Swiss Sustainable Finance

FINANCING THE LOW-CARBON ECONOMY
Instruments, Barriers and Recommendations

A compendium of innovative finance instruments prepared by Swiss Sustainable Finance in cooperation with its network

Cover:

EPFL QUARTIER NORD, THE SWISSTECH CONVENTION CENTER, ECUBLENS, SWITZERLAND, 2008–2014

Situated at the northern entrance to the École polytechnique fédérale de Lausanne (EPFL) campus, the SwissTech Convention Center is a landmark in the Lake Geneva area. With its metallic shell, diamond-shaped tiles and in particular its west façade with 300 square meters of dye-sensitized solar cells, the building is well known for its futuristic technology. The revolutionary solar cells, developed by the Swiss chemist Michael Grätzerl of the EPFL, generate 2000 kilowatt hours of clean electricity annually.
The cover image, *"Le Semainier et son double",* was captured by artists Catherine Bolle and Daniel Schlaepfer using the beautiful array of colours made possible by the original façade. Innovative solar technologies are only one of many solutions needed to reduce greenhouse gas emissions and mitigate climate change. Besides an expansion of clean energy generation, the shift to a low-carbon economy also requires solutions for more energy efficiency, sustainable infrastructure and ultimately more sustainable solutions in all sectors of the economy. This image of solar cells generating intervals of coloured rays of light, reflects the multitude of tools and actors needed to achieve a low-carbon economy and society, and ultimately, a bright future.

PREFACE

ZURICH, NOVEMBER 2020

With the Paris Agreement aiming to limit global warming to well below 2 degrees Celsius, and preferably to 1.5 degrees, the international community has set a clear goal: to avoid a global climate crisis and significantly reduce the risks and impacts of climate change. A growing number of countries have translated this overarching target into the concrete objective of bringing down their emissions to net zero by mid-century. It was the European Union who first announced such a 2050 goal, followed by Switzerland, which aims to halve its emissions by 2030 and achieve net zero by 2050 as well. More recently, China, the world's largest emitter of CO_2, declared its ambition to achieve net zero emissions for the whole country by 2060.

Such emission reductions obviously require massive investments in low-carbon solutions, both public and private. The Intergovernmental Panel on Climate Change (IPCC) estimates in a recent report[1] that average annual investments of USD 3.5 trillion must be mobilised between 2016 and 2050 to transform the world's energy systems and meet the 1.5 degree target. This large figure does not even include the investments needed in other sectors such as agriculture or real estate.

Given the financial sector's intermediary role and its ability to allocate capital and support the real economy, financial players are key for transforming our economies and societies into a system that reduces its greenhouse gas emissions and respects other planetary boundaries as well. Innovative lending, investing and insurance solutions can support companies in adopting and developing low-carbon solutions. Financial flows channelled through such instruments have the capacity to accelerate the uptake of new technologies and steer investments into more efficient solutions. Having said that, financial players can only exploit this potential if the right frameworks for all relevant emitters in the real economy are put into place. This publication therefore also sheds light on Swiss environmental legislation and identifies approaches that have been successful in reaching environmental policy goals. The new CO_2 law signed off by both chambers of the Swiss parliament in autumn 2020 will be a crucial next step on the path to improved frameworks, once put into force, although more action needs to follow suit.

The broad compendium of financial tools and instruments within this report demonstrates that the finance industry already has a long track-record in developing climate finance solutions. Particularly in secondary markets for listed equity investments, there are a number of mature instruments through which investors can address climate change. Although such investments are important pieces of the puzzle, direct finance for new projects and companies can have an even stronger effect. Many of the solutions covered in this report therefore refer to primary investments and ways to raise new funding for promising technology. SSF hopes to encourage a variety of players to make use of and further develop these tools. Yet only if we join forces and apply them at scale, both within Switzerland and beyond, will we generate the volumes needed to enable the required change. USD 3.5 trillion of investments– every year! We must get started today to further promote, develop and utilise these and many other innovative financing solutions.

Jean-Daniel Gerber
President SSF

Sabine Döbeli
CEO SSF

1 Intergovernmental Panel on Climate Change (IPCC) (2019): *IPCC Special Report: Global Warming of 1.5°C.*

CONTENTS

EXECUTIVE SUMMARY

This report showcases a wide array of finance instruments that help channel funding into the solutions necessary for the transition to a low-carbon economy. The publication is the result of a joint effort of Swiss Sustainable Finance (SSF) and its broad and diverse network. Accompanied and guided by a high-level Steering Committee throughout the process, SSF has gathered expertise from practitioners within the Swiss sustainable finance landscape to produce a report with concrete examples of how the financial sector can support the decarbonisation of our society in a variety of ways.

In the introduction (Chapter 1), we provide an overview of the 14 instruments and two additional levers covered in this report, classifying and mapping them within the financial system. The following chapters (Chapters 2–17) then provide detailed insights into the different instruments, describing their underlying mechanisms and applicability, as well as related barriers and opportunities. The instruments range from well-proven approaches for traditional asset classes to innovative structures that are currently in development. The report is complemented by eight specific case studies from the Swiss market. Although the selection of instruments is by no means exhaustive, our report clearly illustrates how diverse the finance toolbox to support the transition to a low-carbon economy has become.

In the conclusion (Chapter 18), we look at the various barriers that need to be addressed in order for market players to scale these instruments and mobilise the full potential of sustainable finance for a low-carbon economy. In addition, the report sheds light on the framework conditions and constraints market players face when deploying low-carbon finance instruments.

The following pages summarise the key take-aways from the 16 content chapters and 8 case studies. SSF is confident that further innovative finance solutions will be developed over the next few years. However, this publication shows that there is already a broad set of tools supporting a low-carbon economy. It will be crucial to incentivise both the real economy and the financial industry to work together towards the same goal. With the right balance, all actors will be better placed to embark on an ambitious, science-based low-carbon path and support each other in achieving global climate goals.

CHAPTER 2

Thematic Equity Funds: Capital Allocation and Engagement as Drivers for a Low-Carbon Economy

— Thematic investment strategies with a focus on the energy transition, targeting areas such as renewable energy or energy efficiency, have seen growing interest in recent years.
— Such strategies can be considered a supplement to private-market impact investing, as they build on a clear intentionality. Participation in IPOs or seasoned new issues of companies that often have a small and medium capitalisation can contribute to reducing their cost of capital and provide a source of R&D investments that helps drive innovation.

CASE STUDY 2.1

Thematic Funds for Sustainable Mobility: Are Electric Vehicles the Silver Bullet?

— Electric vehicles and technological advances are crucial for reaching net zero CO_2 emissions by 2050, but societal behaviour is equally important. Thematic funds investing can play a key role in shifting the necessary capital.

CASE STUDY 2.2

Financing Alternative Mobility Concepts with Public Equity: Electric Buses Replace Diesel

— Public equity markets are increasingly providing expansion capital to finance the transition towards a carbon-neutral economy, for example within the commercial transport industry.

CHAPTER 3

Climate Indices for Listed Equity: Comparing Different Methods to Minimise Climate Risk Exposure

— Based on consistent, reliable and independent ESG-related data, an index-based investment approach can be developed that manages to significantly reduce the CO_2 emission exposure of a portfolio, while not compromising the classical investment rationale.
— Passive benchmark-linked investment solutions like these will be key for re-channelling major asset flows towards greener investment, thus encouraging the paradigm change towards a low-carbon economy.

CHAPTER 4

Instruments for Non-Thematic Listed Equity: Decarbonisation through Climate Engagement

— Climate engagement is a valuable approach to facilitate large-scale and system-wide decarbonisation in the real economy, by conducting an active dialogue with investee companies.
— International collaborative engagement initiatives allow investors to pool assets and strengthen their negotiating power to incentivise the world's biggest carbon emitters to adopt strategies aligned with the low-carbon economy.

CHAPTER 5

Green Bonds: Channelling Proceeds into Green Solutions

— Green bonds are a fixed-income security designed to finance new and existing projects that deliver positive environmental and/or climate benefits.
— With a strong increase in green bond issuance over the past few years, issuers are not only signalling their awareness of environmental risks, but also their willingness to exploit attractive low-carbon opportunities.
— In order to ensure credibility and provide transparency on the use of proceeds, second-party opinions and voluntary standards help to structure the market.

CASE STUDY 5.1

Sustainability Bonds: Financing Environmental and Social Outcomes

— As opposed to green bonds, sustainability bonds not only direct investments into environmental outcomes, but also address social issues, as the example of the Raiffeisen Switzerland sustainability bond shows.

CHAPTER 6

Sustainable Real Estate: Green Buildings from an Investor Perspective

— Empirical evidence shows that green buildings can generate premiums, hence investors should analyse green building projects from a value perspective and not only from a cost perspective.
— Greater transparency in labelling methodology would improve comparability and encourage investors to commit to sustainable real estate, as well as help the industry benefit from existing standards.

CASE STUDY 6.1

Green Real Estate Funds: Providing a Future-Fit Portfolio while Reducing Carbon Emissions

— This case study highlights the key elements of a sustainable real estate investment strategy, which includes an in-depth energy analysis of real estate properties, provides a multi-year building upgrade programme and explores the potential of each property within a portfolio to lower its carbon footprint, while increasing rental levels and the value of real estate assets.

CHAPTER 7

Energy Efficient Mortgages: Supporting Energy Efficiency and Sustainability in Real Estate

— Due to the enormous scope for Switzerland to achieve energy savings through upgrading existing properties, the market for services supporting property modernisation has great potential, while current instruments, such as interest-rate reductions on mortgages (e.g. "eco" mortgages) only have limited effects.
— The approach of a long-term use and renewal strategy for properties is one way of increasing the renovation rate. This allows for optimal financial planning and appropriate actions to be taken.

CHAPTER 8

Direct Investments in Non-Listed Companies and Projects: The Entrepreneurial Approach to Supporting the Low-Carbon Economy

— Private equity investment managers typically have a strong influence over how assets are developed and managed.
— This is particularly true for direct investments, where an active ownership model provides opportunities to work closely with portfolio assets to implement low-carbon initiatives for clean energy and energy efficiency.

CASE STUDY 8.1

Financing of Infrastructure Investments: The Example of Heizwerk Gotthard AG

— Clean energy infrastructure funds can make a valuable contribution to sustainable energy production in Switzerland by providing long-term equity capital to private and public companies.
— Companies use this capital for the construction, operation or renovation of sustainable infrastructure facilities and energy utilities.

CHAPTER 9

Venture Capital Investments: The Role of Early-Stage Capital for Low-Carbon Solutions

— Start-ups play a vital role in developing and testing innovative solutions for reducing the resource- and carbon-intensity of today's economy, and early-stage capital is an important catalyst for such businesses.
— As direct investments in early-stage ventures are linked to high risks, bundling such companies into funds makes this asset class investable for institutional asset owners and can channel further capital into low-carbon start-ups.

CASE STUDY 9.1

Virtual Power Plants: Delivering Flexible Renewable Energy to the Grid

— The significant increase of renewable energy sources in the global energy mix, coupled with information technologies, is disrupting the energy value chain and bringing about investment opportunities in clean-tech start-ups and smart utility business models.
— One such model is a Virtual Power Plant (VPP), which harnesses the power of information technology to virtually aggregate a diverse set of distributed renewable energy assets into a platform, operating them as a unified resource.

CHAPTER 10

Insurance Solutions: Energy Savings Insurance Removing Barriers to Energy Efficiency Projects

— High upfront costs, perceived risks and lack of access to finance often hinder investments in energy efficiency, especially among SMEs.
— In order to increase investments in energy efficiency, the Energy Savings Insurance (ESI) model has been developed to reduce the risks, by offering a policy to cover clients in case the energy savings guaranteed by the technology provider are not delivered.
— The model has been developed in Latin America and is currently under implementation in Europe.

CHAPTER 11

Energy Performance Contracting: Scaling Energy Efficiency Investments through Tested Financing Models

— Energy efficiency investments face unique barriers, such as high up-front costs, long pay-back periods and small scale of individual investments, all of which contribute to the investment gap needed to reach the climate goals set in the Paris Agreement.
— Energy Performance Contracting (EPC) carries the potential to address some of these financing barriers by aggregating investments into portfolios to achieve the required scale.
— Receivables from EPCs are sometimes sold to institutional investors who appreciate their alignment with their long-term liabilities.

CHAPTER 12

Community Finance: Renewable Energy Cooperatives

— Community finance can provide funding for renewable energy projects and allow small-scale retail investors to invest in renewable energy.
— The number of such projects is expected to further increase while prices of renewables are expected to further decline, which will support the creation of a profitable investment environment.
— Besides financial benefits, community energy projects increase electricity-customer engagement with renewables, customer satisfaction and loyalty, and community well-being.

CASE STUDY 12.1

A Promising Investment Model for a City to Foster Solar Power: The Experience of Lausanne City Council

— This case study shows how the city of Lausanne set up a company to successfully implement and invest in rent-a-roof models to develop solar photovoltaics.
— This leasing model can deliver attractive returns for the investor company and allows building owners to install PV and benefit from renewable energy without high upfront costs.

CHAPTER 13

Fundamentals of Carbon Credit Markets: Opportunities, Barriers and Enablers

— With companies stepping up their efforts to mitigate their carbon-intensive activities and set science-based emission reduction goals, global carbon markets are likely to provide a natural bedrock for policy development and financial innovation, especially in light of the recovery from the COVID-19 pandemic.
— As a result, financial institutions are increasingly applying carbon pricing scenarios in their disclosure of climate-related risks and opportunities in a variety of sectors, from banking to insurance underwriting and asset management.

CASE STUDY 13.1

Challenges and Opportunities for Timber Buildings in the Swiss Real Estate Market: The Role of Carbon Credits

— Timber buildings can potentially generate additional cashflows from carbon credits, which can increase the attractiveness of timber real estate investments compared to traditional building materials, such as concrete and steel.
— This attractiveness is however highly dependent on the assumed carbon credit price and developments on the regulatory level.

CHAPTER 14

Blended Finance: Building on Partnerships for Effective Climate Finance

— Blended finance is the concept of using capital from public or philanthropic sources to de-risk transactions, which helps mobilise private capital into investments aiming to achieve targeted impacts.
— Traditionally employed in development finance, blended finance has proven to work well in climate finance, especially for renewable energy and climate mitigation projects, due to its robust track record, linked project cash flows and government support.

