerland to make its financial centre more sustainable. Actions not only regarding low climate finance is necessary, but also to make the financial centre greener and more sustainable in general.

We have seen in this chapter that climate finance is clearly necessary and important to confront climate change. The promotion of renewable energies plays a decisive role in this. This could be a lucrative area of business due to falling costs and growing demand. However, the situation is not optimal at the moment, as it can be seen in the example of Switzerland: Switzerland is lagging behind its own footprint in climate finance payments, and private funding is very limited, although the latter would be indispensable for the transition to a low-carbon economy. So there is clearly still a need for political action.

2.6 Financialization of Nature

Before calculating the investments of Swiss financial players into the energy production with coal, it is important to address the underlining assumptions around the blending of finance and nature and its elements. To show how finance interacts with the environment, one must ask if this should even be the case that nature and finance should be interconnected to such an extent. Interlinkages of natural products and natural capital with the world of finance is examined as well as the question whether such relationships should exist. A framework highlighting these connections called *Financialization of Nature* is established. It shows the interlinkages between the financial sector and the nature, and more specifically, natural capital. It critically assesses to what extent such relationships are valuable or in which circumstances they are rather damaging to the environment. This is important as in the debate of the financing of thermal coal, it must first be understood if its financialization as well as the financialization of its alternatives are needed. Also, as with higher amounts of climate finance, nature is included more in financial decision processes, so it should also be discussed how far this is to be advocated. This provides the reader with a critical perspective, so that fossil and renewable energies are not only seen purely as "good" or "bad", but that this topic is viewed in a differentiated manner and critically questioned.

2.6.1 Financialization of Nature & Accumulation by Dispossession

Kemp-Benedict & Kartha (2019) define Financialization of Nature as "*the creation of environmentally-based commodities and tradable financial assets"* (Kemp-Benedict & Kartha 2019: 69). Thus, in this process, parts of nature become products of the financial world, where nature and resource-based production are given a financial value form which leads to its trade in specialized markets. This has been happening for a long time, since products of nature, such as coal, were given a value and were traded. However, this has become more intense over the neoliberal aera. The finance world has established even more relations with the natural world in this time, with financing arrangements in mining, oil, and gas extraction as well as with the definition of new financially engineered products that are based on natural commodities such as weather derivatives and catastrophe bonds. This development did not stop: New products and markets were introduced, such as the carbon market, the valuation of ecosystem services and mitigation schemes as well as water rights and agricultural micro-insurances (Ouma et al. 2018: 500f). Gunnoe (2014) for example found a substantial shift in landownership in rural America where farmland is increasingly controlled by financial institutions, potentially having profound effects on rural communities across the United States and potentially creating a land bubble. This widening and deepening of finance into nature and nature-based products is also a ramification of the neoliberal era as financial capital seeks to expand, find, and create new products from which an income can be derived (Leyshon & Thrift 2007). Not only the scale and reach of finance expanded, but also its complexity and its speed increased, as well as its function as a medium for unhampered speculation (Lee & LiPuma 2004). And exactly such expansion could pose risk to the entire market as it will make the market more volatile and introduce more systemic risks (Augar 2006).

Such products were intended – maybe with a good intention – to fix certain problems a traditional market cannot fix, as problems such as tragedy of the commons and negative externalities could arise. Potschin-Young et al. (2016a) for example argue that the valuation of nature and its ecosystem services are only about providing information and Costanza et al. (2014) underline that such information is critical if ecosystems are to be protected. But without a proper compensation scheme in place, such valuation could damage nature dramatically, meaning that fixing mechanisms in finance could potentially harm the environment more than it should. Actors implementing this valuation are called "fixers" and are mainly big corporations which accumulate wealth by potentially harming others and creating markets that would not exist otherwise. They grew by neoliberalism in the 20th century through globalization where deep national and global capital were divided – and resulted in an emergence of a strong financial sector which expanded across the globe (see Kotz 2015; Burch & Lawrence 2009, 269ff.) This is also linked to David Harvey (2009) and his theory of accumulation by dispossession where neoliberal capitalist policies result in the centralization of wealth and power by dispossessing others, the public and private entities off their wealth as well as their land. He described four practices that these policies are mainly guided by: Privatization, Financialization, Management and Manipulation of Crises as well as State Redistributions. The financialization of nature that is seen now in the light of expansion of finance

into new territories underlines Harvey's theory where finance reaches more (or even all) parts of society and gives every entity a monetary value. This development is expanding spatially as market relations are expanding onto territories, sectors and areas that have not been integrated until now. Therefore, the expansion of finance could result in an even bigger divide in society and in new forms of imperialism (Harvey 2009), as these divides are also spatially visible between more and less developed countries.

Although a lot of economic geographers highlight the damaging impact financialization of nature and financial institutions can have on the environment (see e.g. Fletscher & Büscher 2017, Bracking 2012; Dempsey & Suarez 2016), it has also been theorized by some that capital ventures from global finance into geographically far distant places to produce new socio-natures, which can also be understood as an environmental fix, *"[…] whereby nature and resource-based production serve as new circuits for capital to help resolve global capitalism's multiple crises (financial, climate, food, energy)"* (Ouma et al. 2018: 501) (see Brand & Wissen 2014; McMichael 2012). Environmental fixes are a theoretical framework connected with the ideology of market environmentalism & neoliberal nature which has gained prominence within environmental policy since the 1980s (Liverman 2004). Such a perspective is to be placed in neoclassical economic theory where the absence of prices in environmental goods results in its degradation (O'Neill 2001). This paradigm saw growing acceptance in society through the rise of neoliberalism, also introducing the term *Commodification of Nature*, where nature and natural resources are being repurposed to be economic goods (Castree 2003). Such a neoliberal approach sees nature as "world currency" where it is given the *"opportunity to earn its own right to survive"* (McAfee 1999: 133f). This approach of "selling nature to be able to save itself" requires economic valuation, either through a cost-benefit analysis or a contingent valuation, or even through direct commodification (Castree 2003: 285). These commodification efforts are mostly propelled by private firms, as they are seeking for new areas of investment and new possibilities of circulation of capital. There are certain explicit policy prescriptions for privatization. Resources are made available for market exchange as by-products and processes of rationally managing and conserving the environment (Harvey 2007: 123). Exactly there, environmental and ecological fixes – terms that are sometimes used as synonyms, however in another charged context – are to be placed: Vandana Shiva defines ecological fixes *as "[…] means of turning a potential threat into an opportunity"* (Shiva in Bakker 2009: 1782). Castree (2006, 2008) however defines environmental fixes as *"[…] a set of strategies adopted by fractions of capital (or the state) to combat barriers to accumulation and foster continued economic growth"* (Castree in Bakker 2009: 1782). The contrast of both definitions is striking, underlining the inherent different assumptions both authors have. Shiva (in Bakker 2009) portrays it more positively than Castree. The latter mostly uses the term in a negative light: Castree (2008) also built a framework of four different types of environmental fixes. The first three reflect and highlight that *"fractions of capital […] specifically [use] neoliberal measures to gain commercial advantage in and through the domain of the physical environment"* and a fourth with which *"state bodies [use] neoliberal environmental measures to solve problems arising within the state apparatus or the wider economy and society"* (Castree 2008, 146). In the first three types of environmental fixes, Castree (2008) portrays strategies of private capital to profit from

environmental conservation, accumulation by dispossession as well as environmental degradation, where only in the fourth type, possible strategies by governments are addressed, namely the mediation of tensions within the regime of accumulation by deregulation/devolution or the adoption of a more minimalist stance on the matter (Bakker 2009: 1782). This framework misses an important point however, made by Shiva before: Such environmental/ecological fixes are not only a danger to environment, but also an opportunity. And Anthias & Radcliffe (2015) found another striking positive usage of (ethno-)environmental fixes as it was used to limit the destructive effects of marketisation of an indigenous population. Although this theoretical framework where the valuation of cultural and natural capital was used to protect indigenous peoples, had failed partially in practice (Anthias & Radcliffe 2015), it showed that a valuation does not have to be inherently bad, as portrayed by Castree (2006; 2008).

One explicit example of environmental fixes is the fission of nature into various ecosystem services and valuing them accordingly, so that they receive real monetary value. Nature can therefore be incorporated into economic decision making. This was triggered through the thinking that the benefits of nature that are provided by nature and semi-natural ecosystems did not gain enough attention in decision making (Odum & Odum (1972) in Hein et al. 2006: 210). Since then, methodologies for the valuation of ecosystem services have been further developed. Although this helped to attract support for conservation, it however also contributed to commodify a larger number of such ecosystem services, which in turn reproduces the neoclassical economics paradigm as well as the logic that the market is to tackle environmental problems (Gómez-Baggethun et al. 2009).

Nonetheless, striking results could also be reported. Groot et al. (2012) examined more than 300 scholarly works to give a comprehensive overview of the 10 most important biomes and their economic values. They find that ecosystem services can be valued from 491 int.$/year for a hectare of marine habitat to around 352,000 int.$/year for a hectare of coral reefs (de Groot et al. 2012: 55). But they underline that their results show that most of this value should be considered as non-tradable public benefits. This shows that most of this value should be outside the market. Most importantly, the continued over-exploitation of the examined ecosystems comes at the expense of the livelihoods of the vulnerable generations where future generations are also included. This builds on the argument that positive externalities of ecosystems are lost or at least strongly reduced after a land use conversion. To stop this process, better accounting measures regarding public goods and services that are produced by ecosystems are crucial. This could also lead to improved decision making and an increased number of institutions engaged in biodiversity conservation and sustainable ecosystem management (de Groot et al. 2012: 50). This shows that still, a marketization of such goods is not desirable and corresponds with other criticism of the valuation of ecosystem services from a deep ecological perspective where the inherent worth of living beings and the world itself is to be respected, regardless of the instrumental utility to human needs (Smith 2014). Also, Kill (2015) from Friends of the Earth International, a grassroots environmental network, argues that this is just the latest step of a centuries-old process where whenever there is a new crisis in capital markets, new ways to extract value from nature are found. This can be compared to

colonial powers declaring nature as "empty land" (Kill 2015: 4), also linked to the term of terra nullius as justification method (see e.g. Fitzmaurice 2007). However, in this valuation, only the valuable ecosystem services to capital market are regarded, leading to devasting results where some ecosystem services are included while some others are not, just creating externalities at another location. Kill finds that such valuation of ecosystem services is also used as a part of offsetting mechanisms where pollution is regarded as tenable if it is compensated for it somewhere else. Mechanisms that use valuation of certain ecosystem services are flawed in nature and the destruction of ecosystem service on one part of the world cannot just simply reimbursed for somewhere else. It also reduces the community control over their territories and shows an extension of the social license for capital markets to profit on the back of the earth (Kill 2015). De Groot et al. (2012: 59) somewhat agree with this criticism as prices given to ecosystem services are sometimes very low. This does not reflect the variety of market and non-market services supplied by nature which is why they are turned from multi-functional systems to mono-functional systems, where the costs of the loss of the other services are not or only partially considered. However, they argue that valuation is about assessing trade-offs to optimize benefits the human population receives from the interactions with ecosystems, all in the light of sustainable development. Such trade-offs are here represented in monetary values which does not mean that all these ecosystem services must be commodified and exchange them in markets. They link this with the valuation of human lives implied by the spent amount of money on highway safety which also does not imply human trafficking per se. Such values should only be regarded as additional information to policy makers to make better decisions when faced with trade-offs between different ecosystem services (De Groot et al. 2012: 60f).

There are certain authors that point out important nuances of the debate around the financialization of nature that should be addressed as well. While Potschin-Young et al. (2016b) agree with Silvertown (2015) who claimed that ecosystem (ES) valuation is damaging, they argue that assigning a monetary value to an ecosystem service may be appropriate in certain situations and also, and most importantly, *"monetization does not equal marketization"* (Potschin-Young et al. 2016b: 335). It is out of question that it must be examined quite extensively where ES valuation is appropriate. However, not all economic mechanisms are simply leading to neoliberal marketization or commodification (see Muradian et al. 2010). Issues around governance as well as around moral and ethical choices about what can be traded must be solved and this must not necessarily lead to marketization. There are various means of governance beyond payment or economic mechanisms which contribute to sustainable ecosystem management as well as the success of biodiversity conservation (see Primmer et al. 2015). Also, there is a wide range of literature which documents the benefits of valuation (see Borie et al. 2014; Juutinen et al. 2012). The valuation of ecosystem services has additional benefits, namely the measurements and communications of the importance of the nature to people where assigning a monetary value is part of (Primmer & Furman 2012 in Potschin-Young et a. 2016b). Therefore, the valuation of ecosystem services and the literature around it should not be solely classified as danger to nature as it can also be a way of (re)connecting people with nature. This potentially leads to a more sustainable biodiversity management as well as a better well-being for all (Potschin-Young et al. 2016b). This short discussion shows that such

financialization and valuation is not inherently bad and can potentially lead to good consequences. Nevertheless, marketization of ES and other natural products can also lead to devastating consequences.

To link this debate more closely to the financial world, it must be highlighted that tradable financial instruments and their exchange on financial markets can lead to increased protection of nature. Environmental economists such as Chichilnisky and Heal (2000) claim that the creation as well as market exchange of financial "environmental assets" could help to stop degradation and destruction of natural environments. Kemp-Benedict & Kartha (2019: 70) question this argument and argue that an asset must be fungible and comparable to other financial products so that it can be used as a financial asset. However, this is not the case with environmental goods such as ecosystem services. Also, the point of view of investors that distinguish along a narrow set of dimensions, for example price, risk and expected return, is not suitable for environmental goods as they occupy manifold and complex dimensions. They additionally argue that financial assets are rights to a stream of income payments and its value has only weak ties to the particularities of the underlying physical asset. However, its market value is determined by being traded which can diverge from the fundamental value. This could lead to simplification and degradation of ecosystems, also linked to Polanyi's *fictitious commodities* (Polanyi 1944).

Treating ecosystem services as commodities creates strong incentives to maximize output of such commodifiable services at the cost of the broader ecosystem function and of non-commodifiable services. For natural capital, it is imperative how well its value is reflected by the characteristics of the financial asset portraying it. If preserving the natural capital is the aim, it is important to preserve the function of the ecosystem service. If, however, the high and reliable return is given priority, as it is done by financial markets, ecosystem services will suffer. This especially applies to ecosystem services that are valued by people but are not commodified, as well as the ones that are not valued by people. In addition, growing economies also place increased pressure on their ecosystem services for other short-term benefits, for example around waste management as well as carbon dioxide absorption (Kemp-Benedict & Kartha 2019: 70). Ecosystems are complex systems and are always in flux and attempts to grasp this complexity most likely fail as they cannot grasp all aspects. And if one of these aspects is left out – which will almost certainly happen – then a market around this product cannot display an optimal outcome, where supply and demand of this ecosystem service are equal (Kemp-Benedict & Kartha 2019: 74).

To sum up, the valuation of nature and especially ecosystem services is highly debatable. Although a valuation of a natural good does not necessarily reflect its intrinsic value, since the systems involved are far too complex, it can nevertheless have positive effects, especially for policy-making. In addition, marketization of these ES and other natural capital is highly dangerous as it is exposed to the financial markets and its fluctuations as well as other pitfalls.

2.6.2 Green Capitalism

In the light of financialization of nature, Brand & Wissen (2014) connect the debate of environmental fixes and valuation of ES with the term of *Green Capitalism*, which is, according to some scholars, an

emerging hegemonic project which has high socio-ecological costs in form of massive dispossession, land-use conflicts, and further ecological degradation. It is somewhere contradictory to fix the climate with an instrument that at least partially is responsible for the damages in the first place (see e.g. Bergius et al. 2020; Fairhead et al. 2012). Dawson (2010) argues that it is questionable if policies, such as carbon trading, supposed to save the environment really work as intended, as such policies may be labelled "false solutions to climate change" - as they are *"[…] far more damaging for small-scale, sustainable family farming than climate change itself"* (Dawson 2010: 333). However, other (maybe less critical) scholars see green capitalism, or eco-capitalism, as a potentially viable solution to capitalism and its problems around climate change. Therefore, Rogers (2009) defines green capitalism quite differently, as *"[…] an approach that says we can use the levers of the market to fix the broken environment"* (Rogers 2009). The incorporation of environmental aspects into financial and economic decisions could lead to a comprehensive rethinking of economics and finance regarding climate change. With the implementation of sustainable development goals as well as other cooperation mechanisms for the now emerging multipolar world economy, green capitalism must play an important role in this, trying to transform finance-led capitalism into a more ecologically-oriented one (Guttmann 2018a, 2018b). Green capitalism merges the desire for generating profits of a capitalist society with the urgency to take measures to address the current climate crisis as well as other environmental problems caused by human activities. In order of green capitalism, business incorporate environmental issues in their operations and commodify them so that they can be also addressed in a monetary way (Smith 2015).

This ideology is attacked: major criticism comes from more traditional capitalist ideologies condemning the increased regulations of green capitalism since unregulated capitalism sees environmental issues to be addressed by individuals. These individuals may allocate their wealth and their own income without intervention from the state (Meltzer 2012), surprisingly also opposing commodification of nature (even though the motive of criticism is quite different). This system, however, is seen as transformative and progressive by proponents of green capitalism since free market capitalism ignores environmental responsibility for the danger to the environment (Juniper 2014). Daniel Tanuro (2014) leads another big part of criticism on green capitalism, as he challenges people to recognize that environmental destruction will not and cannot stop if capitalism is to continue. He argues that the climate crisis cannot be stopped by means that do not include radical social change, such as carbon taxes, ETS, green subsidies and green consumption, as the climate crisis must be addressed quickly. The energy transition that is needed to tackle climate change cannot, in Tanuro's eyes, be tackled by mechanisms of price, competition and the market in place (Tanuro 2014: 70). Especially green consumption is criticized: Consumption must go in hand with the changing of the energy production, as the process of manufacturing and installing these new technologies will increase emissions during the transition as well. And this can only be coped with by less consumption in energy and attacking other roots of the GHG emissions (Tanuro 2014: 71f).

This goes in hand with another big part of academia where degrowth is seen as a viable option for saving the planet, and where (green) capitalism is criticized as it is described as incompatible with degrowth

since it is based on growth and consumption (Foster 2011). Smith (2015) also argues that green capitalism that builds on new, more efficient technologies is not the solution, as such advancements do not fundamentally alter the eco-suicidal tendencies of capitalist development because even green growth is not possible on a finite planet, resulting in abolishing capitalism (Smith 2015). Prudham (2009) underlines the growth for growth's sake of green capitalism, which translates in Marxist terms to accumulation for accumulation's sake. This is again guided by the anarchic and amoral search for profit and realization of surplus value raising questions to the legitimacy of green capitalism (Prudham 2009: 1594).

Green capitalism is portraying an ideology that thrives strongly on the evaluation of all environmental aspects. Individual authors, such as Kemp-Benedict & Kartha (2019), consider this evaluation to be useful only in exceptional cases and only recommend its use in these situations. For example, carbon trading, the internalization of externalities that is central in the ideology of green consumption, or other tradeable permits to place on-specific pressure on ecosystems can be an exception. This may be used only for ecosystem services *"for which a biophysical assessment can determine the total allowable pressure consistent with social and environmental goals, for which neglected pressures on ecosystem services and other socio-economic impacts are not, in fact, dominant, and where political economic factors do not allow rent-seeking behaviour to undermine environmental integrity"* (Kemp-Benedict 2019: 83). This is a quite narrow set of criteria, which may apply for tradable permits for emissions of widely-dispersed gases such carbon emissions. It is highly conceivable to create securities like locally traded and backed by payments for ecosystem services (Kemp-Benedict 2019: 83). Kemp-Benedict (2019: 79) also critiques socially-responsible investing (SRI), an investment approach also linked to green capitalism where money is only invested in companies that have certain social environmental standards. There, data is a big issue and the valuation of companies, according to their social and environmental standards mostly done by third parties in a mechanical way, just because of the sheer amount of companies that need to be evaluated. And because of its mechanical nature, the multiple and complex social benefits of environmental systems cannot be captured easily. Nevertheless, SRI is worth pursuing, although its effectiveness is limited as it cannot ensure that companies take account of the specificity, richness, and function of any ecosystem. This is mainly due to the broader conception of nature and society than investment in traditional natural resource commodities. But it only encourages better conservation practice in already-managed ecosystems (Kemp-Benedict 2019: 80).

2.6.3 Interim Discussion

It was shown in chapter 2.6 that the implementation of nature and its components into the economy and especially into the financial world is not without any controversy. Bracking (2012) finds that financial institutions *"[…] currently employ thin, partial and pseudo-mathematical methods of assessing environmental impact and worth and […] and that environmental and developmental impact "science" is a performative technology, with only marginal relation to the material world it seeks to measure and protect. Using calculative technologies in which financial considerations are privileged, financiers have wrought a dissociated, incomplete and partial valorisation of the non-human world"* (Bracking 2012:

271). Bracking (2012: 271) adds that such calculations are assisting the position of private equity funds as institutional leaders in pre-existing power structures which are exploiting natural resources for the only benefit of money-holders, applying to nature-based accumulation which performs as a political process of financialization. And with the emerging of climate finance from the 1990s onwards, this problem of valuing nature with all its complexity is also apparent in climate finance products which cannot completely be eliminated. Biometric natural science calculations for carbon and its effects do not exist and therefore, climate change is difficult to price (Latour 2014). There is a lot of effort required to take flexible nature to a financialised product such as computer modelling, scenario planning and mediation by the financial industry (Cooper 2010). So, it is framed as something capital can "see" (Robertson 2004 in Bracking 2019). And it is particularly difficult to account for future time and rapid ecological change, also in the context of climate finance. Nonetheless, risk as an organisational rationality has shown the strongest efficacy in respect to climate finance, even though this assemblage overall gives greater power to financiers in the context of nature-society relations (Bracking 2019). The expansion of financial markets with environmental aspects, such as emissions trading, is often touted as a good solution to climate change but sometimes seems to be a further extension of neoliberal and capitalist norms to environmental governance (Bigger 2018). To take a critical look at the basics of finance, however, these must be examined more closely and the complexity of these should be reduced (Asiyanbi 2018 in Ouma et al. 2018: 506). In this thesis, the evaluated equity investments will reduce some of the complexity mentioned and show in which way the financialization of nature is visible in the coal industry.

Climate finance is also looking for monetary means to finance mitigation measures. This is dangerous because it gives the impression that it can reduce the effects of climate change for the individual. This bases on the false assumption that finance cannot cause crises. Financial instability is added to environmental instability, which can have serious consequences, partly because finance is undemocratic, and it is likely that the inequalities in the population increases (Keucheyan 2018: 497f). This should also ensure to scrutinise climate finance instruments such as green bonds. These instruments have similar problems to other financial products, such as a lack of inclusion and the spread of inequalities. In addition, there are differences between geographical regions in terms of their exposure to risk and their financial practices completing a critical view on climate finance products (see Christophers et al. 2020).

