BlueOrchard
Academy

Rethinking Climate Finance

Taking Action against Climate Change

Opportunities and Challenges for Financial Players

2019/2020

Acknowledgements

Climate action and climate finance are a priority for BlueOrchard. We seek to contribute to tackling climate change, the major challenge of our time, not only through our climate finance funds but also by actively engaging in research and sharing our experience and expertise.

We are grateful for the collaboration with the FINEXUS Center for Financial Networks and Sustainability at the University of Zurich in quest of what asset managers like us can do to raise the importance of climate action for public and private investors alike and channel more funding towards climate finance.

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We are also grateful to our BlueOrchard colleagues in various teams who have provided valuable input for this report. Special thanks go to Tahmina Theis for her professional editorial support that has shaped this report in all details till the end. Big thanks go also to Delia Wagner for her eagle eyes and careful review and to Valerie Harrington who has provided valuable support in the preparation of the paper. Our final thanks go to Peter A. Fanconi, our Chairman, and Patrick Scheurle, our CEO, who have provided continuous guidance to ensure that BlueOrchard's ambition to be a game changer in climate finance is central to the company's "raison d'être".

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Executive Summary

Failure to act on climate-related risks can have potentially devastating consequences. Human lives could be affected by a long list of disastrous outcomes, such as more frequent natural catastrophes, health problems and an escalation in hunger and water crises as well as migration flows. Scientific evidence shows that less-developed countries would be the most affected. Furthermore, climate-related risks could also present significant economic losses in the financial system. Scenarios vary substantially depending on how and how fast we react to climate change and move towards a new low-carbon economy.

On the other hand, this necessary shift to a new low-carbon economy also presents important investment opportunities. Financial investments directed toward mitigating climate change effects and adapting to negative consequences are referred to as *climate finance.*

Both the public and private sectors need to increase their climate finance investments to reach the climate targets outlined in the Paris Agreement and the United Nations' Sustainable Development Goals (SDGs). Therefore, a partnership between the public and private sectors that maximises synergies and mobilises capital, while setting clear impact targets toward climate change adaptation and mitigation, is crucial. Without it, achieving the Paris Agreement targets and SDGs is at risk.

Against this backdrop, BlueOrchard has collaborated with the FINEXUS Center for Financial Networks and Sustainability at the University of Zurich to analyse the climate finance market's most recent dynamics. This paper builds on both organisations' experience and knowledge in the asset-management industry, focussing on the relevant aspects and importance of climate finance for the different players in the asset-management value chain.

It highlights the urgent need for private financial players to react to climate-related risks. Moreover, this paper attempts to show that reasonable commercial incentives exist for the private sector to increase its engagement in climate finance. A case study illustrates a scenario of a disorderly transition to a low-carbon economy with two hypothetical portfolios: a 'brown' bond portfolio and a 'green' bond portfolio with comparable average annual returns. After the disorderly transition, both portfolios are adversely impacted, but the impact is much stronger in the 'brown' portfolio. Climate finance can thus be viewed as an opportunity to develop portfolios that are more resilient to climate-related risks in the long term.

To successfully unlock private capital at scale, climate finance must be developed further and investment vehicles must be customised to meet private investors' needs and expectations. In order to better understand them and to identify the extent of their activities in climate finance, BlueOrchard conducted a survey among its private sector investors. The survey's main findings show: i) the limited understanding and reporting of climate-related risks; ii) the moderate exposure of private investors to climate finance; iii) their strong interest in further expanding their sustainability portfolios and including climate finance; and iv) the need for public and private sector actors to work together in constructing an inclusive, forward-looking climate finance strategy.

I. Introduction

Climate change is considered one of the most important global threats nowadays. The recent Global Risks Report from the World Economic Forum shows that climate and environmental risks ranked at the top, both in terms of probability and impact. Since the signing of the Paris Agreement in 2015, the signatories agreed on the urgency to address climate change and committed to holding the increase of global average temperature well below 2 °C above pre-industrial levels, although the goal is for temperature increases not to exceed 1.5 °C (United Nations, 2015). Most world leaders, from governments to corporate CEOs, signed on and expressed their intentions to address climate change. Now pressure is mounting to translate intentions into actions, which need to come in the form of public initiatives but also through additional understanding, transparency and participation from the private sector. Upscaling climate finance, i.e. the funds directed toward mitigating and adapting to climate change, is fundamental (UNFCCC Standing Committee on Finance, 2018).

Despite recent increases and the positive trend in climate finance globally, an important finance gap to reaching the Paris Agreement targets and the SDGs remains. For these objectives to materialise, markets will need structural changes to move toward a new low-carbon economy, which essentially means moving away from carbon-intensive energy sources (energy supply) and becoming much more energy-efficient (energy use). This entails two dimensions:

Climate-related risks. Asset managers have a mandate to keep certain levels of profitability, minimise impaired assets and comply with regulatory requirements. Therefore, they must start measuring such climate-related risks, incorporating them into their asset-allocation strategies and disclosing them in a more comprehensive manner. For financial markets and the economy, how, when and at what pace the shift to a low-carbon economy materialises will lead to very different outcomes (Knight & Ganguly, 2018), with different degrees of potential losses. The task ahead is not simple.

Climate-related opportunities. To achieve the targets of the Paris Agreement, the World Bank indicates that climate financing "must be counted in the trillions, not billions" (World Bank, 2019). This also presents significant investment opportunities through climate finance.

After setting the context with definitions of climate risks and climate finance, this paper aims to explain the rationale on why the private sector should: i) start assessing and disclosing climate-related risks more rigorously and ii) boost its participation in climate finance.

By building on these findings and on the testimonials from a large group of stakeholders (including public and private sector representatives, policy leaders and think tanks), and leveraging BlueOrchard's and the FINEXUS Center for Financial Networks and Sustainability at the University of Zurich's extensive expertise and experience in impact investing for climate finance, this paper seeks to contribute to the mobilisation of private capital.

II. Climate Finance Market

1. Climate Finance for Climate Action

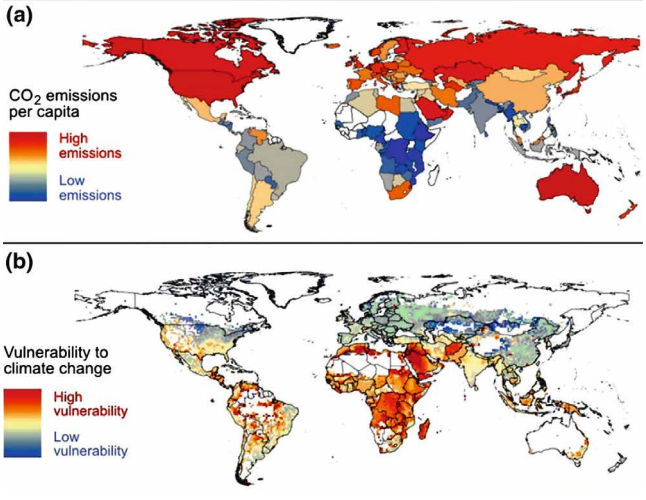
World records on high temperatures keep getting broken. Globally, 9 out of 10 of the hottest Junes occurred in the past 10 years, with June 2019 being the hottest so far (National Oceanic and Atmospheric Administration) and 2018 having been one of the hottest years measured (Swiss Re Institute, 2019). As per the latest natural catastrophes report published by the Swiss Re Institute (Swiss Re Institute, 2019), estimated losses from natural catastrophes and man-made disasters totalled USD 165 billion in 2018, with more frequent and harsher local climate events relative to past years. Moreover, the report states that this trend is expected to continue and that climate change-related losses from events such as heatwaves, droughts, wildfires and floods will continue to accelerate in the coming years. Without action, the World Bank estimates that 100 million people could fall back into poverty by 2030 (World Bank, 2015) and 143 million people from Sub-Saharan Africa, South Asia, and Latin America could be forced to migrate to escape climate-related impacts (World Bank, 2018).

Furthermore, the distribution of these events and associated losses are not even and disproportionately affect the poor and most vulnerable, mostly in developing countries (UNFCCC Standing Committee on Finance, 2018).

This is especially because:

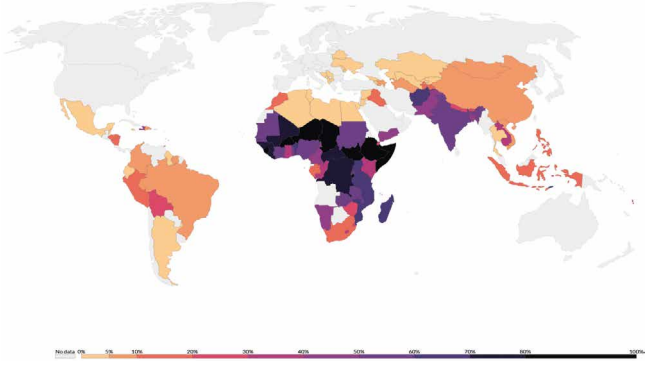
A country's exposure to extreme climate events depends on its geographic location. Climate models indicate that temperature variability will be stronger in many poorer countries (Bathiany, et al., 2018). As seen in Figures 1 and 2, less developed countries that are more vulnerable to climate change are the ones that have contributed the least to this global threat (Saraswat & Kumar, 2016).

Figure 1: Vulnerability to Climate Change and CO_2 Contribution by Geographic Location



Source: Saraswat & Kumar, 2016

Figure 2: Share of Population Living in Multidimensional Poverty*



Source: Our World in Data, 2018

** Proportion of people per 2014 who are poor according to the Multidimensional Poverty Index. The index weights ten indicators of deprivation in the context of education, health and living standards. Individuals are considered poor if deprived in at least one third of the weighted indicators (see Alkire, S., and Robles, G., 2016. "Multidimensional Poverty Index Winter 2016: Brief methodological note and results. Oxford Poverty and Human Development Initiative, University of Oxford, OPHI Briefing 44. for more details).*