CHAPTER 15

Green State Investment Bank: An Effective Climate Policy Tool

— Research has shown that public banks, such as state investment banks (SIB) with a clear mandate, can be an effective tool to mobilise private investment.
— SIBs typically have three key roles: de-risking projects or providing direct investment capital, contributing crucial knowledge through specialised risk assessment and due diligence teams, and providing signals to the market.
— There are multiple examples of SIBs with a green mandate across the world. Switzerland could build on these experiences and leverage domestic finance skill sets to develop a Swiss SIB model for climate investments.

CHAPTER 16

Transformation Capital: A Systemic Investment Logic

— Climate change is a systemic problem. To address it, the IPCC calls for the transformation of the socio-technical systems that constitute modern civilisation.
— The axioms, paradigms and structures of today's capital markets mean that traditional investment approaches are ill-suited to drive this type of change.
— This chapter describes a systemic investment logic at the intersection of systems thinking and finance practice. Its hallmarks include new notions of value, a strategic blending paradigm, the deliberate engagement of tipping points and alignment with levers of change controlled by other actors in society, such as policymakers and philanthropists.

CHAPTER 17

Swiss Environmental Legislation: A Brief History and Analysis of Effectiveness

— Building on the polluter pays principle (PPP), Switzerland has in the past introduced a number of legislative measures that use market signals to achieve the desired environmental outcomes. However, the implementation of effective environmental market-based instruments continues to be challenging and new tax incentives often fail to obtain political majorities.
— Substantial improvements are expected with the revision of the Swiss CO_2 Act, which aims to halve GHG emissions by 2030 compared to 1990 levels. Nevertheless, in order to achieve the Swiss net-zero goal by 2050 further legislative action will still be necessary.

1 INTRODUCTION

Since the phrase was coined in 2003 in a white paper for the British government[1], the idea of a "low-carbon economy" – and how to achieve one – has been receiving more and more attention, both in business and politics. Today, the effects of human activity on climate change are well-proven and a global framework to limit the most severe consequences is in place, making the need to transform our economy into a system that is aligned with a sustainable and prosperous future for humanity and the planet more pressing than ever. This publication therefore comes at an opportune time. With the aim of accelerating the required transformation, it outlines finance solutions that can help us reach a low-carbon economy and identifies barriers we need to overcome to get there.

Having signed the Paris Agreement in 2015, Switzerland, together with a total of 189 other countries, committed to play its part in preventing global temperature increases of more than 2 degrees Celsius above pre-industrial levels. To reach this goal, efforts must be made to foster low-carbon technology through the right political frameworks for all sectors, enhance capacity-building on all levels and – last but not least – steer financial flows into segments of the economy that are part of the solution. This transition obviously presents great challenges, given the significant amount of public and private capital required to transform a global economy still very dependent on fossil fuels.

In an attempt to spur change in the real economy, financial markets are increasingly recognised as an important partner for business and governments in Switzerland and around the world. The diverse array of financial players across the entire investment chain and hence all financial flows, will have to mobilise the tools at their disposal. Table 1 provides an overview of all financial instruments covered in this report and classifies them by the type of financial activity, involved players and maturity within the Swiss market. In Figure 1, these instruments are mapped within the financial system. In the process of redirecting financial flows, the responsibility not only lies with banks and asset managers, but also investors, service providers, governments and corporations in the real economy. Many of these actors have already taken steps to support the transition, but much more is still needed. Connecting the right people, capital and ideas to scale up solutions will be imperative for moving forward at the required pace.

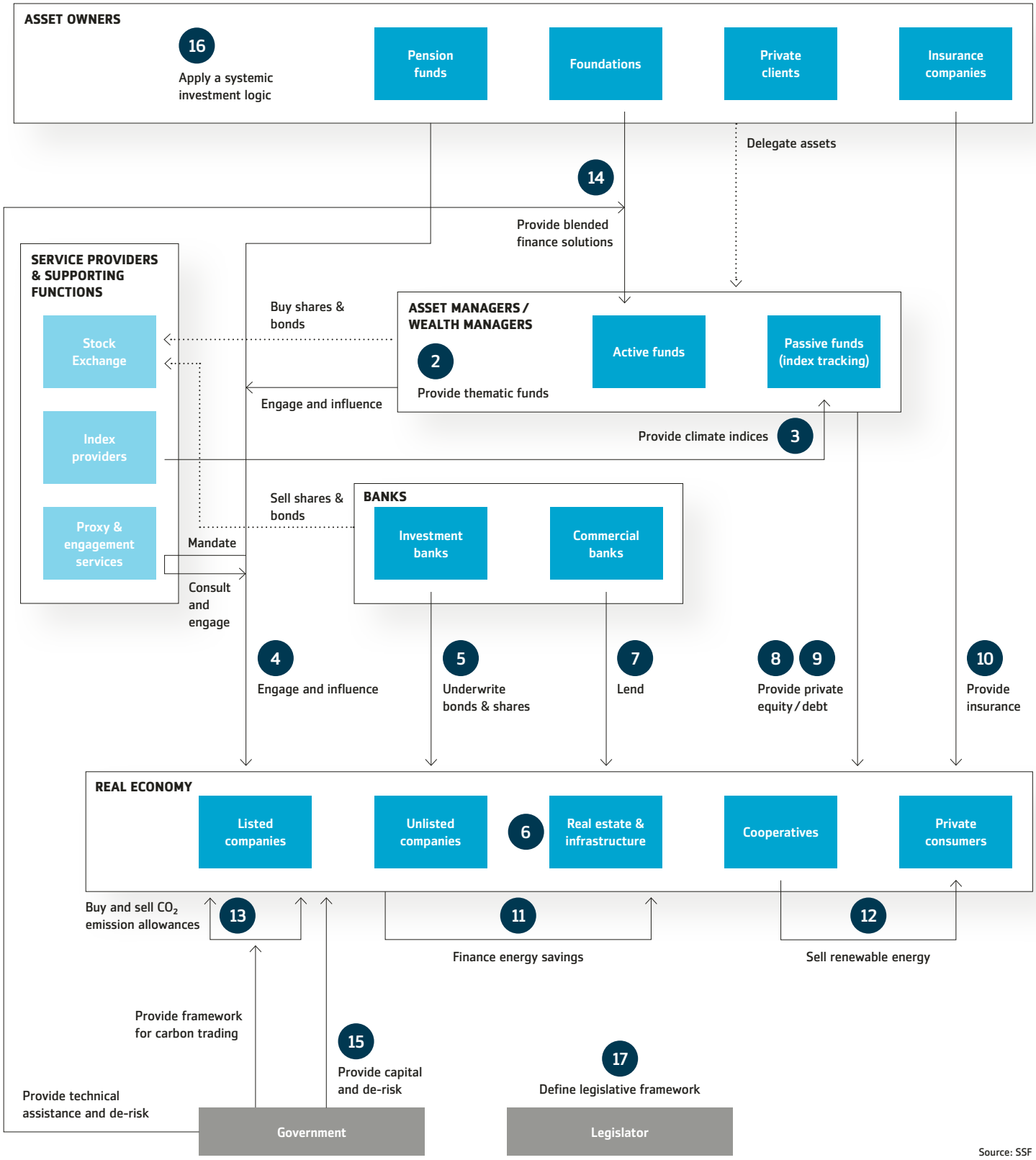
In particular, more and more investors are looking for ways in which they can contribute to and invest in low-carbon solutions, not least because such low-carbon investments offer attractive investment opportunities with competitive risk-return profiles. So far the discussion has mainly revolved around financial flows into liquid investments traded on secondary markets. However, financial flows go well beyond public-market instruments. They encompass private-market investments, credits, corporate finance,

Table 1:
OVERVIEW ON FINANCING INSTRUMENTS
CATEGORISATION BY FINANCIAL ACTIVITY, RELEVANCE FOR DIFFERENT PLAYERS AND MATURITY IN SWISS MARKET

CHAPTER	INSTRUMENT/STRUCTURE	FINANCIAL ACTIVITY	INVOLVED PLAYERS	Maturity of instrument in Swiss market*
2	**THEMATIC EQUITY FUNDS**	Investment	Supply: Asset managers Demand: Institutional and private investors	● ● ●
3	**NON-THEMATIC LISTED EQUITY AND BOND INDICES**	Investment	Supply: Index providers, stock exchanges, asset managers Demand: Institutional and private investors	● ● ●
4	**ENGAGEMENT FOR NON-THEMATIC LISTED EQUITIES AND BONDS**	Investment	Supply: Proxy and engagement service providers, asset managers Demand: Asset and wealth managers and Institutional investors	● ● ●
5	**GREEN BONDS**	Capital markets/ Investment	Supply: Investment banks and issuers (corporates, sovereigns) Demand: Institutional and private investors	● ● ○
6	**SUSTAINABLE REAL ESTATE INVESTMENTS**	Investment	Supply: Asset managers Demand: Institutional and private investors	● ● ●
7	**ENERGY EFFICIENCY MORTGAGES**	Lending	Supply: Banks Demand: Private clients	● ○ ○
8	**DIRECT INVESTMENTS IN NON-LISTED COMPANIES AND PROJECTS**	Investment	Supply: Asset managers Demand: Institutional investors	● ● ○
9	**VENTURE CAPITAL INVESTMENTS**	Investment	Supply: Asset managers Demand: Institutional investors	● ● ○
10	**INSURANCES FOR ENERGY EFFICIENCY AND RENEWABLE ENERGY**	Insurance	Supply: Insurance companies Demand: Corporates (SMEs)	● ○ ○
11	**ENERGY PERFORMANCE CONTRACTING (EPC)**	Other instrument/ structure	Supply: Corporates (ESCOs) Demand: Corporates	● ○ ○
12	**COMMUNITY FINANCE: RENEWABLE ENERGY COOPERATIVES**	Other instrument/ structure	Supply: Cooperative Demand: Retail energy clients	● ○ ○
13	**CARBON CREDIT MARKETS**	Other instrument/ structure	Supply: Government and stock exchanges Demand: Corporates	● ● ○
14	**BLENDED FINANCE**	Investment	Supply: Asset managers, multilateral development banks, corporates, donors, NGOs Demand: Institutional and private investors	● ● ○
15	**GREEN STATE INVESTMENT BANK**	Other instrument/ structure	Supply: Government Demand: Corporates	● ○ ○
16	**TRANSFORMATION CAPITAL**	Other instrument/ structure	All financial players	N.A
17	**ENVIRONMENTAL POLICY**	None	Government and legislator	N.A

*Existing level of expertise and uptake in market on a scale of 1–3. 1: low maturity 2: medium maturity 3: high maturity

Figure 1:
MAPPING OF INSTRUMENTS WITHIN THE FINANCIAL SYSTEM



Source: SSF

insurance solutions and many other financial services. A concise overview of such instruments and an interpretation of their mechanisms and areas of application is missing. This report attempts to fill this gap by illustrating a multitude of existing innovative financial instruments that can provide the private funding necessary for the low-carbon transition.

Within the report we aim to:

— Describe established and innovative finance instruments and their role in achieving a low-carbon economy;
— Illustrate best practice through case studies;
— Identify barriers and make recommendations to foster the instruments illustrated in this report;
— Highlight how political frameworks can support the necessary change.

The following chapters were written by authors from the SSF network and beyond, and outline 14 different financial instruments and two additional levers for a low-carbon economy. The chapters draw on the rich experience of Swiss financial players, but the application and scope of the financial instruments and structures described is global, reflecting the nature of today's financial flows. While investment instruments in secondary markets have already reached a high level of maturity, other instruments providing finance for new projects and companies are often less established. Yet, they can have a more direct effect on the decarbonisation of the economy and our society, which is why this report aims to raise the awareness about such promising solutions. Throughout the report, there are also 8 case studies that complement specific chapters and provide additional insights into how low-carbon finance strategies are implemented by various players. We further look at the role of Swiss environmental and financial policy instruments, and conclude with a section on barriers and recommendations to highlight where action can be taken to aid further investments in low-carbon solutions.

In this publication, finance professionals will find a compendium of well-proven tools to support a low-carbon economy. However, it is also evident that not all approaches are equally accessible, nor are they working at the required scale. In addition, private finance cannot act alone. Therefore, this publication also calls for politicians and government representatives to create the frameworks in which sustainable finance can thrive. We are confident that the content presented is useful for different players aiming to contribute to further translating financial instruments into a powerful solution supporting a low-carbon world.

1 UK Government (2003). *Our energy future – creating a low carbon economy.* Available at: https://www.gov.uk/government/publications/our-energy-future-creating-a-low-carbon-economy

2 THEMATIC EQUITY FUNDS
Capital Allocation and Engagement as Drivers for a Low-Carbon Economy

Thematic investment strategies with a focus on the energy transition, targeting areas such as renewable energy or energy efficiency, have seen growing interest in recent years.

Such strategies can be considered a supplement to private-market impact investing, as they build on a clear intentionality. Participation in IPOs or seasoned new issues of companies that often have a small and medium capitalisation can contribute to reducing their cost of capital and provide a source of R&D investments that helps drive innovation.

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Thematic investing in environmental strategies

In the set of instruments to finance the transition to a low-carbon economy, thematic equity funds are one of the most accessible vehicles for investors. Thematic investment strategies with a focus on the energy transition, targeting areas such as renewable energy or energy efficiency, have seen growing interest in recent years. We define thematic investing as an approach that a) focuses on pockets of the global economy underpinned by structural growth over the long term, b) prefers companies that exhibit a high degree of specialisation in the targeted area, c) practises an unconstrained investment style without a link to traditional benchmarks. Because of the focus on companies whose goods and services provide solutions to specific challenges and needs, the thematic approach is perceived as very tangible by investors and can be viewed as the closest substitute to private-market impact investments when it comes to providing funds for low-carbon economy solutions, while remaining within listed markets.