In this context, *Financialization of Nature* is used to draw attention to the fact that the monetization of nature and natural capital should be critically questioned, and thus also the "green growth" of the economy (Kemp-Benedict & Kartha 2019, 69). Even the IPCC report hits the zeitgeist of neoliberalism to find solutions to climate change. Among other things, the authors have the tendency to appraise the financial market primarily as part of a solution of this issue, rather than as a source of economic and social problems (Keucheyan 2018: 492). This is also a criticism of the concept of climate finance, since without a monetary evaluation of a mitigation or adaptation measure, a comparison of environmentally friendly or hostile investments cannot be distinguished easily. Therefore, the evaluation of individual projects does not depend neither on the monetary value nor on the CO_2 equivalent emissions only, but

on many other factors as well. Kemp-Benedict & Kartha (2019) underline that with mitigation and adaptation measures in climate finance, applied pressure of some permits like emission permits must be commodifiable and then converted into financial assets. This means that one firm's or household's pressure on the environment must be directly exchangeable which is the case for GHG or ozone-depleting gases. Issues arise where there are gases involved that have differential impact over time (Neubauer & Megonigal 2015). This is most apparent when different measures for reducing pollution may have different effects on ecosystems or effects such as *"[…] learning-by-doing benefits, help achieve greater economies of scale, shift perceptions of technological riskiness, weaken socio-institutional carbon lock-in, and otherwise help induce further innovation, deployment, and thus emission reductions."* (Kemp-Benedict & Kartha 2019: 81). Another problematic of tradeable permits and market in credits is its structural bias since both buyer and seller have economic incentives to define credits as generous as possible. This is quite different from the normal market dynamic (see Schneider & Kollmuss 2015). However, all these criticism on climate finance and the expansion on green capitalism seem to be based on the premise that there exist viable alternatives soon. With climate change being an issue that must be tackled as soon as possible, and with a capitalist world order not expected to change very soon, it seems that such a financialization could be necessary. Even Kemp-Benedict & Kartha (2019) admit that the implementation of investments filters for example in the fields of environmental, social and corporate governance (ESG) is viable in cases where ES are already under pressure from pre-existing activities of companies, individuals, or governments (Kemp-Benedict & Kartha 2019: 84).

I argue that in our globalized world, there are only a few, if not none, places on earth, that are not under pressure due to human activity. One of the clearest examples is the energy production with thermal coal where human and wildlife habitats and whole ecosystems are destroyed, the environment gets eradicated, and most importantly, the emission activities of carbon dioxide output that threatens the global climate. There still are countries in the coal business without effective measures to restrict coal usage. An external valuation from global investors could help. It is true that valuation should be avoided if not needed. But when an ecosystem is under pressure from capitalist exploitation, additional valuation of ecosystem services may lead to a better outcome. Therefore, it is needed to value ecosystem services as well as pollution to balance out already existing valuation methods in today's economy reflecting only partial value of the ES, which lead to its degradation and depletion. This then reflects a regulatory or market risk coal operators and investors are exposed to. If the alternative of green capitalism and the financialization of the nature is a capitalist world where natural aspects are not regarded for at all, it is viable to at least get certain aspects of the environment into the economy although it is sure that not all aspects can be included at beginning. In this context the implementation of climate finance payments is highly welcomed to also pay attention to inequalities by a neoliberal expansion of capitalist economies in the last few decades. As demonstrated, green capitalism and the shift to a greener economy has the potential to shift capitalism in a fairer direction. This certainly does not signify to expand climate finance without restrictions and climate policy without second thoughts. If properly managed, policy changes and implementation of some sort of enumeration payments to nature and society in form of mitigation

and adaption payments may be an environmental fix, a solution to the current environmental problem – at least better than current systems. In the following chapters one particularly striking example of the exploitation of nature by society is given, the extraction of thermal coal for energy production.

Building on the argument that valuing climate finance measures is beneficial if it protects nature more than it destroys it, the following chapters also show comparisons between investments in thermal coal and in mitigation and adaptation measures. However, it should be kept in mind at all times that such a valuation does not come without controversy.

3 Research Gap & Design

With this intensive literature review done before, it was shown that (i) risks in thermal coal are highly risky and various aspects play a role, (ii) investments in climate finance are needed, (iii) the Swiss financial centre is not concerned enough with environmental issues, and (iv) the implementation of the environment into finance comes not without controversy.

Through this examination of the literature, the research gap for this thesis is now defined: The impact of the Swiss financial sector on the environment must be shown. This thesis specifically deals with the energy sector, where the thermal coal business will be highlighted in particular. These investments are then contrasted with climate finance investments. In this way, a potential paradox can be highlighted where investments that rather protect nature and others that destroy nature are made at the same time. This bases on the premise that links between the environment and the financial world should be examined more closely. First of all, investments in coal will be reassessed using a method based on TCFD recommendations (see TCFD 2017b), and then placed in the context of climate finance and investments in renewable energies. The aim is to produce policy recommendations to minimise the shortcomings that have been identified.

To make a decisive decision concerning policy around sustainability in the financial sector regarding the energy sector and especially thermal coal, some questions need to be answered, in addition to the main research question outlined in chapter 1.1:

- *How high are the investments of Swiss financial actors in coal?*
- *How high are the emissions caused by these investments*?

However, this would only give a quite one-dimensional and quantitative picture. While it is informative, the reasons behind these investment decisions and the context around this paradox are even more interesting. Therefore, additional questions need to be asked:

- *What are the reasons behind these investment decisions?*
- *Why are investments in sustainable energy sources still lacking?*

Setting up these goals has various implications for the research design, which is explained in more detail in this chapter.

3.1 Mixed Method Approach

To provide the best possible indication of the extent and to illuminate the situation in different ways to which the Swiss financial actors are investing, a mixture of quantitative and qualitative methods is chosen. While the analysis of the financing of coal business will be mainly quantitative, the qualitative data collected will illuminate soft factors, such as the reasoning and the context behind investments. The reason that quantitative data is only collected on investments in coal, is quite obvious: With coal financing, there is much more need to examine this in more detail than with sustainable investments, as these data around who has invested in which company and where this company is active in the coal business are often published only involuntarily, in fragments, or are not available at all. This means that data must be collected at first quantitatively and will be processed further later. In contrast, the amount of climate finance is provided by the Swiss government. It communicated its investment goal for Switzerland and the current state of a yearly amount of USD$450 to USD$600 Mn. from 2020 onwards voluntarily (Federal Council 2017). Thus, the qualitative part is used to put the quantitative data into context.

This follows a mixed methods approach, where both quantitative and qualitative techniques are used to collect and analyse data within the same work (Bowers et al. 2013, Creswell & Plano Clark 2011). As mixed methods combine strengths from both quantitative and qualitative methods (Greene et al. 1989), this allows research to explore and display different perspectives of an issue and to uncover existing relationships between different layers within the research question (Shorten & Smith 2017). The most important step here is the data linkage or data integration of the two data types in an appropriate stage in the research process (Ivankova et al. 2006). In a research setting where neither qualitative nor quantitative methods alone could answer the research question, mixed methods are appropriate (Ivankova et al. 2006; Tashakkori & Creswell 2007, Wisdom & Creswell 2013). With such a mixed method approach, connections and contradictions between quantitative and qualitative data can be much better understood. This enriches the experience of research as it illuminates the same issue from different perspectives. But it also has its drawbacks, as researchers need to be trained in quantitative and qualitative methods, and they need to become conversant with other research paradigms and different approaches. This spans from data collection and analysis to data synthesis and integration (Wisdom & Creswell 2013).

Creswell & Plano Clark (2011) introduce three types of mixed methods designs: the explanatory sequential, the parallel, and the nested research approach. In this thesis, the explanatory sequential research approach is appropriate, where quantitative data is collected and analysed first. Qualitative data is then collected and analysed to (partly) help explaining the quantitative data (Halcomb & Hickman 2011).

This is implemented the following way in this thesis: Investments in energy production with (thermal) coal are analysed first. For this purpose, investment data for equity holdings in companies involved in the thermal coal business from the financial database Thomson Reuters Eikon is used. Thus, through a detailed calculation (see 4), the emissions which the Swiss financial centre is responsible for can be calculated. It also shows what additional expenditure is needed to offset these environmental burdens.

For this, a brief comparison with the GCF is made. Subsequently, these results are then later integrated into the interview series to provide context.

During the interview series, the sustainability aspect of the Swiss financial sector is the centre of attention. The quantitative analysis is origin of some questions of the interview guide, for example the reasoning Swiss investors have in still investing in fossil fuels, here (thermal) coal. This interview series consists of a number of interviews with market participants to cover a wide range of issues: It attempts to identify the specific reasons for the continuing high level of investment in thermal coal. In addition, an important aspect is the financing of renewable energies, serving as a counterpart to investments in fossil fuels such as thermal coal in the group of *Alternative Investments*. An attempt is made to find out how the interviewees perceive the general situation of the Swiss financial centre with regard to the integration of environmental aspects into decision-making. This includes both knowledge building within the financial actors and the demand for sustainable financial products by their clients.

The results of the quantitative and qualitative analysis will thus be compared and together provide an overall picture of the current situation. In this way, ongoing problems, but also opportunities, can be identified. These points will be taken up in the discussion after the two assessments.

For enhanced reading comprehension, detailed methodology approaches for the two parts, the quantitative assessment of the investments in coal as well as the interview series of various stakeholders in the financing industry, will be constituted before the respective analysis. This ensures that both parts will not be mixed with each other, for example their different sampling techniques, and therefore preventing possible misunderstandings.

3.2 Ontological & Epistemological Position

However, such a mixed methods approach as outlined above is creating challenges around the ontological and/or epistemological approach of a research project. For example, regarding epistemology, it is not possible to choose an either positivist or interpretist epistemological approach as introduced by Marsh & Furlong (2002), as these approaches lead to different research methods, either quantitative or qualitative ones. Ma (2012) also points out that one critical issue of mixed method research (MMR) is the reconciliation of the different viewpoints of reality in the two parts of research. Green (2006) therefore calls for clarification regarding the philosophical assumptions, since *"assumptions about the nature of social world (ontology) and about the nature of warranted social knowledge (epistemology)"* (Greene 2006: 93) and *"objectivity and subjectivity, the role of context and contingency in social knowing, and the relationship between the knower and the known"* (Greene 2006: 93) should be made clear. These issues arise because qualitative research is generally associated with, for example, hermeneutics, constructivism, and relativism, whereas quantitative procedures are characterized by positivism and empiricism. And the usage of different methods could therefore also imply the acceptance of "multiple realities", as the presumed nature is different (Ma 2012: 1859).

There are three major possibilities for dealing with this problem, introduced by Creswell and Plano Clark (2011: 26f): (i) pragmatism, where the research question is regarded as primary importance regardless of method or philosophical worldview, (ii) multiple paradigms, where researchers recognize the different paradigms that give rise to contradictory ideas or arguments – parts of research that are not to be honoured but cannot be omitted, and (iii) where MMR is strictly viewed as a method, which allows the researchers to use any number of philosophical foundations to justify its usage. However, Ma (2012: 1860) criticizes that this does not solve the underlying problem, but rather avoids the fundamental questions arising with MMR.

While quantitative research is most of the times called "scientific" and "objective" (Johnson et al. 2007), qualitative research is often considered "subjective" and "non-scientific", as they seem to be depending on the researchers' interpretation. However, this assumption is dangerous and can lead to false claims, as quantitative research is never completely objective either. Human desires, intentions (Ma 2012: 1860), and ultimately motivations are not best described by quantitative models (Blair 2003 in Ma 2012), also leading to misunderstandings and misconceptions about qualitative research (see Flyvbjerg 2001). *"Unlike the studies of natural objects, understanding of social phenomena begins with a preunderstanding or prejudgment of human feelings, desires, and intentions. Arbitrary and other forms of shared understanding are necessary in human communication"* (Ma 2012: 1861). Therefore, as an epistemological principle, research and its method cannot solely be reduced to the technicalities that were used to examine an object or a phenomenon. Rather, the intrinsic preunderstandings of the researcher who examines other persons must be investigated as well. The lack of understanding of this principle lead to this narrative of qualitative research being "subjectivist" and "non-scientific". As research is upon person, it cannot be left behind or hidden behind some establishments of natural laws (Ma 2012: 1861). And quantitative research is never completely "objective" either, as observable facts and data is also again being interpreted or perceived by a researcher in a certain way, reflecting its desires, intentions, values, and beliefs (see Daston & Galison 1992). Therefore, quantitative research is not exempt of being "subjective", as it also involves human action and interpretation (Best 2008). But saying that all social phenomena are "relativistic", is also wrong, as there are points, also in social sciences, that can be considered normative (Ma 2012). And the assumption that human behaviour and social conditions can be studied implies some sort of a shared reality, where shared understanding of an event is objective. Such a shared interpretation can be described as "facts", although not entirely everybody agrees (Ma 2012).

With combining both research strings, flaws of both can be minimized and advantages around subjectivity and the implied shared reality that is studied can be highlighted. While these two methodological approaches have been regarded as incompatible before, popularity of MRR and amount of research done grew heavily in recent years (Hall 2013). Advantages are outlined by Wisdom & Creswell (2013: 3): Mixed method research reflects the point of view of participants and gives them a voice, ensuring that study findings are grounded in participants' experiences. Mixed methods ensure in this study that the findings of the quantitative study are discussed by various stakeholders and interpretations are not solely

formulated on top of the quantitative data, but also on the reasonings given by interviewed experts. Wisdom & Creswell (2013: 3) also see an advantage of fostering scholarly interaction, providing methodological flexibility and the collecting of rich data.

As philosophical foundation, Hall (2013) proposes various paradigms, while a realist perspective overcomes limitations of others and provides a satisfactory framework for MMR. Postpositivism, constructivism and pragmatism limit the range of topics to be researched and the range of methods that can legitimately be used to conduct research (Hall 2013: 7). The realist perspective of Pawson & Tilly (1997) and Henry et al. (1998) overcomes these limitations. The latter have developed a "emergent realist" paradigm for evaluation in which they argue that the objectives of their approach *"will often best be served by a combination of quantitative and qualitative methods"* (Henry et al. 1998: 19). Also, Sayer (2000) shows that this paradigm is compatible with a wide range of methods used in social science research, including both quantitative and qualitative methods. Miles & Huberman (1994) finally argue that *"social phenomena exist not only in the mind but also in the objective world-and that some lawful and reasonably stable relationships are to be found among them"* (Miles & Huberman (1994: 4). This ultimately means that realism recognizes the complexity of social phenomena and other research areas by enabling various roles of values and interpretive meaning. At the same time, it accepts explanation as a legitimate goal of social research (Hall 2013: 8).

Therefore, ontological realism is used as a part of the philosophical position for this research. This means that it is presumed that what you know exists independently of our perceptions, theories, and constructions (Haldane & Wright 1993: 16). However, many philosophical accounts of social science are anti-realist in nature. This encouraged the idea that quantitative and qualitative research are fundamentally different (Haig & Evers 2016, ix), although most of society probably behaves as empirical realists where objects in the world are regarded as existing entities, independent in some way of the experience of each other, from society, institutions, feelings, to body parts, the sun and the sky (Schwandt 2007: 256). Therefore, to be more precise, a framework of **scientific realism** is chosen which assumes that *"'"the world is the way it is" while acknowledging that there can be more than one scientifically correct way of understanding reality in terms of conceptual schemes with different objects and categories of objects"* (Lakoff 1987: 265). To understand and interpret the viewpoints of interviewed stakeholders, this philosophical foundation is very important. This is also portrayed by **epistemological constructivism** which assumes that our understanding of the world is inevitably a construction from our own perspectives and standpoints (Balbi 2008). Together with scientifical realism, this completes the philosophical background of this thesis where MMR is possible and still different viewpoints can be respected as they are quite compatible (Crotty 1998). With this framework, the research questions can be answered as certain facts as the investments in coal by Swiss financial players can be regarded as a fact, but the perceptions of these can differ considerably between actors. How these perceptions are unfolded and explained is subject to the qualitative procedure later in this thesis. This is important as believes, feels and thoughts of people affect the behaviour of people where, in turn, the extrinsic effects of their actions are partly

determining their patterns of thought and affective reactions (Bandura 1986: 25). This plays into the advantages of realism where meaning and mind are just as real as physical objects and processes and thus underlines that diversity and subjectivity is a real phenomenon. And while validity is not a property of designs or methods and cannot be guaranteed by methods (Campbell et al. 2001, Brinberg & McGrath 1985), and there is no generic criteria for definitively assessing validity, the essential feature of science is its ability to test and make sure that other, alternative explanations can be ruled out (Maxwell 2011). It is expected that these conclusions requirements can be met through an in-depth analysis and a comparison of the various views of the stakeholders.

4 Quantification of Investments in Thermal Coal

This chapter provides a quantitative assessment of all investments in thermal coal by Swiss financial actors. The monetary value of the total investment and the resulting GHG emissions as well as their geographical distribution are shown.

4.1 Existing Climate Progress Metrics

There are a lot of climate change metrics or climate progress metrics assessing either the compatibility of a financial portfolio with a climate-friendly future or selected operations of an individual company. However currently, there is a lack of concise and comparable metrics with which the climate compatibility of an investors' portfolio could be measured. This also is a major factor which hinders major investors to have the full incentives to reallocate their portfolios. Additionally, looking at the transition to a low-carbon economy, it is not clear how to measure the exact market share along the supply chain, because a lot of economic sectors produce or induce GHG emissions. These two limiting factors are hindering policy making when enforcing fair competition policies. Investors cannot safely assure the emissions of their portfolios as well as the effects of their own and their competition's portfolio reallocation (Monasterolo et al. 2017). However, this urgency is increasingly recognized by scholars as well as practitioners working on closing this gap: For example, Battiston et al. (2017) developed a network-based climate stress test methodology that finds that direct and indirect exposures to climate policy-relevant sectors are a large part of the equity portfolios of investors across Europe. They also find that the share of the portfolios of selected banks exposed to policy-relevant sectors are comparable to banks' capital (Battiston et al. 2017: 283), underlining the high risk banks are undergoing with their investments. Monasterolo et al. (2017) also propose two other indices to close measurement gaps: *GHG exposure*, which captures the exposure of the portfolio of one single investor to climate transition risks as well as *GHG holding*, capturing the market share of each financial actor weighted by its contribution to GHG emissions (Monasterolo et al. 2017: 495).

However, these metrics are not directly applicable here as they focus on portfolios of one single company and/or are showing the relative importance of financial actors in various decarbonization paths (see Monasterolo et al. 2017). To assess all financed emissions of Swiss financial players, this thesis follows

an approach of the Task Force on Climate-related Financial Disclosures (TCFD) where the carbon metric of *Total Carbon Emissions* is applied to all coal-related equity holdings of all Swiss financial actors active in the coal business. This metric has a lot of advantages. The metric can be used to communicate the carbon footprint of a portfolio consistent with the GHG protocol and to track changes in GHG emissions in a portfolio. In addition, it allows portfolio decomposition and an attribution analysis. Nonetheless, it also has some disadvantages as the metric is generally not used to compare portfolios because data are not normalized and changes in underlying companies' market capitalization can be misinterpreted (TCFD 2017b: 43). The first disadvantage is not crucial as the goal is not to compare portfolios. The second disadvantage could pose some mistakes in interpreting the data if the study were to continue over a longer period. As we currently only look at one point of time, this disadvantage is neglectable as well. It must be noted that there will be important changes around this metric in the future as better data quality will allow a simpler usage of this metric.

4.2 Initial Situation and Basis of Data & Methodology

As financial actors are not obliged to publicly declare which companies and sectors they are investing in, information about financial linkages is missing to some extent. Providers of financial data, such as Bloomberg or Thomson Reuters Eikon, can recover some of these data points. As these databases are the most complete source of financial data, one of them, Thomson Reuters Eikon, was used to retrieve necessary data. It is important to note that this data is only revealing certain financial relationships and is by far not complete. Results only represent a certain portion of the actual extent of Swiss involvements in the thermal coal business and are thus most likely underpredicting the real size of the investments.

Simultaneously, a coalition of different non-governmental organizations under the lead of Urgewald compiled a list of companies associated with the coal business, published in late 2019 as "Urgewalds Global Coal Exit List (GCEL)" (Urgewald et al. 2019a). This list is providing the list of companies in question and hence is a vital part of the basis of this assessment. Since a lot of companies are not solely active in the coal business but in general in the energy sector, and as some companies are so small that they can be neglected on a global scale, Urgewald et al. (2019b) used certain criteria to select the companies that ended up on the Global Coal Exit List. These criteria are:

Relative criteria

- *Coal share of revenue exceeds 30%*
    - Companies are included if the share of the revenue which is generated through coal related activities is 30% or more of their total revenues. These activities include coal mining & coal power, exploration & drilling, mining services, coal processing, coal trading, transport & logistics, equipment manufacturing, O&M services, EPC services, transmission & distribution of coal-fired electricity, Coal to Liquids (CtL) and Coal to Gas (CtG). Not included are revenues from coke, aluminium, steel, or cement production.

- *Coal share of power production (CSPP) exceed 30%*
    - If a power production company is generating more than 30% of their power with coal, they are included. It must be distinguished between two different CSPPs: generation based and capacity based CSPP. Where data is available, generation based CSPP is used as it reflects the actual output of a company. If this data is not available, the capacity based CSPP is used which is the potential performance of the companies' power plants.

Absolute criteria

- *Annual thermal coal production exceeds 20 Mn. metric tons*
- *Coal-fired capacity exceeds 10 gigawatts*
    - Both criteria are important as, just with relative criteria, very large power production companies could have slipped through, as their relative share of coal is quite small even though their absolute thermal coal-usage is substantial.

Expansion criteria

- *Mining expansion*
    - Companies are included in the list if they are engaging in (thermal) coal-related exploration activities, are developing new mining project, or are plaining a substantial increase of its annual (thermal) coal production volume.
- *Power expansion*
    - Companies are included if they plan a substantial increase of their coal-fired generation capacity, exceeding 300 megawatts.
- *Infrastructure expansion*
    - Companies are included if they are planning new coal infrastructure. Examples include coal export terminals or railways dedicated to coal transportation (Urgewald 2019b).[1]

As these criteria are diverse and there are many companies in the coal business, the list of examined companies accordingly became quite long. This is important and to be welcomed, as it is more likely to cover the biggest possible share of the coal business. Other lists are far less complete: For example, with the detailed list of coal companies from Urgewald et al., it was possible to show that the Swiss National Bank (SNB) is investing in 33 companies with coal-related activities. When using other the classification criteria of coal companies, for example from Thomson Reuters Eikon itself, it would have only been

[1]*However, this is just a summary of the information about the exact methodology Urgewald et al. (2019b) used. On their website (coalexit.org) much more additional interesting information can be found. Also, these criteria are extended for the newest version of this list which was published in mid-November 2020. This resulted in an even more detailed list of companies. Criteria are changing accordingly: CSR > 20%, CSPP > 20%, absolute mining > 10 megatons per annum, absolute power > 5 gigawatts (Urgewald et al. 2019b). Unfortunately, it was too close to submission date to change to the newest version of the list. However, for future publications, the quantitative analysis here can be repeated to have an even more detailed (and current) result.*

possible to define five coal companies the SNB is investing in. This shows that the classification and methodology of Urgewald et al. (2019b) is far more detailed than other comparable lists.