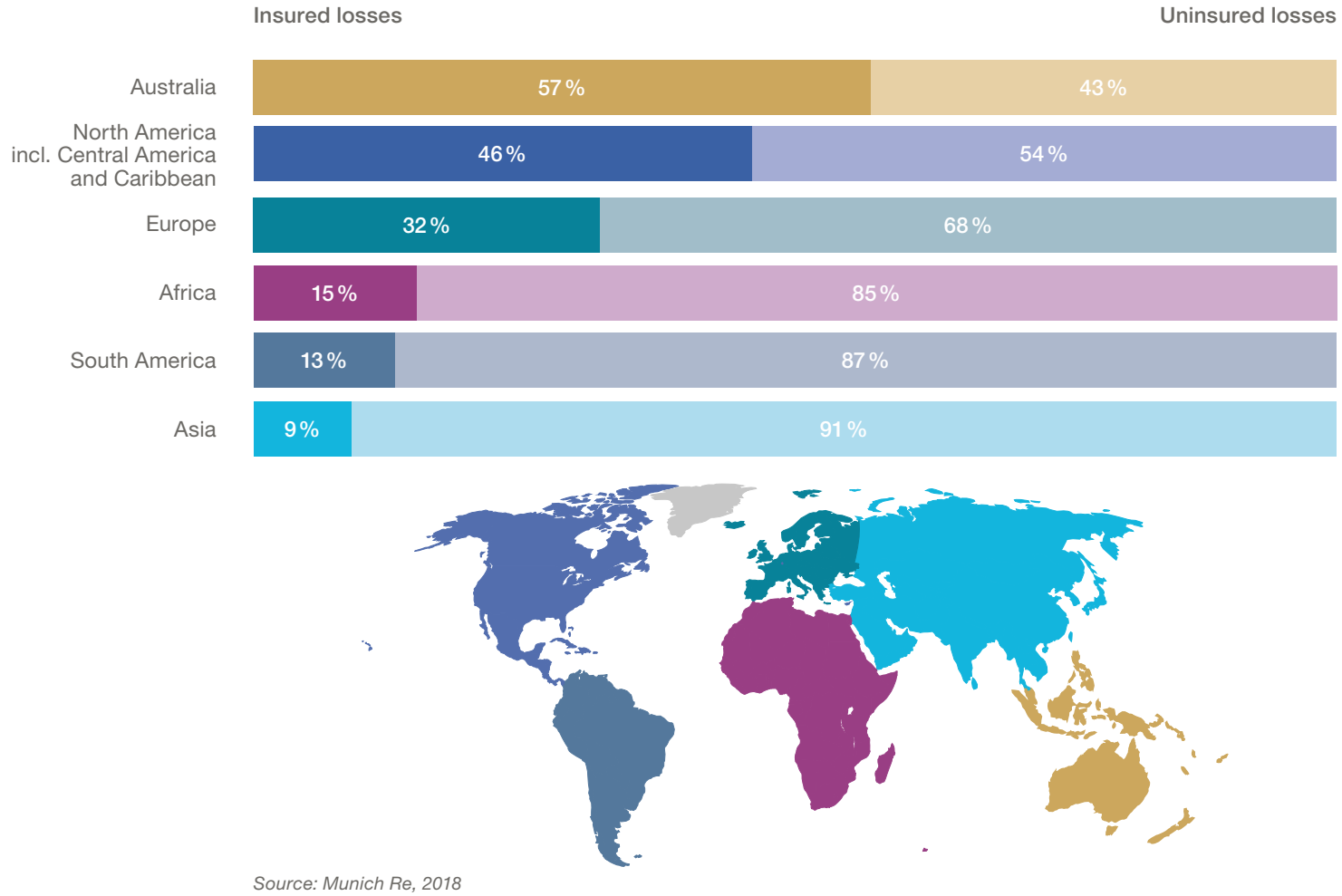
Impacts within a country will also vary depending on the population's economic activity. Agriculture is severely impacted by climate change[1] and around two thirds of the world's population living in extreme poverty depend on it (Food and Agriculture Organisation of the United Nations, 2017).

Poorer populations are often less-prepared, uninsured and have lower coping mechanisms. In developed countries, around 46% of total losses from natural catastrophes in 2017 were covered and paid for by insurance. In less-developed countries, however, covered losses were close to only 10%, as seen in Figure 3 (Munich Re, 2018).

Goal number 13 of the United Nations' 17 SDGs, Climate Action, refers to the need for urgent action to be taken to combat climate change and its impacts (United Nations Development Programme). To tackle this, signatories of the Paris Agreement committed to keeping the increase of the global average temperature well below 2 °C above pre-industrial levels, with the precise goal being a maximum of 1.5 °C (United Nations, 2015)[2].

To achieve the 1.5 °C target, the world needs to decrease net CO_2 emissions substantially. The Intergovernmental Panel on Climate Change (IPCC) estimates the need to decrease net CO_2 emissions by approximately 45% by 2030 (relative to 2010 levels) and reach zero soon before 2070 (IPCC, 2018). For this objective to materialise, markets will need structural changes to move toward a new low-carbon economy.

Figure 3: Insurance Gap in Various Regions



Source: Munich Re, 2018

[1] For example, 80% of the losses from drought are taken up by the agriculture sector (Food and Agriculture Organisation of the United Nations, 2017).

[2] The impact and risks associated with a temperature increase of 2 °C are significantly higher relative to a temperature increase of 1.5 °C, as highlighted in the most recent update of the Intergovernmental Panel on Climate Change (IPCC, 2018).

Nancy Saich

Chief Climate Change Expert at the European Investment Bank

European Investment Bank

The European Investment Bank (EIB) has made climate action one of its top priorities, and through its lending and advisory activities, it is helping to mobilise financial resources worldwide and channels them into addressing climate change mitigation and adaptation. EIB's climate strategy focuses on finance, impact and mainstreaming climate change across the organization. EIB has committed to ensure that at least 25% of all EIB's lending activities are dedicated to climate action, increasing to 35% in developing countries by 2020.

Nancy, what is EIB's strategy towards climate finance in less-developed markets?

"We support regions that have less accurate data to develop climate-resilient planning and less financial capacity to invest in climate change mitigation and adaptation. One example of how we are doing this is through our investment in the Land Degradation Neutrality Fund (LDNF) led by the United Nations Convention to Combat Desertification (UNCCD). The LDNF targets countries with significant land degradation resulting from climate change."

How does EIB engage private investors into increasing their share of climate finance investments?

"EIB normally finances up to 50% of any project and thereby facilitates the contribution of private investors to the underlying climate action. The bank shares its technical and financial know-how to the work of the EU's Technical Expert Group to guide private actors by setting common standards and benchmarks regarding green bonds and carbon levels."

2. Defining Climate Finance

Climate finance refers to funds directed toward mitigating and adapting to climate change (UNFCCC Standing Committee on Finance, 2018). It is an integral part of the economic contribution to achieving the targets set in the Paris Agreement. Depending on the context in which the term climate finance is used, it features many aspects and nuances, e.g., industry, region and public or private sector, among others. When discussing different facets of climate finance, the following questions often arise: a) Does climate finance include only 'additional' or 'new' investments and not those that were planned already? b) Does it include investments only from developed to developing nations? c) Do projects need to specify climate change as a 'principal' objective and purpose?

Given these different facets and aspects, currently no universally accepted definition exists. Following best practices in line with the United Nations Standing Committee on Finance (SCF), this paper uses the following comprehensive definition:

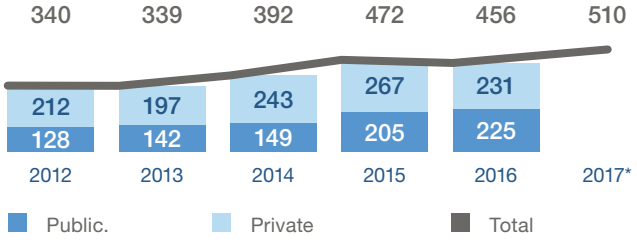
Climate finance is any investment that finances mitigation and adaptation activities that address climate change globally. Mitigation activities aim to reduce or limit GHG emissions (renewable energy, energy efficiency, etc.), whereas adaptation activities aim to reduce society's vulnerability to current and expected climate change impacts (water preservation, early warning systems for extreme weather events, climate insurance, etc.).

3. Climate Finance Investment Gap

With no universal agreement on the exact concept and content of climate finance, measuring and accounting for global climate finance flows is a challenge (see Figure 4). Current flow measurements differ substantially, as the universe of what is in scope can differ significantly depending on the perspective of the entities leading such efforts.

Despite these measurement complexities, preliminary estimates reported by the Climate Policy Initiative (Climate Policy Initiative, 2018) indicate that global climate finance in 2017 reached USD 510 billion, which represents an increase of 12% relative to 2016 and 50% relative to 2012 levels (see Figure 5). Even though this increase is positive, it is still very far from the USD 16.8 trillion target investments needed until 2030, both in climate adaptation and mitigation (Global Green Growth Institute, 2016).

Figure 5: Global Climate Finance Flow Estimates (USD billions)



Source: UNFCCC Standing Committee Finance, 2018; Climate Policy Initiative, 2018

** Split not available*

Figure 4: Challenges in Measuring and Standardising Climate Finance Flows

Accounting problem. Linked to diverse accounting standards, inconsistencies can be as basic as parties reporting committed vs. disbursed funds, or more complex financial treatments.

Attribution problem. Discretionary decisions can vary as to what is the exact part of a larger project that comprises climate finance. For example when climate change is not the 'main' objective of a project, but a 'significant' objective, various parties suggest different approaches on how much they account for climate finance.

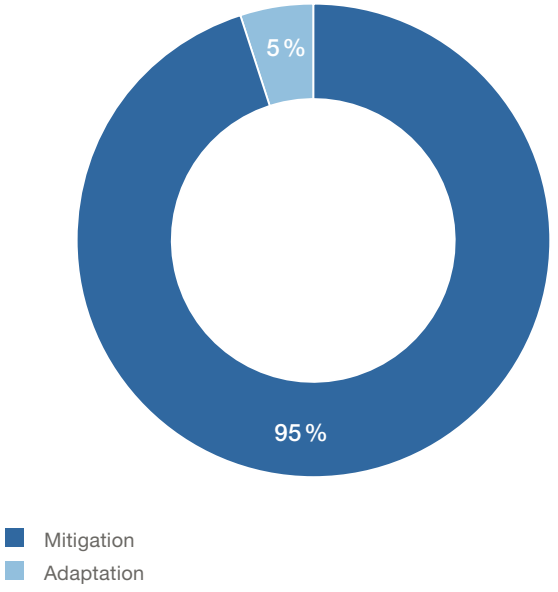
Overstatement problem. Given the various political commitments to tackle climate change, a certain incentive exists for all involved parties to over-report climate finance flows.

Source: Climate Policy Initiative, 2017

Climate adaptation finance, totalled USD 22 billion in 2016 and represented merely 5% of total flows that year (see Figure 6). This falls worryingly short of the estimated range of USD 210 billion to USD 300 billion needed per year between 2010 and 2030 according to the 2018 United Nations Environment Programme (UNEP) Adaptation GAP Report (UNEP, 2018). Moreover, that amount is based on the assumption that the world realises the 2 °C temperature rise limit. Costs could increase exponentially if temperatures rise higher.

Climate mitigation finance also needs to be increased. To achieve the 1.5 °C target of the Paris Agreement, the estimated investment gap which needs to be addressed is close to USD 400 billion per year until 2030 (IIASA Policy Brief, 2018). The longer it takes to close this gap, the larger it becomes (IIASA Policy Brief, 2018).