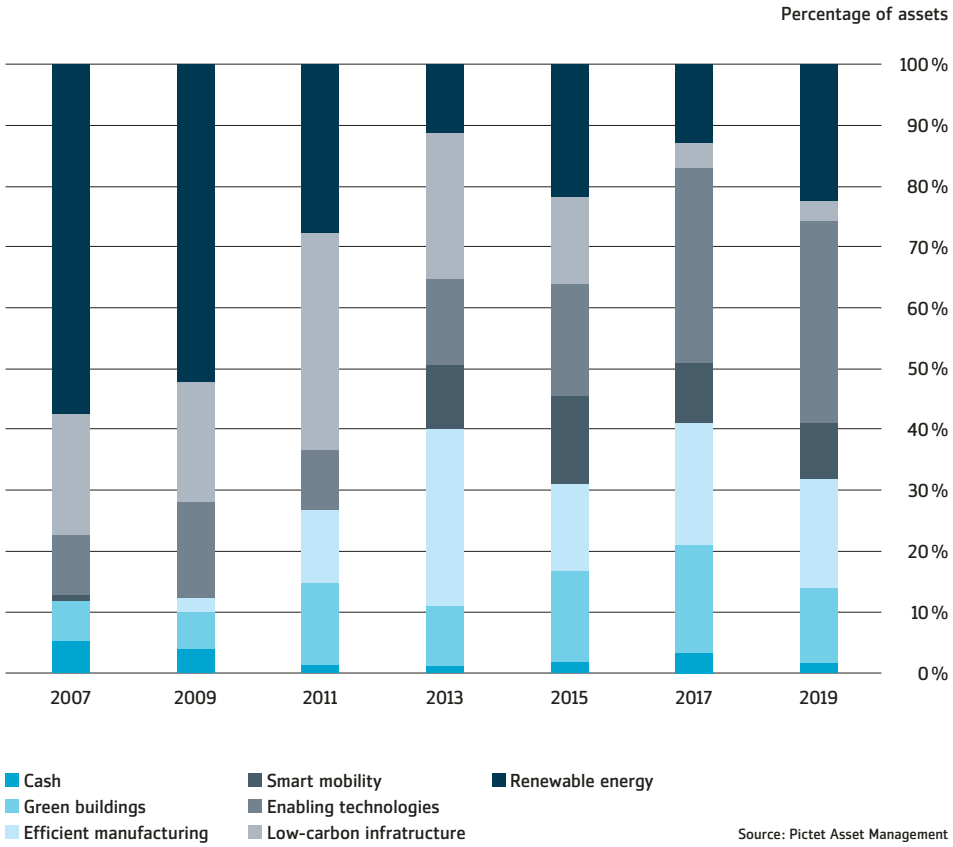
Opportunity set is broadening

When thematic investment funds related to the energy transition emerged over a decade ago, they focused mostly on renewable energy. This fledgling sector was fashionable at the time but not competitive with more traditional energy sources, and therefore relied heavily on often unreliable government subsidies, which led to boom and bust cycles. Times have changed in very significant ways. First, the cost of renewables has come down dramatically, making them the most cost-effective energy source for new energy capacity in many parts of the world. Second, the investment universe has broadened considerably beyond renewables, with areas such as e-mobility, smart cities, building automation, energy efficiency, autonomous cars, electrification and storage now all an integral part of the energy transition.

The case for investing in the energy transition is now much more attractive to investors. The innovation-driven decline in the costs of solar and wind power, as well as energy storage devices, has led to less reliance on government subsidies, which reduces the policy uncertainty that has weighed on the sector historically. It has also contributed to a shift towards the electrification of motor vehicles, especially passenger cars. This trend has been strengthened by increasing concerns around climate change and health, which have resulted in a favourable policy environment culminating in the global Paris Agreement on Climate Change. The growing opportunity set includes the following areas:

— Investing in *renewables* through listed equity has become mainstream. In particular, it is now mostly regulated utilities that are leading the energy transition and they offer high transparency on revenues and earnings. What used to be the highly

Figure 2:
ILLUSTRATIVE EVOLUTION OF A CLEAN ENERGY PORTFOLIO COMPOSITION



Source: Pictet Asset Management

cyclical component of the portfolio is now a much more defensive, albeit high-growth segment with often predictable double-digit total shareholder returns.

— *Energy efficiency* investments are not only a cost-efficient way to reduce emissions but also a very pressing necessity, since 70% of energy is lost between power generation and the moment it is converted into useful power such as motion, light, or heat at the final point of consumption.[1] Efficiency solutions provide a wide variety of investment opportunities from building efficiency to e-mobility or efficient manufacturing.

— A somewhat overlooked but critical segment is the one of *enabling technologies,* such as power semiconductors, energy storage and smart grids, that is key to making the energy transition happen. Integrating intermittent renewable energy at scale into the power system will require improving the power grid, in particular the greater adoption of hgh-voltage direct current (HVDC) for long-distance power transmission. This will boost demand for semiconductors, the critical hardware components indispensable for running the electric grid. Semiconductors convert power between different alternating current (AC) and direct current (DC) and at different frequencies, which helps minimise power loss and stabilise electricity flow.

— In *transportation,* regulation is playing an important role for smart mobility developments, as manufacturers improve the efficiency of their vehicles in response to increasingly stringent emission and fuel economy standards. Targets for increasing the proportion of electric cars in cities – supported by innovation to increase the capacity of batteries and reduce their prices – are expected to make electric vehicles overall cheaper than conventional fuel vehicles by 2025. Demand for electric cars is expected to reach 22 per cent of new sales by 2030.[2] An attractive way to invest in smart mobility is through suppliers of the parts and components which most carmakers will rely on. The share of a vehicle's content supplied by energy-efficient component manufacturers is expected to rise by seven to nine times versus today's share as electrification develops, while the content in enabling technologies such as semiconductors needed to operate electric and autonomous vehicles should grow by a similar proportion.

— Tighter *building* codes are also driving strong demand for high energy performance homes. Effective insulation of walls and roofs, more efficient appliances and heating, ventilation and air conditioning (HVAC) systems are all seeing growth well beyond the baseline for the construction market.

— Factories are also undergoing a significant change towards greater resource and energy efficiency. Technological innovation in recent years is leading to another *industrial revolution* centred around industrial software, sensors and artificial

intelligence. For example, highly sophisticated simulation software can be used to optimise the design, composition, shape and production methods for new products, which spares companies from going through multiple iterations and prototypes. In addition, replacing conventional industrial motors by more energy-efficient systems such as variable-speed motors can reduce electricity consumption by about 20–30% on average, with the potential to reduce total global electricity demand by about 10%.

Given this broadening of the opportunity set, Pictet's flagship clean energy strategy, as an example, invests in listed companies where more than one third of sales, EBITDA[3] or enterprise value comes from energy-transition-related activities – sectors such as renewables, smart mobility, efficient manufacturing, green buildings and enabling technologies (see Figure 2).

Impact of thematic equities

With the growth in impact investing – i.e. investment seeking to generate a positive environmental and/or social impact as well as a financial return – in private markets (such as private equity and private debt) and the desire to apply similar principles to listed markets, thematic equities are increasingly being viewed as a potential substitute, or at least supplement. The question arises as to what the actual impact of energy-transition-themed investments is.

One commonly used criterion for impact is the notion of intentionality, i.e. whether driving positive change is an objective of an investment strategy. For thematic funds with a clear mandate to fund companies contributing to the energy transition, that is not difficult to establish.

A second common criterion is the causality between funds invested and resulting positive outcomes. While such a connection may generally be more difficult to establish in listed markets than for impact investments in private markets, the case is easier to make for thematic investments versus broad equity investments. Because of the intention to target thematically pure companies, thematic investments often focus to a greater extent on stocks with a small or medium capitalisation (i.e. below USD 10 billion). The participation in IPOs or seasoned new issues is a way to directly fund such companies. This can both contribute to reducing their cost of capital and provide, for instance, a source of R&D investments within the company that drives innovation. Even the active participation in secondary market trading in smaller names contributes to lower cost of capital by ensuring that growing privately-held companies have easier access to capital markets should they eventually choose to go public.

Finally, impact measurement is also viewed as a requirement for impact investing. For example, Pictet Asset Management publishes annual impact reports for its environmentally themed funds. These reports highlight the performance of the funds based on the Planetary Boundaries framework, using nine scientifically determined dimensions of environmental sustainability and associated critical thresholds (see Figure 3). They also report on various aspects of ESG performance and Engagement activity.

In addition to their thematic characteristics, thematic portfolios can benefit from standard ESG techniques such as ESG integration in the investment process or engagement with company management on relevant ESG topics. Such features can strengthen a fund's sustainability and impact credentials.

Opportunities and barriers

Assets in environmentally themed funds are expanding, driven by interest among both institutional and private investors in funding the transition to a low-carbon economy. Their interest is motivated both by a view that important structural trends create attractive investment opportunities and the motivation to contribute to change through sustainable and impact investing.

There are, however, barriers to the rapid adoption of such strategies. In earlier days of thematic investing, some investors had negative experiences with renewable energy and its boom and bust cycles. Many are still "once bitten, twice shy", even though the fundamentals of renewables have improved significantly and the opportunity set has broadened and matured considerably.

Another obstacle to a broad adoption of thematic strategies is the fact that they typically allocate their assets globally and hence often do not fit nicely into the traditional regionally focused asset allocation models that are widespread in the industry.

Outlook

The clean energy revolution is no longer just about renewables or public subsidies. Increasingly, it is characterised by rapid technological progress, the adoption of energy efficiency measures as well as deep-rooted changes in the behaviour of consumers, businesses and governments worldwide. This confluence is leading to an inflection point in the adoption of renewables, electric vehicles and energy-efficient technologies and investments in such solutions. For investors, that's a positive change. It means that investment opportunities are emerging across a far broader and more diversified range of countries and industries. In other words, clean energy is no longer a niche.

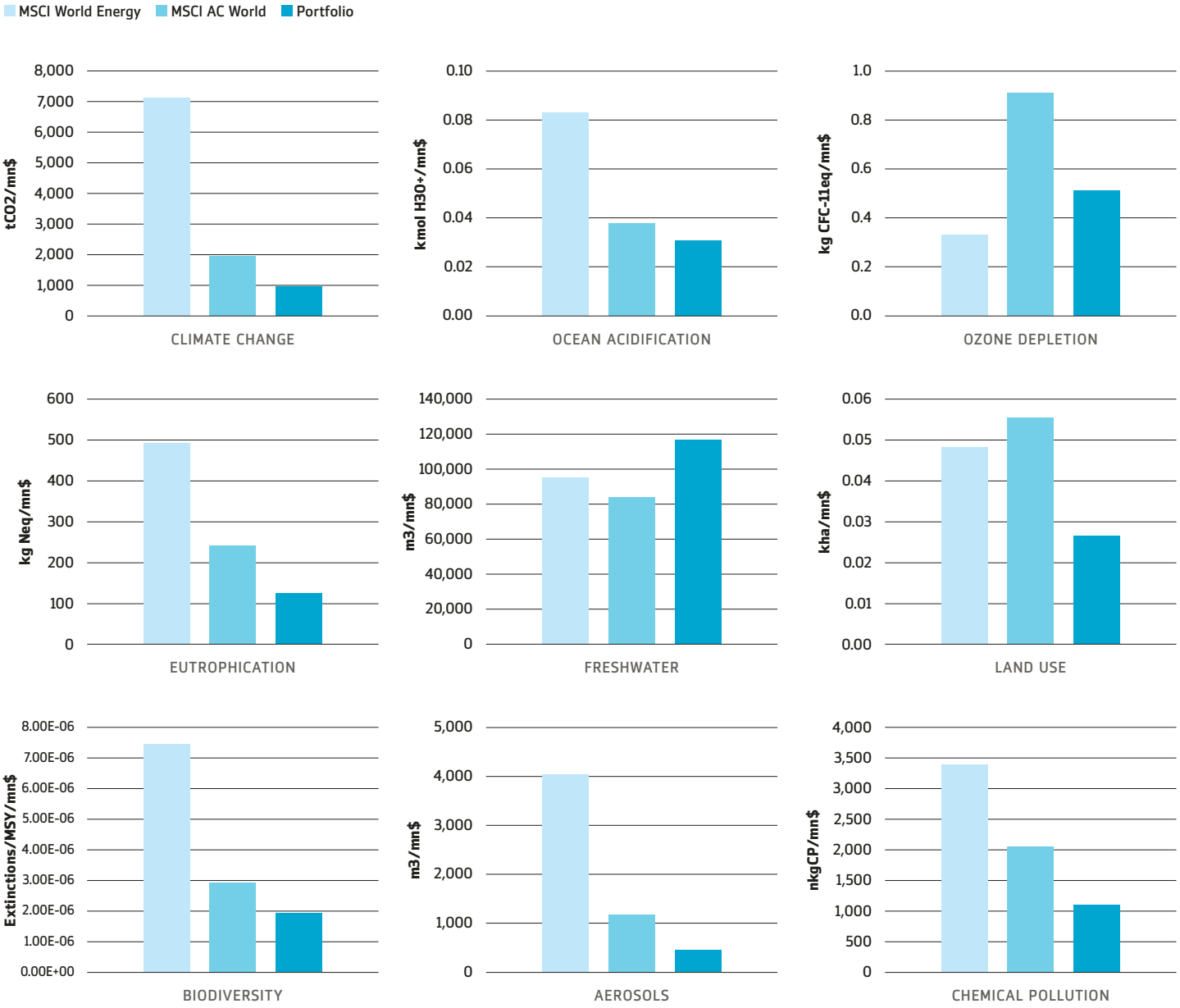
1 European Environment Agency. (2012). *Energy efficiency in transformation.* Available at: www.eea.europa.eu/data-and-maps/indicators/energy-efficiency-in-transformation/energy-efficiency-in-transformation-assessment-3

2 Bloomberg New Energy Finance. (2019). *Electric Vehicle Outlook 2019*. Available at: www.eenews.net/assets/2019/05/15/document_ew_02.pdf

3 Earnings Before Interest, Taxes, Depreciation and Amortisation

4 For more information on the Planetary Boundaries Framework see: https://www.stockholmresilience.org/research/planetary-boundaries.html

Figure 3:
IMPACT REPORTING USING THE PLANETARY BOUNDARIES FRAMEWORK[4]



Source: Pictet Asset Management, as of 31.12.2019
Note: higher values imply a bigger environmental footprint

2.1 CASE STUDY

THEMATIC FUNDS FOR SUSTAINABLE MOBILITY
Are Electric Vehicles the Silver Bullet?

Electric vehicles and technological advances are crucial for reaching net zero CO_2 emissions by 2050, but societal behaviour is equally important. Thematic fund investing can play a key role in shifting the necessary capital.