In this thesis, an assessment of all financial activities is not possible due to the restrictive time frame. Therefore, the focus is laid on equity holdings of Swiss financial actors in coal-related companies since owners of a company are direct responsible for the emissions of this company. To clean up Urgewalds list, each individual company was analysed to see whether it is publicly listed and whether Swiss companies are investing in it. Hence, the list was reduced from 2272 companies to 439 publicly listed companies around the world in the thermal coal business. For each coal company, the Swiss investors were manually detected. The totality of Swiss investors across all coal companies was grouped as follows:

Table 2: Amount of Swiss investors per group

Name of the Group	*No° of companies included*
System-relevant Banks	6[i]
Cantonal Banks	10
Small/Private Banks	23
Asset Managers	77
Foreign-controlled Banks	8
Investment Managers	28
(Re-)Insurers	14
Others	2
Total	**166 Financial Actors**

[i]of which two have no reported investments

In addition, two other groups of possible investors were examined to obtain a vast overview of possible additional financial relationships:

Table 3: Additional groups of Swiss investors

Name of the Group	*No° of companies included*
MDBs	9
Pension Funds	49
Total	**58 Financial Actors**

Surprisingly, none of these actors of Table 3 had one single direct equity investment in one of the companies affiliated with coal. This is attributable to (i) their focus primarily on project finance and not equity, or (ii) their portfolio investing indirectly through investment management firms outside from Switzerland. A comparison with the newest PACTA report shows if this report came to the same conclusion of no direct equity holdings of Swiss pension funds (see 4.7.2).

4.3 Data Processing & Monetary Amount of Investments

The result of the predefined framework resulted in 98,336 (439 coal companies*(166+58 financial actors)) points of retrieval from the Eikon database, showing the investments in equity of the various Swiss actors in the respective companies related to coal activities. The cut-off date was 31 December 2019, to make it possible to use the same data to calculate the amount of GHG emissions caused for the year 2019. Of course, this does not reflect the current situation, because data on the emissions of individual companies can only be seen much later, which made an analysis of the year 2020 not possible as data around scope 1, 2 and 3 will only be available in early 2021. Without adjusting the amount of held equity capital, the investments are distributed as follows:

Table 4: Amount of financing per group

Name of the Group	*Amount of Financing [Mn. USD$]*
System-relevant Banks	5,690.53
Cantonal Banks	47.29
Small/Private Banks	155.28
Asset Managers	1,072.89
Foreign-controlled Banks	42.86
Investment Managers	35.44
(Re-)Insurers	28.14
Others	557.11
Total Sum [Mn. USD$]	**7,629.53**

As of 31st of December 2019.

It is important to note that only a part of the total investment of a company relates to the coal business. They can also have other activities, for example investments in renewable energy production. Therefore, the financed emissions and the amount of coal financing must be adjusted accordingly. In this analysis, the coal share of revenue is used to align the monetary values of the investments. Fortunately, this data has already been collected by Urgewald et al. (2019a) for the examined companies. For some companies, the share of revenue generated with thermal coal is not reported. In this case, these adjustment factors have been approximated. Since Urgewalds list provided some data around the business type of the company, it was possible to calculate an individual adjustment factor for every company which was missing the necessary information by taking the mean of the adjustment factors in its corresponding business sector. These sectors and the approximated adjustment factors can be seen below in Table 5:

Table 5: Calculation of adjustment factors

Business Sector	*No° of Businesses without Data / Total No° of Businesses in the Sector*	*Share of Businesses with Data*	*Adjustment Factor (Mean of the Adjustment Factors of the respective Sector)*
Mining only	11/72	0.85	0.77
Power only	17/101	0.83	0.39
Services only	16/62	0.84	0.53
Mining & Power	7/72	0.9	0.54
Mining & Services	13/61	0.79	0.78
Services & Power	7/43	0.84	0.51
Mining, Power & Services	5/43	0.88	0.5

Surprisingly, these factors are quite similar for most sectors. Nevertheless, it seems reasonable that companies affiliated with power production have such a "low" adjustment factor since a lot of these companies are not solely producing energy with thermal coal, but also with other fossil fuels or even renewable energy sources. These adjustment factors seem to make sense and are therefore used for further steps in the analysis. These adjustment factors are then applied to the investments of Swiss financial actors in all 439 companies examined shown before in Table 4. This results in an amount of adjusted equity holdings in coal of **USD$2,214.42 Mn.**. Detailed numbers can be seen in Table 6:

Table 6: Adjusted amount of financings

Name of the Group	*Amount of Financing [Mn. USD$]*
System-relevant Banks	1,642.20
Cantonal Banks	13.88
Small/Private Banks	35.43
Asset Managers	448.83
Foreign-controlled Banks	12.40
Investment Managers	11.07
(Re-)Insurers	7.64
Others	42.96
Total Sum *[Mn. USD$]*	**2,214.42**

As of 31st of December 2019

It was rather unexpected that this amount is so low since the adjustment factors suggest that in the mean, at least half of the share of revenue of the companies is generated with coal. Together with the total sum of non-adjusted investments from Table 5, this would suggest an amount of around USD$3.5 Bn.. But when investigating, it became obvious that big companies tend to have a lower share of revenue in coal

since they probably have other branches of business which reduce the adjusted amount of investment by a larger extent than initially expected, resulting in a diversification effect of the adjustment factor.

4.4 CO_2e Emissions and its Calculation

However, monetary values alone do not show the full picture. When comparing these monetary amounts of financing with compensation payments, e.g. contributions in climate finance, this would mean that every dollar invested in coal is responsible for emitting as much CO_2e emissions as one dollar invested in climate finance payments is responsible for mitigating. In other words: One dollar of investments in coal and one dollar in climate finance compensate for each other. But this is certainly not the case and would be an unjustifiable assumption. Instead, for assessing the climate impact of Swiss investments, the CO_2 emissions of the companies in the coal business will be calculated with data categorized in scope 1, 2 and 3 emissions which are often disclosed by the companies themselves. The three categories are defined as follows:

Scope 1: Direct emissions from owned or controlled sources (GHG Protocol 2019a: 12) including, for example, emissions from combustion in owned/controlled boilers or from vehicles (Ranganathan et al. 2004: 25; TCFD 2017b: 78).

Scope 2: Indirect emissions from the generation of purchased energy (GHG Protocol 2019a: 12; TCFD 2017b: 79), defined as *"electricity that is purchased or otherwise brought into the organizational boundary of the company. Such emissions physically occur at the place electricity is generated"* (Ranganathan et al. 2004: 25).

Scope 3: Indirect emissions resulting of the operations of an organization but are whether owned nor controlled by the company (GHG Protocol 2019a: 12; TCFD 2017b: 79). These are consequences of the activities of the company but do occur from other sources (Ranganathan et al. 2004: 25). Since we look at power generation as well as mining companies, double-counting would occur if we were including scope 3 emissions in our calculations since in a value chain, indirect emissions of one mining companies would be the direct emissions of a power generating company and vice versa (see GHG Protocol 2019b: 39). Therefore, this approach using scope 1 and 2 emissions includes all emissions produced.

When looking at the total of scope 1 and scope 2, emissions of the business activities of the companies can be highlighted. But this data is not flawless as the companies report the data voluntarily and there is not a universal standard for the categorization. For example, Hannover Re reports zero scope 1 emissions, as they are compensating for their direct emissions with money and claim to have a net zero carbon footprint (Hannover Re 2018: 1). This is highly controversial as an accurate compensation of emissions is not given. Nevertheless, they can claim this, as there are not yet standardized measures for data around scope 1, 2 and 3.

Luckily, the data situation is not so bad after all. Some of the examined companies report their CO_2 emissions with data for scope 1,2 and 3. With this, the total carbon emissions over a period of one year using the following formula can be calculated:

Equation 1: Formula for total carbon emissions

$$\sum_{n}^{i}\left(\frac{current\ value\ of\ investment_i}{issuer's\ market\ capitalization_i}\right)\times issuer's\ Scope\ 1\ and\ Scope\ 2\ GHG\ emissions_i$$

Summed up for all companies reporting in an according way, in 2019, Swiss financial actors are directly responsible, through their holdings and thus ownership of the company that made them, for a total of **4.63 Mt CO_2e** emissions. But this are by far not all emissions caused by Swiss financial players since some of the actors do not disclose data, and others probably do not disclose the real amount, presumably improving their result with questionable compensation efforts or just leaving out some of the emissions caused. So, the total emissions Swiss actors are responsible for can only be approximated, as already mentioned before.

In this thesis, a new approach for approximating total caused emissions is proposed: Here, the coal sector is again divided into different groups and the caused emissions, which are already reported, are summed up for each of the groups. It basically suggests that the emissions per dollar is the same for each group, but not across them. Although the summation is not perfect, to divide the coal sector into different groups is an improvement. As we have already seen before, the adjustment factors vary across groups, and this is also expected here: One dollar in power generation with coal is certainly responsible for a different amount of emissions than one dollar in services around the coal extraction process.

In Table 7, the CO_2 emissions per group as well as the summed up represented and not represented amounts of investment can be seen. Represented investments are investments for which we have data around scope 1 and 2. Not represented investments are equity holdings in companies which do not disclose this data. The rate of representation is calculated as follows:

Equation 2: Formula for the rate of representation

$$\frac{Not\ Represented + Represented\ Investments}{Represented\ Investments}$$

The rate of representation is the multiplication factor for approximating the real emissions of each group. This means that the CO_2e emissions are corrected to the actual complete amount of emissions caused by each group, assuming the not disclosed data is distributed the same way as the represented data. This is shown in Table 7. Also, it is visible that investments are mostly focused on power generation. Even though this had to be expected, the contrast to solely mining companies and other business sectors is surprising. Noteworthy are also the investments of companies combining all three business sectors. Fully diversified, big companies across the value chain are making up a big proportion of the examined industry.

Table 7: Calculation of adjusted emissions

Business Sector	CO_2 Emissions *[Mt. CO_2e]*	Represented Emissions *[Mn. USD$]*	Not represented Emissions [*Mn. USD$]*	Represented Percentage *[%]*	Adjusted Emissions *[Mt. CO_2e]*
Mining only	0.88	188.8	16.26	0.92	0.95
Power only	2.61	935.265	216.26	0.81	3.21
Services only	0.09	14.78	118.11	0.11	0.83
M & P_i	0.09	199.99	18.84	0.91	0.1
M & S_i	0.14	26.27	119.62	0.18	0.77
P & S_i	0.01	74.76	57.17	0.57	0.02
M, P & S_i	0.82	193.90	34.29	0.85	0.96
TOTAL	**4.63**	**1,633.74**	**580.54**		**6.83**

[i] M = Mining, P = Power, S = Services

4.5 Geographic Distribution

It is also important to look at possible north-south relationships. As the coal business is highly globalized, it must be asked if neoliberal tendencies are visible when looking at the trading of these natural resources and the financial flows that come with it. This touches on various geographic academic debates about the relationship between neoliberalism and globalization, as well as poverty. For example, Kacowicz (2007) argues that there are certain tendencies that globalization causes and deepens poverty and inequality both within and among nations. However, globalization has also its positive impact on poverty reduction in least developed countries (LDCs), when looking from a more liberal perspective. It is concluded from a more "agnostic" view that these linkages are complex and ambiguous, and it is difficult to present a purely one-sided relationship (Kacowicz 2007: 578). But there are also underlying processes involved: When incorporating the theory around financialization of nature, it is important to note that global accumulation processes (e.g. land grabbing, see Edelman & Léon 2013) and other commodification processes certainly have negative effects on the local population. Financialization of a natural good will have unequal impacts on different firms and geographic regions. Also, capital accumulation needs these unequal developments to reproduce itself, which is an ongoing process, also fuelled by neoliberalism in recent decades. Accumulation by dispossession is therefore an integral part of financialization of nature, where the appropriation of the assets of others is crucial (Harvey 2006: 94f). The question therefore is not, if there is a certain accumulation by dispossession happening in the coal industry, but rather if such a relationship is visible between the global north and global south. This can be shown with a mapping of two properties: (i) the geographic distribution of where the coal is being mined and (ii) where the companies that are responsible for the extraction have their headquarters, meaning where the earnings and revenues flow to in reality. This is shown in the following two Figures.

Figure 1: Swiss investments per coal activity (Reading example: Swiss investors are investing between USD$250 Mn. and USD$1.25 Bn. into companies that are active in the coal business in the United States of America.)

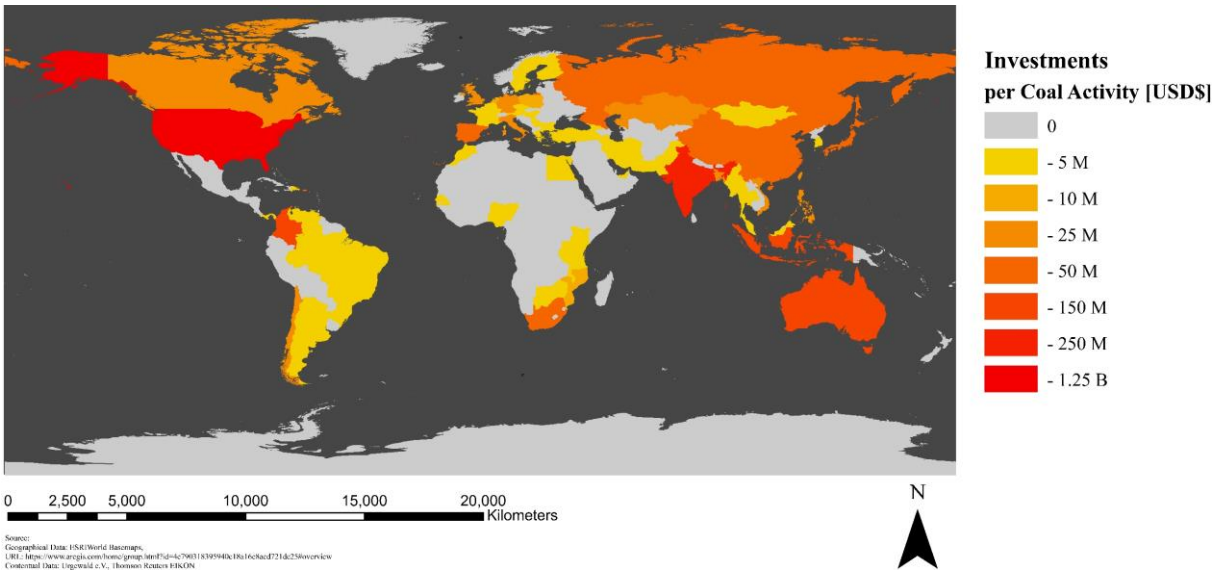


Figure 2: Swiss Investments per headquarters (Reading example: Swiss investors are investing between USD$50 Mn. and USD$150 Mn. into companies that are active in the coal business and have their headquarters in Switzerland.)

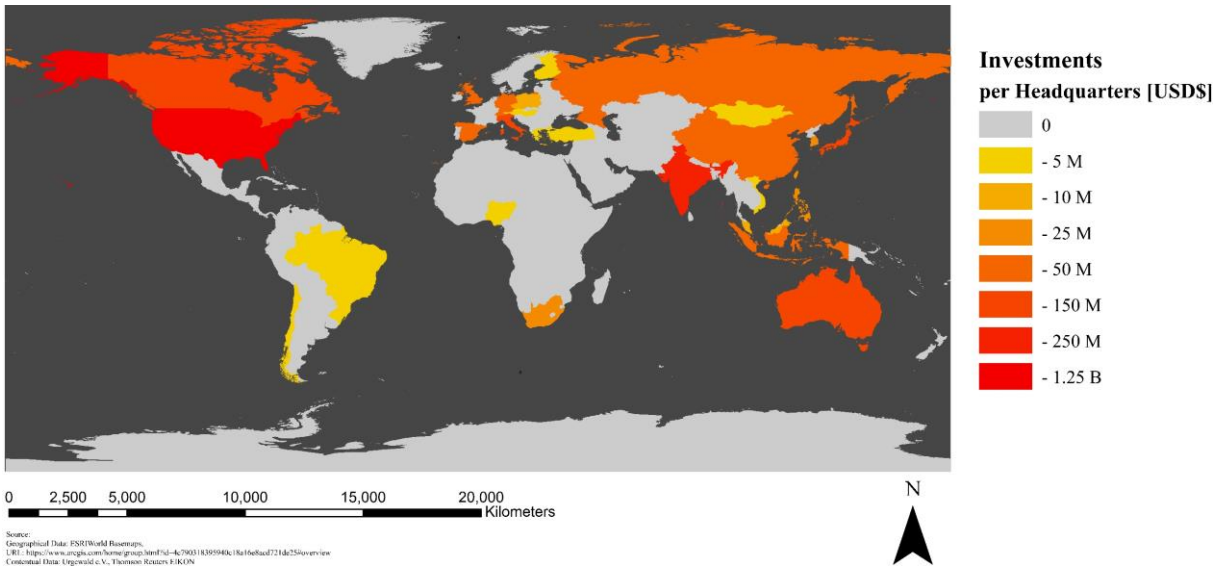


Figure 1 and Figure 2 show the same amount of investments, but with a different focus regarding distribution. The first shows the investments apportioned to the countries where the coal business is actively executed, the latter shows the investments apportioned to the headquarters of the examined company active in the coal business. Since Urgewald et al. (2019a) worked out the countries of coal activity and of the headquarters of these companies, the monetary values of the investments are added up for each country. If a company is active in multiple countries, investments are equally divided by the number of countries it is active in and attributed evenly to these countries. Although this is not entirely accurate, it is an acceptable approximation since a precise segmentation would go beyond the time frame of this thesis and be impossible to execute with given data basis. When interpreting the figures, there seems to be no clear differentiation between them. This ultimately shows that the companies in the coal business

are either operating in their home country or that the companies more or less evenly distribute across the globe. Therefore, there seems to be no clear evidence of exploitation of resources in the south by players from the northern hemisphere where Swiss investors are investing in. Since Africa does not have a lot of coal deposits in comparison to the rest of the world (with exception of South Africa) (Suárez-Ruiz et al. 2019), it is not surprising that not a lot of investments are done in Africa. India and the United States of America are most favoured by Swiss investors, followed by coal companies from/in Australia, China and Germany. This is no surprise as these are established markets, have a lot of coal deposits (Suárez-Ruiz et al. 2019), and are economically stable.

In addition, it is important to show where companies Swiss financial actors are invested in are expanding their coal business. This highlights the difficulties of a worldwide coal exit and shows that, although many discussions are being held regarding the need for a transition, the path to a low-carbon economy is not being followed equally across the world. The role played by Swiss financial actors in this contradictory expansion of coal power is important to be shown. As it was difficult to obtain information regarding the capacity of the planned coal-fired power plants and their efficiency, numerous approximations would have been needed to show potential emission amounts. Therefore, only the number of companies per country Swiss financial actors are invested in, is displayed. Nevertheless, this information is highly valuable as it shows trends and developments in the global coal business. This is shown in the next two figures.

Figure 3: Amount of companies that are expanding their mining operations (Reading example: Swiss financial actors are invested in 10 to 11 companies that are expanding their mining operations in Australia.)

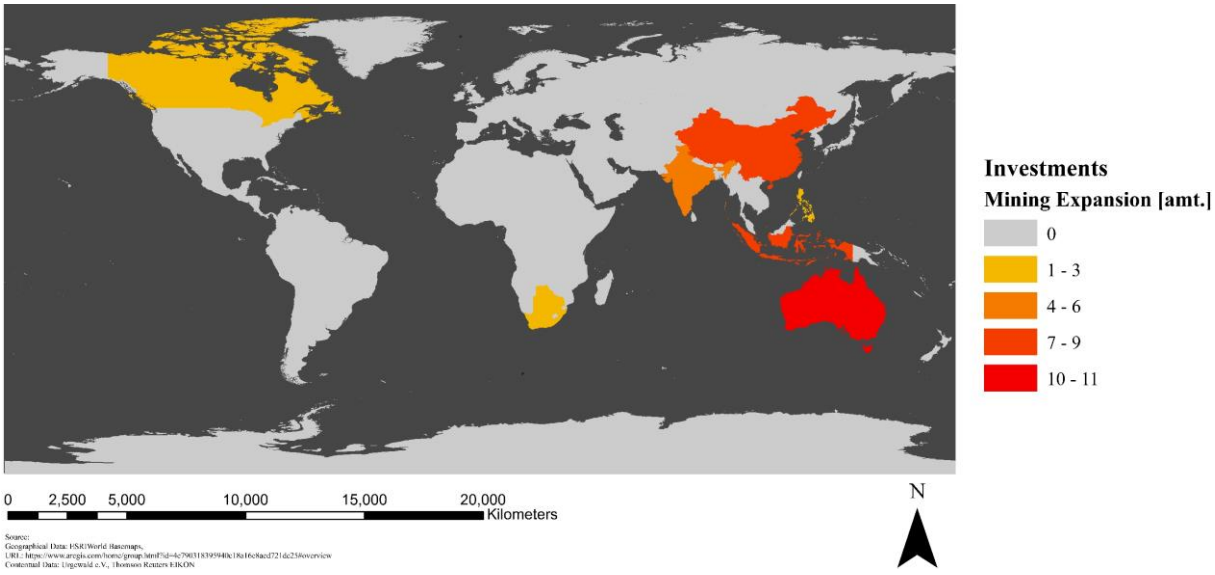
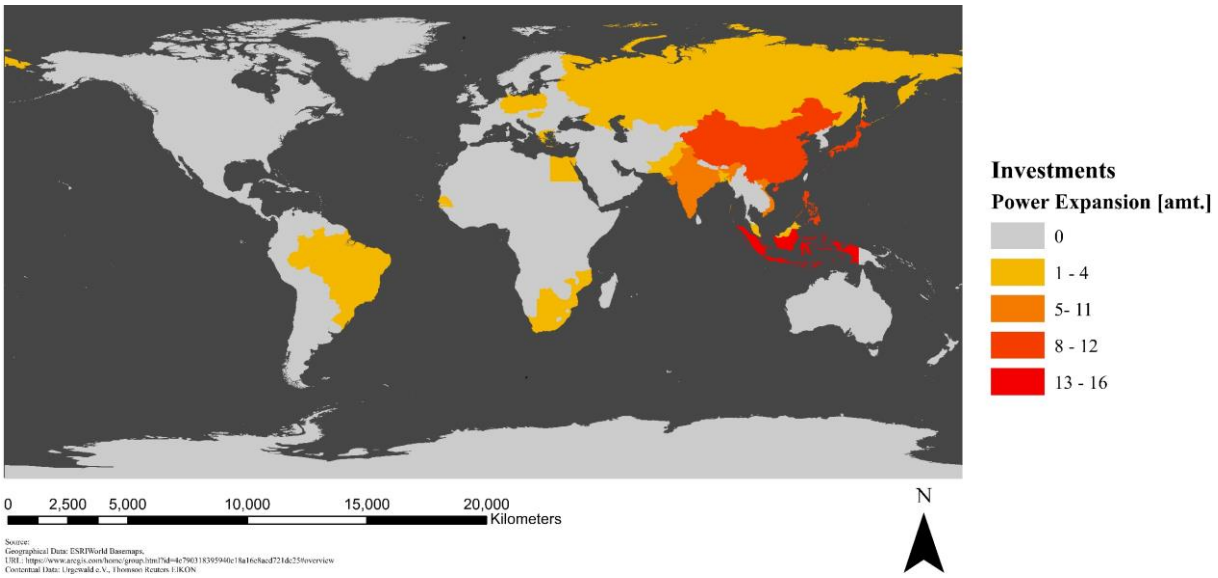


Figure 4: Amount of companies that are expanding their power operations (Reading example: Swiss financial actors are invested in 13 to 16 companies that are expanding their power generation operations with thermal coal in Indonesia.)