Figure 6: Climate Finance Flows per Type of Activity (2016)



Source: UNEP, 2018

Lukas Schneller

Deputy Head of Section at the State Secretariat for Economic Affairs (SECO), Private Sector Development

Schweizerische Eidgenossenschaft
Confédération Suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs FDEA
State Secretariat for Economic Affairs SECO

Lukas, what are SECO's climate finance targets for 2020?

"Based on Switzerland's international commitments, there is an objective to reach USD 450 to 600 million per annum in terms of climate finance from 2020 onwards. This objective should be reached by a combination of own account funding and mobilization of private capital. As of 2017, we are at the lower bound of this target range. For SECO, as one public actor in the space, we are broadly on track with our targets. Equally important as quantitative targets is the quality and effectiveness of the projects. The concomitant development of market standards to avoid 'green washing' is critical."

What is SECO's approach to engage the private sector in climate finance?

"Engaging the private sector is a broader topic than climate finance. More generally, in terms of our economic development work, engaging with the private sector has always been a key focus. This matters for poverty reduction via job creation, or for finding innovative solutions to development problems. And, of course, for scaling scarce public funding for climate change. We have defined an approach to engage with the private sector with a set of principles: subsidiarity, additionality, complementarity, avoiding market distortions and assessing environmental and social risks. These principles guide us through the phenomenon of blended finance. In one way or another, blended finance entails a subsidy and this needs to be linked to a public good. The goal is a self-sustaining project. That means planning an exit from donor support at a certain point."

4. Blended Finance Products as Enabler for Increased Private Flows into Developing Economies

Public concessional finance alone is unlikely to bridge the climate finance gap. Achieving climate mitigation and adaptation objectives requires major engagement of the private sector by scaling up private investments. Reasonable commercial incentives exist for the private sector to increase its engagement in climate finance. Natural catastrophes can affect companies directly, disrupting their production. At the same time good opportunities exist from new adaptation and mitigation products sold in large markets (Global Environment Facility, 2012). However, a lack of strong business models, little knowledge of adaptation and mitigation activities and high risk perceptions limit additional private-sector engagement (Green Climate Fund, 2018).

Moreover, in many of the world's poorer countries where citizens have limited financial capacity, adaption and mitigation costs are expected to be higher. At the same time, these countries often face uncertainties and market barriers that can deter investments, especially private investments, which include:

- Poor sovereign ratings such as unstable political environments, uncertainty on repatriation of revenues, macroeconomic instability, weak regulatory environments, unstable local currencies, etc.
- Some climate-adaptation investments are long term, and most private investors target shorter time horizons for their portfolios
- Lower liquidity and immaturity of financial and capital markets in underdeveloped economies (e.g., lack of intermediation and of a secondary market)
- Business model barriers in which high upfront costs of new technology, or benefits from new technology, are not well-understood by users, as well as by other important stakeholders in the implementation value chain (Micale, et al., 2018)

Blended finance products, applied correctly, can help mobilise public and private investments into poorer economies (BlueOrchard Academy, 2018). Typical examples would be structured funds in which different investors have risk and return incentives to match their investment appetites.

Stefan W. Hirche

Principal Project Manager at KfW Development Bank
and Chairperson InsuResilience Investment Fund

The German Development Bank KfW supports change and forward-looking ideas worldwide. KfW is fully committed to the fight against global warming, with 40 % of its total business volume dedicated to climate and environmental protection. In 2017, KfW participated in the launch of the InsuResilience Global Partnership for Climate and Disaster Risk Finance and Insurance Solutions, with the objective to build up the developing countries' resilience capacity and protect vulnerable populations that are most exposed to climate change consequences, such as natural disasters.

Stefan, what is the role of blended finance structures in reducing the climate finance gap?

"We believe in the power of bringing public and private investors – impact and commercial alike –together to fund developmental objectives. KfW pioneered structured investment funds as a blended finance product in 2005 with the European Fund for Southeast Europe, and has built on this ever since. In the thematic field of climate finance funds, KfW has initiated and invested among others in the eco-business Fund, the Global Climate Partnership Fund (GCPF) and the InsuResilience Investment Fund (IIF)."

BlueOrchard's Climate Action

Skymet: Supporting Indian Farmers through Investments in Climate Adaptation

The BlueOrchard managed InsuResilience Investment Fund (IIF) was initiated by the German Development Bank (KfW) on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ). IIF's aim is to facilitate adaptation to climate change by improving access to and use of climate insurance solutions in Official Development Assistance (ODA) recipient countries, with the goal to improve resilience to weather events among poor and vulnerable households as well as micro, small and medium enterprises.

Skymet Weather Services Private Ltd. (Skymet), an IIF investee, is India's largest weather-monitoring and agri-risk solutions company for the insurance and financial sectors. Through its activities, the company reaches out to more than 2 million farmers. This technology-driven company is the market leader in providing weather and crop-yield-related information services to the insurance sector in India, with over 6,000 automatic weather stations (AWS) nationwide.

India's rural population is particularly vulnerable to climate events, especially in regions that are predominantly dependent on agriculture and livestock farming. Monsoon patterns have been changing in the last 70 years, and the 2017 monsoon season for example was particularly strong, affecting around 40 million people, with losses of up to USD 2.5 billion in India (Munich Re, 2018).

Skymet, in partnership with the United States Agency for International Development (USAID), launched a program in which it expanded its AWS in 11 Indian states to provide crop-advisory services to small farmers, with the objective to help them achieve climate-resilient and sustainable agriculture. These AWS sensors provide real-time weather data to farmers, such as temperature, wind direction, rainfall and humidity. In addition, farmers have real-time access to crop advisory and farming practices through their mobile phones. This significantly helps farmers make time-sensitive decisions. IIF's investment supports the roll-out of these AWS.

Furthermore, the programme particularly targets female farmers, who have learned how to use digital weather information generated by Skymet for their farming activities. Through weather technologies, this innovative programme is helping to strengthen Indian farmers' adaptive capacity and resilience to climate risks, as well as triggering improvements in short- and medium-term crop productivity.

Bilateral organisations and development finance institutions play a catalytic role in providing required credit enhancement to commercial investors by being fully subordinated to them in the fund capital structure. Through these blended finance mandates, driven by impact objectives, both in terms of climate finance and regional focus, scalable climate finance initiatives can increase financial flows and deploy investments at market rates in even the poorest countries.

Blended finance instruments (e.g., debt, equity, guarantees) can be combined with grant-funded capacity building to accompany climate finance initiatives with sector-specific awareness and educational programmes for ultimate beneficiaries, government officials and all other relevant national and subnational actors. Technical Assistance (TA) facilities can also be vital in preparing a pipeline of bankable climate finance projects. Some successful TA initiatives have been designed by governments to reduce entry barriers in emerging and frontier markets for the private sector.

5. Understanding Climate-Related Financial Risks

Besides the need for additional private investments in climate finance in general, climate-related risks affecting financial performances require the private sector to act out of self-interest. Financial authorities have started to recognise climate risk as a financial risk and are assessing how different financial actors are managing these risks. For the years 2016, 2017 and 2018, climate risk issues have been ranked at the top in the World Economic Forum's Global Risks Perception Survey 2018–2019, both in terms of probability and impact (World Economic Forum, 2019).

Asset managers have a mandate to keep certain levels of profitability, minimise impaired assets and comply with regulatory codes. If climate-related risks are not taken into consideration, and losses occur, managers will have failed to act.

Some mainstream institutional investors already have taken significant steps toward addressing climate change recognising potential risks while also focussing on significant associated opportunities.

Climate-related financial risks can be classified into transition and physical risks. The subsequent sections discuss these risks in more detail.

Peter Sandahl
Head of Sustainability at Nordea Life and Pension

Nordea

Nordea, the largest financial services group in the Nordic region, has ranked for two consecutive years as one of the top 100 most sustainable corporations in the world. The institution has screened 100% of its total assets for negative environmental and social impacts, raised more than USD 2.7 billion in green bond financing and offered a robust sustainable selection of funds to its private clients.

Peter, what have been the main challenges in quantifying climate-related risks in your portfolio?

"The lack of available data and the lack of standardisation/harmonisation of climate risk models for scenario analysis and stress testing have been the main challenges. In Nordea Life & Pension we are mainly doing two things: first, based on our risk assessment and scenarios, we are managing financial risk by reducing exposure to certain sectors and companies in our long-term asset-allocation strategy. Second, we are piloting science-based models to align our total assets to the 1.5 °C target."

Transition Risks

Climate change transition risks arise from sudden asset price adjustments as a result of the coordination of market participants' expectations about climate policies' implementation or impact. Risk managers face the complex task of estimating and measuring these risks and their interconnectedness (Swiss Sustainable Finance, 2019).

The Task Force on Climate-Related Financial Disclosures (TCFD), established by the Financial Stability Board (FSB), classifies transition risks into five categories (Task Force on Climate Related Financial Disclosures, 2017):

Policy risk. This includes, among other aspects, the unanticipated introduction of new carbon price mechanisms, subsidies and tariffs. The timing of policy is crucial in determining its impact. If effective policies are implemented early and in a stable manner, transition risks can be minimised and even become an opportunity for inclusive growth.

Legal risk. Failure to mitigate climate change's impact or insufficient disclosure of climate risks can lead to litigation claims.

Technology risk. New technologies in renewable energy, energy efficiency and any other new development toward a low-carbon economy will have a significant positive impact in the long term. However, some negative externalities may develop from this transition, such as unemployment, as certain skills would become redundant, and stranded assets, among others.

Market risk. As awareness of the devastating consequences of climate change increases, demand for carbon-intensive products and services can reduce. Costs of certain high-carbon supplies could therefore rise.

Reputation risk. Increasing climate change awareness across the entire product value chain (i.e., from consumers to investors) may put negative value judgements on certain sectors, organisations and industries at large.

Governments and regulators are major actors in the management and oversight of the above risks, as they can influence financial markets and their players with policies, incentives and fiscal interventions to promote climate-mitigation initiatives to achieve set targets.

Physical Risks

Physical risks refer to risk of damage to physical assets, natural capital and/or human lives from climate-induced extreme events. The TCFD classifies physical risks into two categories (Task Force on Climate Related Financial Disclosures, 2017):

Acute risk. This is event driven, such as a cyclone or a flood.

Chronic risk. This is related to long-term changes like a higher mean global temperature or higher sea levels.

Physical risks can have a long list of negative effects; like lower production capacity, damage in assets and property, safety of employees and increases in insurance costs, among others (Task Force on Climate Related Financial Disclosures, 2017).

6. Measuring and Disclosing Climate-Related Financial Risks

For an adequate capital-allocation decision and for risk-return pricing of climate finance investments, relevant, consistent and accurate information is necessary. This entails additional progress in measuring climate-related risks and climate finance flows. It is believed that once enough transparency and tools to assess these risks exist, private investors might increasingly allocate their portfolios toward climate-aligned projects.