VINCENT COMPIÈGNE
Deputy Head of ESG Investments & Research, Candriam

JESSICA CARLIER
ESG Analyst, Candriam

The transportation sector is responsible for 23% of CO_2 emissions in Europe, of which road transport accounts for 73%.[1] New EU regulations on internal combustion engines aim to accelerate the transition to a low-carbon economy with concrete emission limits by 2021 (95 gCO_2/km). It is estimated that automakers must reduce emissions by 5%–6% per annum to meet the target, versus the 3% p.a. over the last decade.[2] However, demand for larger and higher consumption vehicles is on the rise, with the SUV market share in the EU having increased to 29% in 2017 vs. 9% in 2010. Furthermore, despite some CO_2 benefits, diesel engines cannot offer a full solution, as they remain fossil fuel-based and associated NO_x emissions are responsible for deteriorating air quality.

In an effort to meet the targets, the industry is thus in the midst of an electrification process, with electric vehicles (EVs) coming to the forefront. EV passenger cars and technological advances will enable us to make great strides, but we cannot solely depend on them to achieve these ambitious objectives. It is also essential that societal behaviour move towards more sustainable practices. Further to their individual actions, investors can contribute by supporting companies that are providing key technologies, or that have embraced the positive mobility trends. Investors must also bear in mind that investments in companies that do not adapt their business models accordingly may face various financials risks.

Technological solutions to greener transport

Companies improving the efficiency of existing technology and those providing disruptive technology will be essential in meeting the objectives set for the transport sector. Thematic funds focusing on climate change will play a key role by specifically targeting and shifting capital towards these companies. Key technologies investors should be aware of are outlined below.

- Vehicle weight is crucial, as it correlates with fuel consumption and CO_2 emissions. **Light-weighting** alone is estimated to contribute at least 6g/km of CO_2 emission reductions by 2021.[3] Light-weighting technologies can be implemented specifically for EVs by targeting heavy batteries (e.g. Tesla S battery weighs 500 kg) or generally for any car through alternatives to heavy metal structures. For instance, a bumper made by the component manufacturer Plastic Omnium is 5kg lighter than an average bumper and offers a total reduction of 2.5g CO_2/km due to its improved aerodynamics. In the financing of light-weight technologies, we must also be conscientious of the sourcing of raw materials and support responsible mining operations.

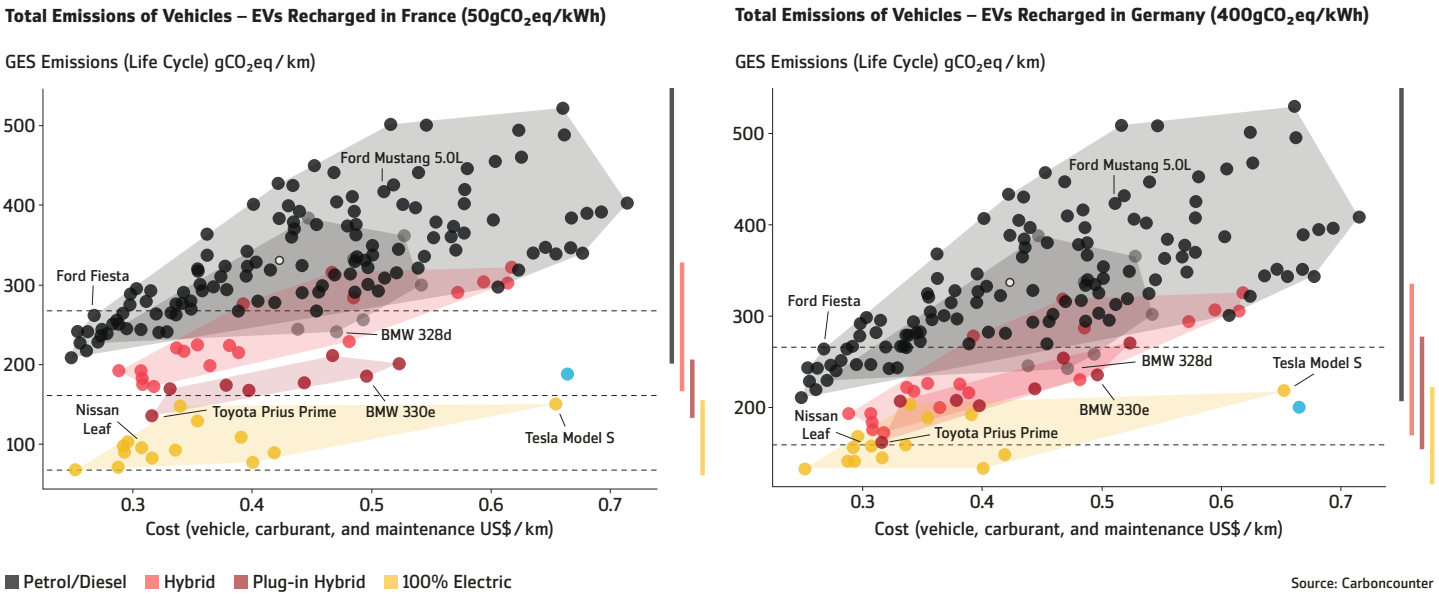
- As EVs and plug-in-hybrid EVs (PHEVs) require different levels of voltage, there is a great need for converters. Companies providing **converters** and other EV solutions (e.g. chargers, electric motors, transaxle, etc.) will facilitate the transition.

- Transitioning to a 100% EV world will require time, **combustion efficiency and accompanying technologies** such as power steering or rolling resistance will be key. As engines account for 50% of consumption, providing alternative models and/or enhancements to ICE motors will be essential in improving efficiency. For example, Valeo produces 48-Volt engines, which add energy recuperation to enhance its start-stop system, reducing CO_2 emissions by more than 7% versus a classic start-stop system. Hence, suppliers that enhance their engine solutions can significantly reduce CO_2 emissions and help to meet targets, whilst benefiting from industry trends.

Will technology be enough?

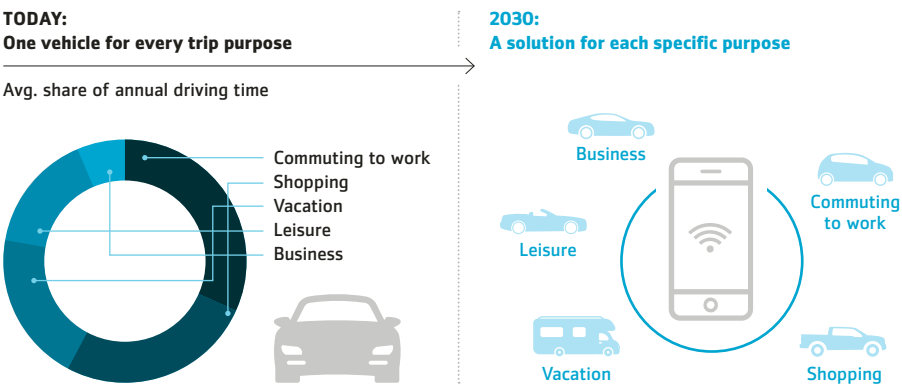
Technological advances can help meet certain targets, but societal behaviour regarding mobility also needs to move towards more sustainable practices. The rise of SUVs conflicts with these objectives due to their weight and aerodynamics, which account for approximately 25% and 20% of fuel consumption respectively. Investors must be aware of various societal changes, which are necessary to reach the targets in the transportation industry. First, consumers need to embrace EVs. Second, governments need to ensure that the supporting energy mix is well aligned with a 2-degree scenario, since the energy mix used to recharge EVs has a significant impact on CO_2 emissions. In a country that relies entirely on coal, this can represent up to 150g CO_2/km.[4] As seen in Figure 4, EVs recharged in France, where the energy mix has a lower carbon

Figure 4:
COMPARISON OF LIFE CYCLE AUTOMOBILE GREENHOUSE GAS EMISSIONS IN FRANCE AND GERMANY



Source: Carboncounter

Figure 5:
THE EVOLUTION OF PURPOSE-BASED TRANSPORT SOLUTIONS



Source: Adapted from McKinsey & Company

intensity, emit less greenhouse gases over their lifetime than those recharged in Germany.

Third, car utilisation trends such as the emergence of car sharing, in which EVs and connectivity will play a strong role, are promising. The shift to shared mobility enables consumers to use the optimal transport solution for each purpose. For example, users can choose smaller EV models for daily commutes whilst having the flexibility to choose larger models for family vacations (see Figure 5). The shift in mobility behaviour is expected to lead to a fall in car production and thus a reduction in emissions as automotive manufacturing is CO_2 intensive.

Conclusion

Thematic funds have a great role to play in transitioning the transport sector towards a low-carbon model by supporting companies active in the field. Thematic investing has grown in popularity, with volumes tripling in the past five years.[5] We believe that this positive growth, specifically in thematic funds targeting climate change and CO_2 mitigation solutions, will enable EVs to come to the forefront for passenger cars. It is essential to finance progress in vehicle light-weighting and combustion efficiency solutions, and explore and financially support other technologies, such as hydrogen power, that may be more suitable for trucks and other heavy weight vehicles. Finally, financing technological advances alone is not enough. It is crucial that consumer behaviour evolves, together with access to alternative transportation solutions, to successfully move towards a low-carbon transportation system.

1 International Energy Agency. (May 2019). *Tracking Transport.* Available at: www.iea.org/tcep/transport/

2 Deutsche Bank Research. (5 Feb. 2019). *Full speed into a low emissions future: Who can make it and at what cost?* Deutsche Bank AG.

3 Pearson et al. (January 2015). *The Efficient Car – The End of the World (as We Know It).* Exane PNB Paribas.

4 Carboncounter.com (n.d.). Cars evaluated against Climate Targets. Available at: http://carboncounter.com/

5 Sardon, Maitane. (5 Jan 2020). "Four Fund Themes That Investors Are Likely to Bet On" *Wall Street Journal.* Available at: www.wsj.com/articles/four-fund-themes-that-investors-are-likely-to-bet-on-11578279840

2.2 CASE STUDY

FINANCING ALTERNATIVE MOBILITY CONCEPTS WITH PUBLIC EQUITY

Electric Buses Replace Diesel

Public equity markets are increasingly providing expansion capital to finance the transition towards a carbon-neutral economy, for example within the commercial transport industry.

ROLF HELBLING
Founder, Carnot Capital

Expansion capital to finance low-carbon solutions in different sectors of the economy is increasingly provided by public equity markets. While 'sustainable companies' have historically often been undervalued by investors, public companies that curb climate change are beginning to build up valuation premiums against the broader market. This new investor perception is a strong incentive for public companies to promote carbon-efficient products and technologies. At Carnot Capital, we are pleased to see that this trend is attracting increasing attention in capital markets.

One company at the heart of this trend is Akasol, a German provider of battery systems for E-buses. For decades, diesel buses were the preferred solution for local public transport due to their durability, efficiency and low cost. With the advent of the low-carbon economy, electric concepts are threatening diesel's dominance. There is huge potential to reduce carbon emissions in the commercial transport industry. Technology and economies of scale are the fundamental drivers behind the energy transition. To ensure this transition's successful financing, large amounts of capital are now required.

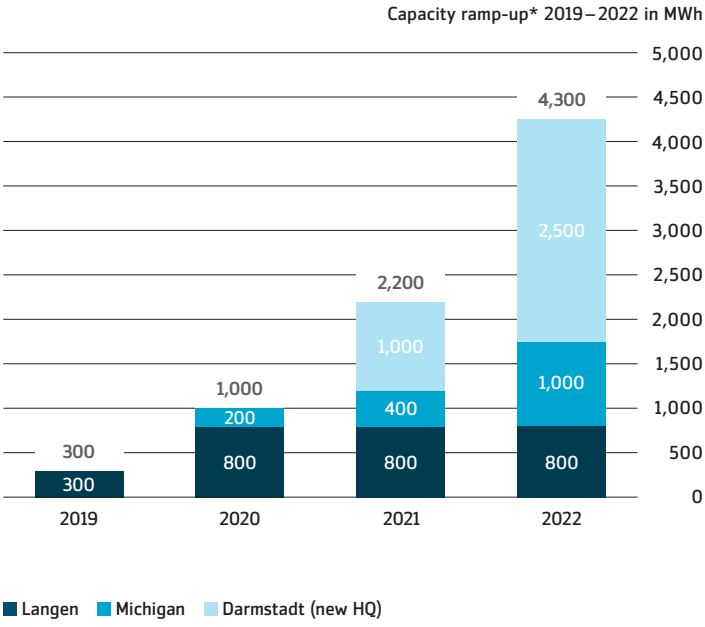
Today, Akasol is a market leader for high-quality and efficient battery systems. The company started as a research group at the Technical University of Darmstadt, with a winning streak in race competitions for solar automobiles in the late 90s. Research was later directed towards the field of battery systems. Rather than developing the battery cell, the company's efforts were focused on the management of battery systems, a key technology to be mastered when rolling out electric mobility concepts. At the beginning, the university itself financed the research activities. When the company was spun off in 2008, further funding came from private investors. At this early stage, the amounts necessary could still be provided by private investors (entrepreneurs and their families). Financial needs rose when battery technology reached the level where it had to be integrated into commercial applications.[1]

The signing of two supply contracts with leading European bus manufacturers, worth several hundred million euros, pushed Akasol to the next level.[2] Capital requirements to build production facilities, equipment and working capital amounted to tens of millions of euros. The company, together with its financial advisers, considered different sources to fund the expansion. At the end of this process, Akasol decided to initiate a public listing on the stock exchange.

The IPO process is a challenging exercise for any company, even more so for a small, fast-growing 'newcomer'. The banking consortium appointed for the IPO decided to focus its efforts on thematically aligned investors with a special consideration of impact in their respective investment processes. Akasol's management was able to spark great investor interest and the listing took place in the summer of 2018 on the German stock market. The company raised EUR 100m in the IPO process, with a substantial contribution from investors following impact and sustainability goals. This is proof that the ever-increasing climate targets present great opportunities for innovative companies focused on reducing CO_2 emissions.

Akasol is currently ramping up its production capacity at great speed (see Figure 6). The company was able to buy a fully equipped manufacturing site where diesel technology used to be produced – a transaction symbolising changing times. Revenues are expected to more than double in 2019, from EUR 20m to EUR 45m, with another

Figure 6:
PROCEEDS FROM IPO OF EUR 100M ARE USED TO FINANCE THE CAPACITY RAMP-UP



* Total installed capacity p.a.

Source: Akasol company presentation

doubling anticipated in both 2020 and 2021. At the same time, product development to further improve efficiency in battery systems will continue, as battery technology is far from being mature. Globalisation is an additional challenge, as the above-mentioned bus manufacturers intend to roll out electric buses globally.