It is visible that mining and power expansion are still significant. Especially Southeast Asia is experiencing a big growth in expansion activities of thermal coal. This is in line with findings of the Global Energy Monitor (2020) where Southeast Asia is worked out as a hotspot for announced coal power and mining operations. In contrast to current coal activities as depicted in Figure 1 and Figure 2, there seems to exist a somewhat clear difference between less and more developed countries where especially power expansion is critical. While the difference is not as striking for the expansion of mining operations, this is rather clear for power expansion where Germany and Greece seem to be the only more developed countries with expansion plans with Swiss financial participation. All other countries are either considered less developed countries or belong to the newly industrialized countries/ emerging markets. This indicates a possible geographical difference and could potentially lead to accusations of financial neocolonialism in the energy sector.

4.6 Indirect Investments

Since direct investments in equity holdings are just a small portion of the real investments in coal, one example for indirect investments can show the real impact of the Swiss financial actors. In this example, the investments of BlackRock (BLK), one of the largest global investment management corporations in the world and called a shadow bank (The Economist 2014) with a total of 16 subsidiaries, is examined:

Table 8: Examined subsidiaries of BlackRock

BlackRock Institutional Trust Company, N.A.	BlackRock Japan Co., Ltd.	BlackRock International Ltd.	BlackRock Asset Management North Asia Limited
BlackRock Advisors (UK) Limited	BlackRock Asset Management Canada Limited	BlackRock (Netherlands) B.V.	BlackRock Financial Management, Inc.
BlackRock (Singapore) Limited	BlackRock Asset Management Ireland Limited	BlackRock Asset Management Deutschland AG	BlackRock Advisors (UK) Limited
BlackRock Fund Advisors	BlackRock Investment Management (UK) Ltd.	BlackRock Investment Management (Australia) Ltd.	BlackRock Investment Management, LLC

In total, Swiss financial actors hold equity valued **USD$327,395,722** in BlackRock. BlackRock itself holds equity valued **USD$79,171,450,482** in coal companies with reported total carbon emissions of **184.22 Mt CO_2e** emissions (numbers are not approximated!). So, Swiss financial players are indirectly in minimum responsible for the following emissions:

Equation 3: Derivation of indirectly financed emissions

$$\frac{327{,}395{,}722.24}{\text{Total Equity of BLK}^{i}} * 184.22 \text{ Mt. } CO_2e \text{ emissions} = 1.79 \text{ Mt. } CO_2e \text{ emissions}$$

[i]Equity of BLK = USD$33,547,000,000

Therefore, Swiss financial actors are indirectly, only through holdings in BlackRock, responsible for additional **1.79 Mt CO_2e** emissions. This shows that the direct investments are just the tip of the iceberg and the Swiss financial actors are responsible for much, much more emissions than initially depicted in this thesis. This also opens the window for further research in this field.

4.7 Comparison to Other Studies

4.7.1 Greenpeace

Compared to other reports such as the one from Greenpeace, the present analysis follows a conservative approach to calculate the caused emissions by Swiss financial actors. Greenpeace (2020a) uses mined fossil fuels and the resulting emissions. Therefore, the amount of emissions per kilogram of thermal coal mined is approximated and used as a unit of measurement. Since the emissions of various fossil fuels vary widely between different types of fossil fuels, this approach is quite inaccurate and probably increasing the emissions. The analysis in this thesis uses the reported scope 1 and scope 2 emissions as an alternative and is in accord with the TCFD (see TCFD 2017b) as well as with UN reports and shows exact (but self-reported) emissions of the companies.

4.7.2 PACTA Report 2020

The PACTA report 2020 is complementary to this assessment, as it extends the analysis of the involvement in the coal business of Swiss financial actors substantially since it also include pension funds and a lot of insurances that were not visible in the data of Thomson Reuters Eikon. It also shows corporate bonds which are not included in this analysis. A similar picture are depicted for these two groups of financial actors: Spuler et al. (2020) find that regarding corporate bonds, pension funds and insurances also have a relative high exposure to coal and other fossil fuels. Comparing across fossil fuels, coal is even the most important energy source that is invested in. A similar picture is painted for listed equity, although even worse: Pension funds and insurance are the two groups of financial actors that show the highest exposure of fossil fuels in their equity portfolios (Spuler et al. 2020: 55). They find that Swiss financial institutions have made limited progress since the last test in 2017. Especially the financing of coal is problematic as it has not slowed down and is not expected to do so in following years (Spuler et al. 2020: 56), indicating that the transition in the financial sector is not occurring as fast as it is needed. It must be noted that regarding the technology mix in corporate bonds as well as listed equity over all

groups of financial actors, renewable energy makes up just a small proportion, where coal and gas still are still most important (with the exception of hydro-power in listed equity investments of pension funds, where long-term investments in hydro-power make up a huge proportion of total investments) (Spuler et al. 2020: 61). Therefore, the PACTA report as well as this thesis point in the same direction: The Swiss financial sector is way to fossil fuel-heavy (especially thermal coal) and urgent action is needed.

4.8 Interim Discussion & Data Quality

When adjusting for the missing share coal in revenue and the missing data on emissions from scope 1 and 2, the Swiss financial actors are responsible for approximately **6.83 Mt. CO_2e** emissions from investments in coal companies (see Table 7). It must be noted again that this is not an exact number but an estimated amount. This value is based on various criteria. The fact that financial databases do not show the whole amount of Swiss investments in these companies means that the emissions calculated here underestimate the actual amounts. Self-disclosure of scope 1, 2 and 3 data also hinders correct (and probably higher) results. In addition, this result is influenced by the two approximations of the adjustment factor and the representation rate. It is unclear if these factors affect the result positively or negatively. Overall, the calculated result probably reflects a conservative approach for assessing the impact of Swiss investments as they could be much higher if data disclosure were to be trustworthy and credible. The same applies for indirect investments which presumably are higher than estimated.

This figure becomes even more impressive when viewed in context. Switzerland was responsible for 46.4 Mt of CO_2e emissions in 2018 (FOEN 2020c: 15). Directly financed emissions from coal investments are therefore as high as nearly 15% of the emissions of the whole country. And when comparing to climate finance payments of USD$450 to 600 Mn. p.a. (see Federal Council 2017), it becomes apparent that already with coal financing, net climate finance of Switzerland is strongly negative (see 2). The impact of Swiss investments solely in equity holdings in the coal sector are therefore substantial. This number will be even much higher when considering all fossil fuels and underlines the paradox of current Swiss politics with regard to environmental and financial issues.

4.9 A Calculation Mechanism for Offsetting Emissions

Finally, this estimate can be used to approximate how high the additional payments for climate finance would have to be. Staudenmann (2019) already mentioned that payments of Switzerland regarding climate finance should be much higher than initially anticipated by the Swiss government. However, it is generally difficult to calculate how high such payments should be. Although it is possible to estimate such numbers depending on the size of the economy and the total emissions caused, this is not helpful, as a total amount of global enumeration payments is needed to calculate the share of each country. This total should in any case be much higher anyway, as UN's Intergovernmental Panel on Climate Change (IPCC) already mentioned that an annual investment of USD$2.4 Trn. is needed in the energy system alone until 2035 to limit temperature rise to be below 1.5°C from pre-industrial levels (IPCC 2018: 24).

Not all this money must be climate finance as large proportions of the global energy systems also need to be transformed in more developed countries. But money of course is not to be spent solely for mitigation: It also needs money for reforestation, coastal-defence systems and various other adaptation measures (Yeo 2019). Spending on adaptation efforts is particularly low. In this matter, economists believe that currently, half a trillion US-dollars are spent every year for climate-related activities. Padraig et al. (2018) put it at around USD$510 Bn. to USD$530 Bn. in 2017, while the UNFCC (2018) put it at USD$748 Bn. in 2018. But again, these numbers only reflect estimations since data gaps, limited systematic tracking and a lack of agreed accounting definitions exacerbate real accurate calculations. And as investors, banks and governments continue to fund other counteracting measures, the amount of money dedicated to the climate is nowhere near enough, and it is quite uncertain if even the pledge of USD$100 Bn. p.a. made in Copenhagen in 2015 will be achieved. Particularly the lack of definition of climate finance is a source of uncertainty, and only a wide definition of finance, maybe also partly counting loans and not just grants as climate finance, will make it possible to achieve the said goal (Yeo 2019). It is particularly difficult to decide how much a country should spend on climate finance as this is politically very controversial. Switzerland, as an example, is the country with the highest climate finance payments per capita and per tonne of CO_2 emitted (UNFCCC in Yeo 2019). However, these numbers do not consider the emissions that were not directly emitted by the country. The calculations done here are therefore not considered.

Next, a short introduction to the Green Climate Fund (GCF) is given. This is followed by a short calculation in comparison to the GCF to show how much higher Switzerland's climate finance payments would have to be if the examined investments by Swiss companies were also considered.

The Green Climate Fund (GCF) is *"the world's largest dedicated fund helping less developed countries reduce their greenhouse gas emissions and enhance their ability to respond to climate change"* (GCF 2020a). It was set up by the UNFCCC in 2010 and plays a crucial role in fulfilling the Paris Agreement, as it helps direct climate finance to less developed countries. This is done with a pooling of climate finance payments from different more developed countries, but also from some less developed nations. Various countries, regions and even one city (Paris) agreed to jointly mobilize financial resources for efficiently allocating this funding. The GCF aligns its activities with the priorities of less developed countries and pays attention to the needs of population groups threatened by climate change. This particularly includes Least Developed Countries (LDCs), Small Island Developing States (SIDS), and African States. As the GCF aims to catalyse the development of a low-emission and climate-resilient development, they aim to drive a paradigm shift in the global response to climate change, paying attention to the mobilization of private finance. They intend to catalyse funds, multiplying the effect of its initial funding by opening the markets to new investments as well (GCF 2020a).

As of mid-December 2020, the GCF has avoided an expected amount of CO_2e emissions of 852 Mt. with its projects. A committed total of USD$7.3 Bn. was used to fund these projects (GCF 2020b). With

this, the efficiency of one dollar of climate finance invested by the GCF can be calculated as follows (only regarding anticipated tonnes of CO_2 equivalents avoided, not including increased resilience):

Equation 4: Derivation of price of 1t CO_2e emissions

$$\frac{USD\$7{,}300\ Mn.}{1200\ Mn.\ Co2e\ tonnes} = 6.1\ USD\$/CO2e\ Tonne$$

As Swiss financial actors caused around 6.83 Mt. CO_2e emissions in 2019 with investments in thermal coal, Switzerland would have to increase its pledge to the GCF by **USD$41.7 Mn.** (to the total of USD$450 to 600 Mn. p.a.) just to offset such investments if efficiency of the GCF stays constant. This is an increase of **7 to 9%** of its current climate finance pledge. This is a significant increase, considering that this is only due to holdings in companies related to the coal business. It must be noted that with its budget, the GCF has not only financed mitigation measures but also adaptation measures. Thus, the price of mitigation measures which would purely compensate for CO_2e emissions through financing in thermal coal would certainly be lower than the calculated monetary value. However, energy production with thermal coal is also accompanied by changes in the environment, which makes adaptation measures necessary and underlines the importance of this comparison. This simple comparison illustrates the need for additional pledges quite accurately. This shows that the financial sector alone is offsetting a considerable amount of the efforts of Switzerland in the field of climate finance, just with day-to-day practices.

5 Perceived Climate Friendliness

After the quantitative analysis, an interview series was conducted to put the findings into context and also show additional problems of the financial centre regarding sustainability. Considering the current state of the Swiss financial centre on sustainability issues, there exists a gap of knowledge regarding the perception of the climate friendliness by different market players. To close this gap, a qualitative interview series was conducted to ask several market players from different standing points about their perception of the current state as well as their thoughts for the future of sustainable standpoints in the financial industry of Switzerland. Of interest was the paradox illustrated above: On the one hand, the investments of Swiss financial actors in thermal coal, but on the other hand the efforts of Switzerland in the field of climate finance as well as increased efforts around sustainable finance across financial actors. The goal of these interviews was to get a grasp on how various experts perceive the current situation and how current developments should be classified. Emphasis was laid on a result that is not either black or white, where it should not only be concluded that the experts are hopeful or rather resigned about the sustainability of the Swiss financial sector, but what arguments and opinions they have on various issues.

This lead to various types of questions and topics, for example the investments in renewable energy sources and energy generation with thermal coal by Swiss actors, or the limited climate finance payments as well as the limited mobilization of private funds by Switzerland. Below, the detailed research methodology and methods are described.

5.1 Methodology

Away from a more quantitative approach that was used in previous chapters, in this series of interviews a clear qualitative procedure is applied to get a grasp of the current state of sustainability of the Swiss financial centre and how investments in fossil fuels (in particular thermal coal) and renewable energy projects are perceived. For this qualitative analysis, an interpretative-categorising approach was chosen, since for the research question to be answered, the content of arguments was more important than its structure and form, so how the arguments were formulated. It was generally more important to analyse what was said and how meaning was attached to it, rather than how it was said or what could be said in a certain context. Within interpretative-categorising data analysis methods, the qualitative content analysis was selected. However, different types of qualitative content analysis methods exist and also in literature, it also is sometimes not quite clear how a qualitative content analysis has to be constructed: For example, in contrast to other authors, Krippendorff (2013: 22f) adds the discourse analysis as well as the conversation analysis to the group of qualitative content analysis, and also describes this group of methods as rather explicative and not as reductive. Mayring (2010) and Kuckartz (2012) however emphasize the foundation of the method around qualitative content analysis where they underline the systematisation of the analysis procedure. They also highlight the orientation of the methodological quality criteria as a central, defining feature (see also Rustemeyer 1992; Schreier 2012). Nonetheless, there is an important difference between them: While Mayring (2010) defines the qualitative content analysis as a theory-driven procedure (see also Rustemeyer 1992), Kuckartz (2012) and Schreier (2012) underline the importance of the development of the categories also on the material itself. As a third alternative, Gläser & Laudel (2009, 2013) argue for a mixed deductive-inductive procedure during the evaluation of the content analysis. This shows that there does not exist one universal definition of qualitative content analysis. However, consensus exists that all qualitative content analysis methods are understood as procedures to describe selected passages. This description is done by explicating relevant meanings as categories of a content analytical category system and subsequently, passages of the texts are matched to the respective category of the category system. Therefore, the orientation on the categories is central. These categories serve as variables that stand for every relevant text passage. Thus, the category system can be understood as the most important part in a qualitative content analysis. The creation as well as the application of said category system is done interpretatively and allows for integration of the latent form of the source. This differentiates it from the quantitative content analysis (Schreier 2014).

The procedure is done systematically and respects the quality criteria of validity and reliability. Reliability means that an intersubjectively consensual textual interpretation is sought (so that all possible beholders would come up with the same category system) (see e.g. Kuckartz 2012: 82f; Schreier 2012: 170ff). The term of validity underlines the ability of the analysis to comprehend crucial passages of the text. This usually means that some categories are created and developed inductively on the material itself during the process (Schreier 2014), and not only deductively before the classification procedure.

There exist various types of qualitative content analysis: Mayring (2010) distinguishes between summarizing, restructuring and explanation methods and emphasizes that the restructuring approach must be understood as a central technique and divides it further. Similarly, Kuckartz (2012) and Hsieh & Shannon (2005) also introduce various styles of qualitative content analysis, and other authors also modified and altered these approaches (Schreier 2014; see e.g. Steigleder 2008; Gläser & Laudel 2009). In this thesis, a continuous structuring form of the qualitative content analysis according to Mayring (2010, 2014) was applied which is a form of structuring qualitative content analysis by Mayring (2010). Such an approach has also been referred to as the core of a qualitative content analysis (Kuckartz 2012; Mayring 2010; Schreier 2012), as general depictions of qualitative content analyses concerning the method were guided by the structuring content analysis (see Groeben & Rustemeyer 1994; Schreier 2012).

The aim of this qualitative method is to identify selected aspects of the material, to conceptualize it and to systematically describe the source material. Particular attention is paid to which specific topics are to be covered in the interview series. At the same time, these aspects form the structure of the category system, so that the various topics are made explicit as categories of the category system (Schreier 2014). The process of a structuring content analysis essentially comprises the following steps, some of which must be carried out several times (Mayring 2010, 2014):

- *Familiarization with the material*
- *Derivation upper categories from the question or the interview guide*
- *Determination of the coding units*
- *Development of subcategories and category definitions*
- *Testing the category system*
- *Modification of the category system*
- *Coding of all material with the revised category system*
- *Presentation of results, interpretation, answering the research question*

However, these categories are not set in stone, as there are fundamental differences between different representatives of qualitative content analysis with regard to the basis of the category system. The approach of Mayring is criticized by Steigleder (2008) for not sufficiently specifying the evidence for a revision of deductively created categories. Thus, the author applies a modified variant of a continuous adaptation of categories to the material (Steigleder 2008: 188f), which ends in the fact that a test coding as well as a subsequent revision of the category system is not necessary (Schreier 2014). This mix between inductive and deductive of the category system was adapted by Schreier (2012) and will also be used in this analysis. In following chapters the steps of the modified content analysis are executed to give an overview of the methodology of qualitative data analysis.

5.2 Familiarization with the Material

This chapter describes the material collected for the qualitative analysis in more detail. This analysis is based on seven expert interviews that were carried out in July, August, and September 2020. The following table shows all details regarding the interviews. Since it was not necessary to give the full names

of the experts, as disadvantages which could result from their publication are clearly to be weighted more heavily than its advantages of greater transparency, both the names of the interview partners and their employers were made anonymous. This was also important because many of the participants wanted to their data to be anonymized or were not allowed to make any official statements without approval of the communications department of their employer. This made it possible to create an overarching system where the experts did not have to fear any disadvantages from their participation. An overview can be found here:

Table 9: Overview of interview partners

Interview Nr.	Date	Type of Financial Actor	Duration [min.]
1	06.07.2020	*Swiss Fund Manager*	42
2	13.07.2020	*Swiss NGO*	52
3	27.07.2020	*Swiss Private Bank 1*	61
4	30.07.2020	*Swiss Federal Agency*	63
5	04.08.2020	*Swiss Private Bank 2*	121
6	13.08.2020	*Expert Swiss Sustainable Banking*	35
7	08.09.2020	*System-relevant Bank*	56

Note: The names of the experts are known to the author of this study.

These interviews were rather structured, knowledge-based interviews. Therefore, they were conducted and are to be categorized as expert interviews since the information given by the interviewees was crucial and not necessarily the persons who gave the information themselves. With this method, it is ensured that different aspects of collecting data around a research topic can be gathered. This means that statements on how the world is are picked up at the same time with how the world is perceived by the interviewed people. Therefore, the world is "measured" at the same time as when the "interpretation" of it on people is picked up. Respectively, such data collection shows both low and high summaries of reality (see Atteslander et al. 2003: 145). Expert interviews are described as semi-structured in the form of guidance of the interview. This could be a disadvantage to the episodic interview where discussions are more open-ended. The form of communication of the interviews is regarded as more natural than with episodic interviews. Also, another characteristic of expert interviews is that authority in relation to "truth" and detail lays more in the arms of the interviewer, which is beneficial when talking about sustainability issues, a somewhat precarious topic to some (see Helfferich 2011).

One of the most important questions in this research project was to get access to the field as no immediate connection points could be found. But firstly, the role of the researcher had to be defined: As Flick (1998) described, the researcher acts initially as a stranger or as an alien in the system under question.

It is important to allocate a certain role and position to the researcher which must be communicated openly. This was done with every interview, written with emails and orally shortly before the interview. Access to the field was quite difficult as there was no real "existing" space which is to be researched about, but rather a bubble of experts and expertise. Connections to the field and potential interview partners had to be found through research: Which institution should or must be represented and which employee or expert of an institution is suitable as an expert? These questions lead to an in-depth online research to answer the questions about the identification, regarding who can tell something about the selected topic, as well as the accessibility, meaning which expert was reachable. When a person was identified, they were contacted via mail. One important topic, the willingness to participate of the experts (see Flick 1998), emerged as major difficulty, as most mails ended in a dead end. This potentially uncovered a problem, also already defined by Flick (1998): Researchers can be perceived as strangers in the field which leads to a certain unwillingness to communicate/participate. This problem was overcome however, once when access was granted. With the help of one of the supervisors, one interview with a field expert was completed which promptly opened doors to other experts and interviews. About half of the interviews were made possible through previous interviews, a quarter through direct access and a quarter through connections of the supervisor.

But all three access points were subordinated to a sampling method: To identify the interview partners, two points should be given special attention: Who and why should someone be considered an expert, and what information can be gathered (Bogner & Menz 2009)? Therefore, a purposeful sampling method was used where most of characteristics about the interview partners, such as sample characteristics, features of the basic population as well as the sample size was not known. Also, as already described before, sampling was quite a challenge where a repetition of choosing sampling elements was needed, for example needed characteristics or channels through which experts are searched for. The sampling was only finished when a "theoretical saturation" has been reached (Flick 1998: 67). The aim was to use a selection process that was as targeted as possible (after Patton 1990: 169). Due to the small number of cases, a *Critical Case Sampling* was used. Thus, persons were selected who can provide as much information as possible (Struwig & Stead 2001). To create a certain trade-off between the effort of further interviews and the amount of information generated by the interviews, the number of interviews was limited to seven, since further interviews could probably provide only little further information. It was considered that each interview partner should have a strong expertise in the examined field, which was also achieved by the seven interviews.

Since the interviews were not about the person but about the information produced, focus was on factual questions. These were generated using the SPSS principle which includes four phases: Brainstorming, reviewing questions, sorting questions by themes, and subsuming and consolidating questions (see Helfferich 2011: 182 - 189). The interview guide was adapted for each person, depending on their background. Depending on the expert's knowledge on various topics, certain question blocks were asked, and some were not. The complete interview guide with target interview partners can be found in the

appendix B (see 8.2). This interview guide is structured with main questions that introduced the topic. In addition, follow up/maintenance questions were used to maintain the narration and invite the interviewees to extend their narration. Probing and specializing questions were used which deepen the topic and introduce potentially new or unstated information. Also, interpreting questions were used to summarize and rephrasing the answer in its own words (Helfferich 2011; Kvale 2011). However, these are not written down in the interview guide as they are depending on the answer of the experts. With all questions, it was made sure that no suggestive questions, presuppositions, or questions for simply gathering facts were asked.