In 2017, the TCFD finalised its first Recommendations Report (Task Force on Climate Related Financial Disclosures, 2017). It was the first comprehensive guide on what is relevant to report, with an emphasis on main risks and opportunities to transition to a lower-carbon economy (see Figure 7). From 2020, signatories of the Principles for Responsible Investments (PRI) will be required to report on 'TCFD-aligned' indicators.

Central banks and financial regulators are also turning their attention toward improving measurement and disclosure of climate-related risks. In 2017, at the Paris One Planet Summit, the Network of Central Banks and Supervisors for Greening the Financial System (NGFS) was created. It started with eight members, and as of June 2019, it has increased to 34. The NGFS aims to contribute to the analysis of climate and environmental risks. The first significant step in the First Progress Report, published in October 2018, was the mere recognition that climate-related risk comprises a financial risk (Network for Greening the FInancial System, 2018). In April 2019, the NGFS published a set of six best-practice recommendations related to climate-risk management directed at central banks, super-

Marion Verles
CEO at SustainCERT

SustainCERT quantifies, reports and certifies its clients' impact through the Gold Standard for Global Goals framework. It serves businesses and investors that want to verify their emission reductions, or assess their value chain interventions or investment portfolios' broader impact.

Marion, how can the process of disclosure and transparency on climate risks and footprints be accelerated?

"There has been significant improvement in commitments to disclose, but we have yet to see concrete improvements in actual disclosures. Corporates are ahead of financial investors in the process, since they have been disclosing carbon footprints for much longer. Three key factors are needed to accelerate the process. First, regulations need to be improved. Second, businesses need to feel more pressure both from the top, with institutional investors making disclosure of climate risk a requirement, and from the bottom, with consumers demanding action. Third, we need early movers to showcase what is possible. By having role models, other players will follow (e.g., Church of England, Handelsbanken, etc.)."

Figure 7: TCFD Recommendations of Disclosures on Climate-Related Risks and Opportunities

Source: Task Force on Climate-Related Financial Disclosures, 2017

visors, policymakers and financial institutions (Network for Greening the Financial System, 2019).

Transparency and consistency in reporting standards is another key factor to address if climate finance is to step up as needed. For instance, the European Commission published the Taxonomy Technical Report in June 2019, which aims to set the criteria on what should be considered green or climate friendly investments (see Figure 8).

While efforts to conceptualise, measure and standardise climate-risk metrics have progressed, and recommendations have been shared, the next big step is for financial actors to actually measure and disclose climate-related risks. The subsequent chapter therefore discusses the monetization of climate-related financial risks and why managing them can be an opportunity for financial players.

Figure 8: A New Taxonomy to Avoid Greenwashing

In June 2019, the EU Technical Expert Group on Sustainable Finance issued the 'Taxonomy Technical Report on Financing a Sustainable European Economy'. The report's main objective is to guide investors in making informed decisions on environmentally friendly economic activities.

The taxonomy provides a tool to increase the level of sustainability in investors and asset managers' portfolios by helping them classify investment products as environmentally sustainable. The taxonomy covers six main environmental objectives: i) climate change mitigation; ii) climate change adaptation; iii) sustainable use and protection of water and marine resources; iv) transition to a circular economy, waste prevention and recycling; v) pollution prevention and control; and vi) protection of healthy ecosystems. Investors can apply the taxonomy to their own portfolios and define which activities conducted by the company, issuer or projects are eligible. The main challenge in implementing this taxonomy is data availability at the company, issuer and project levels. Although putting in practice the taxonomy for private investors and asset managers will take time, it is important to recognise that this tool is designed to contribute to avoiding greenwashing by setting disclosure and common standard requirements. Investors can avoid reputational risks and benefit from a framework which helps them increase their activities and portfolios' sustainability levels proactively.

Source: EU Technical Expert Group on Sustainable Finance, 2019

III. Monetisation of Climate-Related Financial Risks

1. Financial Markets and Climate Policies

As outlined in Chapter II, climate change elicits physical and transition risks. Climate change transition risk arises from sudden asset price adjustments as a result of coordination of market participants' expectations about climate policies' implementation or impact (e.g. a carbon tax, renewable energy target share). These adjustments can impact fossil fuel-related assets' value negatively (so-called carbon-stranded assets) (The Carbon Tracker initiative, 2014). They also can impact the value of assets in other sectors indirectly. However, any impact can be positive or negative, depending on whether firms can anticipate the policy and adapt their businesses to alternative energy sources.

Undertaking an appropriate approach to financial risk management in the face of climate-related risks requires taking full stock of the dynamics between financial markets, public investments and national climate policies. Studies conducted both by industry and public bodies have concluded that achieving climate-mitigation objectives requires major engagement in the private sector by scaling up private investments.

So, what are the incentives for private investors to engage? An argument often is made that, given the right information, investors are expected to deliver the best climate solutions (Carney & Bloomberg, 2016). Accordingly, as outlined in Chapter II, the G20's TCFD has pushed for more transparency on investors' climate-related risks.

One limitation of the transparency argument is that climate-related risk is largely endogenous. This means that transition risk depends on whether and how governments and firms will undertake a climate-mitigation pathway (as opposed to continuing on a business-as-usual (BaU) pathway, i.e., in misalignment with Paris Agreement objectives). Simultaneously, whether firms and governments undertake a climate-mitigation pathway depends on their perceptions of the risks involved (Battiston, et al., 2017).

On one hand, investors report that they would invest more in climate-related projects if they saw credible signals from governments about climate policies' timings and magnitude. On the other hand, policy makers are hesitant to embrace climate policies without some clear signals from investors that they would invest. With two players involved, and one moves only if the other moves, only two outcomes are possible: either both move or neither moves. Without some level of coordination, there is no method to tell the outcome in advance. This grid-

lock situation results in a delay in the implementation of climate policies. In turn, the delay increases the chances that any low-carbon transition is disorderly, which will be explained later.

The standard approach to financial risk assessments comprises computing expected values and risks based on historical values of market prices. Because of climate risks' endogeneity and the fact that it is impossible to assign reliable probabilities of climate policy scenarios' occurrence, this approach is not adequate to manage climate-related financial risks. It is also important to bear in mind that, even in a single scenario, costs and benefits vary substantially with assumptions on agents' utility, productivity and intertemporal discount rates, which ultimately depend on philosophical and ethical considerations (Nordhaus, 2007); (Pindyck, 2013); (Stern, 2008).

2. Managing Climate-Related Financial Risk with a Forward-Looking View

To deal with events whose probabilities are unknown, the quantitative assessment of climate risk conditional to scenarios (Battiston, et al., 2017) (Monasterolo, et al., 2018) can be combined fruitfully with decision theory under uncertainty to provide a portfolio's risk-management approach to climate-related financial risk. While more formal work in this direction remains in progress (Roncoroni, et al., 2019), the general idea is summarised below. We can consider a risk-averse investor with an information set representative of the best available knowledge that includes:

- Sets of future climate scenarios, as summarised in the IPCC reports, i.e., forecasts of the relation between global GHG emissions, temperature changes, climate physical risks and their forecasted socioeconomic impacts.
- Economic trajectories under climate policy scenarios (i.e., output by region and low/high-carbon sector, compatible with each climate policy scenario, as provided by a set of well-established economic models of climate change).
- Historic values of market data on firms and sectors' financial performance.

Financial investors can conduct a climate-transition risk assessment of their portfolio. Using the information set described above, it is possible to obtain estimates of climate policy shocks' magnitude that are compatible with the state of the economy. Integrated Assessment Models (IAMs) are equilibrium models of the economy that consider GHG emission targets and (to some extent) physical damage from climate change. One of the main issues related to the analysis of future climate risks is whether an orderly or disorderly energy transition will occur. Therefore, the shock scenario that we should consider is the impact of a disorderly transition in one or more countries and sectors. We consider the transition of the economy from a BaU trajectory and from a trajectory compatible with a given 2 °C target policy. An estimate of the shock is obtained from the differences in output across sectors between the two trajectories for the same IAM. Probabilities can be obtained by pooling models or parameter values together.

The financial-risk part of this climate stress test includes translating the macroeconomic shock into shocks on the value of the securities and loans in which financial institutions have invested. The transmission channel works as follows: during a disorderly transition, energy sector firms that have not adapted their businesses to climate targets face unanticipated costs and reduced revenues. However, firms that have invested in low-carbon technologies face unanticipated profits via changes in production costs, prices and revenues. The relation between changes in economic output and changes in financial investments' values depends on the type of asset class considered (e.g., equity, sovereign bond, corporate bond, loan) and the valuation approach used.

In summary, for a given climate policy shock, it is possible to compute familiar risk measures to obtain, for instance, a climate value at risk (VaR). A prudent investor could then follow the risk-management strategy to compute the climate VaR (at a certain level of confidence, p, e.g., p=1%) for several climate policy shocks that are judged as severe, but plausible, applying a minmax rule across scenarios. This way, the institution would be able to withstand a 1-in-100-years loss in the most adverse transition-shock scenarios considered.

3. Case Study

To illustrate, we construct two example portfolios, i.e., a 'brown' bond portfolio and a 'green' bond portfolio, which can be of particular interest in the discussion on climate finance and the methodology presented earlier. To construct our example portfolios, we first select bonds with comparable issuance, maturity and investment grade criteria. The difference is that the 'brown' universe comprises bonds not declared as 'green bonds' and are issued by issuers classified as having primary business lines in the manufacturing or supply of oil and gas, or in supporting activities. The green universe on the other hand comprises bonds declared as 'green bonds', i.e., the proceeds from the bonds are earmarked for specific activities deemed eligible green projects. The two universes' selection criteria are listed in the table below:

Bond selection criteria	Brown universe	Green universe
Grade	Investment grade	
Issuance and maturity	Issue date after 1 Jan 2014; duration: < 30 years	
Use of proceeds	not declared 'green' bond	declared 'green' bond
Number of bonds selected	656	596
Total amount outstanding	USD 398 billion	USD 312 billion

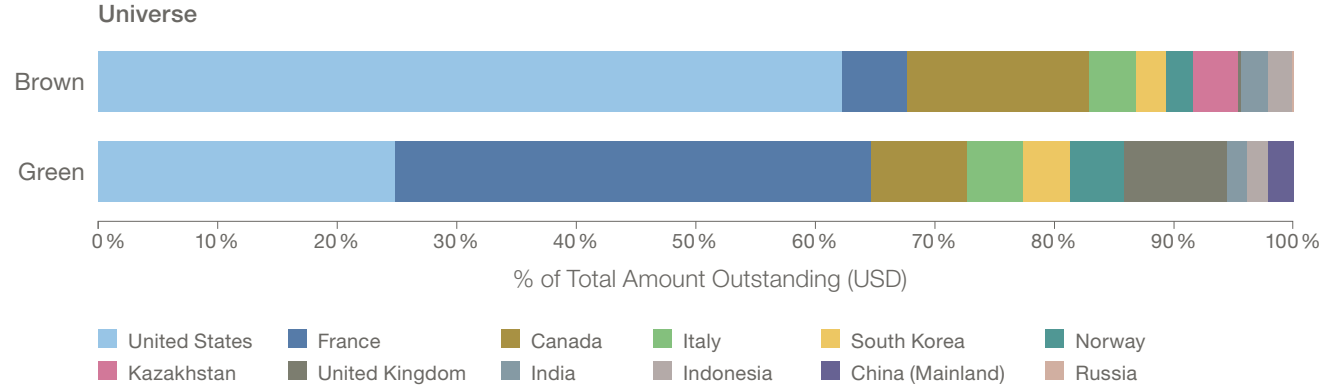
Some descriptive statistics on the two bond universes are provided in the following charts: a breakdown of amounts outstanding (all in USD) of the two bond universes by issuer country (see Figure 9.1); a breakdown by subsectors (see Figures 9.2 and 9.3); and a breakdown by issuer type (see Figure 9.4).