Having reached profitability at an early stage, Akasol's expansion still consumes substantial amounts of cash. Analysts expect the company to turn cashflow positive by the end of 2022. This could still change however if, for example, new expansion opportunities arise and production and research capacities are expanded further. Investors of course would have a say on a potential capital increase, and, as part of good corporate governance, on all other relevant matters as well. Engaging with portfolio companies is an integral part of Carnot's investment process and we maintain an active relationship with senior management of the company. In the case of Akasol, the main topics are (i) How will the building of new production capacity proceed? and (ii) Could additional opportunities arise that would require additional financing?

Akasol is becoming a success story in the transport industry by transforming mobility towards a carbon-efficient world. The IPO played an important role in facilitating the industrial expansion of the company. Transitioning towards a low-carbon economy requires deep pockets and public markets enable large amounts of capital to be raised.

Further reading

— Carnot Capital AG. (2019). *Investments into Energy and Resource Efficiency with a Measurable Impact.* Available at: https://www.carnotcapital.com/_pdf/dokumente/Carnot_Capital_Research_Paper_Impact_Investing_in_Public_Equities_EN.pdf
— Carnot Capital AG. (2019). Carnot Impact Investing – Overview & Case Study Belimo. Available at: https://www.carnotcapital.com/_pdf/dokumente/Carnot_Impact_CaseStudy_Belimo_EN.pdf

1 Akasol Company Website. (n.d.). *Company.* Available at: www.akasol.com/en/company

2 Ibid.

3 CLIMATE INDICES FOR LISTED EQUITY
Comparing Different Methods to Minimise Climate Risk Exposure

Based on consistent, reliable and independent ESG-related data, an index-based investment approach can be developed that manages to significantly reduce the CO_2 emission exposure of a portfolio, while not compromising the classical investment rationale.

Passive benchmark-linked investment solutions like these will be key for re-channelling major asset flows towards greener investment, thus encouraging the paradigm change towards a low-carbon economy.

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Senior Lecturer, School of Management and Law, ZHAW

JAN-ALEXANDER POSTH
Senior Lecturer, School of Management and Law, ZHAW

The proliferation of climate-related indices – a call for greater transparency

Following the unmistakable signals and intensifying debate on global warming, the majority of investors have been confronted with the question of how to adjust their portfolios in a way that would significantly contribute to the transition towards a low-carbon economy. Yet, as of today, it is not possible to reliably measure the effective long-term impact that asset managers have by allocating (or not allocating) capital to specific stocks. Nevertheless, asset managers should evaluate the available solutions and choose the one that best matches their needs to reposition their portfolios accordingly.

In recent years the financial world has witnessed a rapid and broad proliferation of ESG-based and climate-related investment indices, a development warmly welcomed by investors seeking climate-oriented benchmarks for their equity portfolios. As pointed out by respected academics, however, the lack of comparability and transparency of these indices remains a serious challenge.[1|2] The European Commission and other international bodies are currently developing taxonomies on climate-related activities that should contribute to clarity in the future. This chapter aims to provide practical guidance on emission-related measures and on associated climate risk exposure available for listed equities, focusing on Europe.

Climate-focused indices differ in terms of climate data and index construction

Over the last five years, several index providers have launched climate-focused indices. Currently, the products available are all CO_2-emission focused and differ mainly in terms of data and construction methods:

- All indices are based on greenhouse gas emissions (GHG); however, it is not clear how the indices differ with regards to the applied scopes (1, 2 and 3) and the data processing.
- Climate-related data are sourced from different providers. STOXX, for example, uses both disclosed and estimated (undisclosed) data, while S&P takes account of disclosure quality in the process.
- Integration of climate data into index construction differs considerably, as specified in the last column of Table 2 below.

Index providers diverge in terms of targeted measures and by how much their CO_2 emission exposures should be lower in comparison to conventional indices. For instance, MSCI aims and effectively achieves a 50% reduction in carbon intensity, while the targets for S&P and STOXX remain undisclosed. The fact that comparing different methods is so difficult reflects the shortage of climate-reporting standards – both for companies and for index providers.

Table 2:
OVERVIEW OF SELECTED CLIMATE-FOCUSED INDEX FAMILIES

INDEX FAMILY	LAUNCH DATE	CLIMATE-RELATED MEASURES AND SCOPE	SOURCE OF CLIMATE DATA	INDEX CONSTRUCTION METHOD
S&P Carbon Efficient Indices	2018	GHG Emissions Scope 1 and 3 (first-tier suppliers) Fossil Fuel Reserves	Based on company reports and disclosures provided by S&P Trucost	Weights are adjusted according to disclosure quality and carbon footprint
MSCI Low Carbon Indices	2014	GHG Emissions Scope 1 and 2	MSCI ESG	Weights are adjusted according to CO_2 emission intensity and to replicate the factor exposures of the parent index
STOXX Low Carbon Indices	2016	GHG Emissions Scope 1, 2 and 3	Reported data is provided by CDP, estimated data is provided by ISS ESG	Weights are adjusted according to CO_2 emission

Sources: Company websites of S&P, MSCI, STOXX

Identifying an adequate climate risk measure and construction method

Investors seeking environmental impact need to become familiar with numerous metrics, including emissions types and scopes, use of water and energy, and waste management. In this chapter, however, we focus on equivalents of CO_2 emissions.

Most climate-focused index providers quote carbon intensity, measured as tons of CO_2 equivalents per million US dollars of investment or revenue. Despite its popularity, this metric has its limitations for two reasons. First, it is typically based on company disclosures, which are neither obligatory nor standardised. Second, it is a backward-looking measure which does not account for reduction efforts, regulatory effects, or any potential income from carbon-reducing technologies.

Alternative data sources represent a viable solution to this challenge. Several technology-driven companies such as Carbon Delta AG, 2° Investing Initiative and Four Twenty Seven have developed alternative measures in recent years. In this article, we will focus on Carbon Delta AG's Climate Value-at-Risk® (CVaR), which is a forward-looking measure for analysing climate-related risks and opportunities for publicly traded companies. This does not rely on company disclosure but instead is consistently calculated, and hence provides a quantified and comprehensive guidance for investors seeking to contribute to a low-carbon economy.

The premise of CVaR is based on a two-step process. First, it aggregates costs and opportunities related to specific CO_2 reduction scenarios over the next 15 years. Second, it calculates how the cost of regulation-induced transition might affect financial performance in the immediate future. The metric was formulated using the widely recognised Value-at-Risk methodology and is calculated consistently for the majority of listed companies across most sectors and locations. Thus, CVaR provides a quantifiable measure that enables the investor to identify and choose companies with a low CO_2 emission profile and thus actively contribute to a low-carbon economy.

Evolution not revolution: Constructing an effective, climate-proof index without sacrificing performance

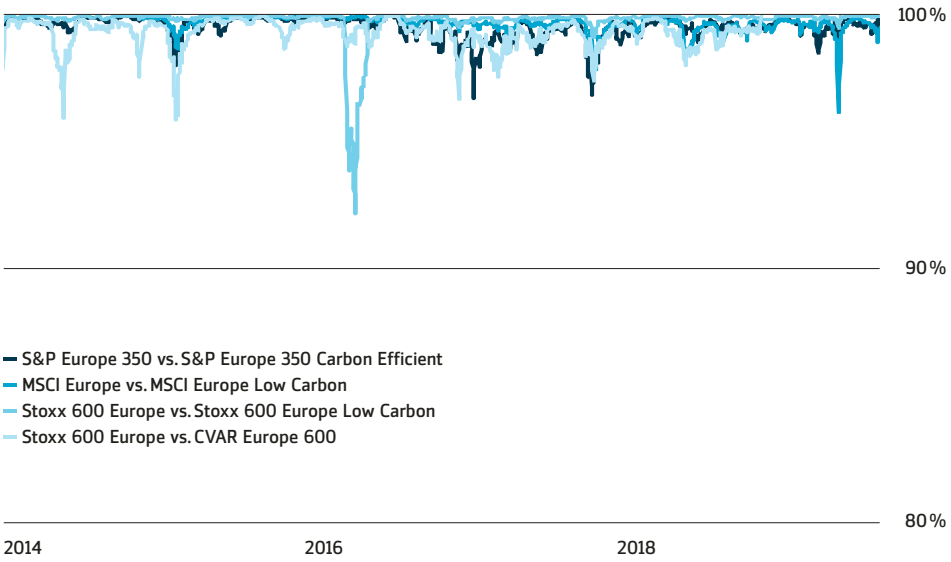
Switching to climate-focused indices can lead to concerns about performance and tracking error. Having said this, European CO_2 emission-efficient equity indices provided by S&P, MSCI, and STOXX as well as the CVaR-based index (see Figure 7) exhibit near-perfect correlation with conventional benchmarks. On average, the return correlation oscillates around 99% and, on a 20-day rolling basis, it rarely falls below 95%. This implies that going green can be achieved without disrupting the sector, country or factor exposures of an investment portfolio while the individual asset in the selection are of course different.

As explained earlier, however, the principal challenge lies in transforming adequate measures of climate change into a functional equity index. The UN PRI lists three general approaches[3], namely broad market optimised, best-in-class and fossil-free, while the EU defines two benchmarks, the EU climate transition benchmark and the EU Paris-aligned benchmark. For the UN PRI, the second and third approaches are designed for investors who can accommodate negative exclusions, while the first approach is essential for investors seeking benchmark-like investment products with a positive climate impact. Here, the existence of general and globally accepted and respected benchmarks is essential, since passive investment instruments like ETFs or passive funds that are linked to such benchmarks open up the investment market to a broad range of institutional and private investors who would not adapt their investments strategies to climate goals without the existence of such benchmarks. To facilitate the transition towards a low-carbon economy however, the redirection of large asset flows is imperative – a paradigm change not feasible without benchmark-based investing.

To analyse the effect on the portfolio, we used the CVaR to re-weight the constituents of a benchmark index in such a way that the overall climate transition impact of the portfolio is significantly reduced while, at the same time, the main characteristics of the benchmark are retained. For a benchmark portfolio, we use the

Figure 7:
SUSTAINABLE INDICES TRACK THEIR BENCHMARKS VERY CLOSELY

Sustainable vs. conventional equity indices
20 day rolling correlations



Sources: Data from Bloomberg, CVaR data from Carbon Delta AG, Limeyard for index construction

STOXX Europe 600, a market-cap weighted index of the 600 largest European-listed companies.

Based on the preliminary data analysis, neither a positive selection bias nor a weighting scheme based purely on CVaR is an option for viable index construction. Consequently, the best approach is to sharply lower the weightings of those companies with the highest costs associated with transition risks, expressed by their regulatory CVaR values. In effect, the worst companies regarding CO_2 emission exposure are more or less excluded from the index while little else is changed. The resulting index thus has a low allocation for high-risk companies, while the factor, sector and country profile of the low-risk companies remains virtually unaffected.

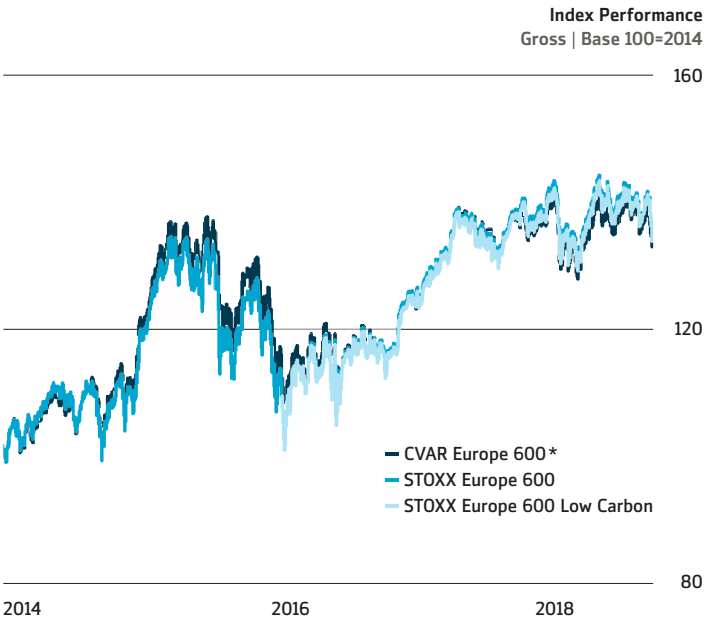
Figure 8 illustrates how the resulting CVaR-optimised index is, by construction, very close to its benchmark concerning country, size, and industry distribution.

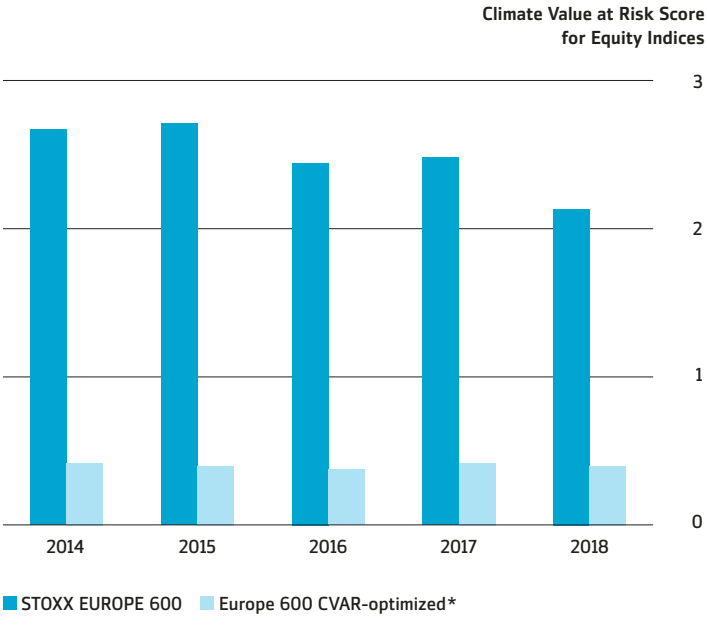
What becomes apparent from Figure 9 is that an optimisation using the metric CVaR produces an index that has, on average, six times less climate risk exposure while, at the same time, retaining the fundamental characteristics of its benchmark. An investor looking to contribute to a low-carbon economy through their investment choice thus has a passive investment vehicle at hand that avoids selecting companies with a high CO_2 emission exposure but does not compromise the overall investment process too much. These findings prove that consistent and forward-looking climate-related risk measures can be used to construct passive investment strategies that have a lower future risk associated with regulatory CO_2 transition changes, provide transparency with regard to their effective methodology, and are suitable for a wide variety of investable financial products.