All expert interviews were recorded with either a mobile phone, laptop, or a dictating device and were transcribed afterwards. Additionally, notes that were taken during the interviews worked as a complementary source of information. However, the outbreak of COVID-19 made it quite difficult to meet the experts in person, which lead to quite a lot of interviews via telephone, where either the interviewee or the interview partner was not comfortable in meeting, were restricted due to possible contamination, or where there was no meeting room in which the 2 meter restriction could be safely implemented. In total, 6 interviews were conducted remotely, while only the last one was done in person. Afterwards, the audio files of the interviews were transformed into textual sources via transcribing. Transcription generally was done as a smoothed, partially summarised transcription, as emotions such as laughter did not make a difference in analysing the data. Also, as most of the interviews were done by phone, it was mostly not possible to see any countenances that might have been helpful in analysing the information.

5.3 Research Expectations

The purpose of this qualitative series of interviews was to examine the background to the unsustainable working methods of the Swiss financial actors. With the background of the literature work, which shows the financing of thermal coal as well as a possible solution to the climate crisis, namely climate finance, these expectations below were formed and then helped to formulate some research questions which shows this contrast between climate-damaging and climate-friendly activities in more detail.

The aim was to find out why investments in coal are still being made, but also why the financial actors are not moving in the other direction, in the direction of increased measures regarding climate finance or also impact investing, as well as in the direction of sustainable finance in general. Thus, this series of interviews helped to look behind the scenes of the quantitative analysis and, above all, to show the reasons for the behaviour of the Swiss financial actors. Based on previous chapters and the quantitative analysis of Swiss investments in thermal coal, several expectations were formulated that underline and specify the overarching research.

Dealings with Sustainability in the Financial Sector

As it was shown in chapter 4 that Swiss financial actors are still investing in energy production through thermal coal and surrounding areas, it is assumed (i) that financial actors either do not acknowledge the dangers of climate change or stranded assets or (ii) that they are arguing to be in a transition phase for

phasing out coal from their investment portfolio. As it would be damaging to its business, it is highly unlikely that some representatives will admit to not include some sort of sustainability measures in their investment decisions or that they downplay the risks of energy production with coal. Generally, it is expected that persons in the financial industry think that their business is doing its part regarding saving the environment/fighting climate change.

Differences in Perception of Climate Finance & Opportunities in Emerging Markets

Less developed countries have a large gap in the financing of renewable energy (see 2.4.3). It is therefore (more) efficient to finance mitigation and adaption projects in less developed countries to fight climate change. On the other hand, more developed countries have an obligation to support less developed countries through their polluting activities in previous decades and in the future. It is assumed that institutional organs and private investors as well as NGOs have different opinions on this matter: The apportionment of blame, who is responsible to finance mitigation and adaption measures, is a dispute of high complexity. Private investors are hesitant to invest in emerging markets, as risks presumably outweigh opportunities heavily. It is assumed that the amount of responsibility each actor has to take on is considerably different when asking representatives of different stakeholder groups.

Attractiveness of Infrastructure Investments around Renewable Energy

It is assumed that financial actors are attracted to investments in renewable energy as they are regarded as safe investments for a longer period. A big gap between more and less developed countries is assumed as other risks are too high for certain investors in certain regions. From the institutional side, investments in renewable energy are very important to achieve climate change mitigation and adaption targets.

Financialization of Nature and Neo-colonial Tendencies of Climate Change

The concept of financializing nature or climate change mitigation and adaptation is rather critical for globalization and the spreading of the financial world and its products into new territories, and generally not well known by professionals in the finance business. It is assumed that they highlight the benefits of ongoing financializations and do not acknowledge its negative side effects.

National & International Political Processes

While products around sustainable finance are picking up speed in Switzerland (see Dettwiler et al. 2020), other countries are far more advanced in this, also in regulatory terms. It is assumed that finance professionals will underline the need for standards in the sustainable finance sector and will maybe accuse other market players of greenwashing. Especially experts from the government or NGOs presumably underline the problems of knowledge gaps in the financial industry and the short-term thinking of certain market participants.

Objectives of the Financial Industry

It is assumed that customers and providers of sustainable financial products are more concerned about the risk/return perspective than the sustainability perspective. In the end, financial players will need to

prioritize profit which lowers the chance of climate finance to be attractive to such players. This will have an important indication on how to shape the financial industry politically.

5.4 Derivation of Categories & Coding

Back to categories and coding: As described above, Mayring (2010; 2014) explicitly distinguishes between deductive and inductive derivation of the categories. In this thesis, the categories are formed both deductively and inductively, as it was also suggested by Steigleder (2008: 188f). Other authors such as Kuckartz (2012), Schreier (2012) as well as Rustenmeyer (1992) also leave it open how strongly the categories are formed guided by theory or inductively on the material. The three authors mentioned above only write that at least some of the categories are derived from the material, so that a fit of the material to the category system (and vice versa) is ensured. Therefore, the strict dedication as suggested by Mayring (2010, 2014) does not necessarily portray the most appropriate one. Since the material of this interview series addresses a very wide range of topics, from population composition to energy policy in less developed countries, it is very difficult to form categories inductively or deductively only. A first brainstorming session was held before the analysis, especially to form superordinate categories, but there had to be enough freedom to design sub-categories (or in exceptional cases even superordinate categories) during the analysis process. This approach ensures that although a solid framework for the analysis is available from the beginning, it can still be continuously expanded and improved. Thus, previous knowledge about the material was also included in the creation of categories to make them explicitly visible. Schreier (2012: 85) even suggests that category formation, which is completely inductive, is also possible, although this is not common. Therefore, to reflect the prior knowledge, the categories in this thesis were formed both deductively and inductively.

The exact category formation can be done in different ways. Mayring (2010, 2014), for example, suggests a summarizing strategy that is also used in other content analyses. The author additionally mentions the strategy of subsummation where the material is reviewed in small steps and examined for new aspects which then form a (sub-)category. If, however, a statement of the material is already covered by an existing category, this text passage is to be subordinated to this group and thus subsumed (see also Schreier 2012: 115ff), which is thus quasi the standard procedure in a content-structuring qualitative content analysis (Schreier 2014). In addition, there are further differences between different authors about the process of content-structuring content analysis: Kuckartz (2012), for example, envisages different phases for the development and application of categories. In addition, the author suggests that the statements should be set in contrast with case summaries and individual aspects of the interview partners to connect the totality of the respective case with what is said. In addition, Schreier (2012) points out that a certain transformation and reflection of the categories may be necessary prior to evaluation.

In this qualitative content analysis, several steps mentioned above were therefore included in the analysis, according to Mayring (2010; 2014). First, categories were formed deductively. The deductive process of generating categories before the analysis included various topics which are generally built on the

expectations (see 5.3), as well as the literature work done before. As transcription was performed by the same person that did the analysis, complete separation of deductive and inductive categories was difficult as the analysing person was already familiar with the material. Nevertheless, before analysis, categories were formed, and two interviews were coded with this system. This is also described by (Schreier 2012) as the "piloting phase" of the coding where the coding frame is tried out on a small subset of the material which represent the whole data collection the best. The deductively created codes were not fixed and could be changed, deleted, or combined depending on the need. During this piloting phase, the coding frame was completed with inductively formed codes that emerged during the coding of the two interviews. To ensure variability as seen in Schreier (2012: 151), the trial coding was done two times within an interval of seven days. This was done because of reliability concerns that also is concerned with consistency, so that it can be ensured that coding is not depending on moods or personal preferences on that given day (see Schreier 2012: 174f). The revised coding frame was again used to recode all transcripts used in the trial coding phase to ensure that all material before and after the revision of the frame is coded using the same frame. During this time, several subcategories that were capturing the same points were merged. Also, categories were also sometimes divided into subcategories where this made sense to achieve greater clarity for the creation and interpretation of the results. The coding procedure worked without major problems, but this is also due to the small number of interviews and the fact that there is only one person evaluating the transcripts. After the piloting phase and the inclusion of inductively generated codes, the coding scheme was complete and was applied to all interviews. During the additional coding, no further categories were added or removed, as it was needed to ensure validity and reliability. The full category system can be found in the appendix A (see 8.1).

In addition, the context of the person in question was also included in some cases. For example, it was important to keep in mind that a person who works for the Swiss government has a different viewpoint than one who works for a small private bank. And this person again has a very subjective attitude as someone who works for a large bank.

5.5 Reflection on Data Quality & Implicit Assumptions

Generally, it can be considered that gathered data reflects well the positions sought as all interviewed persons are influential people in their respective field and/or in their company. However, in retrospective, questioning and the handling of the discussions with interview partners could have been handled better since linkages between various topics seemed to be sometimes quite rough. Also, the fixation of such a big question catalogue was somewhat obstructive to the actual conversation. This could also lead to the conclusion that a more unstructured approach with just open concepts and some stimuli would have worked better than a stricter interview guide.

Another disadvantage, which was due to the COVID-19 outbreak, was the circumstance of mostly interviews being conducted by phone where connection quality had a serious impact on verbatim transcription. In some interviews, connection quality was that bad that for some statements, so that during

transcribing, only the core meaning could be worked out, and not the literal meaning. This reduced the collected data that was available for data analysis, but only by a very small margin.

Implicit assumptions came to the forefront quite quickly after the first few interviews. As most of the interview partners were employed by a financial actor, prejudices started to appear: It was sometimes implicitly assumed by the interviewer that employers of companies active in the financial industry can only to a certain extent grasp and comprehend "green" difficulties. However, this assumption was quickly debunked in a positive way as (nearly) all the interview partners showed a strong interest and deep knowledge to nature and natural processes. However, as some people are working in sustainability departments of these actors, it cannot be ruled out that, even though they show a high degree of knowledge around sustainability issues, executive staff or other employees think differently. Therefore, it must potentially be differentiated between sustainability experts and upper management.

5.6 Results

After all data was coded, results are shown in the following subchapters, where findings are described and illustrated using continuous text. The results are organized by categories. This makes sense as the number of categories as well as the number of cases are limited. All categories are illustrated with a summary of the core of the category and the concept underlying it. Each category was illustrated with several quotes where each quote related to a different aspect of the category (see Schreier 2013: 220ff). These quotes were translated from German to English as all the interviews were conducted in German. This was more comfortable for the interview partners as well as the interviewing person. Key was to include the most important information about every category with comparisons between subcategories as well as potentially frequency information (see Appendix A: 8.1). The most distinctive part of the category had to be emphasized. In some cases, some smaller categories had to be merged with bigger categories. So, it was tried to concentrate on the essentials.

After the descriptive analysis of the results, additional data exploration was important for examining the results for patterns and co-occurrences. There, not only the individual categories and cases are relevant, but also the relations between the categories (Gibbs 2007). Lewins & Silver (2007) also highlight that, to support the analysis of qualitative data, looking for co-occurrences has become common. For this, the tool of code-relations browser of MaxQDA was used and can be found in appendix A (see 8.1) so that co-occurrences of certain categories can be observed. Frequency information is very important and was integrated into the analysis (see Schreier 2013: 229), as it was an indication of importance of the matter.

A typology construction for material reduction, for example sorting the material into different groups was not necessary, as the number of cases was limited. With the analysis of each case individually, it can be insured that all aspects and details of each case were captured by the analysis. As the case number was low, quantitative analysis only took place through frequency information and is also represented by frequency-related terminology throughout the continuous text description, for example "majority of experts …" or "only few experts …". To back up such claims, the code-relations browser in appendix A

(see 8.1) can be consulted, as it also shows frequencies, although the exact number is not visible. This is not necessary, as this table is only meant to serve as an illustration of which topics were more important for the interview partners and which were less important. Other quantitative approaches, such as the reporting of absolute frequencies in charts, was disregarded due to the small number of cases.

5.6.1 Reasons to Invest in Thermal Coal and other Fossil Fuels

One of the most important points regarding fossil fuel investments, and especially in thermal coal, were the reasonings behind such financing activities, which are outlined here.

One of the main reasons were **ongoing habits in the financial industry**: Without questions into this direction, nearly half of experts mentioned the customs that are linked to the banking business where the operations have not changed in the last decades, and now, with the implementation of ESG factors and the upheaval regarding sustainability and the exclusion of non-sustainable business practices, this creates problems in implementing them quickly (see Expert 2, Par. 19 & 21; Expert 3, Par. 25; Expert 5, Par. 19 & 23). However, this is not entirely the fault of the people in the financial business, but rather of its structure: **Financial institutions are standardized in many transactions**, which leads to a procedural and process-oriented business structure so that it takes an extremely long time to integrate climate compatibility (or biodiversity) analyses into the processes:

"That doesn't mean that these banks or people don't want that, it's just until it happens, and until you start doing that [ESG integration], it takes a lot." (Expert 2, Par. 19)

These habits are also linked to another reason that has a significant impact, **a generational difference**:

"I think it is also a mixture of the fact that this has been going on for years, there is relatively little innovation in the industry that would change more [...]. Then it also depends on who is on top of the financial actors and the other partly dirty companies. These are old, white men, who claim to be very relevant. I personally don't really know if they are really that relevant" (Expert 5, Par. 23)

While expert 5 put this more dramatically, also other experts have expressed the problem that a lack of innovation in terms of investment targets comes mainly from the top. Another reason that was mentioned quite often were **economic considerations**. This is, again, linked to generational conflicts, as most of the times, solely economic considerations are expressed through older generations (see Expert 2, Par. 25; Expert 7, Par. 27).

And it is also difficult for other market participants to forego potential profits. For example, **the exclusion of a part of the listed companies as possible investments is seen as a disadvantage**, and the restructuring of an entire portfolio is not quite so easy, and therefore takes a certain amount of time (see Expert 3, Par. 11 & 27; Expert 6, Par. 13 & 25; Expert 7, Par. 3 & 17). The difficulties of the conversion can also be seen in another reason, namely **the potential lack of knowledge of financial service providers**. The experts were very divided, both between whether a knowledge gap indeed exists or not and whether if this knowledge gap is unequally distributed across the financial centre (see Expert 2, Par. 21;

Expert 3, Par. 30; Expert 5, Par. 23). A representative of a system-relevant bank, for example, said that there are clear differences in knowledge between larger and smaller banks, so that expertise would clearly be available at larger banks (Expert 6, Par. 27). However, another expert argued that there is clearly a problem at large banks too, and that knowledge has not yet been fully developed there either (Expert 2, Par. 21). But it must be said that almost all experts were in favour of the fact that **knowledge around climate change is now growing** and that **all market participants have actually recognized the importance of the topic**, although this was not the case some time ago (see e.g. Expert 3, Par. 29).

This (non-)existing knowledge gap differs largely across different topics. While the climate and climate change do not seem to be a substantial issue anymore, this gap is still existing when talking about biodiversity or water pollution (see Expert 6, Par. 33). And one expert also mentions that not only the knowledge itself is important, but also how critically these complex themes are questioned (Expert 7, Par. 21). One of the experts also linked the knowledge gap to the **lack of a political framework** and thus also the lack of recognition and support for the actions of many actors in sustainability aspects (Expert 2, Par. 21). In addition, one expert argued that multilateral organizations should also be involved and should oppose such unsustainable investments (Expert 5, Par. 41). However, since this is not happening enough in the expert's view, this is a sign of a certain policy failure.

Another reason for investments in thermal coal and other fossil fuels was seen in the problem of **companies being in a transition phase** as well as the **role of certain fossil fuels as energy sources in the future**. For most experts it was clear that it would not be expedient to simply stop investing in these companies but rather the firms, which are involved in rather "dirty" activities, should be accompanied in their journey towards a more sustainable future (see Expert 6, Par. 13).

Additionally, it was highlighted that **innovative companies must be promoted, even if they are not yet very sustainable overall**. Thus, some experts emphasize that not only the status quo, but also the decisions made in following months and years will be relevant for the transition and the economy in the far future. It is argued that an economic crisis, due to a large divestment series, would be far worse as it would have a way worse impact on the climate in comparison to the negative impacts current investments have in the short term (see Expert 3, Par. 13; Expert 6, Par. 13). The latter expert also emphasized, however, that their employer is willing, although heavy-hearted, to part with customers if they did not embark on this transition or did not act quickly or ambitiously enough. There, the speed of these transitions plays an important role, and whether the plans for a more sustainable business could really be implemented in time. In addition, it also played a role for this expert whether other market players from other countries, which would potentially not be as heavily regulated as Swiss players in the future, would not then take over these shares. This highlights **the problems that arise from purely national regulations**. Since countries regulate differently, actors from other regions could benefit from the divestment approach of Swiss actors and would suffer relatively little loss if the transition is not supported by their local regulatory framework (Expert 6, Par. 17).

Technical considerations are also necessary when choosing investments. Almost half of all experts emphasize the importance of fossil fuels, also in the coming decades, as renewable energies cannot be used for all applications of energy (see also Expert 1, Par. 31; Expert 2, Par. 43; Expert 7, Par. 5 & 59):

"Even in the most optimal scenarios, where one considers where one would like to produce mainly electricity from renewables, they would still not be able to cover 100% of the electricity from renewables in 30 or 40 years. […]. One problem is that you would then have high volatility, so you still need electricity production from controllable resources […], for example coal or gas. And that is why we still need this infrastructure. (Expert 1, Par. 31)

Although these points show that a world completely without fossil fuels is not yet possible, no distinction is made between oil and coal, which have different CO_2e emission values. Therefore, this is only a partial reason to invest in thermal coal. There was again an expert, as in the divestment approach, who emphasized that **if some players got out of this business, other players would step in and continue to finance fossil fuels**. These players would benefit disproportionately from the divestment of other players (see Expert 5, Par. 13). In addition, another expert underlined the responsibility financial actors have:

"After all, banks are not only committed to environmental protection, but also to their shareholders. You must look at that, because if I give up P&L (Profit & Losses) […],at the end I simply give up value for the shareholders. I have to anticipate what most shareholders want." (Expert 7, Par. 35).

Therefore, for financial actors, this is then **a pure risk/return consideration**: Is the risk posed by potential regulation or other dangers too great or are these investments still worthwhile? This notion was also picked up by some experts were risk/return considerations are key for causing the existing investments in thermal coal (see Expert 1; Par. 29; Expert 2, Par. 39; Expert 5, Par. 14 & 22; Expert 7, Par. 35). Thus, it is argued that investment decisions often result from weighing up risk and return:

"I think this risk component discussion is the most effective discussion, sustainability is about morals or ethics, but this is a discussion that does not work at all with financial institutions, it must somehow always be calculable and quantifiable." (Expert 2, Par. 39).

One expert emphasized that, if you have a purely risk/return-driven view, this mainly reflects the short-term risks and returns. Even with this risk/return consideration, the question is whether financial players understand climate change as a risk category (see Expert 1, Par. 29). This is also coupled with another consideration about the, rather long-term, climate issue. Since it does not necessarily fall back on the individual, the topic of **stranded assets is not relevant for the individual**:

"Some say that stranded assets were not relevant at all because you are so short in this business. They do not last that long, and so the loss does not fall on the individual, so it is not really a problem. This thought is sometimes right, but it is also partly a fallacy. Because it is quite clear that this development can happen very quickly, which can also be caused by shocks, as we have seen with the price of oil." (Expert 5, par. 21)

All these statements underline how a discussion with financial players on this topic must be conducted at all, namely **on the consideration of risk and return**. It is also evident that the considerations about which risk the environment and climate change really represent are taken seriously by the interviewees and have also been considered, but that there are still people close to them who have a different opinion.

Missing responsibility was also very important for some interviewees, so the answer to the question "who really is responsible for the production of energy from fossil fuels?" (see Expert 5, Par. 13, 27, 31; Expert 6, Par. 3; Expert 7, Par. 5). There, two important points must be showcased. First, some experts said that in their investment businesses, it is not themselves but their customers who decide where to invest compared to their lending business:

"You have to distinguish two points: One is what I do in the credit business, e.g. in my own banking business, and what I do in the investment business. In the investment business we are trustees of our customers. So, we do not invest ourselves, but we must consider what the customer wants. In our own lending business, we can of course do what we want." (Expert 7, Par. 5).

This representative of a large bank argued that they would only finance what was demanded by consumers and therefore allowed by the regulatory framework (Expert 7). Secondly, it was stated that some market participants **would not recognize indirect responsibility**, where the activities of Credit Suisse financing the North Dakota Pipeline served as an example (see Expert 5, Par. 13). Thus, individual market participants would not feel responsible for damage caused by companies co-financed by Swiss players, leading to a certain frustration among individual experts. This shows that **the financial sector has clear ideas for regulations** which have not (yet) been implemented, and that politics is accused of a certain incompetence. One expert underlines the contradiction of regulating the financial market industry while the rest of the economy is not regulated:

"Current regulations work in such a way that often not the real economy itself is regulated, but rather the financing of certain activities. For example, making the financial industry subject to interpretation. If oil heating and coal subsidies are legal, the way forward now is not to restrict the financing of homes with oil heating but to ban oil heating directly." (Expert 6, Par. 3)

This clearly **emphasizes the desire for an efficient regulation**, which underscores the role of politics in the problem of transition to a low-carbon economy. This is linked to **the missing political framework** mentioned above. One expert also said this after being questioned the reason behind missing regulations:

"Just look at the political landscape. The private financial sector has great influence! That is simply politically motivated, why there is no regulation yet. Because if the parliament wants one, then there is one." (Expert 4, Par. 27)

This showcases that also **experts acknowledge the need of regulation**, although this opinion is not shared by all. To summarize, there are a variety of possible reasons, at least according to the experts interviewed, why people are still investing in coal and other fossil fuels. These range from technical to financial and regulatory reasons. These are further examined in the discussion (see 6).

5.6.2 Limited Attractiveness of Investments in Renewable Energy

In contrast to the investments in fossil fuels and thermal coal, renewable energy are, at least from a long-term and sustainability-driven perspective, much more desirable. During the interviews, various reasons were identified why or why not individual actors invest in renewable energies or, more generally, in sustainable financial investments. These are described in more detail in this chapter.

First, one of the major reasons in favour of sustainable investments was their **attractiveness**. For example, one expert explained that investments in sustainable infrastructure projects and especially renewable energies are **not dependent on the financial market and therefore do not correlate** (Exp. 3, Par. 7). In addition, the **returns on renewable energy projects are exceptionally high** compared to other projects, although this is slowly stabilizing. And since the returns are also relatively constant, these are relatively attractive investments for their customers. Several experts also mentioned that many market participants are now saying that they will invest sustainably, which also underlines its attractiveness (see Expert 3, Par. 7, 21 & 27; Expert 5, Par. 5 & 17; Expert 7, Par. 63). It is now really relevant for various investors what impact their investments have. Thus, investments that are financially attractive are also highlighted by their influence in various ESG areas. This should also be linked to the fact that investments with good ESG values also show a certain performance (see Expert 5, Par. 17**).** Sustainable investments would even perform better than their non-sustainable counterparts, which underlines their attractiveness once again. Their **risk/return ratio is also better**, which was also emphasized by individual experts (Expert 1, Par. 9; Expert 2, Par. 23; Expert 3, Par. 11; Expert 5, Par. 3).