In terms of issuer country, OECD countries and some emerging economies are included. The activities of both the green and the brown universe have been assigned following an extension of the classification of economic sectors known as Climate Policy Relevant Sectors developed in Battiston, et al., 2017 and recently used also in the ECB Financial Stability Review 2019 (European Central Bank, 2019). Such classification is based on the European standard classification of economic sectors, which is also the basis for the EU Taxonomy of Sustainable Finance. The brown universe consists of activities within the gas and oil industry, with extraction, pipeline transportation and manufacturing being the most prominent. The sectors of the green universe pertain diverse activities with generation of electricity, transportation and buildings as the most prominent.

Information on the issuer's sector has been combined with information on the use of the proceeds from green bonds. The brown universe includes almost only corporate issuers, while the green universe's issuer type is more diverse, including about 40% of bonds issued by governments, agencies or municipalities. For this reason, the two universes can be expected to present differences in terms of credit risk.

To provide some insights into the hypothetical portfolios' performances, for each of the two universes, we construct a synthetic dynamic portfolio in which the allocation in each bond is proportional to the amount outstanding (all in USD) across the bonds that are active on that day and for which price data is

Figure 9.1 Breakdown of Amounts Outstanding by Issuer Country



available. We compute the total daily value of the portfolio based on the daily prices of bonds in the portfolio. We then compute the annual return from holding the same portfolio for one year. This computation only focuses on price shocks, so we do not consider yield from coupons. As shown in Figure 9.5 (top and centre panel), the two portfolios have comparable average annual returns, but the distribution is more broad for the brown bond portfolio.

Furthermore, as discussed in the previous section, we consider the scenario of an economy's disorderly transition to becoming a low-carbon economy in which the sectors involved in the fossil fuel value chain are expected to shrink in terms of market share. This adversely impacts issuers' profitability, thereby increasing their default probability. The ultimate effect, everything else remaining the same, is a decrease in bond price. The estimation of the effect's magnitude involves several steps, and it is specific to countries and sectors. Being a forward-looking estimate, it also bears a level of uncertainty. In this report, our goal is to illustrate the effect of climate transition risks on the portfolio. Figure 9.5 (bottom panel) shows the impact on the distribution of annual returns from the brown bond portfolio under the scenario of a disorderly transition to a 2 °C climate policy trajectory. While the magnitude of the shift in the distribution of annual returns depends on the specific scenario considered, the shift's negative sign is common to all disorderly transition scenarios based on available information on future country-specific energy trajectories.

Figure 9.2 Breakdown of Amounts Outstanding in Brown Universe by Subsector

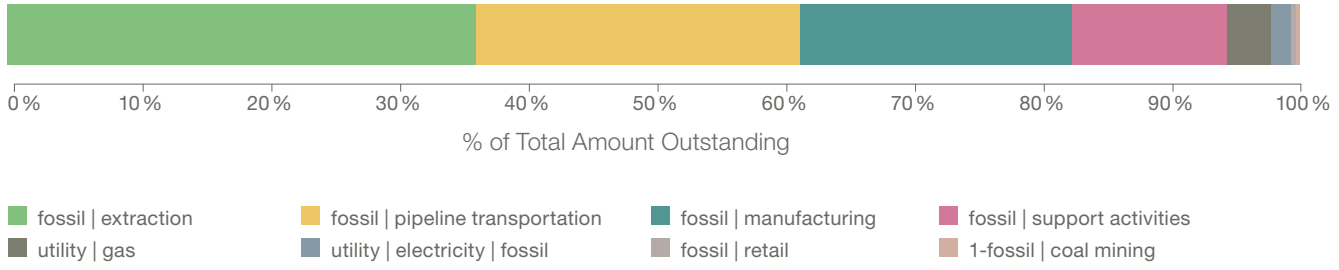


Figure 9.3 Breakdown of Amounts Outstanding in Green Universe by Subsector

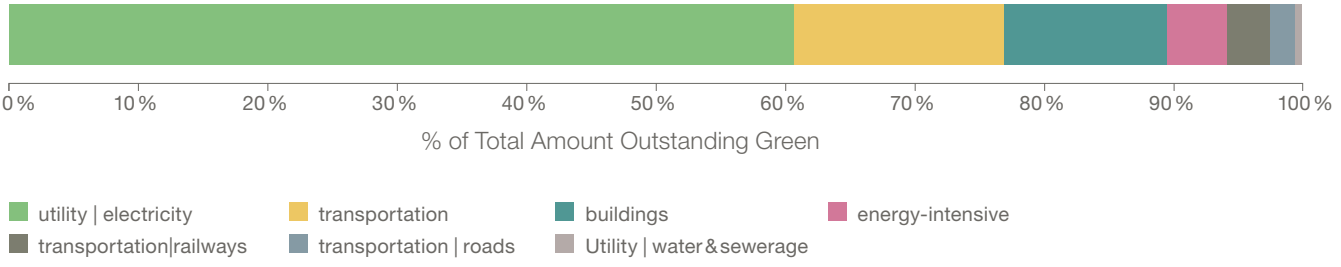
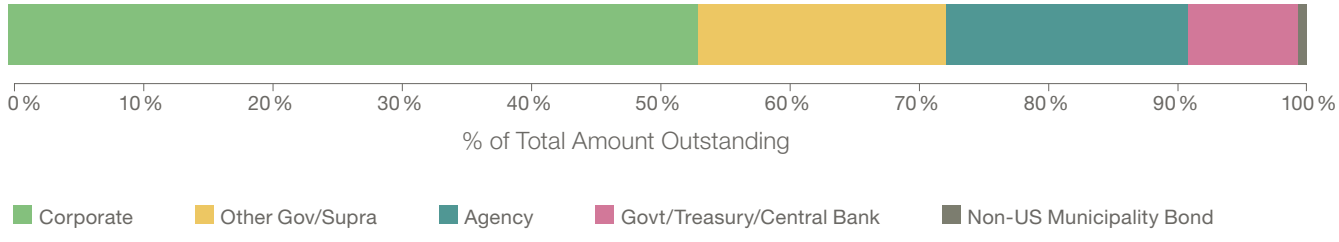
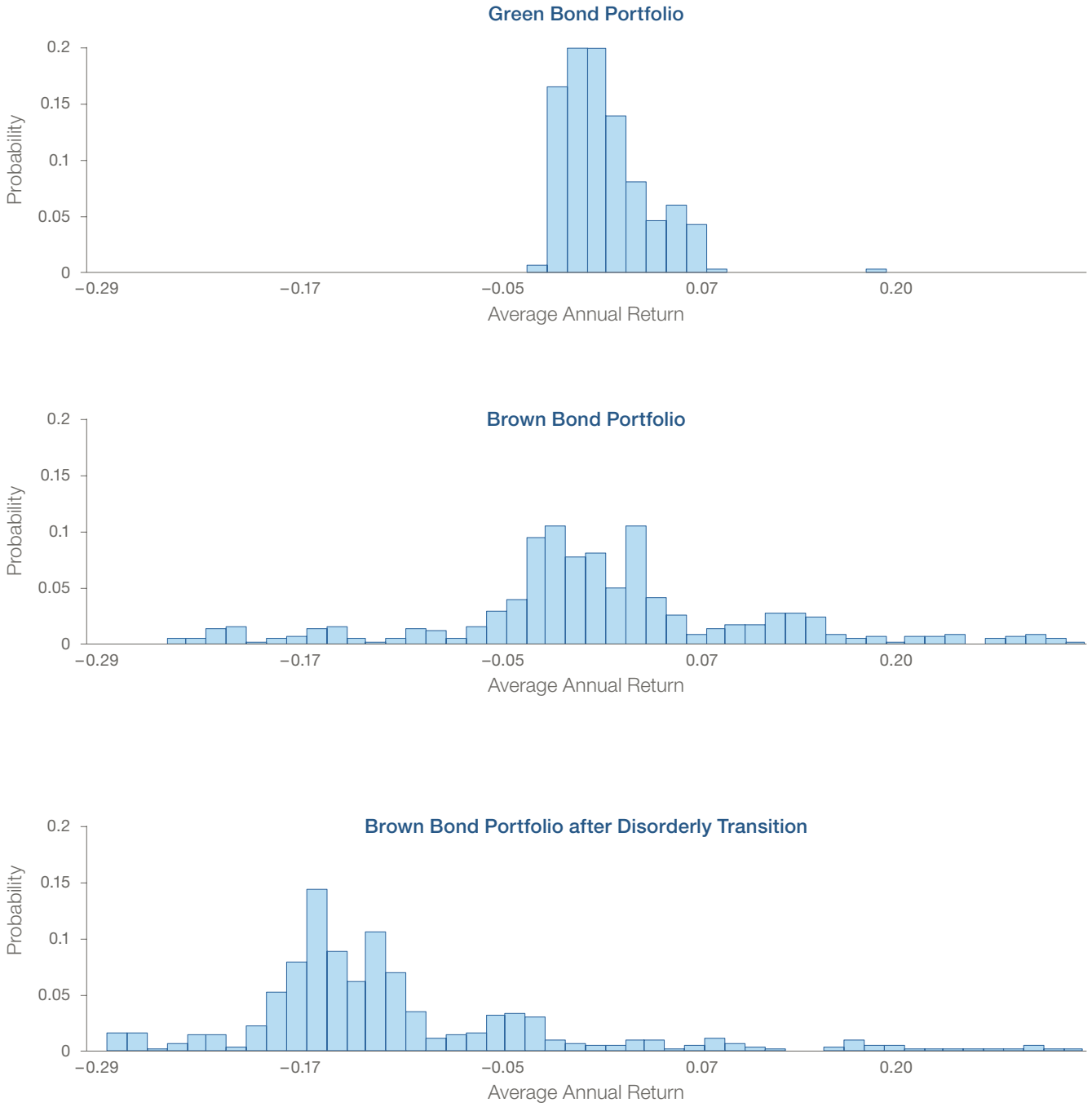


Figure 9.4 Breakdown of Amounts Outstanding in Green Universe by Issuer Type



Overall, this case study aims to illustrate how climate-transition risk can be estimated using case studies of real-world portfolios of securities, including equity and bonds. It exemplifies how a hypothetical brown bond portfolio is impacted adversely by a disorderly transition to a low-carbon economy. In a disorderly transition scenario, everything else remaining the same, the impact on the brown portfolio is much more severe than on the green portfolio.