Transparency and effectiveness will become differentiating factors

The transition towards a low-carbon economy, or towards a green economy in general, can be accelerated by the redirection of the major asset flows – institutional as well as private. Climate-aligned benchmark indices, as well as ETFs based on them, will play a crucial role on this path, as illustrated by mainstream benchmark indices that have been uniquely successful in attracting enormous amounts of investment capital. Even so, investors should be aware that the effectiveness of the capital reallocation heavily depends on the adequacy and standardisation of the underlying measures. CVaR constitutes such a measure and the study we reference to has illustrated that a passive investment strategy based on a respective benchmark index delivers both investment continuity as well as a significant reduction of the CO_2 emission exposure. While the way for climate indices has already been paved, index and data providers

Figures 8 and 9:
MASSIVE REDUCTION OF CLIMATE RISK EXPOSURE, WITHOUT LAGS IN PERFORMANCE





* Europe 600 CVAR uses the same universe as Eurostoxx 600

need to be transparent about the materiality and scope of the impact of their methods while making sure they guarantee consistency and high data quality. Going forward, measures need to be standardised not only for CO_2 emission but for all ESG-relevant criteria. In short, to further increase investments geared towards facilitating a green and sustainable economy, sustainable finance needs to accelerate the change from a single-file qualitative opinion towards a data-based, objective and holistic assessment. This is a journey that classical equity analysis underwent decades ago – and that has now started for sustainable finance.

1 Friede, G., Busch, T. & Bassen, A. (2 Oct. 2015). ESG and Financial Performance: Aggregated Evidence from More than 2000 Empirical Studies. *Journal of Sustainable Finance & Investment 5*, No. 4: 210–33. https://doi.org/10.1080/20430795.2015.1118917

2 Busch, T. & Friede, G. (1 July 2018). The Robustness of the Corporate Social and Financial Performance Relation: A Second-Order Meta-Analysis. *Corporate Social Responsibility and Environmental Management 25*, No. 4: 583–608. https://doi.org/10.1002/csr.1480

3 UN PRI (13 June 2018). *Section Climate Change. How to invest in the low-carbon economy. Low-carbon indices.* Available at: https://www.unpri.org/climate-change/low-carbon-investing-and-low-carbon-indices/3283.article

4 INSTRUMENTS FOR NON-THEMATIC LISTED EQUITY

Decarbonisation through Climate Engagement

Climate engagement is a valuable approach to facilitate large-scale and system-wide decarbonisation in the real economy, by conducting an active dialogue with investee companies.

International collaborative engagement initiatives allow investors to pool assets and strengthen their negotiating power to incentivise the world's biggest carbon emitters to adopt strategies aligned with the low-carbon economy.

MATTHIAS NARR
Head Engagement International, Ethos Foundation, Switzerland

A broad consensus exists regarding the significant risks that climate change poses to institutional investors. Investors have several options when it comes to addressing these risks in listed equity. They can divest, by excluding carbon-intensive sectors such as the coal industry from their portfolios, which helps to manage sector risks related to climate change and sends a strong signal to companies, civil society and the media. A related approach, but with less tracking error, lies in the carbon-optimisation of portfolios, which removes the largest carbon emitters in the most carbon-intensive sectors from portfolios. Such portfolios have a lower carbon-intensity compared to the standard indices used as benchmarks, allowing investors to manage climate risk at the company level. Third, investors can choose to finance the energy transition through thematic equity investment strategies in the field of renewable energy or through fixed-income strategies focused on Green Bonds. All three approaches described above are valuable tools for climate-aware investors. However, the question remains: how can these strategies facilitate a swift and large-scale decarbonisation of the real economy?

Decarbonising the real economy through engagement

For investors that want to de-risk their portfolios while decarbonising the real economy, a fourth approach is rapidly gaining traction: Climate Engagement. Recent academic evidence has shown that targeted engagement has the ability to stimulate real-world impact by driving change in companies.[1] Within this approach, investors use their shareholder rights and thereby act as responsible owners of investee companies. By initiating a board-level dialogue, investors encourage the companies in their portfolios to adopt a long-term perspective, to review their strategy and to steer capital expenditure towards low carbon solutions. During a climate-related engagement, investors typically urge companies to decarbonise their business models and align them with the goal of the Paris Agreement[2]. To be credible, Climate Engagement should always have clearly defined targets to be met within a pre-defined timeframe. In case the targets are not reached, adequate escalation measures should be in place such as filing shareholder proposals or divestment.

Engagement pools in Switzerland

In order to maximise influence, investors often opt to join forces and pool their assets. This approach is cost-efficient, and the concerted effort increases the negotiating power of investors in engagement dialogues, offers access to a broader knowledge base and can help to gain direct access to board members and senior management. In Switzerland, the Ethos Engagement Pool Switzerland (EEP Switzerland) was launched in 2004 by the Ethos Foundation together with several pension funds. Since its creation, the EEP Switzerland has emphasised the importance of decarbonisation and the development of appropriate climate strategies in its dia-

Table 3:
KEY ACHIEVEMENTS OF CLIMATE ACTION 100+ INITIATIVE TO DATE

SECTOR	COMPANY	ACHIEVEMENTS
OIL & GAS	Repsol	In December 2019, Repsol became the first Oil & Gas company to announce a target to achieve net-zero emissions by 2050, including the emissions of its customers (Scope 3 emissions).[8]
OIL & GAS	Shell	In December 2018, Shell announced its ambition to reduce its carbon footprint by 20% by 2035 and by 50% by 2050, including Scope 3 emissions. To operationalise these targets, Shell has set corresponding short-term targets linked to executive remuneration[9] and published a review of its trade association memberships, after which it decided to cancel its membership of the American Fuel and Petrochemicals Manufacturers (AFPM).
MINING	Glencore	In February 2019, after a period of intensive engagement, Glencore announced a number of important commitments such as capping its coal production at current levels, a strategy to align its capex plans with the goals of the Paris Agreement, emissions reduction targets for Scope 1 and Scope 2 emissions and a review of its climate lobbying activities.[10]
TRANSPORT	Maersk	In December 2018, the shipping company Maersk committed to become carbon neutral by 2050. This commitment is noteworthy because unlike other industries, the shipping industry does not yet have low-carbon technology options readily available, thus it will require extensive R&D spending to develop new solutions from scratch.[11]

Source: Company website and Ethos research

logue with companies listed in Switzerland. Concrete demands were for example the disclosure of carbon emissions, emissions reduction targets based on climate science ('Science-based targets') and collaboration with suppliers to decarbonise supply chains. In 2017 Ethos expanded its engagement activities to target companies listed outside of Switzerland and launched the Ethos Engagement Pool International (EEP International) together with a number of Swiss pension funds. At the beginning of 2020, EEP Switzerland counted more than 140 members with total assets of over CHF 220 billion and EEP International counted more than 50 members managing assets in excess of CHF 140 billion.[3]

Global collaborative engagement

Large global collaborative engagement initiatives to incentivise companies with the highest decarbonisation potential are powerful tools to make Climate Engagement even more effective. Therefore, when the collaborative Climate Engagement initiative Climate Action 100+ was launched, the members of EEP International signed up and Ethos took an active role. Climate Action 100+ is one of the largest investor-led engagement initiatives on climate change ever initiated. Since its launch in December 2017, Climate Action 100+ has been signed by over 370 investors. Collectively these investors represent over USD 35 trillion in assets under management[4], roughly equal to 45% of the total global assets under management.[5] The initiative targets 161 companies around the world that represent more than 80% of the total global industrial greenhouse gas emissions. Ensuring that those companies change course and reduce their emissions is absolutely vital for the decarbonisation of the global economy.

What is Climate Action 100+ trying to achieve?

The CA100+ initiative has formulated a straightforward engagement agenda with three clear requests[6] for the boards and senior management of the targeted companies:

— Governance: Implementation of a strong governance framework which clearly articulates the board's accountability and oversight of climate-change risks and opportunities.
— Action: Reduction of greenhouse gas emissions across the value chain, consistent with the Paris Agreement's goal of limiting global average temperature increase to well below two degrees Celsius above pre-industrial levels.
— Disclosure: Enhancement of corporate disclosure in line with the final recommendations of the Task Force on Climate-related Financial Disclosures (TCFD).[7]

Climate Action 100+ is a time-bound initiative, with a five-year period from December 2017 to December 2022 set for reaching the targets outlined above. This clear deadline creates the necessary accountability. For each target company, the coordinators of the initiative have selected one or two 'lead investor(s)' to lead the engagement. The lead investors develop a clear set of engagement priorities and conduct the engagement activities.

Table 4:
EXAMPLES OF ACHIEVEMENTS BASED ON COLLABORATIVE ENGAGEMENT

TARGET COMPANY	LEAD INVESTOR	FOCUS AREA	ACHIEVEMENTS
NESTLÉ	Ethos and APG	Decarbonisation (The majority of Nestlé's emissions occur in its supply chain e.g. as a result of deforestation.)	At the end of 2018, Nestlé agreed to report in line with the TCFD recommendations and with a special focus on the sourcing of raw materials. In September 2019 the company committed to net zero emissions by 2050 and put forward measures across its value chain to work towards this target.[12]
LAFARGEHOLCIM	Ethos and Hermes	Decarbonisation (Cement production is a very carbon-intensive process and R&D is needed to develop additional technical solutions to decrease associated carbon emissions.)	In December 2019, a key engagement task was met when the science-based targets initiative approved LafargeHolcim's carbon reduction target.[13] In February 2020, the company announced that it would link its carbon reduction targets to its long-term executive remuneration.[14] To implement its decarbonisation strategy LafargeHolcim appointed a Chief Sustainability Officer to its executive committee[15] and allocated CHF 160 million to reduce its carbon footprint through the use of advanced equipment and technologies.[16]
THYSSENKRUPP	Ethos	Decarbonisation (A majority of the company's substantial carbon footprint stems from its steel-making business.)	In July 2019, Thyssenkrupp announced its aim to become climate neutral by 2050.[17] This long-term target has been made concrete by a mid-term emissions reduction target of -30% by 2030, which has been approved by the science-based targets initiative in August 2019.

Source: Company website and Ethos research

Climate Action 100+ engagement across carbon-intensive sectors

Over the past two years, some significant successes have already been achieved, not least in carbon-intensive sectors such as Oil & Gas, mining and transport. Table 3 outlines some of the landmark achievements of the initiative so far.

These initial results demonstrate that by joining forces investors can influence companies to review their strategies. In view of the diverging interests of financial markets participants, the existence of such a broad investor coalition with a common agenda is essential for incentivising the boards and management of these companies to embrace change and to align their investment plans with the Paris Agreement.

Key elements of successful engagement

Ethos acts as lead investor for three companies located in Switzerland and Germany. Based on its experience, important elements for successful engagement are:

1. Identifying specific and ambitious (but reasonable) focus areas
2. Involving senior management and the board of directors
3. Setting up a well-defined, continuous process with regular interactions and updates from both sides
4. Attending AGMs to help place a topic firmly on the board agenda and to raise awareness amongst fellow shareholders

Based on these elements, Ethos together with other lead investors, was able to push for the corporate commitments outlined in Table 4.

Climate Action 100+ challenges

With a number of companies having made promising announcements, it is now important to track progress made against these announcements. The organisations behind Climate Action 100+ have taken note and procured the services of credible research providers to develop an analytical framework to assess corporate climate performance and thus evaluate the impact of Climate Action 100+.[18]

A second challenge will be to move the entire peer group, i.e. all 161 targeted companies, towards decarbonisation. It is often difficult to launch a dialogue and initiate a decarbonisation process

with companies based outside of Europe and North America, which are sometimes less accustomed to discussing ESG topics with investors. A possible solution can be to appoint local lead investors familiar with the local context and language. In fact, academic evidence shows that engagement conducted by local leads supported by large international investors can be a very efficient approach to get engagement results.[19] Thus, Climate Acton 100+ is aiming to recruit more investor signatories based in Asia, Africa and South America.

Besides the dialogue described above, an important part of meaningful Climate Engagement is consistent proxy voting that supports climate-related shareholder resolutions at the annual shareholder meetings of targeted companies. A study by ShareAction discovered that several Climate Action 100+ signatories failed to support climate-related resolutions at companies targeted by Climate Action 100+, some of which were even filed by the respective Climate Action 100+ lead investor.[20] Voting in favour of climate-related resolutions is an effective tool to push for decarbonisation at companies that are less open to requests from their shareholders.

Outlook

By pushing for appropriate governance, action and disclosure, collaborative engagement such as Climate Action 100+ will hopefully contribute to meaningful system-level decarbonisation and encourage the boards of the targeted companies to embrace a long-term perspective and support expensive but necessary investments to adjust business models and develop low-carbon solutions. The investors involved in Climate Action 100+ should be proud to play an active role in this significant global effort.

During the next phase of Climate Action 100+, additional emphasis will be placed on curbing corporate lobbying against climate-friendly policies and achieving a just transition for the workers employed in industries which will have to adapt their business model because of the transition to a low-carbon economy. In the future, investors will also have to increasingly think about escalation measures in case of unsuccessful dialogues. This could mean publicly disclosing the names of laggards or voting against the re-election of boards not willing to address the demands of Climate Action 100+. It could also entail the systematic filing of shareholder resolutions in jurisdictions where this is possible, and ultimately the divestment of reticent companies.

For investors seeking to not only de-risk their listed equity portfolios, but to bring about the necessary system-level decarbonisation, engagement, be it pooled or individual, is a crucial strategy.

1 Kölbel, J., Heeb, F., Paetzold, F. & Busch, T. (2019). *Can Sustainable Investing Save the World? Reviewing the Mechanisms of Investor Impact.* Available at: http://dx.doi.org/10.2139/ssrn.3289544

2 The Paris Agreement aims to limit global warming to well below 2 degrees above pre-industrial levels and requires carbon neutrality by 2050 the latest.