Here again, the balance between impact, risk and return is crucial. Thus, in sustainable investments, ESG factors are perceived by market participants not only as a risk, but also as an opportunity. Individual experts also mentioned the fact that they not only invested in companies that are already sustainable now, but would become so in the future, which again touches on the transition in the previous chapter (see e.g. Expert 3, Par. 11). Another reason for sustainable investments are **environmental aspects**, which are now emerging: **Signs of stranded assets are slowly becoming visible**, prompting other stakeholders, especially investors, to change their investment decisions, which leads to external pressure. Thus, also the **climatic change**, by its effects**, indirectly drives changes in investment practices**. An expert also mentioned the **regulatory risks of the alternatives**, which again underlines the attractiveness of sustainable investments (Expert 5, Par. 31).

In addition to the reasons mentioned for a stronger focus on sustainable investments, the experts also emphasized its weaknesses and problems. One term that should be particularly emphasized here is **greenwashing**, which was taken up by five experts (Expert 3, Par. 21 & 29; Expert 4, Par. 51; Expert 5, Par. 13; Expert 6, Par. 7 & 31; Expert 7, Par. 13 & 47). However, as was the case with coal financing, the experts never talked about their own employer, but always about other market participants who are not yet so well versed in the subject. Thus, the main reproach is that **sustainable investments are used too much only as a marketing instrument** and that they generate too little impact:

"It was noticed that it is attractive in this area and then a strategy is made to get it as cheap as possible. But you have that wherever there is an investment opportunity, there you always have a small risk that there is somebody who does some free-riding" (Expert 4, Par. 51)

Individual experts also emphasize that while many market participants are trying to offer sustainable products, for example with SDG reporting, **these are very vague and controversial** (see e.g. Expert 5, Par. 5). Such investments would then be clearly titled as sustainable although they are not, which can be problematic. This makes it extremely difficult for customers to see through this, and even for the experts themselves (Expert 6, Par. 7). But individual interview partners emphasize that there is **not any ill will** on the part of financial service providers behind this, but rather a learning process that had to be followed. Thus, to some degree, experts are also confident that this component of the criticism of sustainable investments could change in the future, as market participants are likely to be punished by the market and thus, **greenwashing represents a risky strategy**. Standardization would help here, such as measuring "impact" of products. This is central to sustainable investments, as impact should be measurable and provable which is difficult for a lot of financial products that are called "sustainable" today (see e.g. Expert 5, Par. 5). There, the one expert from an NGO clearly sees **the need for clearer rules and interpretative regulations,** calling for defining rules for the financial industry (Expert 2, Par. 43).

Another topic was the **limited investment amounts and the financing gap in renewable energy**. One reason why some experts explicitly do not invest in renewable energy projects in less developed countries was **the lack of the right financial structure**. Smaller players in the market with limited "lending" activities would have relatively few points of contact. However, this is not a problem for a larger bank, at least that was explained by an expert from a smaller bank. Others also have too few investments in the private equity sector. It can thus be stated that **impact investing is also mainly reserved for specialized or very large players**, but this does not per se deny the Swiss financial market any competence (Expert 3, Par. 17; Expert 5, Par. 7 & 13).

As far as renewable energy projects as an alternative to fossil fuels are concerned, **the increased complexity or technical difficulties** were also mentioned in individual cases. A great deal of infrastructure is required in the renewable energy sector, which is also needed in less developed countries to be able to produce electricity at all. Such investments are associated with **high start-up costs**, which is not necessarily the case with existing coal-fired power plants (Expert 5, Par. 43; Expert 7, Par. 61 & 67). Above all, **decentralization is a difficulty** that still must be overcome (Expert 5, Par. 45). There are also other technical difficulties, such as finding the o**ptimal locations for wind farms without harming other people** (Expert 1, Par. 13). Thus, renewable energy projects have requirements that fossil fuels do not necessarily have, but this is only because the latter have been in use for much longer.

Of course, price subsidies are also part of the discussion but do not seem to be as important to the experts. Rather, **other risks must be clearly covered**, for example **with a purchase or price guarantee**. However, **local conditions** that cannot be influenced by the investor at all, such as capable workers or reliable partners, also play a role, and this also in the long term. Thus, very different parts of the risk spectrum

are relevant, which can only be influenced by a regulatory power to a limited extent (see Expert 1, Par. 17). **Regulatory risks are central**. Although regulatory frameworks with feed-in tariffs for RE projects could strongly promote them, investors are then highly dependent on these interventions in the market:

"There is also a regulatory risk, because a feed-in tariff is always a political decision that can be reversed." (Interview 1, Par. 13)

This also plays a strong role when looking at investments in emerging markets or the investment opportunities in these countries from the experts' perspective. One expert clearly shows that there is clearly a **higher risk in emerging markets**, which means **that potential investors expect a higher return**. And this risk/return consideration is not so easy to fulfil:

"They have the technology risk that the infrastructure that you build is bogged down or the regulatory risk that the subsidy is spoken or not. You have the political risk, that a government changes where all kinds of taxes are levied, or new taxes are levied, on energy projects. Or all of a sudden, as in America, a political change is aimed at, that they say we are going to move away from renewable energy, we want to promote fossil fuels again. That is a risk, then you have the resource risk that the solar radiation is actually as high as you estimate, and of course they also have quite different usual risks, wherever they occur, and in the end it's simply a matter of considering all these risks and weighing them up against each other." (Interview 1, par. 17)

In general it can be said that the **experts consider emerging markets to be a potential place for investment activities**, and that impact investing would make sense there. For impact-oriented investing or blended finance, less developed countries are a huge business opportunity (see e.g. Expert 5, Par. 37).

However, **various risks are too high for individual market participants**. These risks could only partially be offset by the Swiss government (or even not at all). In many cases, conditions that a Swiss investor would like to have, such as an existing constitutional state or the guarantee that a contract will be honoured for the full period, are difficult to fulfil. This is especially true for countries that would benefit disproportionately from these investments (see Expert 1, Par. 9, 13, 17 & 29; Expert 5, Par. 31). A last risk, which was pointed out by an expert, was the currency risk:

"Companies in the emerging markets are traded in currencies that are very volatile and therefore it is more difficult to invest in them. But of course you can also invest in large companies: An ABB also invests a very large share in the emerging market area [...], so it is always a question of how you look at it, the company must have its headquarters there, or can you also profit from the growth opportunities in the emerging markets through the sales shares of other companies." (Interview 3, Par. 13)

This statement also shows that this is **purely a risk perspective**. One expert summarizes this well:

"The world in developing countries ticks quite differently again. In other words, that ESG risks are in part much higher, and in part much more difficult to mitigate, and that the legal framework is also, in many places, quite different, [...] and I believe that many banks also see this in such a way that

government support should be offered specifically for projects and institutions in order to make them more attractive and easier to invest for large private investors." (Expert 6, par. 11).

But it is quite clear that there is **a clear call for state intervention**. And developments in the future are clear, according to experts. More than half of the experts said they were confident that the Swiss financial centre and international players will move in a more sustainable direction. Several experts said that players who do not move in a sustainable direction will have considerable problems:

"So, a bank that does not do that these days, does not offer it, such a bank probably will not be around forever, and I think it's simply something that will be part of the future." (Expert 3, Par. 21)

In addition, several of them stressed that this development would grow even more strongly in the next one to two years. For many experts, sustainability is a **central topic and is also actively being used in decision-making**, although this is still a process that is not yet complete. However, it is not clear how fast this process will take place and whether it is fast enough at all, especially considering the differences between Swiss actors and other actors across the world. (see e.g. Expert 7, Par. 17).

5.6.3 Differences among Customers

But it is precisely in this changeover that the customer's point of view plays a decisive role. A **clear distinction must be made between private investors and institutional investors**, as they have different goals and trends. In both categories, the experts have different opinions about the status and how things can continue. Among private investors, most of the experts feel that the sustainability issue is important and that there is demand for it. This was particularly evident among experts who explicitly offer sustainable products (Expert 2, Par. 25; Expert 3, Par. 19; Expert 5, Par. 11; Expert 7, Par. 17). But one expert from a larger bank, that not only offers sustainable products, made the following objection:

"It's not yet the case that most bank customers really want it, I don't have that impression yet, we still have a deferred bias. If a customer now has a choice between sustainable and non-sustainable investments […], I think many people are even more sceptical about non-sustainable investments, because they think that they lose an opportunity. They think that they have to put money into it somehow, so that they can finance some small wind power plants ["Windkrafträdli"]." (Expert 7, Par. 13)

In addition, another expert criticized the fact that it is also difficult for the average private investor to keep track of sustainable investments, and that the pressure for sustainability is building up among institutional investors. **This expert sees this pressure is building up with large institutional investors, who can also create pressure at general meetings, and less by the private customers** (Expert 6, Par. 7). But institutional investors are also seen as more conservative, partly because of their strict requirements. As a result, they would not drive the change as much as private investors who are more courageous (Expert 5, Par. 11). This indicates that the perception of which part of the investors is now more responsible for the change strongly depends on the environment in which the expert is operating.

Here, also the **generational conflict** should be addressed again, which was mentioned by individual experts. This generational conflict is thus not only evident within the banks, as already mentioned above, but also in the customer data. Thus, there is a **strong difference between young and older customers about sustainability** in their portfolio. This is particularly evident in the case of millennials who will inherit large amounts of assets and are now looking for sustainable investment strategies, which is an attractive business within the banks. In addition, the personal commitment of young people on the streets and through the climate strike is also important for individual experts. They see this as a strong sign of the extent to which the customer base, and ultimately the banking business, will develop in the coming years and decades (Expert 2, Par. 25; Expert 3, Par. 25; Expert 5, Par. 21; Expert 7, Par. 49 & 53).

5.6.4 Difficulties of Climate Finance

Among the difficulties that sustainable products have, climate finance, which is also seen as a solution to climate change, has several problems in its execution, according to one expert (see Expert 4): **Multilateral solutions are not possible**, which would determine individual contributions,. This is why Switzerland and other countries unilaterally determine their contribution of climate finance. A distribution key would clearly help with this distribution, and Switzerland would also benefit from it. But such a global solution is far from being able to achieve a global majority. This also appeals to **politicization, making the process of raising money for climate finance more difficult**, as even such an instrument, which aims to fight climate change, is always influenced by political goals (see Expert 4, Par. 41). For example, the right-wing political camp argues that in the case of climate finance, Swiss companies should benefit from these mobilizations, although this is not the aim of climate finance at all and it is completely secondary whether climate financing is financed by a Swiss actor or not, although former would be preferred by political forces (Expert 4, Par. 19). A similar picture is presented by the board of the GCF, which is also influenced by political forces and prevented from acting efficiently, which is done by different states with different interests. This is influenced by the fact that different countries have different approaches:

"Japan with the financing of coal-fired power plants, where they say it is more efficient than the old one, therefore it is climate financing, that's what they say." (Expert 4, Par. 23)

This way, different views can collide, which makes it difficult to move forward. This status will certainly continue for a while until the GCF has reached a consensus and is able to work efficiently. In this process, different sides will have to come together to clear disputes that is depicted by the divide that currently exists between less and more developed countries (Expert 4, Par. 33).

Although it is evident that the target of USD$450 to 600 Mn. will clearly be reached in 2020, **the share of private funds is still small**, as the lower threshold is almost only reached with public funds. However, to reach the upper threshold, more private funds must be mobilized, which is also a focus of the Swiss international cooperation. Nevertheless, there are still further problems with Swiss activities, as the structure of Swiss development aid, which consists mainly of grants, limits the scope for mobilization.

Other instruments, which are mainly multilateral, have a higher mobilization potential (Expert 4, Par. 12, 14). However, if these do not function efficiently, Swiss climate financing is also limited. In addition, some Swiss activities cannot count as climate finance. Since parliament also exerts political pressure, **other instruments will be used in the future:**

"We will probably invest more in capacity building directly with the private sector, which can then perhaps be partially credited, and this makes sense to mobilize the private sector, and we will certainly also invest more in blending instruments. So that we give an advance, but a third/second institution does the blending." (Expert 4, Par. 14)

Thus, Swiss climate finance will also change, and this is also necessary to achieve a higher level of climate finance. Other problems that may arise in this area, such as lobbying, do not seem to be a problem in the multilateral institutions around climate finance. In addition, multilateral institutions can also work efficiently, which can also be seen in the GEF (Expert 4, Par. 41).

5.6.4.1 The Role of Politics in the Transition to a Low-Carbon Economy

The difficulties listed so far have shown time and again that the **transition to a low-carbon economy depends on the political background**. So, this was an important topic in the interviews.

Experts gave various reasons why progress is now being made or should be made at the political level. In particular, the focus is on the pressure that is being exerted on politics from various sides. Thus, various experts have stated that the climate debate in the public has led to this change especially the climate strike on Swiss roads. This is also evident from the last elections in 2019. Thus, one can see **the pressure for financial service providers which was created by their customers, to slowly change the political level as well** (Expert 3, Par. 31; Expert 4, Par. 27 & 29; Expert 6, Par. 17 & 29; Expert 7, Par. 35). One expert also explicitly mentioned the speed at which this transition has been happening recently, which is giving hope (see Expert 5, Par. 32). Moreover, **political risks are high** on the international stage, which was emphasized by most experts as well. Thus, the strong links of the Swiss financial actors with international markets and especially the EU have also had the effect that Switzerland and its government have had to think about change. (Expert 2, Par. 34f; Expert 4, Par. 28; Expert 5, Par. 24; Expert 6, Par. 9 & 27). In addition, one expert emphasized **Switzerland's innovative strength**, which could be exploited in this area, it only needed to be triggered. This was also reinforced by the greater presence of the effects of climate change (Expert 3, Par. 31). This has led to the fact that more people have become concerned with the topic and that climate change itself is thus also seen as the reason for this change. However, **experts disagreed on whether politics should intervene in this process**: While one expert would focus on the real economy, more detailed guidelines for the financial economy would be desirable for the other (Expert 6, Par. 3; Expert 4, Par. 27). Here, the former elaborated on this to the extent that the aim is not to regulate the financial economy, but rather the real economy, since the real economy creates the emissions (see Expert 6, Par. 5).

This was underlined by another expert, expressing that currently, the focus is very much on the financial economy, although one could potentially also put pressure on the real economy (Expert 5). However, this was again clearly denied by a different expert: This would not be possible at all as this would only result in too much bureaucracy to be able to analyse everything in detail. There will also be **international difficulties**, especially in sectors such as air transport, which is very international. In addition, it is said that **mainly socially weaker people consume fossil fuels**, which would then lead to the need of compensation payments and thus to greater bureaucratisation (see Expert 7, Par. 31)

This was also underscored by the fact that the **Swiss financial marketplace is already very heavily regulated** and further regulations would only complicate matters considerably. Thus, regulations would have different interactions and would have international effects that could not be predicted at all up to now. So, for this expert, the way to go on would rather be to say that an understanding of this development, even on a small scale, should be spread among the population. In addition, the same expert added:

"I think the financial sector plays a big role, I don't think it should be the only one, we are not state aid, so the financial sector is not the extended arm of the state, we are not the tax police, but we are an essential factor in the cost base of a company, through the refinancing costs. So, we will always play a role in the discussion." (Expert 7, Par. 39)

So far, there are **different opinions about the role of the state within the Swiss financial centre**. However, there also exist some challenges that must be overcome to really advance the financial marketplace, according to questioned experts. These concern the policies and regulations affecting the Swiss financial centre. According to one expert, the political push that is currently being driven by the Federal Council is not necessarily optimal:

"The interpretation of the Federal Council, it is a little waste of paper, to put it bluntly. […] Also, in terms of coherence, it is not exactly the greatest thing since sliced bread, because it confuses a lot of things. But in general, it is a good sign that Ueli Maurer is standing there with all the industry associations and saying that this is the most important topic, that is welcome." (Interview 2, Par. 29)

This again addresses **the demand for political intervention**, whereby it is not important for the expert what kind of intervention, just a statement on the exact objective, for example a 1.5°C compatibility would be sufficient. A clear definition of which investments are considered sustainable and which are not, would be appreciated as well. This is already done by the EU, which makes a similar definition by Switzerland necessary. The same arises with standards and taxonomies that need to be unified. Moreover, a rigorous disclosure of environmental risks would be desirable:

"This whole disclosure story is certainly important because it simply gives a signal to the market, and to customers. [...] Because environmental risks are financial risks, we do not need to talk about it for a long time, we need to integrate it into our processes." (Expert 2, Par. 43)

In addition, it was added that a precise definition of where the Swiss financial actors should move to, is still missing. Another expert explains a certain disillusionment as follows:

"The financial industry sees itself as responsible, but it has not seen itself as responsible for a long time either, […] and sometimes they still do not see themselves as responsible, and sometimes they are even right about that. They do not have to decide what is right and what is wrong. That is a task for politicians." (Expert 5, Par. 27)

The same expert added **that pressure should be taken off the "0815" financial world and pressure should be put on the development banks and on politics** as it is incredibly unclear what is really financed by such actors, including MDBs, governments, and national banks (Expert 5, Par. 39). Another expert also added that political leaders must be careful as potential regulation can do much damage:

"This is simply too short-sighted; it is not like we simply prohibit the financing of gas and coal and then the problem is solved. We must find sector-specific strategies for individual carbon-intensive industries and find innovative solutions so that these sectors can transition to low-carbon business models and people do not lose their jobs, but also we must continue to make companies greener. It is a very, very difficult balancing act to be very ambitious and at the same time not to give the impression that we can cope with that, economically, socially and ultimately also for the climate, if we simply say, "we simply won't finance such companies from tomorrow on." (Expert 6, Par. 21)

In summary, **the experts disagree with each other on whether politics should intervene in this process** and on how strong these interventions should be. Some experts see great dangers in this, as well as the fact that this could cause more damage than the investments themselves.

5.6.5 Expansion of Financialization of Nature

To come back to an important part of the literature, the financialization of nature, it is also worth looking at what the experts think about integrating nature into financial structures. A clear picture emerges. All four experts, who had made statements on this topic, **were strongly in favour of integrating nature more strongly into the financial world**, as they hope that this would bring many benefits.

"I would now tend to see it as strongly positive if this were to become more strongly interwoven, or that the financial industry is increasingly aware that environmental concerns are central. Because if they start to align their business model more sustainably with these interests and start to perceive environmental risks as real economic risks, then it will have a huge effect, it will have 10 times more impact than we could ever afford in development financing. Cash flows have so much impact globally, I really see this as a great opportunity." (Expert 4, Par. 51)

Another expert also goes into more detail on the fact that it is imperative to include other parts of nature:

"It is important that we expand the discussion to include other aspects of sustainability, because there are also very intensive interactions, biodiversity is also very difficult to define, biodiversity loss - in other words, these are very real economic effects, and it is very, very important not only for agriculture, but also for other aspects of the world to look beyond the challenges that climate change poses for financial institutions" (Expert 6, Par. 33)

Thus, it is evident that the discussion around implementation of environmental aspects into investment decisions, which is sometimes heatedly debated in the literature, is no longer worth a discussion in the financial world and considered a fact. Of course, it must be said that all interviewees deal with the sustainability issue and mostly meet this topic within their daily activities for their employer. Nevertheless, it is astonishing that no dangers were listed, but purely business opportunities.

6 Discussion

In the following chapters, the results of both analyses are linked, put into context with the literature and are critically assessed.

6.1 Greed for Profit & Lack of Responsibility

This thesis shows that investments in the business with thermal coal and related mining activities, such as the operations of coal mines or related infrastructure as well as energy generation in coal-fired power plants, is highly risky in several aspects. First, climate change introduces new environmental dangers. Additionally, indirectly through potential regulatory changes, mining operations and fossil fuels business face additional risks of assets being stranded. Both investors and operators are potentially exposed to liability risks so that they may be held accountable for climate change and its effect on others. Government subsidies of such business activities pose an additional indirect transition risk: changes in the political landscape could lead to termination of said subsidies, or introduction of subsidies to substitutes. This may have detrimental effects to coal operators and its investors (see 2.3). It seems that these risks are not accounted for by financial actors, as shows the quantitative analysis of Swiss investments in thermal coal: **In 2019, Switzerland and its financial actors invested approximately USD$2,214 Mn. into thermal coal and are, through these investments, responsible for 6.83 Mt CO_2e emissions** (see 4). This estimate is conservative, as the data only show direct equity investments rather than loans and other financing activities, such as project finance. As this analysis is only based on data available to the public gathered by Thomson Reuters Eikon, these number can be higher as it is likely that not all investments were picked up, especially considering that investments of pension funds could not be retrieved at all through Thomson Reuters Eikon. As Spuler et al. (2020) found that pension funds also have considerable amounts of equity holdings in the coal business, the findings in this thesis underestimate the real effects of total Swiss investments. These financing activities are highly problematic for the investors as well as the whole world, as these investments are firing up climate change and restrict possibilities of sustainable development even further. This thesis finds high investments in the coal business and is in line with findings of another study from Greenpeace as well as of the PACTA report 2020 that underline that Swiss financial actors are still financing coal to a high degree (see Greenpeace 2020; Spuler et al. 2020). In addition, the geographic distribution of the investments showed that while investments in current coal activities are distributed more or less evenly across the world (with the exception of Africa, see 4.5), the expansion of mining and power activities is mainly based in less developed countries and is potentially firing up the expansion of fossil fuels (see Shearer et al. 2020). Thus, the Swiss financial

actors not only contribute to the current pollution of the world by financing thermal coal and thus the resulting CO_2e emissions, but it also increases the dependency of less developed countries on thermal coal. This could lead to a situation where less developed countries will be more dependent on thermal coal and are therefore more affected by rising fuel prices and an increasing amount of stranded assets. This potentially widens the gap between more and less developed countries regarding the possibilities of energy production. In this way, the **Swiss financial actors benefit from the weak regulation of the country they are investing in** and thus **make a short-term profit at the long-term expense of the local population in the respective countries.**

Thus, the research question could also be answered (see 1.1): The emissions that were caused by investments in thermal coal would increase the amount of emissions caused by Switzerland by **nearly 15%** and thus highlighting the tremendous effects Swiss financial actors have on the global environment. Looking at the mitigation efforts of the GCF, it was additionally found that to offset these caused emissions, an approximate additional pledge of **USD$41.7 Mn. p.a.** to the GCF is needed if the efficiency of the GCF stays constant (see 4.9). This shows the cost Swiss financial actors cause through their environmentally damaging investments. This underscores the fact that the **Swiss financial actors make profits in the short term on the back of the population at the place where the coal is mined or burned,** but at the same time also **on the back of the Swiss population** since higher mitigation payments are presumably necessary due to their financing activities**.** Moreover, **financial actors negligently put their financiers at risk, as they are also affected by potential losses in value.**

At the same time, investments in renewable energy (also in the form of climate finance) are lacking and produce a huge financing gap. Switzerland plays a decisive role in this issue. It is a more developed country with sizeable financial actors and could be an initiator to close this financing gap. On the other hand, it is a country with high emissions, especially when considering indirect emissions. **Switzerland and its financial actors should therefore take responsibility and stop financing the thermal coal business and move to investments in renewable energies.** This poses challenges for Swiss policy and their structure of development cooperation.

The following chapters discuss potential reasonings for investments in thermal coal as well as missing investments in renewable energy obtained from the conducted interviews. Underlying contradictions are devised in order to put the findings described above and the answer to the overarching research question into context. At the end, possible solutions for closing the financing gap for renewable energy and meeting Switzerland's obligation in the Paris Agreement regarding climate finance are debated.