Figure 9.5 Distribution of Annual Returns from the Brown and Green Portfolios



IV. BlueOrchard Private Investor Survey

Many publications on climate finance have focussed on the rationale for public funders to adopt climate finance; exploring their motives, funding allocations, sectoral focuses and targeted impact objectives, among others. However, available research on private investors' primary objectives is still limited, even though understanding their motivations is pivotal to unlocking private capital and reaching the Paris Agreement targets.

Therefore, we conducted a survey among BlueOrchard's private investors, exploring their views, objectives and limitations related to climate-related risks and opportunities.

The survey was carried out in the second and third quarters of 2019 on a diverse sample of BlueOrchard's private investors from Asia, Australia and Europe. In terms of volume of assets under management (AuM), the survey respondents represented a wide spectrum, from below USD 100 million to USD 500 billion[3]. As shown in Figure 10, among the survey participants, asset managers comprised the largest group (25%), followed by asset managers of fund of funds (17%), private banks (17%), family offices (17%), pension funds (16%), and foundations (8%).

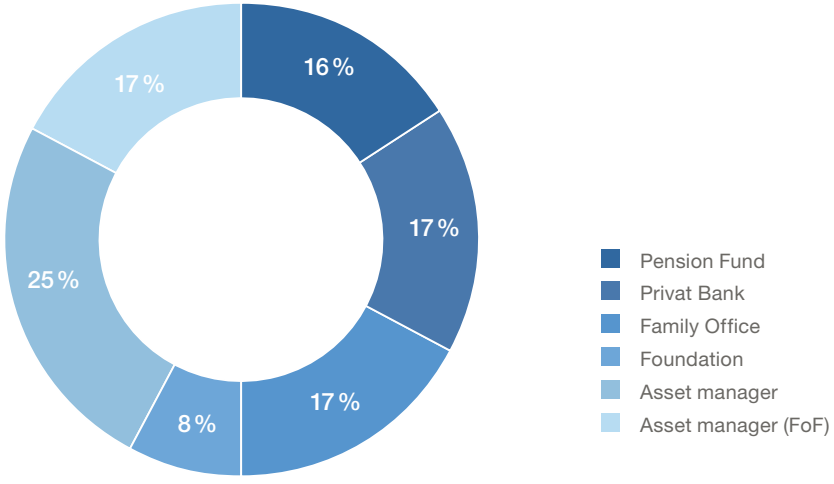
The survey designed jointly with the FINEXUS Center for Financial Networks and Sustainability at the University of Zurich focused on four main topics: 1) climate risk assessment; 2) climate risk disclosure; 3) investment barriers; and 4) climate risk actions.

Climate Risk Assessment

In terms of climate risk assessment, the survey participants were asked to quantify how important climate risk is in their portfolios, and 58% indicated that it is seen as either a high or very high risk. Only 8% stated that they consider it a small risk. This is consistent with the results of the World Economic Forum's Global Risks Perception Survey 2018–2019, in which climate-related risks issues were ranked at the top, both in terms of probability and impact (World Economic Forum, 2019).

Despite acknowledging the high financial risks that climate change poses, around 42% of the survey respondents reported that they did not have a climate risk management policy in place. When asked about their plans to implement one in the near future, only around 8% had concrete plans in this regard over the next 12 months (see Figure 11).

Figure 10: Type of Investors



[3] The survey is to be regarded as a qualitative assessment as the sample is not statistically representative.

Furthermore, the survey tried to shed light on factors that limit a thorough assessment of climate risks. The most important setback was lack of relevant and standardised data, as perceived by 64% of respondents. The perception that measuring climate risks is costly also ranked high, with 36% emphasising this as a limiting factor, even though costs of not measuring climate risks could be a lot higher (see Chapters II and III). Finally, almost a third of participants cited lack of internal knowledge, showing that more education for climate-related risks is necessary (see Figure 12).

Participants in the survey that do measure climate-related risks were asked about the resources they use (see Figure 13). The majority have used a third party company, either to start the measurement process or to develop a specific tool to be used by an internal team.

Climate Risk Disclosure

Regarding climate risk disclosure in public available reports, most respondents (63%) indicated that they do not yet disclose it, although 9% stated that this will be in place in the next 12 months (see Figure 14). Figure 14 also shows how climate-related risk disclosure is a relatively new practice in the market, as none of the respondents have been disclosing these risks for more than 5 years.

Investment Barriers

An important aspect of the survey was to identify barriers to investing more in climate finance. The respondents cited i) government policies and incentives' inconsistency (e.g., subsidies); ii) the risk perceived in sectors such as renewable energy and energy efficiency, given companies' limited track records in these sectors; iii) the perception of lower-return opportunities; and iv) the long term horizon usually required (see Figure 15) as main barriers. As many as 80% of survey participants indicated that they consider blended finance structures as a suitable instrument to overcome these barriers.

Figure 11: Climate Risk Management Policies

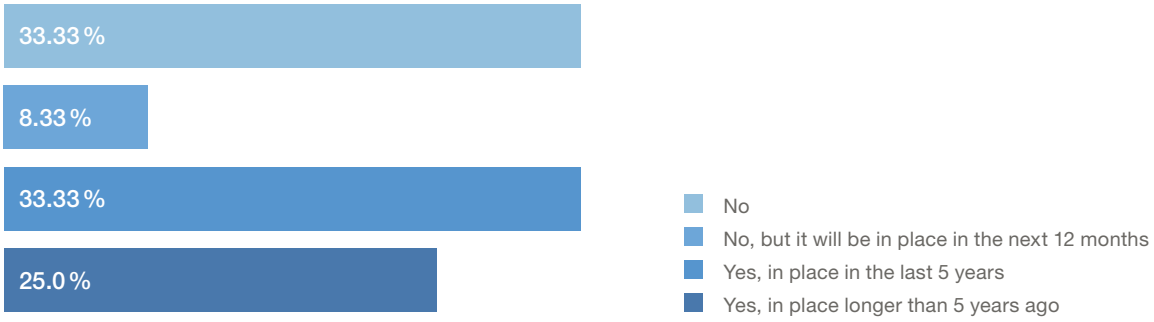
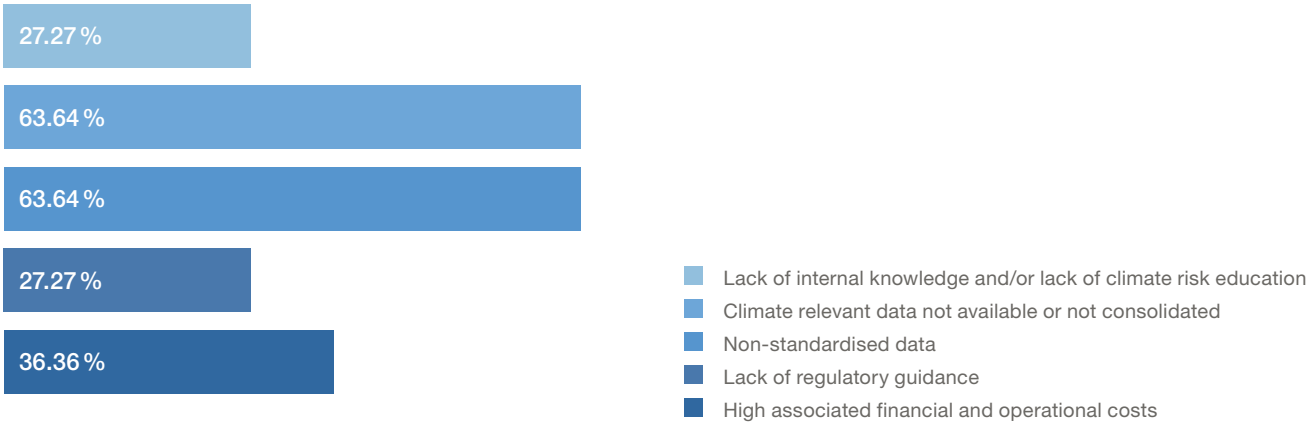


Figure 12: Factors Limiting Assessment of Climate Risks[4]



[4] This question was open to multiple answers. Total therefore exceeds 100%

Figure 13: Measurement of Climate-Related Risks

Figure 14: Disclosure of Climate-Related Risk Exposure

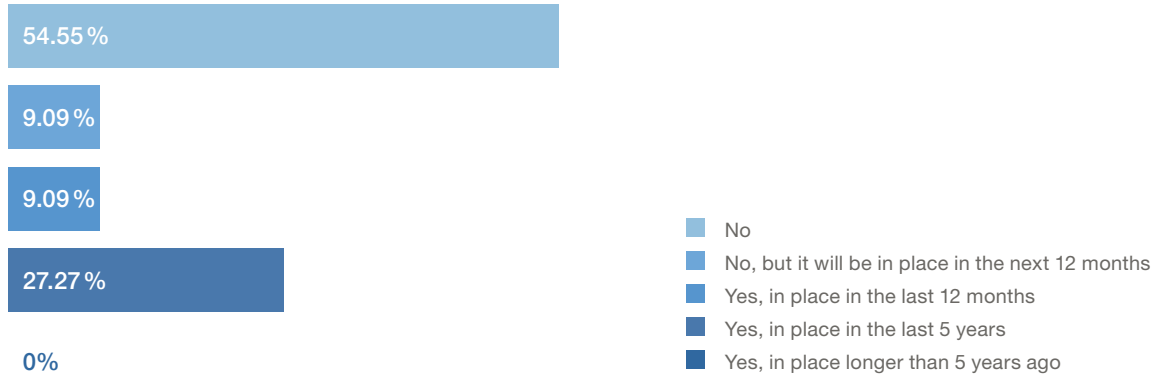
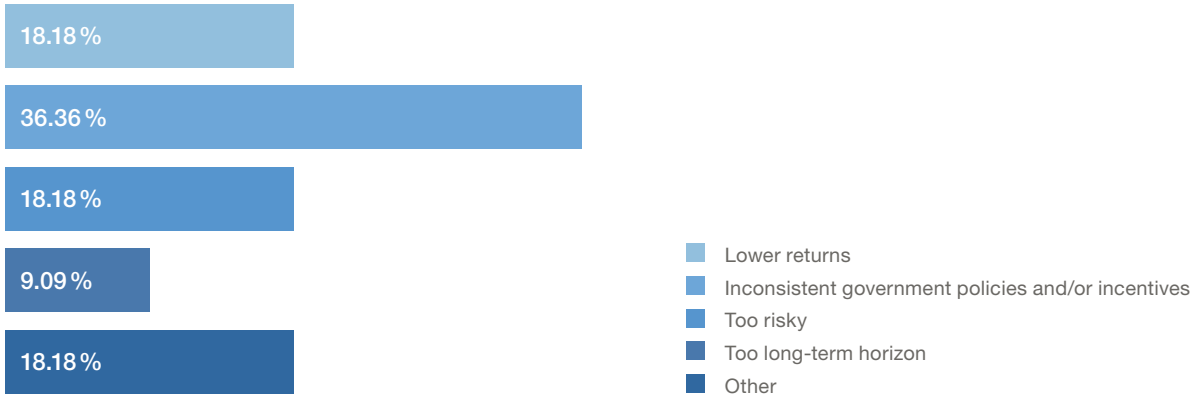


Figure 15: Barriers to Investments into Low-Carbon Industries



Climate Risk Action

This section of the survey focussed on assessing how investors have incorporated climate-related risks into their asset-allocation strategies and their demand for climate finance.