3 Ethos. (n.d.) *Company Dialogue.* Available at: www.ethosfund.ch/en/products-and-services/company-dialogue

4 Climate Action 100+. (11 Dec. 2019). *Investors.* Available at: www.climateaction100.org/investors

5 Boston Consulting Group. (July 2019). *Global Asset Management – Will these '20s roar?.* Available at: http://image-src.bcg.com/Images/BCG-Global-Asset-Management-2019-Will-These-20s-Roar-July-2019-R_tcm20-227414.pdf

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7 TCFD. (June 2017). *Final Report: Recommendations of the Task Force on Climate-related Financial Disclosures.* Available at: www.fsb-tcfd.org/publications/final-recommendations-report/

8 Repsol. (2 Dec.2019). *Repsol will be a net zero emissions company by 2050 [Press release].* Available at: www.repsol.com/en/press-room/press-releases/2019/repsol-will-be-a-net-zero-emissions-company-by-2050.cshtml

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10 Glencore. (20 Feb. 2019). *Furthering our commitment to the transition to a low-carbon economy [Press release].* Available at: www.glencore.com/en/media-and-insights/news/Furthering-our-commitment-to-the-transition-to-a-low-carbon-economy

11 Milne, R. (4 Dec. 2018). *Maersk pledges to cut carbon emissions to zero by 2050.* Financial Times. Available at: www.ft.com/content/44b8ba50-f7cf-11e8-af46-2022a0b02a6c

12 Nestlé. (12 Sept. 2019). *Nestlé accelerates action to tackle climate change and commits to zero net emissions by 2050 [Press release].* Available at: www.nestle.com/media/pressreleases/allpressreleases/nestle-climate-change-commitment-zero-net-emissions-2050

13 LafargeHolcim. (19 Dec. 2019). *CO_2-reduction targets validated by Science Based Targets initiative (SBTi) [Press release].* Available at: www.lafargeholcim.com/CO2-targets-validated-Science-Based-Targets-initiative-SBTi

14 LafargeHolcim. (27 Feb. 2020). *Record net income and free cash flow [Press release].* Available at: www.lafargeholcim.com/full-year-results-2019

15 LafargeHolcim. (25 Sept. 2019). *Appointment of Magali Anderson as first Chief Sustainability Officer to the Executive Committee [Press release].* Available at: www.lafargeholcim.com/appointment-magali-anderson-first-chief-sustainability-officer-executive-committee

16 LafargeHolcim. (18 Sept. 2019). *LafargeHolcim allocates CHF 160 million to reduce carbon footprint in Europe [Press release].* Available at: www.lafargeholcim.com/lafargeholcim-reduce-carbon-footprint-europe

17 Thyssenkrupp. (2 July 2019). *thyssenkrupp sets clear targets: Group aims to be climate neutral by 2050 – 30 percent emissions reduction planned for 2030 [Press release].* Available at: www.thyssenkrupp.com/en/newsroom/press-releases/thyssenkrupp-sets-clear-targets--group-aims-to-be-climate-neutral-by-2050------30-percent-emissions-reduction-planned-for-2030-12803.html

18 Carbon Tracker Initiative, CDP, InfluenceMap, Transition Pathway Initiative and 2° Investing Initiative

19 Dimson, E., Karakaş, O. & Li, X. (29 Oct. 2019). Coordinated Engagements. Retrieved from: https://ssrn.com/abstract=3209072

20 ShareAction. (Nov. 2019). *Voting Matters – Are asset managers using their proxy votes for climate action?.* Available at: https://shareaction.org/wp-content/uploads/2019/11/Voting-Matters.pdf

5 GREEN BONDS
Channelling Proceeds into Green Solutions

Green bonds are a fixed-income security designed to finance new and existing projects that deliver positive environmental and/or climate benefits.

With a strong increase in green bond issuance over the past few years, issuers are not only signalling their awareness of environmental risks, but also their willingness to exploit attractive low-carbon opportunities.

In order to ensure credibility and provide transparency on the use of proceeds, second-party opinions and voluntary standards help to structure the market.

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Green bonds are a young but rapidly growing market

Green bonds are an increasingly prominent instrument to create new investments that support solutions for a low-carbon economy. The market is relatively young, with the first bond issued in 2007 by the European Investment Bank (EIB) labelled as a "Climate Awareness Bond", followed one year later by the World Bank's "World Bank Green Bond" for projects aimed at reducing the effects of climate change. The market remained very narrow and was mostly driven by supranationals until the first municipal green bond was launched by the Île-de-France region in 2012. In 2013, the first corporate and financial issuers arrived on the market, with the Swedish property company Vasakronan, the French utility company EDF and the US-based Bank of America.

An acceleration started in 2014 and a big jump occurred in 2016, when volumes nearly doubled and passed the level of USD 80 billion.[1] A major impact came from the Paris Agreement at the end of December 2015. Many governments announced climate targets, and tapping the green bond market was seen as a key tool to finance green projects. As a result, the first sovereign green bond was issued by Poland at the end of 2016, followed by a French issuance in 2017.

In 2019, about USD 259 billion worth of green bonds were issued, surpassing the 2018 level by 51%. The new global record was primarily driven by Europe, where issuances were up 74% from 2018 and increased the region's global market share to 45%. The second largest region, Asia-Pacific, with a share of 25%, experienced 29% growth, while North America was up 46%, accounting for 23% of green-bond issuance in 2019. Highly welcomed was the fact that non-financial corporates more than doubled their green bond volumes to USD 59.1 billion. The three single-largest global issuers were the Federal National Mortgage Association (Fannie Mae) from the US (8.8% share), German state-owned KfW (3.5%) and the Dutch State Treasury Agency (2.6%).[2]

Most optimistic forecasts for 2020 predict an issuance of USD 350 billion, implying a growth rate of 35% versus 2019 (see Figure 10).[3] Despite the impressive growth, green bonds still account for less than 1% of the global bond market.

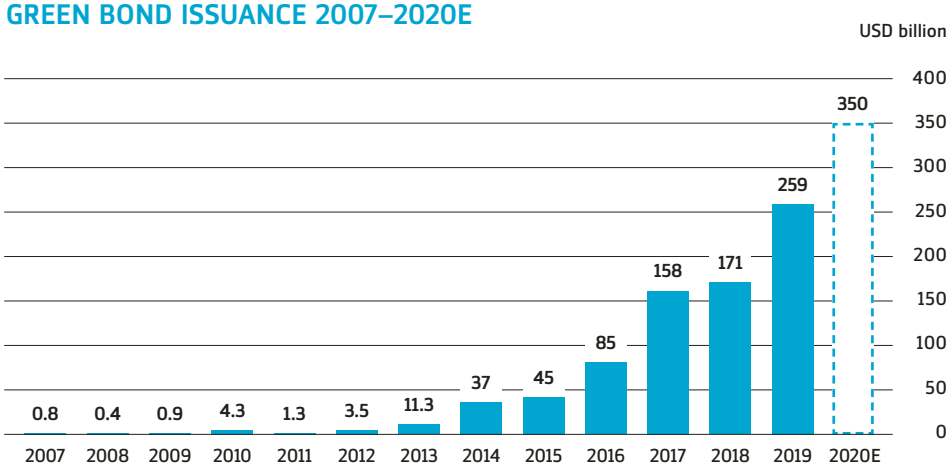
Green bonds from Swiss-based issuers listed on the SIX Swiss Stock Exchange totalled around USD 2.2 billion by year-end 2019, with the Canton of Geneva, Canton of Basel-Stadt and Zurich Cantonal Bank being the largest issuers.

What is a green bond?

A green bond is a fixed-income security designed to exclusively finance new and existing projects that deliver positive environmental and/or climate benefits. Compared to traditional bonds, the only difference lies in the defined use of proceeds, as green bonds are subject to the same capital market and financial regulations as other listed fixed-income instruments.

It is widely accepted that a bond denominated as a green bond has to be aligned with the four pillars of the Green Bond Principles.

Figure 10:
GREEN BOND ISSUANCE 2007–2020E



Source: Climate Bonds Initiative, E= Climate Bonds Initiative estimate

These principles provide general guidelines on best practices and are defined by the International Capital Market Association (ICMA), a self-regulatory organisation and trade association headquartered in Zurich. The Green Bond Principles are voluntary guidelines that recommend transparency, disclosure and reporting, and are based on four core components[4]:

— Use of proceeds
— Process for project evaluation and selection of projects
— Management of proceeds
— Reporting on the actual use of proceeds

While the Green Bond Principles require 100% of proceeds to be dedicated to green projects, the non-profit organisation Climate Bonds Initiative (CBI)[5] includes green bonds in its statistics if at least 95% of the bond proceeds are aligned to green assets. It excludes bonds from its green bond statistics in cases where more than 5% of proceeds are used for working capital or general funding purposes. This mainly affects Chinese issuers, since working capital is an eligible category for green bonds under Chinese rules.

Use of proceeds

The Green Bond Principles provide general guidelines on eligible green project categories, which include, for example, renewable energy, green buildings or clean transportation. In 2019, the proceeds from green bond issuance were primarily directed to energy (32% share), buildings (30%) and transport (20%) (see Figure 11). Water projects took a 9% share and waste a mere 3%. However, the

share of energy had declined versus 2015, when it accounted for about 46%, as most green bond investments were initially made in renewable energy.

Suitable projects for green buildings include, for example, energy-efficiency upgrades like LED lighting and new heating systems, but also improvements in water use. The transport category includes large state-backed railway companies such as the French SNCF, Ferrovie dello Stato Italiane or metro rail lines like MTR in Hong Kong. Given that railways offer an effective low-carbon solution for transporting goods and people, their high share of the green bond market does not come as a surprise.

External reviews to support credibility

In order to create transparency for investors and avoid 'greenwashing', the ICMA recommends an external review or a second-party opinion. The verification refers to the alignment of the green bond with the four pillars of the Green Bond Principles and/or compliance with the CBI's Climate Bonds Standards.

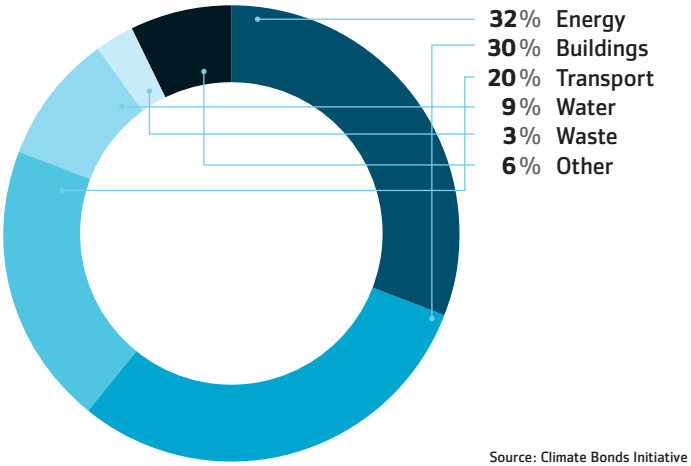
The external review is conducted by an organisation with environmental expertise such as CICERO, Sustainalytics, Vigeo Eiris or ISS-Oekom, and is commissioned by the issuer. In some cases, the second-party opinion provider is involved early in the process and works with the issuer to develop a framework against which it will evaluate the projects at the end. Also, rating agencies Moody's and Standard & Poor's provide external views, and auditors such as KPMG or EY issue verification letters.

In 2019, 86% of the global green bonds issued (by amount) had undergone an external review. However, there was also a slight increase in green bonds without an external opinion, both in value and deal count. While it is common for US municipalities to have no rating, there are also an increasing number of other issuers without an external review. Clearly, prospectus disclosures reviewed by advisers and auditors deliver some level of comfort, but a second-party opinion provides better credibility.

Impact and post-issuance reporting

Impact reporting aims to provide insights into the environmental benefits of green bond financing. The objective is to quantify changes in the performance of an asset, project or portfolio with respect to a set of relevant indicators and benchmarks. As impact reporting is gaining importance, the ICMA recommends reporting not only on the use of proceeds, but also on the expected environmental impact, at least on an annual basis.

Figure 11:
GREEN BOND INVESTMENT ALLOCATION IN 2019
82% OF GREEN BOND INVESTMENTS ALLOCATED TO ENERGY, BUILDINGS AND TRANSPORT



Source: Climate Bonds Initiative

So far, the ICMA has published metrics guidelines for seven sectors: renewable energy, energy efficiency, sustainable water and wastewater management, waste management and resource efficiency, clean transportation and green buildings. However, their recommendations regarding the metrics are limited in scope and the guidelines were published as an additional document to the Green Bond Principles. There are also regional guidelines issued by local governing entities.

In a report published at the end of 2018, Moody's tried to estimate the environmental benefits of a USD 22 billion green bond portfolio.[6] The rating agency estimated an average carbon emission reduction of 500 kg per year for each USD 1,000 spent on renewable energy projects, 175 kg for clean transportation, 60 kg for energy-efficiency projects and 5 kg for green buildings. In sum, Moody's estimated that the green bond sample would save approximately 2.6 million metric tons of annual carbon emissions.

Harmonisation plans for green bond standards by the EU

Due to the absence of a consistent global standard, investors' interest in harmonisation is high. Since Europe is the global leader in green bond issuance, it comes as no surprise that Europe is taking the lead in setting global standards.

In 2018, the European Commission released its Action Plan on Financing Sustainable Growth and established a Technical Expert Group on Sustainable Finance (TEG) composed of 35 members from civil society, academia, business and finance. In June 2019, the TEG published a report[7] on the proposal for EU Green Bond Standards that makes the following four key recommendations:

— Alignment with the EU Taxonomy (use of proceeds for green projects)
— Publication of a Green Bond Framework by the issuer
— Mandatory reporting on the use of proceeds
— Mandatory verification of the Green Bond Framework

The proposals are similar to the four pillars of the Green Bond Principles, but the EU proposal goes into much more detail and provides a harmonised classification system for green economic activities. The EU taxonomy would have the strongest impact, as – based on the recommendations – bond proceeds could only be classified as green if the projects were aligned with a detailed list of economic activities drawn up by the EU. While the taxonomy brings more clarity to what can be considered sustainable, and hence could lead to higher green bond issuance, it could demotivate or limit issuers tapping into the green bond market if its definition is too restrictive and limits the eligible number of green projects.

As opposed to ICMA principles, the proposal by the TEG recommends that allocation and impact reports have to be disclosed annually or at least once at full allocation. Furthermore, verification by a third party should be mandatory and the reviewer would have to be accredited by the EU.

Summary

The future of green bonds looks promising given the steadily increasing investor demand and more issuers tapping into the market. By using the green bond market, issuers not only signal their awareness of environmental and climate risks, but also their willingness to exploit attractive low-carbon opportunities. In addition, environmental aspects are entering the radar screens of the regulators and rating agencies, making it more important for issuers to articulate their sustainability strategies. Proposals of the EU Action Plan on Financing Sustainable Growth include the creation of climate-related benchmarks and the incorporation of sustainability in investors' fiduciary duties, which are all potential demand drivers for green bonds. However, one of the main challenges will be to ensure that the EU taxonomy is scientifically robust, while at the same time being practical.