6.2 Erroneous Decision-Making

The interviews revealed that habits of the financial actors to still invest in fossil fuels, including thermal coal, are suboptimal. Moreover, it is stated that it takes a long time to implement and change decision processes in favour of renewable energy and other sustainable investment options. This is also due to the high standardization of processes in the financial world. But such statements are deceptive, as

changes of processes have been necessary for a long time but were not given high priority. **It is now weak to justify this delayed action by saying that it is now necessary to be patient with changes in processes.** The same holds for the argument that energy companies are now in a transition phase and need enough time to adapt. While it is true that a shift in various companies certainly is visible regarding sustainability, this shift should and could have been taken place much earlier. Thus, the current situation is unsatisfactory (see 2.5.4). A quick adjustment is now required. This should ultimately lead to a condition soon where companies without the will of adopting sustainable practices have more difficulties attracting capital. However, it is likely that the large company withdrawal due to a lack of sustainable business practices would damage the entire economy. It is imperative to find a middle ground. Financial actors should invest more sustainably, but in doing so, they should try not to harm companies and the whole economy unnecessarily. Approaches such as stronger shareholder management would be desirable to get companies on a sustainable path as quickly as possible.

While talking to financial experts, it was found that the discussion around risk and return was most effective, as it was also found by Leins (2020). However, it is questionable if risks are assessed correctly. It was visible that stranded assets and other risks were acknowledged. Considering the equity of all coal businesses owned by Swiss financial actors, the question arises whether this also applies to most of the financial sector. The level of investments made in the thermal coal seems to be more likely to argue against it. However, it must be noted that this series of interviews certainly involves a selection bias, as most of the interviewees are active in specific parts of the financial sector that are mainly concerned with sustainability issues. Thus, one must unfortunately conclude that **environmental risks seem not to be recognized by financial actors to an appropriate extent.** This is underlined by the argument raised by individual interviewees: The opinion is still widely held that excluding certain investments would lead to a loss of profit. This is a fallacy in that sustainable financial products do not perform worse than non-sustainable ones, but sometimes even better (see FTSE Russell 2018). This argument shows that sustainable business practices have not yet been fully implemented in the financial industry. The same applies to the argument put forward by various experts that other market participants would benefit from their exclusion practices, since there would thus be less competition on the financial market for investments in unsustainable business areas if some players were to withdraw from these areas of business. Although this may be true in the short term, stopping investments in thermal coal and other fossil fuels embodies a more sustainable business strategy in the long-term, where expertise can be built up in other fast growing markets, e.g. renewable energy. Anticipating the perception of clients (see 5.6.3) where **a clear trend to more a growing demand of sustainable financial products is visible**, it is only a matter of time before market participants are punished for offering investment strategies that are still highly damaging to the environment. But it seems that reasons against such innovation, for example the ongoing habits mentioned above, are overshadowing this potential. **Thus, initiative regarding sustainability is not taken up because ongoing habits discourage it.** Environmental risks are again being negated and focus purely is laid on the profit aspect. This could reveal a rather weak or superficial

approach to address sustainability. It becomes apparent that environmental risks are seen more as a limitation than a warning of potential losses: Thus, **as more of a nuisance than a necessity**.

Other justifications for financing thermal coal businesses point in a similar direction: For example, some experts said that coal financing would continue as this technology would still be needed for individual processes in the industry. This is in line with Meier (2019) who argues that thermal coal as energy source is still needed to some extent. But the examined investments in the quantitative analysis are way too high to be justified by this argument. In addition, individual, rather small, players push off the obligations to larger players as they claim that smaller players simply do not have enough market power to bring about change. Thus, this lack of a sense of accountability carries dangers so that changes would not be made because one feels unimportant. But these smaller players are needed to achieve a critical mass for change, as it was also described by an expert as the "tipping point" that has now presumably been reached in the financial industry (see Expert 7, Par. 11). It was argued that financial players are primarily committed to their shareholders and not to the environment and climate. This is true, but it should be noted that both long-term well-being and a stable climate are also in the interests of all stakeholders (see 2.1.2). This also underlines how weak (or strong) the idea of sustainability within the Swiss population is as environmental risks are often not considered to be a determining factor by them either.

Nevertheless, **not all financial actors should be lumped together, and the financial marketplace should not be classified as purely malicious.** Many of the experts spoke out in favour of better framework conditions from the political arena, which would certainly be necessary. This is also expressed in a certain frustration caused by a lack of regulations or clear rules. Since the task of building clear boundary conditions has not yet been fulfilled, this clearly indicates a certain policy failure which must be remedied as soon as possible. It should be made clear that regarding liability, actors that facilitate environmentally damaging investments, for example by providing capital, are just as responsible and liable for its effect as the operators of these companies since both players are required to undertake such investments. Therefore, highlighting liability risks is needed, as is their enforcement. Since this still leads to unsustainable investments today, it has been shown that **a self-regulating market does not efficiently include environmental risks in its analyses.** Hence, **stronger regulation should presumably be needed**, although this could certainly lead to an increase in bureaucracy. Interaction between regulation within the financial sector and the real economy should be examined. Thus, such regulation must be well-considered since interventions in other areas of the economy would probably also be necessary to avoid serious negative interactions and be part of a larger, overarching plan for sustainable restructuring of the whole economy. Particular attention must be paid to the fact that not only the financial sector but also the real economy is responsible for Switzerland's high environmental pollution.

However, at the same time, it is also too easy to blame the lack of regulation for the slow progress of the financial sector. Financial players also have a duty to their stakeholders to ensure that they operate sustainably within the legal framework, at least in the financial sense. Thus, **not only should political actors be held accountable and responsible** for the current situation**, but also financial actors who**

do not invest sustainably and do not act pro-actively. Nonetheless, regulations will probably more quickly lead to the goal of making the financial centre more sustainable than letting demand drive this change as demand for sustainable investment opportunities is still rather low, even though it is growing strongly. Thus, the rapid implementation of stronger regulatory frameworks is strongly to be welcomed.

This thesis thus revealed clear shortcomings in the financial industry that still need to be addressed. It joins several papers arguing in favour of stricter guidelines or better goals for the sustainable financial sector. It has been shown that **much investment is still being made in the coal sector today.** However, **the interviews also made it clear that a possible change in the financial sector is in sight.** To drive this change forward, clearer framework conditions are required (see 6.4). This is also being addressed now by politics, as in December 2020, the Federal Council revealed additional measures for making the Swiss financial industry more stable. A binding commitment of the financial sector to implement the recommendations of the TCFD is mentioned (Federal Council 2020b). Since the quantitative analysis of this thesis is also based on these recommendations, this analysis could potentially contribute to this implementation.

6.3 Unused Opportunities in Renewable Energy

In contrast, the gaping void in the financing of renewable energies is clearly visible through the literature work. The experts explain this mainly by **high upfront costs and the lack of political intervention**. Again, the risk perspective is particularly decisive, which was also the main reason for investments in coal. In most cases, however, the experts focused on the attractiveness of such investments: They usually offer **secure, high, and stable returns, perform better, and have a higher resilience**. Many risks were also addressed: Above all, a lot of experts mentioned that the **lack of an appropriate financial structure** of their employers was the reason why such investments are not made. An example would be that they are not active in lending or project finance activities, which are still the main sources of capital for renewable energies. This is also visible in existing literature (see e.g. Steffen 2018). In addition, there are **high regulatory, pricing, technological, currency and governmental risks** that make such investments difficult. This is particularly the case for players operating in emerging markets. It is highly decisive when examining various risks of an investment how such investments are geographically distributed. Not surprisingly, **more developed countries were viewed as far less risky**. This is interesting in so far as investments in coal are also heavily dependent on this geographically varying risk. This can be seen in the maps that show the expansion of mining and power activities (see Figure 3 & Figure 4). Above all, the **expansion of power generation from coal is currently taking place only in less developed countries**, which tend to have the same basic risks for investments for renewable energies as well as coal energy (this includes, regulatory, pricing, currency and technological risks). Thus, this highlights the fallacy of different perceptions of risk of different energy sources and underlines that **risks, that should be attributed similarly to both, are perceived quite differently across renewable and non-renewable energy sources.**

However, one expert also saw the differentiation that coal companies are predominantly large players and would therefore be traded in other markets that are not so volatile, which negates individual risks (see Expert 7). Therefore, the size of a player is key. In the literature, this is underlined by Steffen (2018) who finds that even in Germany, renewable energy indeed uses more project finance, which is rather an expensive way of financing in comparison to corporate finance. This is due to the small balance sheets of new players in the industry, highlighting the need for cheap financing opportunities for renewable energy, even in more developed countries (see Steffen 2018, 15). So, the findings from the interviews underline this statement and show that **the size of the renewable energy provider is a key reason for missing investments**. But this is changing, as players in the renewable energy sector are getting bigger, as a look at the Renewable Energy Industrial Index (RENIXX) shows (see e.g. Wallstreet Online 2020). However, these companies are predominantly active in more developed countries. This could indeed show that there is a higher investment risk in less developed countries for renewable energy projects.

Nonetheless, other risks are again lower for renewable energy, such as transition risks as well as liability risks, which are considerably smaller. Furthermore, the experts made it clear that climate risks play only a small role for renewable energies; renewable energy would rather benefit from environmental changes caused by climate change, for example through stronger wind events. This indicates that **risks for renewable energy projects regarding climate change are not on a par with risks of thermal coal projects**. Thus, this necessarily suggests that the risk perspective, especially in the long term, does not favour thermal coal in contrast to renewables as strongly as elaborated in this quantitative and qualitative analysis. This points to a clear fallacy in the risk management of financial actors.

So far, it has been shown that the same risks are clearly perceived differently between the two types of energy production. But especially for coal financing, time plays an important role. Some equity portfolios are only held for a short period by financial service providers so that climate risks are unlikely to affect such investments as risks arising from climate change must more likely be managed over a longer period. This means that they are disregarded most of the times. Hence, these long-term risks seem to be more relevant for long-lasting investments such as project financing and not necessarily for equity holdings. Nevertheless, sudden shocks triggered by these risks could also have a strong impact on the stock market, which has already happened with another fossil fuel as it was seen with the negative oil prices in April 2020 (see BBC News 2020). **But such potential shifts do not seem to be acknowledged yet by market participants regarding their risk management; and thus, the non-existence of such risks for investments in renewable energies is not necessarily within their scope either.** This time component of risk and return considerations is visible on another scale as it was shown by the increased investments in thermal coal in South East Asia (see Figure 3 & Figure 4). The short-term energy bottlenecks in these regions are particularly relevant for decisions regarding the usage of different energy sources, which go against the general trend towards phasing out such technologies. In the long run, such investments will probably lead to stranded assets and considerable additional costs for these countries

(see IEA 2020a: 5). **This underlines the continued insufficient inclusion of risks emerging from environmental factors in investment decisions,** which was made visible in this analysis.

The differences between investments in thermal coal and renewable energies described here show that, at least in the long run, renewable energies are clearly superior to investments in coal due to the non-existence of risks caused by climate change (physical, transition & liability). However, **the ongoing debate about the risk of investing in both energies (thermal coal and renewables) shows that the risk management of investments in energy projects is clearly flaw.** This is demonstrated by the different perception of the risks of both investment groups where renewable energy is considered as riskier and therefore is in less demand. This probably also has to do with the fact that this risk is only partially quantifiable. Nevertheless, or precisely because of this, incentives should be put forward to change this behaviour of financial actors. This also has the effect of exacerbating problems of impeded climate finance mobilization by underinvesting in renewable energy. Therefore, various measures must also be taken to increase climate finance. In this context, increased attention should be paid to the LDCs, as these offer interesting investing opportunities and at the same time are creditable to climate finance efforts of a country. The interviews thus revealed various reasons why renewable energies are only partly perceived as attractive as investments in coal. As the market cannot guarantee a fast enough transition from coal to renewable energies, enforcement by governments may be necessary.

6.4 Building Favourable Framework Conditions

6.4.1 Definition of Overarching Goals

In general, it can be said that the attention for sustainable investment strategies, including renewable energy, is increasing (although rather slowly), and this is welcomed. However, the danger of greenwashing should still be pointed out. It has been underlined by various experts and is certainly a great danger for the financial sector. To "clean up" the market, more guidelines are needed, such as **precise rules on which investments (i) are allowed and which are not and (ii) what can and cannot be called sustainable**. Politicians are particularly called upon to clearly define goals and interpret where the Swiss financial marketplace should be heading. It must undergo a structural change so that sustainable investment strategies and impact investing, as it is still called today, become the standard, so that environmental risks and other longer-term risks for the public are more strongly considered in decision-making. In addition, other means are needed to make investments in renewable energy and other investments that deal with further mitigation and adaptation measures against climate change, more profitable. This should lead to closing the financing gap of renewable energies and achieving the goals of the Paris Agreement. **Thus, framework conditions and incentives need to be created so that investments are steered in a more sustainable direction.** The need for such a framework is clearly demonstrated by the interviews: although different actors have different opinions on whether private and institutional investors are equally demanding change, they are broadly in agreement that change is wanted by the general public and various stakeholders. As also mentioned in the interviews, there may also be a certain

generational conflict, displaying too much emphasis on the attitude of older generations. Demand shifts may be possible because of change patterns in the perception of clients of sustainability in the financial sector (see 5.6.3). **Anticipating the future, it is clear that stronger demand and calls for a sustainable financial sector will become louder**. Moreover, more and more financial players themselves acknowledge this trend and started adapting accordingly, which started a learning process in this direction; thus, this learning process should be promoted more strongly in order to advance the transition.

At the same time, currently, climate finance faces enormous problems, for example because multilateral solutions are difficult to find, as **multilateral institutions like the GCF are highly politicized**. In addition, the interests of different national governments in how climate finance should look like, differ greatly, as an example with Japan showed (see Expert 4, 5.6.4). Moreover, **the mobilization potential for Swiss climate finance is still rather small**, which is not only due to the lack of determination of Swiss officials, but also to the crediting methods of climate finance, which limit them to a great extent (see 2.5.3.3). Since this is also triggered by the fact that indirect climate finance cannot be credited, ways should be found in particular to allow it to be credited after all. And although the Swiss government has achieved its goal of financing, it was only able to mobilize limited amount of private funding. Therefore, Switzerland's goal should be **to increase the amount of private funding that is being mobilized**. Such mobilization efforts should be in line with other climate policy measures. In particular, more use could be made of direct instruments, as these also show great mobilisation potential (see 2.5.3.2), as this also makes quantification by the Rio markers easier (see 2.5.3.1). A certain change in Swiss climate finance, so that direct instruments are used more increasingly, was insinuated by expert 4, which is to be welcomed. However, it is clear that this is not easy. In particular, increased fundraising potentially embodies a persistent problem as this is also generally difficult to obtain in development policy.

But all these issues present an opportunity to link several problems together. Since both the amount of climate finance needs to be increased to meet Switzerland's obligation and renewable energies need to be promoted, **these two issues could be solved together**. Needed measures that Switzerland could introduce for the financing of low-carbon energy sources are outlined below. Although these measures are partly based on literature and partly on the empirical analysis, their implementation is supported by this thesis and thus is highlighted as a potential solution to the shown paradox in financing energy projects.

Thus, a solution is presented here, which results as a consequence of the elaborated problems. For solving this paradox presented in this thesis, a favourable regulatory framework must be established, and appropriate measures need to be taken. This has also already been communicated as a goal by the Federal Council (2017: 8). To reach its goal, **such a framework for climate compatibility of the Swiss financial centre** regarding investments in energy production should include the following three basic principles of climate policy: **(i) Inducing a decrease of the returns of high-carbon investments such as thermal coal, (ii) inducing an increase of the returns of low-carbon investments, and (iii) inducing a decrease of the downside risks of low-carbon investments (de-risking)**, which has been firstly introduced by Schmidt (2014) and is supported by the findings of this thesis. It has been shown in the

quantitative analysis of this thesis that the first principle is still not used efficiently, as investments in fossil fuels and thermal coal are still regarded as way too profitable in comparison to their low-carbon alternatives. This results in too high amounts of investments in equity holdings in thermal coal by Swiss financial actors. In addition, the second and third principles also are not fully implemented, as the interviewed experts mentioned that the risk/return perspectives of renewable energy, especially in emerging markets, are still portraying investments in renewable energy as quite (and too) risky.

As it has been demonstrated, such continued investments in coal business highlight a certain market failure, so that not all the externalities of such investments are reflected. In addition, a policy failure was revealed by the lack of countermeasures. This must be addressed as such investments should be restricted in some manner. One possible measure to apply this could be a political advance regarding these financing practices, just like an initiative did in November 2020 in Switzerland, which called for a ban of the financing of war materials. Such a similar approach could also apply to the financing of fossil fuels although a strict ban is highly unlikely and probably opens other issues. Thus, **other less restrictive measures should be taken** to at least make such investments less profitable. However, the details of such a restrictive policy should be precisely defined, as it could also create difficulties in terms of what is and what is not part of the fossil fuel business (e.g. usage of metallurgical coal). Such a restriction on financial actors should not only result in losses for the financial industry with access to the alternative investment group being restricted but should also open up new business opportunities to compensate.

A focus purely on prohibitions is not really beneficial, as it severely restricts the work of the financial industry, an important economic sector in Switzerland. Therefore, the focus should also be, or even more strongly, on making it easier to finance renewable energy projects, utilizing the second and third lever. Thus, **the higher risks as perceived by the interviewed financial actors need to be reduced and/or hedged.** At the same time, technical difficulties in implementation must also be reduced. It should therefore be easier for different actors to invest in renewable energies. This has further advantages: The promotion of sustainable energy sources is also clearly in line with goals of increased climate finance (see 2.4.3). Thus, promoting and facilitating the financing of renewable energy will not only reduce the carbon footprint of the Swiss financial centre by switching from high-carbon investments to low-carbon investments in the group of “alternative investments” and therefore reducing the impact of Switzerland on the climate (see also 2.5.1), but it will also be possible to credit this to climate financing. Thereby, Switzerland's climate finance is being increased at the same time, so that it also reaches the level that is desirable from a social point of view (see 2.5.4.1). In particular, the burden on Switzerland in terms of higher climate finance would thus be reduced at the same time, as less financing in thermal coal would reduce Switzerland's footprint. For example, the payments calculated in this thesis (see 4.9) would not be necessary. This therefore also represents the usage of direct, rather than indirect, instruments, which makes the allocation of climate finance easier (see 2.5.3.2 & 2.5.3.3). This could potentially be done with a stronger focus on bilateral climate finance where all strengths of Switzerland are incorporated in its strategic setup: Given Switzerland's starting position with such a strong financial sector, **it should be**

feasible and at hand to combine regulations or steering operations of its financial centre with efforts in climate finance (even if the mobilization of funds specifically from Switzerland is not necessarily the main goal of Swiss climate finance payments per se (see Expert 4)). As Swiss climate finance contributions and its financial sector are regulated by the same entity, it would be lost potential not to create an opportunity for the Swiss financial marketplace to become more involved in climate financing.

6.4.2 Potential Problem-Solving Approach

It became apparent through the interviews that the risks of investing in renewable energies are still considered very high. This must be reduced in order to bring about a turnaround in the Swiss financial centre regarding investments in energy production. Moreover, the experts have also spoken in favour of it for the most part, so interventions seem necessary. A possible action around cooperation between the public and private sectors is elaborated here: It was shown in the literature work that a **state investment bank**, similar to the UK's Green Investment Bank (GIB), could help to solve Switzerland's ongoing issue with low mobilization of climate finance as well as induce more investments in low-carbon technologies by Swiss financial actors (see Geddes et al. 2018; 2.4.3.3). Such an approach is supported by the findings of this thesis, as this would combine the need for sustainable investment opportunities and the need for greater mobilization of climate finance actors. Also, it would build on existing Swiss expertise: With the established units of the *Swiss Investment Fund for Emerging Markets* (SIFEM) and the *Technology Fund*, Switzerland has already gathered expertise which could be helpful. And such an institution has additional potential benefits: A state investment bank is **not only important for the provision of capital**, but also for the **de-risking of investments**. In addition, it could serve as an **educational entity** and have **a signalling role**, where expertise is given out and participation signals could be crucial for a transition in the financial sector. As it was shown with the interviews, such investments are still not mainstream, with which such a state investment bank could help, as it could serve as an early mover (see Geddes et al. 2018; chapter 2.4.3.3). Of course, such an implementation is not an easy task; however, it would solve many problems and make efficient use of the last two principles of climate policy. And its financing would also be possible, as shown, for example, by Kollmuss (2018) on the fair amount of climate financing by Switzerland.

The introduction of such an institution certainly depends on various factors, in particular political decisions, and the weighting of importance by political actors. Its exact design is not part of this thesis, as this was not possible due to time and space constraints; nevertheless, it should be stressed that the introduction of such a state investment bank and/or at least an expansion of the efforts in the context of climate financing by Switzerland is welcomed and necessary. This thesis thus shows that changes are necessary not only from an energy policy perspective, but also from a climate finance perspective and from the perspective of the Swiss financial sector. A potential solution from the literature is the introduction of a state investment bank, which, together with clear guidelines and certain governance instruments, can contribute to a clear improvement of the current situation. However, in the detailed

elaboration of such an institution, there will certainly be political hurdles to overcome, for example the funding of such an institution.

Such an implementation must also be accompanied by political changes that would facilitate such a transition, where domestic policies in less developed countries play a major role for greater incentives for investments. Certain policy instruments are particularly successful in this regard, including **de-risking programs**, and **the promotion of stronger domestic climate policies** that can help to generate spillover effects and encourage investment in renewable energy and instruments that mitigate certain risks. These include, for example, feed-in tariffs (FITs) or price guarantees, like the export guarantees already implemented by the *Swiss Export Risk Insurance* (SERV) in Switzerland. In addition, environmental taxes and the resulting cross subsidies generated by higher taxation of the generation of energy from fossil fuels such as coal could initially contribute to a greater reduction in the price of renewable energy sources (for details, see 2.4.3.2). In this way, the potential of domestic energy policies in less developed countries must be highlighted, which would need to be promoted more strongly through direct efforts by Switzerland in the area of capacity building in order to be able to implement such instruments at all (see e.g. Stender et al. 2020). Efforts in this direction have already been indicated (see Expert 4), which are clearly to be welcomed. At the same time, however, care should always be taken in such cooperation to ensure that **Switzerland does not patronise other countries**, in order to prevent neo-colonialist tendencies. All these operations and changes are also particularly linked to political stability within a country as political risks must be at least as much of a focus of development cooperation in the context of climate risks as the direct financing of renewable energies. This entails a large and difficult task, as it means that the strategy for development cooperation must be more closely linked to climate goals. This is the only way to achieve both goals in the long term and in a sustainable manner.

In addition, stronger commitments to multilateral organizations such as the GCF, which has already been partly done (see The Federal Council 2020b), would be advisable to promote climate finance more strongly. This is preferable as multilateral actors are responsible for an extensive share of all power-generation growth in less developed countries with an increasing share of renewables (see also Steffen & Schmidt 2019). This would thus further strengthen Swiss efforts in the context of climate finance, fulfilling Switzerland's responsibility and thus mobilizing increased amounts of private funds.