In terms of asset-allocation strategies and policies, more than 41% stated that their carbon footprints were not yet taken into consideration in their decision-making processes. However, 8% had plans to include their carbon footprint as one of the variables in the next 12 months, and 25% had done so in the past 12 months, clearly indicating a positive trend (see Figure 16).

When asked whether climate change could also be an opportunity for investors (e.g., to improve their competitive position, access new markets, diversify portfolio activities, etc.), all respondents answered 'yes'. This is a clear indication of the positive interest of the private sector in climate finance. However, as of yet this has not necessarily translated into their business strategies (see Figure 17). When asked whether investors had a specific allocation for climate finance products by the end of 2019 a significant number, more than 70%, replied with 'no'. However, some investors are planning to increase their climate finance allocation in the next 5 years, with 36% committing between 10% and 30% of their AuM to climate finance products (see Figure 18).

Figure 16: Consideration of Carbon Footprint in Asset Allocation

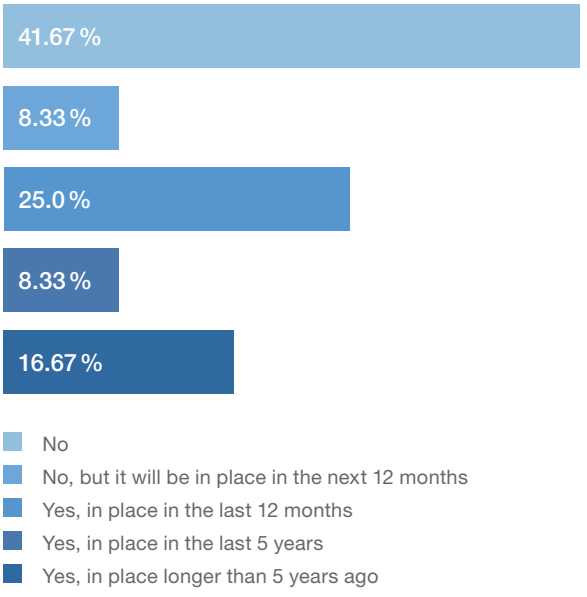


Figure 17: Earmarked Allocation to Climate Finance Products (in % of AuM) by End of 2019

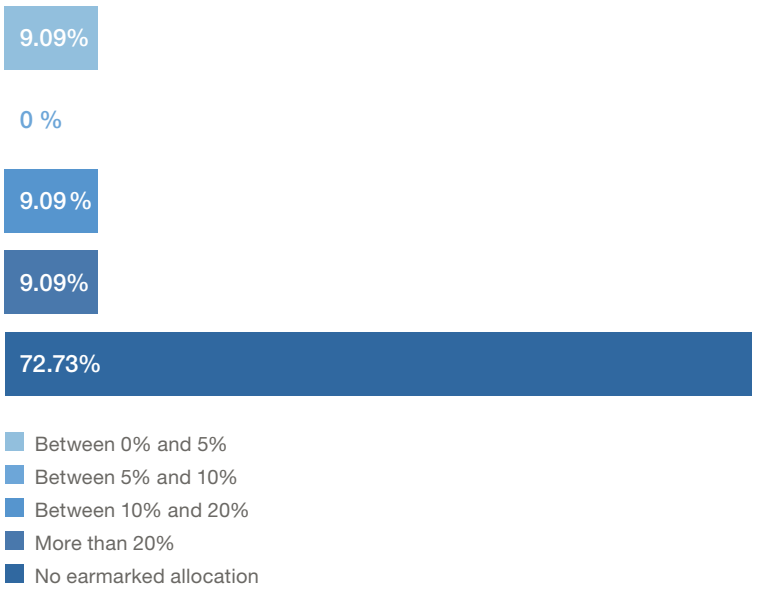
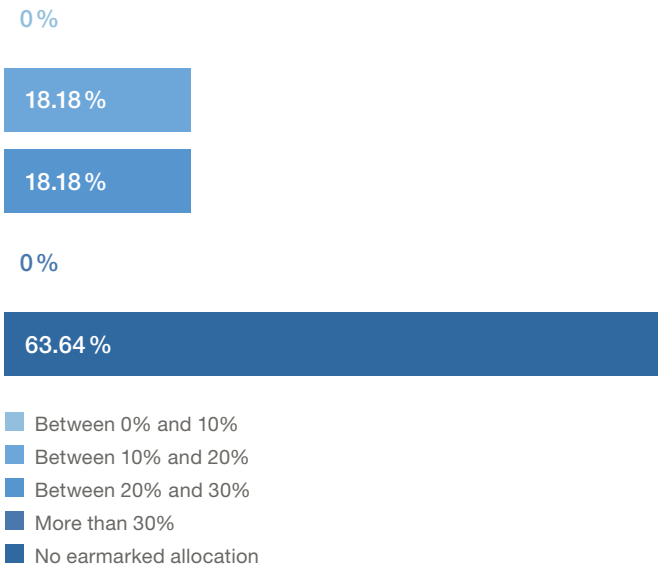


Figure 18: Earmarked Allocation to Climate Finance Products (in % of AuM) for the Next 5 Years



Dr. Barbara Buchner

Executive Director at the Climate Policy Initiative

CLIMATE POLICY INITIATIVE

The Climate Policy Initiative (CPI) is an analysis and advisory organization with the mission to help governments, businesses and financial institutions drive economic growth while addressing climate change.

Barbara, what are the main limitations for the private financial sector to scale up climate finance?

"Finance actors have different needs and barriers depending on their specific risk and return expectations. In clean energy, for example, large institutional investors are concerned with the lack of liquidity and limited scale of many clean energy investments, as well as risks from volatile currencies, off-takers that lack credit-worthiness, and political uncertainties, such as lack of regulatory environment and longer-term policy signals. However, there are also innovative solutions to overcome these barriers, such as those developed within the Global Innovation Lab for Climate Finance.

Some investors believe that investing in climate finance means sacrificing financial returns. Does evidence back this?

"The evidence shows the opposite. In fact, with so many assets at risk because of climate change and the resulting shifts in weather patterns, many investors are more concerned with finding green and resilient assets that can bring long-term and stable returns. With this comes a unique business opportunity for private investors to invest in a way that is both financially attractive and beneficial to the environment. By using a combination of public and philanthropic concessional funding to leverage multiples of private investments, blended finance seeks to deliver both attractive returns to private investors and social and environmental impact to the public."

Findings

Overall, the survey's results indicate that private investors are still at an early stage of incorporating climate-related risk assessments and that they need several resources to step up their involvement in climate finance. The survey's findings show:

Climate change has been acknowledged as an important financial risk, but **a significant number of survey participants still lack a climate-related risk policy** and have not incorporated climate-related risks into their asset-allocation strategies. This indicates that there is a lack of understanding of climate-related risks and opportunities.

Lack of guidance and absence of reliable data is an important limitation for a better assessment of climate-related risks. As discussed in previous chapters, initiatives toward standardised measures, like the guidelines provided by the TCFD, are a step forward to overcome this. But the application of TCFD recommendations requires an institution's commitment to change governance processes and risk policies and procedures. This can take time and effort, which makes it important to start this process as soon as possible..

There is **need for internal education** in order to better assess climate-related risks. Successful change in practices, policies and procedures comes with a good understanding of its rationale and objectives. Education of shareholders, directors and management is crucial. This will also help investors and asset managers with an early identification of the opportunities that shifting to a new low-carbon economy can bring.

There is a **perception that climate finance is not properly compensated** and yields lower market returns. However that assumption is not supported by empirical evidence. Moreover, as climate-related risks will be more apparent in the future, historic investment performance data may not be valuable for predicting the future performance. As seen in Chapter III, a disorderly transition to a low-carbon economy can impact a brown bond portfolio more severely than a green portfolio, with the premise of everything else being the same.

In less developed countries, where increasing climate finance is urgent, addressing market barriers is crucial to step up private climate finance. When assessing what currently limits additional private investments, it becomes apparent that **most of the market barriers that investors mentioned (too much risk, long-term nature of investment) could be addressed through blended finance products.** Commercial investors can benefit from these products' features, and they appear to be ready to invest or increase their current investments as long as the blended finance offering is structured in an 'environmentally friendly manner'.

Anne Charlotte Hormgard
Senior Manager Sustainability, AP3, Third Swedish National Pension Fund

AP3

AP3 –The third Swedish National Pension Fund is a leader in sustainable and green investments, having recently achieved its goal of halving CO_2 emissions in its public equity and debt portfolios compared with 2014. Since its inception in 2001, AP3 has been working with sustainability issues through investment strategies and participation in environmental, climate and corporate stewardship collaborations and initiatives.

Anne-Charlotte, AP3 has achieved all of its 2018 goals including tripling its green bonds holdings and doubling its strategic sustainability investments. What are the AP3's next steps?

"AP3 is including more robust targets for its 2025 plan, but there will be challenges going forward in how we measure such impacts, i.e. climate risk based on publicly available information. The key building block to continue advancing our sustainability agenda is a continued commitment and involvement of the entire organization, a more rigorous measurement and standardization process, taking an active approach to influencing investees to adapt respective operating systems and to take on more alternative investments which help reduce the overall portfolio's carbon footprint further."

V. Conclusion

Climate-related risks cannot be ignored anymore – otherwise, we face devastating consequences on humanity, the environment and the world economy with the poorest and most vulnerable populations affected the most. A transition to a new low carbon economy is imminent. How (which policies) and in what way (orderly or disorderly) this transition occurs will carry different implications for the financial system and the economy overall. Asset managers have the mandate to maintain certain levels of profitability, minimise impaired assets and comply with regulatory requirements. If climate risks are not taken into consideration, and losses occur from climate change, managers will have failed to act. In addition, many regulators in developed economies are already requiring that financial actors report their climate risks and climate strategy.