6.4.3 Additional Considerations

Nevertheless, such approaches are only a partial solution, as they can always be reversed. Rather, it would be desirable to anchor this more firmly in the economic system so that sustainable management and investment become the norm. To generate this change, greater pressure is needed, especially from the Swiss population, both politically and in terms of their financial investments, as this is the only way to bring about a quick turnaround. This is already underway, displayed by the climate strike and a stronger green political awareness, which could lead to more changes in the future. However, such advancements are, according to experts, quite differently distributed: Only a certain part of the population that is actively involved in the topic is more demanding regarding sustainability of the financial services

they use. This can be seen in the splitting of customers of private banks or big banks, as well as the generation conflict within the financial sector and in the customer base (see 5.6.3). **The focus should thus also be on promoting a general understanding of sustainability among the general public.**

Overall, this process should not lead to an overly strong financialization of nature, as this poses a major threat to our environment. However, it should not be ignored that with regard to investments in thermal coal, a stronger consideration of environmental factors would probably lead to a smaller amount of such investments, as this is clearly a very environmentally damaging technology. However, it is clear that this is not so simple for all types of investments. Therefore, this financialization should clearly be handled with caution. Thus, above all, marketization of nature should be considered only in rare cases. It has already become clear that interviewed experts strongly support such an assessment of nature and tend to associate it less with disadvantages. When linked to the literature, this can lead to strong adverse effects that are not yet anticipated. Thus, as already mentioned in 2.6, such an evaluation should only take place if a part of nature is already negatively influenced by other negative effects that endanger the totality of this entity. And since this is clearly a step in the direction of green capitalism, this development should be taken with a grain of salt and its disadvantages critically questioned. However, in the face of the alternatives of an even greater exploitation of nature without including its value, this forms clear advantages. During this transition**, care should be taken to ensure that nature is preserved and only integrated into a financial system where really necessary and unavoidable.** The interviews revealed that the experts strongly prefer the involvement of nature in financial decisions. Although this is to be welcomed in principle, it also requires strong caution as this financialization could destroy more than it protects. Thus, the dangers of financialization should be more strongly pointed out in the financial sector, so that decisions are made more sustainably and responsibly. This aspect should also be strongly in the focus of an expansion of climate finance, so that no undesirable negative side effects for nature arise.

In this thesis, it was underlined that current climate policy includes a huge paradox between investments in thermal coal and investments in low-carbon alternatives, where changes are urgently needed. Switzerland also has an important role to play in international comparison: As a location for many asset managers and as a country with a wealthy population, Switzerland should take a pioneering role for a sustainable future, following the saying of Albert Schweitzer: *"Ownership means responsibility."* However, it should be emphasized that the goal should not be to completely restrict the Swiss financial centre; rather, measures should be taken that facilitate sustainable investments. This leads to the following policy recommendations (Rs) that also serve as a summary for lessons drawn from this thesis:

6.5 Recommendations

In this chapter, suggestions for changes are summarised. An overview of policy recommendations that were developed in this thesis, is given. These reflect the most important measures for solving existing problems to improve the current poor situation of the Swiss financial centre and reduce the observed paradox of finance.

R1 – Sharp Decline in Thermal Coal Investments: Financial actors should drastically reduce their investments in thermal coal, as this poses a risk to their own shareholders, to the local population where the coal is mined/burned and to the population in Switzerland through potential renumeration payments. Sustainable investments should be given priority to unsustainable investments if the risk/return ratio is similar. Every company should define a goal to reduce and comply with their environmental pollution.

R2 – Implementation of Standardized Climate Metrics: Metrics must be developed to calculate the climate footprints of investments. In this thesis, a framework was presented to do this for equity holdings using recommendations of the TCFD. The used metrics should be standardized so that all market participants must proceed in the same way and no competitive disadvantages can arise. When integrating aspects of nature, the dangers of this financialization should also be pointed out and critically questioned.

R3 – Revision of Risk Management: Financial actors should be aware of the climate risks their investments are exposed to and actively take them into account. It is particularly important to base these decisions not only on data from the past and experience, but also to look into the future. Scientific findings on climate change (but also on other issues such as biodiversity) should be considered more in investment decisions. In this way, investment opportunities around renewable energies can also be shown as an alternative to more traditional investments. Financial actors should be encouraged to become more actively involved in the management of the companies in which they have invested in. The focus should be on transparency with regard to various climate and environmental risks (water, biodiversity, etc.) and on reducing GHG emissions and negative environmental impact. This ensures that investment decisions are also based on data that corresponds to reality and the possibility of greenwashing is reduced.

R4 – Creation of a Framework for Steering Investments in Energy Projects: A political framework is needed to make effective use of the three climate policy principles presented. The Swiss government should interact more strongly with the private financial actors and create clear incentives to invest in renewable energies rather than thermal coal. Thus, the (relative) attractiveness of investing in thermal coal should be drastically reduced. At the same time, it should be tried to close the financing gap of renewable energies, at least partially. In particular, financial blending, investment guarantees, or especially a state investment bank could help facilitating this transition and ensure that the Swiss financial centre is swapping to greener investments, also increasing climate finance payments at the same time.

R5 – Inclusion of Financialization of Nature: In this transition, particular care should be taken to ensure that nature is only financialised where absolutely necessary. This should minimise the negative impact of the greening of the Swiss financial centre. If possible, nature should remain untouched.

6.6 Limitations of this Thesis and Possible Future Fields of Research

In general, this thesis could point to various shortcomings in the Swiss financial sector, which can, however, be further specified and expanded. In this thesis, various grievances were identified and linked together, where potential solutions could be found. This thesis thus opens up a multitude of research fields and opportunities for improvement. This chapter presents possible further fields of research.

Although this thesis enabled a starting point for a framework for direct investments in equity to be built, indirect investments are also important to tap the full amount of coal financed. It would therefore be desirable to develop a more complex methodology that fully reflects the emissions caused by an investment. This includes both direct and indirect investments. This should make it clear which investors are responsible for which share of emissions. It would also be clearly beneficial to automate these calculations for each portfolio that is visible to the investor, also considering other fossil fuels. Such an analysis could be extended with a robustness test or with an analysis of networks between financial actors which could make the underlying relationships more visible. Also, it is important to show the developments over time: Analysis of time-series data could help to understand the impacts of regulatory changes, also in the light of stranded assets. In addition, the seven interviews conducted as part of this thesis do not provide a comprehensive overview of the Swiss financial centre, but only an insight. An expanded study will therefore make it possible to generate a better overview. Various other stakeholders could also have been consulted: Investment firms and their customers, but also government agencies should be examined closely. And the focus should not only be on thermal coal but also on other fossil fuels or other polluting industries. Future studies could also show how the majority of the private sector view the design of regulatory measures. This could reveal whether there is a need for greater cooperation between the public and private sectors, for example through a state investment bank. Thus, the exact elaboration of these rules and regulations as well as potentially the creation of new institutions form large new fields of research.

Although chapter 6.4 gave an overview of possible solutions, it did not go into detail on how these can be integrated into Swiss development cooperation. This thesis could not provide clear and specific recommendations on the instruments with which more private capital should be mobilized for climate finance. Rather, it was underlined that the creation of an effective framework is necessary. Further studies should therefore be carried out in order to assess exactly which of these approaches are really suitable for building Swiss capacity and how they affect local needs. The specific investigation of various instruments for mobilizing climate finance or, in particular, the promotion of investments in renewable energy in the light of the domestic state and potential investors, must be carefully examined. A first approach could be to examine the potential creation of a state investment bank or other instruments to mobilise private funding for climate finance. It should also be examined in more detail how investments in coal can be reduced by an appropriate political instrument and which instruments could be used by Switzerland to promote investments in renewable energy in less developed countries.

7 Conclusion

In this thesis, the impact of the Swiss financial sector on the environment was examined and compared to the efforts of the Swiss within the framework of climate finance. It was examined how high the participation of Swiss financial players in companies in the coal sector is and it was quantified how high the resulting CO_2e emissions really are. According to the calculation, it was found that the Swiss financial sector still invests substantially in the coal sector, which led to an approximate emission of **6.83 Mt CO_2e** emissions in 2019, which corresponds to **15% of the national Swiss emissions**. This thesis thus comes to a similar conclusion as other work in the context of coal financing, namely that Swiss investments in thermal coal are still far too high. It is also found that risks arising from climate change are not included to an appropriate extent in investment decisions of Swiss financial actors. Furthermore, justifications for these investments were presented, which underlines that the risk/return perspective is central for financial actors. This thesis shows that mitigation and adaptation measures need to be financed more by Switzerland and that the current political framework for a transition to a low-carbon economy is not sufficient. This is because additional payments to the GCF of **USD$41.66 Mn.** p.a. would be necessary to compensate for the investments in thermal coal under investigation, given the efficiency of the GCF remains constant. This thesis thus substantially expands the narrative both with a precise geographical analysis and by linking the two examined topics, so that the paradox of the current situation can be demonstrated. This thesis also underlines the danger of involving nature in the financial world too quickly, which is already happening now, potentially leading to disastrous consequences if nature is not valued adequately. Finally, potential solutions were discussed to solve the suboptimal allocation of Swiss investments in energy projects. This includes the creation of a state investment bank to promote green investments. With the greening of the Swiss financial centre, the aforementioned paradox could thus be reduced or even eliminated. Future research could focus more on finding appropriate and adequate implementation guidelines of environmental risks in the decision-making of financial actors, as well as on building further policy instruments to steer capital away from thermal coal and towards renewable energies. Nevertheless, the results of this thesis underline the need of urgent action of change in the financial industry regarding financing of energy production.

8 Appendix

8.1 Appendix A: Frequency Table

Codesystem	Transkript1	Transkript2	Transkript3	Transkript4	Transkript5	Transkript6	Transkript7	SUMME
Climate Finance								0
Lobbying								3
Efficiency of multilateral Actors								2
Function								0
Main Idea								2
Swiss Activities								6
Mobilization								2
Difficulties								0
Different Approaches								5
Politicization								1
Politically not enforcable								2
Money in Danger								1
Repudiation								2
GCF								4
Mobilisation								2
Today's State								0
Reaching the Goal								1
Calculation								1
COVID								5
Relations of the Financial System								0
With the Real Economy								4
With Politics								8
Perception of Clients								0
Private Investments								8
Institutional Investors								5
Generational Conflict								8
Funding of Sustainable Financial Produ								0
Reorganization of the financial cent								17
Types of Sustainable Investments								4
Renewable Energy								0
Emerging Markets								7
Reasons								23
Institutional Investors								5
Problems								0
Greenwashing								9
Lack of the right money structu								3
Definition of Sustainability								1
Critique on the notion of "Impa								2
Missing Subventions								4
Complexity/Technical Difficultie								3
Risks								10
Politics								3
Political Level								0
Reasons for political Advancements								2
Pressure								8
Risks								4
International Relations								8
Belief in Climate Change								4
Regulations Yes/No								7
Problems								17
Cooperation on Different Levels								5
Reasons for Investments in Coal								0
Missing Responsibility								5
Case Studies								0
Gas Plants								1
Oil Heating								4
Firms in Transition Pahse								6
Knowledge about Environment								1
Missing								6
Existing								7
Risk/return ratio								5
Political Reasons								5
Habit								10
Technology & Energy Supply								4
Financialization of Nature								0
opposed								0
in favor								5
SUMME	28	27	31	44	69	31	47	277

8.2 Appendix B: Interview Guide

In this part of the appendix, the interview guide that was used as a basis for all interviews is displayed. However, not all questions could be included, as there were asked some company-specific questions in every interview. Their inclusion could give some hints to the employer of several experts. Therefore, it was decided not to publish these questions in the thesis pre-emptively. If needed, these additional questions and/or the complete interviews guides can be examined, but only after a consultation with the respective expert.

The interview guide is arranged in groups of questions, each of which deals with a specific topic. As different stakeholders were interviewed in the interviews, individual groups of questions are only relevant for individual interview partners. Three stakeholder groups were defined:

- **Group 1:** People in the decision-making process (e.g. public sector)
- **Group 2:** Persons dealing with or making investments in (non-)renewable energy (e.g. asset managers, bankers)
- **Group 3:** Observers (independent experts, e.g. NGOs)

Whether a block of questions is relevant for a stakeholder group and whether questions from this block were asked to the experts is indicated in square brackets after the title. The interview guide consists of main questions followed by specification or advanced questions. The latter are listed on the second level below the main questions. The questions are not presented in tabular form, as too many main topics were addressed. Thus, a linear presentation did not interrupt the flow of the interview too much.

As all interviews were conducted in German, the interview guide is also in German. If a translation is needed, a subsequent filing is possible.

Question Group 1: Customer acquisition and their perception of sustainable investments [2]

- Wie schätzen Sie die Wahrnehmung von Anlagestrategien in erneuerbaren Energien ein?
    - Welche Rolle spielt dabei die Sensibilisierung der Bevölkerung bezüglich der Umwelt?
- Wie könnte man solche Investitionen noch salonfähiger machen?
    - Wie könnten eher auch Kleinanleger*innen in diesen Prozess miteingebunden werden?
- Wie stark schätzen Sie den Nachhaltigkeitsgedanken ihrer Kund*innen ein?
- Welche Gründe haben ihre Kund*innen, genau ihre Anlagestrategie auszuwählen?
    - Welcher Aspekt zwischen hoher Rendite und der Nachhaltigkeitsgedanke steht eher im Vordergrund und weshalb?
- Wo sehen Sie Herausforderungen, um mehr Kund*innen für solche Investitionsprojekte im Energiesektor zu gewinnen?
- Wie hat sich das Investitionsverhalten in den letzten Jahren verändert?

Question Group 2: Investment opportunities for asset managers/banks [2]

- Wie schwierig oder einfach ist es an geeignete Projekte zu gelangen?
- Wie sieht die Entscheidungsfindung für ein Projekt aus? (Best-In-Class)?

- Wer Entscheidet, wo ein neues Projekt finanziert wird?
- Inwiefern beeinträchtigt der Klimawandel ihre Investitionsentscheidungen?
    - Welche Implikationen können stärkere Wetterphänomene, wie zum Beispiel stärkere Regenereignisse oder Hitzewellen, auf ihr Geschäft haben?
- Wie wird sich der Markt rund um nachhaltige Investments und vor allem erneuerbare Energien in Zukunft entwickeln?
    - Was erwarten Sie von der Entwicklung der Politik?

Question Group 3: Relationship with the Swiss state & efforts of Climate Finance [2]

- Wieso investieren Sie nicht in Entwicklungsländer?
    - Wie sieht der Entscheidungsprozess dahinter aus?
    - Wie attraktiv wäre es für Sie, sich auch in Entwicklungsländern zu engagieren?
    - Wie stehen Sie zu Blended Finance-Produkten, falls ihnen dies etwas sagt? (Vereinigung von privaten und öffentlichen Geldgebern) Was war ihre persönliche Motivation, sich um nachhaltige Investitionen zu kümmern?
- Was könnte die Schweizer Regierung tun, um diese Tatsache zu ändern?
- Welche Verbindungen haben Sie zur Schweizer Regierung, z.B. zum BAFU?

Question Group 4: Investment in non-renewable energy (by other market players) [2]

- Wieso investieren Ihrer Meinung nach noch so viele (andere) Investor*innen in nichterneuerbare Energien?
    - Welche Argumente wurden bei dieser Entscheidung gegeneinander abgewogen?
- Sind diese Investitionen noch rentabel genug?
    - Wie werden klimarelevante Risiken in die Analyse miteinbezogen?
    - Wie wird in der Analyse rund um die Investition auch das Risiko von «Stranded Assets» miteinbezogen, also, dass diese Anlagen in Zukunft auch in Wert verlieren könnten?

- Welche Herausforderungen sehen Sie beim Miteinbinden von Umweltaspekten in die Investitionsstrategien von Schweizer Finanzakteuren?

- Welche Wissenslücken, auf die Umwelt bezogen, gibt es ihrer Meinung nach in der Finanzbranche?

- Wie werden Ihrer Meinung nach Risiken, welche erst in einigen Jahrzehnten auftauchen werden, von der Schweizer Finanzbranche gehandhabt?

    - Wie bewerten Sie das Miteinbeziehen von Umweltaspekten durch die Schweizer Finanzbranche? -> Ist dies ausreichend oder nicht?

    - Finden Sie, dass sich Personen der Finanzbranche den Risiken des Klimawandels genügend bewusst sind?

        - Wie sind solche Personen gegenüber längerfristigen Risiken, die erst in eigen Jahrzehnten auftreten werden, sensibilisiert?

Question Group 5: Perception of the population [1, 2, 3]

- Wie bewerten Sie die Informationen, welche ein/e Kund*in durch seine/ihre Bank bekommt, wie ihr Geld selbst benutzt wird?
    - Was würden Sie dabei ändern?

Question Group 6: Comparison of Analyses [1, 3]

- Basierend auf meinen Berechnungen:

    - Welche sind die derzeitigen Anstrengungen, die die Schweiz derzeitig unternimmt, um solche Investitionen in Zukunft zu verringern?
    - Was sollte ihrer Meinung nach noch getan werden?
- Wie haben sich die Portfolios von Versicherungen und Pensionskassen in den letzten Jahren verändert?
    - Wie haben sich dabei die direkten Investitionen verändert?
    - Welche Rolle nehmen diese für die Investitionsstrategie dieser Institutionen ein?
    - Wie sieht die Lage bei Investitionen in Kohle aus?

Question Group 7: Climate Finance in Switzerland [1]

Allgemeine Ausgangslage

- Bezüglich den rein freiwilligen Massnahmen, die für Schweizer Finanzakteure gelten:
    - Was sind die Gründe, weshalb es noch keine Gesetzesgrundlage für nachhaltige Investitionen (oder gegen Investitionen in fossile Energieträger) gibt?
- Wie wurde der faire Anteil der Schweiz an Climate Finance von 450 – 600 Millionen pro Jahr ab 2020 berechnet?
    - Welche Rolle soll diese Zahlung überhaupt spielen?
    - Wie wird der Betrag aufgeteilt, und nach welchen Kriterien?
    - Wie wird der Effekt gemessen?
    - Welche Rolle spielen dabei ausserdem indirekt verursachte Emissionen im Ausland (durch Investitionen)?
- Die Berechnung dieser Zahlungen ungenau. Wie hat sich das mittlerweile entwickelt?
    - Was ist der derzeitige Wissensstand bezüglich, ob die Schweiz sich indirekte Mobilisierungszahlen anrechnen lassen kann?
        - Wie beurteilen Sie eine Befragung zur Kausalität dieser Massnahmen?

Quantifizierung

- Wie wurde der Geldbetrag mit einer Menge an CO_2e-Emissionen abgewogen?
- Welcher Preis wurde dabei einer Tonne CO_2 gegeben?
    - Wie werden die durch Climate Finance-Zahlungen eingesparten Emissionen quantifiziert?
        - Basierend auf einem nichtexistierenden Counterfactual?
    - Wie wurde der Impact dieser Investitionen gemessen?
    - Welches sind Ihrer Meinung nach noch die Schwachpunkte dieser «Kompensationszahlungen»?
        - *Wie finden Sie die Tatsachen, dass dies zum Teil als Kompensationszahlungen angeschaut werden?*
    - Wie hoch sollte dieser Beitrag ihrer Meinung nach sein?
- Wie wurden *Equity Principles* in diese Entscheidung miteinbezogen?
    - Wie bewerten Sie die Höhe dieser Zahlungen bezüglich Fairness gegenüber anderen Ländern, insbesondere schwächer entwickelten Ländern?

Zusammenarbeit mit dem Privatsektor

- Bezüglich Erhöhte Zusammenarbeit mit dem Privatsektor:
    - Welche Strategie wurde dabei benutzt, um dies zu erreichen?
    - Wie sieht dabei der derzeitigen Stand aus?
    - Welche Akteure waren dabei von grosser Bedeutung?
    - Wie sieht die derzeitige Lage aus?

Wofür werden diese Gelder benutzt?

- Wofür werden diese Gelder benutzt?
- Wo liegt der Hauptfokus dieser Zahlungen?
- Wie stark werden dabei erneuerbare Energien gefördert?

Zukunft?

- Welches Ziel strebt die Schweizer Regierung mit diesen Zahlungen an?
    - Wie sieht die Zukunft dieser Zahlungen aus (z.B. Erhöhung der Geldmenge)?
    - Was ist nun die Strategie für die nächsten Jahre?

Question Group 8: Underlying political processes [1, 3]

- Was sind die Gründe, weshalb es noch keine Gesetzesgrundlage für nachhaltige Investitionen oder gegen Investitionen in fossile Energieträger gibt?
    - Welche Rolle spielt dabei das Lobbying der Finanzindustrie?
- Inwiefern sollte die Politik ihrer Meinung nach agieren, um den Finanzplatz Schweiz in eine bestimmten Richtung zu lenken?
    - Welche Einschränkungen (falls überhaupt) fänden Sie notwendig?
- Wie schätzen sie ein, ob die Schweizer Politik der Materie genügend Aufmerksamkeit schenkt?
- Welche weiteren Probleme auf politischer Ebene sehen sie?
- Welche Probleme innerhalb der Schweizer Regierung treten bei solch einem Thema auf?
    - Wie gut arbeiten die verschiedenen Departemente zusammen?
    - Welches Departement ist federführend?
    - Wie gut funktioniert die Zusammenarbeit dieser Departemente?
- Wie stark schätzen sie politische Kräfte ein, die eine «nachhaltige» Finanzindustrie blockieren würden?

Question Group 9: Own opinion on the comparison made & more [1, (2), 3]

- Wie bewerten Sie die Aufrechnung von Climate Finance gegen «Dirty Coal»?
    - Inwiefern kann man diese vergleichen?
- Gibt es aus ihrer Sicht noch andere Schwachpunkte dieser «Kompensationszahlungen»?
- Wie stehen Sie den durch die Schweiz gesteckten Klimazielen (bis 2050 klimaneutral, oder auch früher) gegenüber?
- Welche Massnahmen würden sie persönlich treffen?
    - Welche Entwicklungen wünschen sie sich für die Zukunft?
    - Wie sehen Sie das Ganze international?
- Welche Entwicklungen wünschen Sie sich für die Zukunft?

Question Group 10: Additional Questions [1, 2, 3]

- Wie schätzen Sie den Effekt der verstärkten Auseinandersetzung der Bevölkerung mit Klima und Klimawandel (u.a. durch den Klimastreik) auf eine stärkere Veränderung in eine nachhaltige Zukunft ein?
- Welchen Effekt hatten die Wahlen vom Herbst 2019 auf die Entwicklung von nachhaltigen Investitionen?
    - Wie sieht es in Zukunft aus?
- Glauben Sie, dass die verstärkte Debatte in der Öffentlichkeit eher dazu führt, dass sich Banken und andere finanzielle Akteure für ein nachhaltiges Portfolio entscheiden, weil das Reputationsrisiko steigt?

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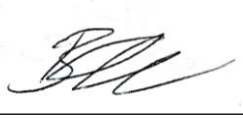
Personal Declaration

I hereby declare that the submitted Thesis is the result of my own, independent work. All external sources are explicitly acknowledged in the Thesis.

Place/Date	Signature
Zurich, 22 January 2021	
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