Despite the positive trend in climate finance globally, a significant gap remains in reaching the Paris Agreement targets. The private sector will play an important role in reaching the target. In this paper we have discussed the rationale of private financial actors to start assessing climate change risks and take advantage of their opportunities. The survey is an indication that the private sector still has a long road ahead and could benefit significantly from partnering with the public sector. There are some important steps that need to be taken in order to move forward.

Recommendations

Start measuring. Despite the challenges of identifying and measuring climate-related risks, a good understanding of the institution's exposure is a first step to determining any actions that need to be included in future strategies.

Improve disclosure. Not only of climate risks, but also its opportunities. The comprehensive guidance provided by the TCFD is an important step forward as it provides a standardised framework. In addition, financial regulators are now recognising climate-related risks as a financial risk and are developing metrics for climate-related financial disclosures.

Improve market transparency. False claims of 'green' investments and the perverse incentive to look more 'environmentally friendly' is damaging trust. Efforts like the Taxonomy Technical Report, published by the European Commission, will help improve transparency.

Develop more blended finance products. Overall, the survey's results indicate that private investors face some important market barriers to step up their involvement in climate finance. These investors can benefit from the features that blended finance vehicles provide, which allow them to invest or increase their current investments as long as the blended finance offering is shaped in an 'environmentally friendly manner'. Development banks highlight the power of bringing the private and public sectors together, provided that certain principles are met. These blended finance products become even more relevant in increasing climate finance investments in less developed countries. Climate change-related losses are expected to be higher in regions more vulnerable to climate change effects, which are also many of the world's poorer, less-prepared countries.

Take advantage of the commercial incentives of climate finance. Engaging in climate finance offers business opportunities. The case study in Chapter III exemplified that. Namely, how in a disorderly transition scenario, with all other factors remaining the same, the impact on a hypothetical brown portfolio is much more severe than on a green portfolio.

Reaching the targets of the Paris Agreement requires coordinated action. The financial sector needs to play its part. It is time for intentions to be translated into actions.

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About the Authors

Maria Teresa Zappia, Chief Investment Officer

Maria Teresa has worked in the emerging markets finance sector for over 20 years. She has worked for several development banks and financial institutions (European Bank for Reconstruction and Development (EBRD), Asian Development Bank (ADB), Overseas Development Institute (ODI), and OECD Development Centre) based both in the field (Africa, South East Asia, and Central Asia) and in head-office.

Before joining BlueOrchard, Maria Teresa worked as Senior Banker in the Group for Small Business which was EBRD's microfinance and SME finance team and managed a portfolio of microfinance/SME credit lines with local commercial banks and MFIs across the Balkans, Central Europe and Central Asia.

Maria Teresa joined BlueOrchard in 2008 to manage the investment team. As of 2012 Maria Teresa was appointed Chief Investment Officer and was responsible for the top-down part of the investment process at BlueOrchard together with the Portfolio Management Team. She now leads the Blended Finance Impact Management team and is responsible for the PPP funds under BlueOrchard's management and the company's impact management practice.

Veronika Giusti Keller, Senior Fund Manager PPP Mandates, Acting Impact Manager

Veronika has over 15 years of experience in emerging markets, out of which the last 10 years have been in impact finance. She has held prior positions at BlueOrchard as Head of Risk Management and in the investment origination team, mainly responsible for Central America, Mexico and the Caribbean, with additional involvement in the African, Asian and Eastern European markets. This experience has allowed her to gain relevant expertise in the assessment of both financial and credit risk and social performance indicators in the microfinance industry, and more recently, in the climate insurance industry. Veronika is today part of the Blended Finance Impact Management team where she works on impact management and measurement activities.

Prior to BlueOrchard, Veronika worked with an international credit rating institution in Latin America and at a European bank in the Derivatives Pricing Project Team.

Veronika holds a Bachelor's degree in Economics from Universidad del Pacifico in Peru and a MSc in Economic Development from the University of Glasgow.

Stefano Battiston, SNF Professor of Banking and director of the FINEXUS Center for Financial Networks and Sustainability at the University of Zurich

Stefano is a leading scholar in the field of systemic risk and sustainable finance. He has made advances in the scientific understanding of the relation between financial interconnectedness, complexity and risk. He has also directed a new and growing stream of research on climate-related financial risk.

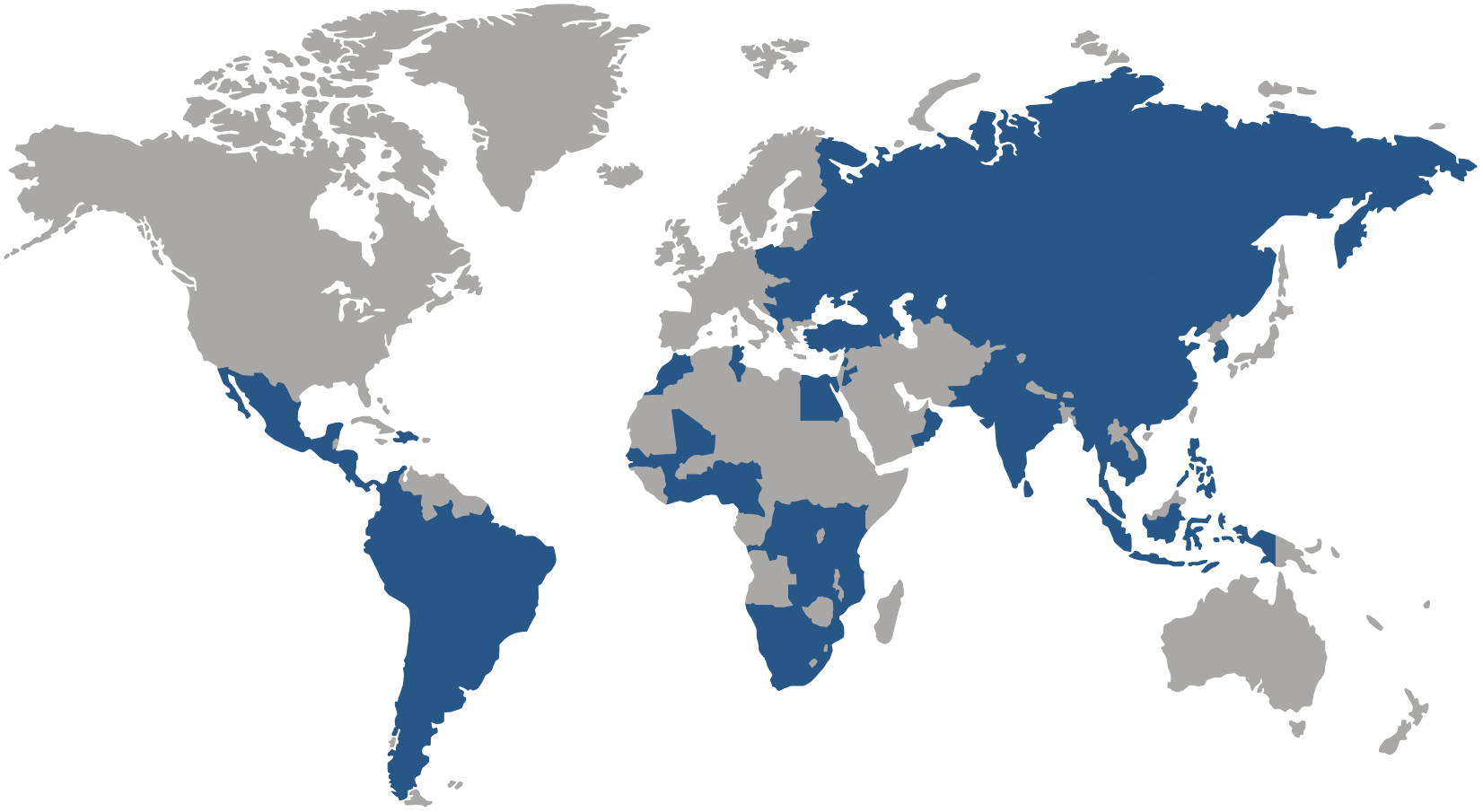
He has co-authored 50+ publications including on top journals such as PNAS, Nature Communications, Nature Climate Change and Management Science. His scientific background in complex systems, combined with 15 years of research in economics and finance, put him in a unique position to understand policy issues both from a quantitative and holistic perspective.

He has also been coordinating several EU and Swiss projects on finance and sustainability. In particular, between 2014 and 2018 he has been the coordinator of the EU Future Emerging Technologies projects SIMPOL and DOLFINS investigating how to improve financial stability and how to better channel finance towards sustainability in a networked economy.

Abbreviations

AuM	Assets under Management
AWS	Automatic Weather Stations
BaU	Business as Usual
BMZ	German Federal Ministry for Economic Cooperation and Development
BOF	Blue Orchard Finance Ltd
CPI	Climate Policy Initiative
ECB	European Central Bank
EIB	European Investment Bank
EU	European Union
FSB	Financial Stability Board
GCPF	Global Climate Partnership Fund
GHG	Greenhouse Gas
IAM	Integrated Assessment Models
IDFC	International Development Finance Club
IIASA	International Institute for Applied Systems Analysis
IIF	InsuResilience Investment Fund
IPCC	Intergovernmental Panel on Climate Change
IRENA	International Renewable Energy Agency
KfW	German Development Bank
LDNF	Land Degradation Neutrality Fund
NAICS	North American Industry Classification System
NGFS	Networks of Central Banks and Supervisors for Greening the Financial System
ODA	Official Development Assistance
OECD	Organisation for Economic Cooperation and Development
PRI	Principles for Responsible Investments
SCF	United Nations Standing Committee on Finance
SDGs	Sustainable Development Goals
SECO	State Secretariat for Economic Affairs
TA	Technical Assistance
TCFD	Task Force on Climate-Related Financial Disclosures
UNCCD	United Nations Convention to Combat Desertification
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
VaR	Value at Risk

Figures



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BlueOrchard Finance Ltd
Seefeldstrasse 233 · 8008 Zurich · Switzerland · T +41 44 441 55 50

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About BlueOrchard Finance Ltd

BlueOrchard *is a leading global impact investment manager. The firm is dedicated to fostering inclusive and climate-smart growth, while providing attractive returns for investors. BlueOrchard was founded in 2001, by initiative of the UN, as the world's first commercial manager of microfinance debt investments. Today, BlueOrchard provides investors around the world with premium investment solutions, including credit, private equity, and sustainable infrastructure. Being an expert in innovative blended finance mandates, the firm is a trusted partner of leading global development finance institutions. With a major global presence and offices on four continents, BlueOrchard has invested to date more than USD 6bn across 80 emerging and frontier markets, enabling tangible social and environmental impact. BlueOrchard is a licensed Swiss asset manager of collective investment schemes authorized by FINMA. Its Luxembourg entity, BlueOrchard Asset Management S.A., is a licensed UCITS management company as well as a licensed alternative investment fund manager (AIFM) authorized by CSSF. For additional information, please visit: www.blueorchard.com.*