1 Climate Bonds Initiative (2017). *Green Bond Highlights 2016*. Retrieved from: https://www.climatebonds.net/files/files/2016%20GB%20Market%20Roundup.pdf

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3 Climate Bonds Initiative (n.d.). *Homepage – Green Bonds Market 2019*. Retrieved from: https://www.climatebonds.net/

4 International Capital Market Association (n.d.). *Green Bond Principles*. Retrieved from: https://www.icmagroup.org/green-social-and-sustainability-bonds/green-bond-principles-gbp/

5 CBI is an investor-focused non-profit organisation, promoting investments in the low carbon economy. Beside leading investors and banks, CBI's partners further include nations, e.g. Switzerland.

6 Moody's (4 Dec. 2018). *Environmental impact and reporting vary by jurisdiction and asset class*. Retrieved from:https://www.moodys.com/login?ReturnUrl=https%3a%2f%2fwww.moodys.com%2fresearchdocumentcontentpage.aspx%3fdocid%3dPBC_1130746

7 EU Technical Expert Group on Sustainable Finance (2019). *Report on EU Green Bond Standard*. Retrieved from: https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/190618-sustainable-finance-teg-report-overview-green-bond-standard_en.pdf

5.1 CASE STUDY

SUSTAINABILITY BONDS

Financing Environmental and Social Outcomes

As opposed to green bonds, sustainability bonds not only direct investments into environmental outcomes, but also address social issues, as the example of the Raiffeisen Switzerland sustainability bond shows.

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Green bonds are well-established fixed-income instruments that can foster positive environmental outcomes such as low-carbon solutions. Less known are sustainability bonds, for which proceeds are additionally used for social benefits. Green and sustainability bonds increase transparency in the capital market and enable investors to make more informed investment decisions. Investors committed to sustainability can allocate their investments to such bonds.

A decisive condition for green and sustainability bond markets to work is reliable standards to qualify assets and projects as green and social. It is thus no surprise that the EU Commission emphasises the importance of developing a taxonomy for sustainable activities within the context of its Action Plan on Financing Sustainable Growth.[1] The Climate Bond Initiative (CBI) is another important actor in this field. It already started to publish sector criteria for different types of renewable energy, forestry, transport, water infrastructure, waste management and low-carbon buildings years ago.[2] CBI sees the largest potential for green bonds in the building sector and expects buildings-related green bonds to amount to 40% of the green bonds market. Such investments are indeed desperately needed, as up to 70% of large city's greenhouse gas emissions are related to buildings.[3]

Raiffeisen Switzerland Cooperative adopted a conceptual framework for sustainability bonds[4] and issued its first sustainability pilot-bond in April 2019. According to the framework, proceeds of a bond issuance can be used within the Raiffeisen Group to finance or refinance loans to housing cooperatives and other non-profit housing organizations. The buildings financed through the loans typically meet recognised energy efficiency standards, generate comparably low CO_2 emissions and are well connected to public transport. In addition to these green factors, housing cooperatives are democratically organised. Buildings are run not-for-profit and apartments are rented at favourable conditions. The latter adds a social factor, allowing bonds to qualify not only as green but as social as well. The Raiffeisen sustainability bond can thus be qualified as a "sustainability bond" according to the International Capital Markets Association (ICMA).[5]

Relevant green bond frameworks

The Raiffeisen sustainability bond's structure meets the ICMA Principles for Green Bonds and Sustainability Bonds, which are voluntary process guidelines on transparency and disclosure. It further follows the spirit of the recommendations of the EU Technical Expert Group on sustainable finance, which state that Green Bonds should comprise the following four elements: alignment with the EU Taxonomy, a bond framework, reporting, and verification by accredited verifiers.[6]

In line with the ICMA principles, Raiffeisen published a report that provides detailed information on exactly how proceeds of a particular bond issued under the framework are used[7], namely an estimation of the number of buildings financed by the proceeds, the type of energy efficiency certification and the percentage of certified buildings, as well as the energy demand and CO_2 emissions of the buildings. The report on the first bond confirms that all build-

ings are within the top 15% of Swiss real estate in terms of CO_2-efficiency, aligning the bond with the CBI's criteria for residential buildings.

At least one external review of a green or a sustainability bond should be carried out by an independent external validator in order to assure investors that proceeds are effectively used for the declared purposes in the declared manner

Key terms of the bond

The CHF 100 million bond was rated A3 by Moody's and listed on the Swiss stock exchange. Its maturity is five years and it came with a 0.125% coupon and a 100.324% reoffer price. The coupon and spread of +43 basis points over swap correspond to the pricing of a conventional five-year Raiffeisen Switzerland bond. The price was set at this level after market research showed that green bond pricing does not seem to differ substantially from conventional bond pricing. Given the bond's terms, influenced by the absolute low interest rate environment in CHF, the bond was of limited interest to retail investors. However, it was very quickly and successfully placed with institutional investors such as banks, insurance companies, pension funds and some asset managers.

Outcome and experience

The inaugural sustainability bond issuance was from the very beginning seen as a pilot initiative by Raiffeisen Switzerland. The main internal objective was to learn and gain experience with this still new instrument as an additional source of funding. Overall, the experience was clearly positive. On the negative side, the conceptualisation and external verification of the bond caused additional costs compared to the issuance of a conventional bond. However, the bond was well received and sold very quickly, meeting high demand on capital markets for such products. Based on this experience, issuing green or sustainability bonds can widen an issuer's investor base.

In order to conceptualise the bond, a certain level of technical expertise was required, for example capacities to identify assets and projects qualifying for a green or a sustainability bond. However, the more decisive factors for the successful launch of the pilot were support from senior management and dedicated, constructive teamwork across all involved parties.

Last but not least, the issuance of a green or a sustainability bond should be put in a wider context. The EU Technical Expert Group on sustainable finance rightly highlights that such bonds can only be declared as green if there are actually investments in green and sustainable assets and projects.[8] Facilitating such investments, e.g. through favourable framework conditions, is thus key to stimulating green, sustainable growth. Given the urgent environmental and social challenges of our time, the creation of such a favourable framework should be a political priority of any responsible financial institution.

1 For an overview of the state of play regarding the EU Technical Expert Group on Sustainable Finance's work on a Taxonomy for Sustainable Activities see: https://ec.europa.eu/info/publications/sustainable-finance-teg-taxonomy_en

2 Climate Bond Initiative (n.d.). *Sector Criteria Available for Certification.* www.climatebonds.net/standard/available

3 Climate Bonds Initiative (n.d.). *The Buildings Criteria.* Available at: https://www.climatebonds.net/standard/buildings

4 Raiffeisen Schweiz (2 April 2019). *Konzept. Raiffeisen Sustainability Bond.* Available at: https://www.raiffeisen.ch/content/dam/www/rch/pdf/information-in-english/investor-relations/Information-for-bondholders/raiffeisen-schweiz-sustainability-bond-konzept.pdf

5 International Capital Markets Association (n.d.) *Principles on green, social and sustainability bonds.* Available under: https://www.icmagroup.org/green-social-and-sustainability-bonds/

6 Technical Expert Group on Sustainable Finance (18 June 2019). *Report on EU Green Bond Standard.* Available at: https://ec.europa.eu/info/files/190618-sustainable-finance-teg-report-green-bond-standard_en

7 Raiffeisen Schweiz (2 April 2020). Bericht *"Performance Kreditpool". Sustainability Bond Raiffeisen.* Available at: www.raiffeisen.ch/content/dam/www/rch/pdf/information-in-english/investor-relations/Information-for-bondholders/performance-kreditpool-bericht.pdf

8 EU Technical Expert Group on Sustainable Finance (18 June 2019). *Report on EU Green Bond Standard.* Available at: https://ec.europa.eu/info/files/190618-sustainable-finance-teg-report-green-bond-standard_en

6 SUSTAINABLE REAL ESTATE
Green Buildings from an Investor Perspective

Empirical evidence shows that green buildings can generate premiums, hence investors should analyse green building projects from a value perspective and not only from a cost perspective.

Greater transparency in labelling methodology would improve comparability and encourage investors to commit to sustainable real estate, as well as help the industry benefit from existing standards.

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DIEGO LIECHTI
CIO, Nest Sammelstiftung

RAPHAEL PEPE
Investment Analyst, Nest Sammelstiftung

Sustainable real estate

The various definitions of "sustainability" and the different aspects summarised under this term often can lead to confusion – and this is not much different in the case of sustainable real estate. While achieving energy efficiency and reducing CO_2 emissions are an undisputed part of sustainable building, there might be a trade-off with other sustainability factors. For example, a heritage building should be insulated and its fixtures updated to improve carbon efficiency. From a social perspective, however, leaving the building's original form and providing affordable housing with lower rent payments may be more desirable. Within sustainable real-estate strategies, investors must therefore carefully consider which factors are at play. Nevertheless, reducing CO_2 emissions remains a key target for sustainable real estate investors, and is thus the focus of this chapter.

Importance of energy-efficient real estate to achieve a low-carbon economy

According to the Swiss Federal Office for the Environment (FOEN),[1] the greenhouse gases released into the atmosphere within Switzerland amounted to 47.2 million tons of CO_2 equivalents in 2017 (not including international air traffic and shipping). 26% of that is caused by buildings, making them the second most important source of CO_2 equivalent emissions after transportation. Correspondingly, buildings account for 28% of global CO_2 emissions.[2] To keep global warming below 2 degrees as mandated by the Paris Agreement, real estate management will therefore need to reduce CO_2 emissions by 36% by 2030.[3] In Switzerland, CO_2 emissions are to be reduced by 2020 by at least 40% below the 1990 level, according to the FOEN. A mix of incentives and regulations are being used to achieve that target. Investors active in the real-estate market will need to carefully assess how they can reduce the CO_2 emissions of their holdings while achieving attractive returns. What are the participants of the real estate sector doing, what tools do they have at their disposal and what could be a possible path to achieving a significant reduction in carbon emissions?

Labels

Labels are one possibility to provide some guidance and/or economic signals to reduce CO_2 emissions. A well-known label in Switzerland is "Minergie". "Minergie" buildings accomplish reduction through two major components: Firstly, less energy is needed due to better insulation and other energy-related upgrading of buildings. Secondly, only 10% of the energy source of "Minergie" buildings comes from fossil fuels. Today, one out of twelve newly constructed residential buildings have a "Minergie" label and more than 630,000 people live in such buildings.[4] Further guidance exists in Switzerland with progressive standards such as SNBS 2.0 or various SIA norms.[5] In the international context, other labels such as LEED (Leadership in Energy and Environmental Design) or GRESB (Global Real Estate Sustainability Benchmark) have similar outcomes as "Minergie". GRESB is considered as one of the most impor-

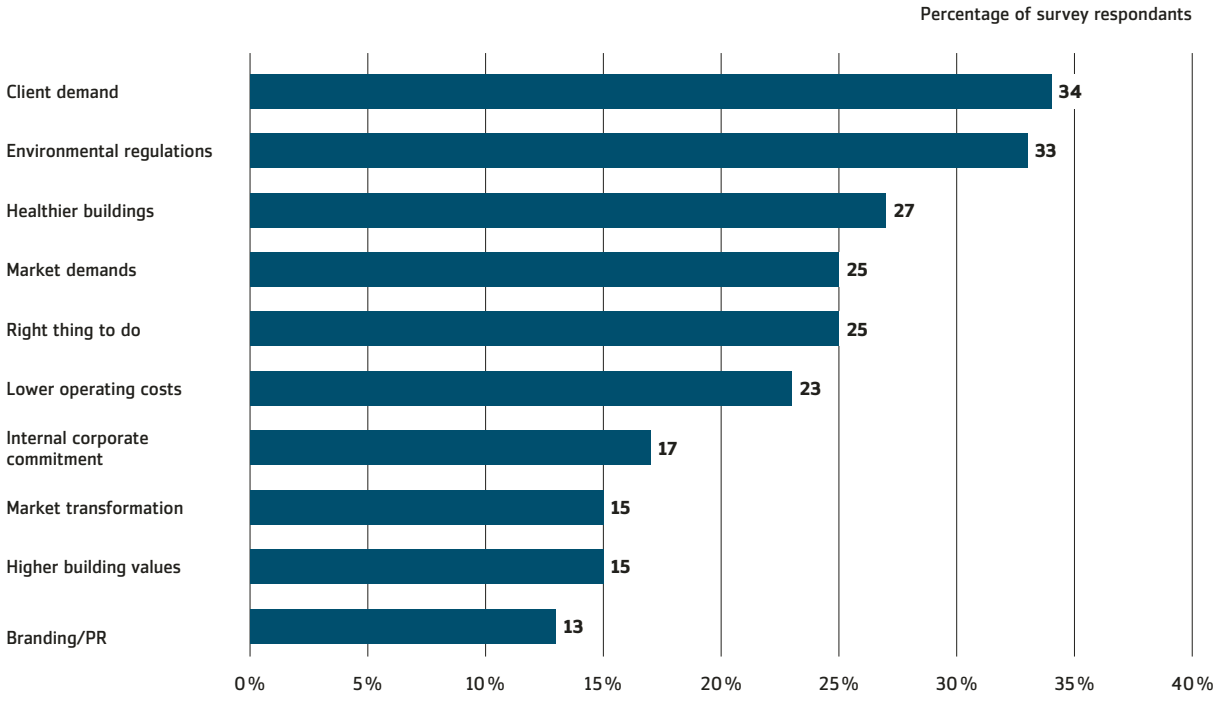
tant international real estate sustainability ratings and benchmarks. The GRESB analysis allows users to benchmark their products to those of the respective peer group and serves as an essential tool to evaluate and optimise sustainability performance.

Although labels have played an important role in the development of sustainable real estate, the industry currently has to deal with the problem of an excessive number of labels. This can lead to more confusion than actual guidance. Second, labels often lack transparency regarding the underlying methodology, which results in incomparability among labels. Third, labels can become outdated and since real estate involves long-term assets, investors often hesitate to choose a label, in order to avoid being stuck with an obsolete one. Fourth, labels in general can lead to moral hazard problems. For example, the Energy Star label helps consumers purchase energy-efficient air conditioners, but this can lead to increased usage of air conditioners, since consumers no longer feel guilty about using such appliances. Still, labelling has enabled progress in sustainable and green real estate.

Triggers and barriers of green building activity

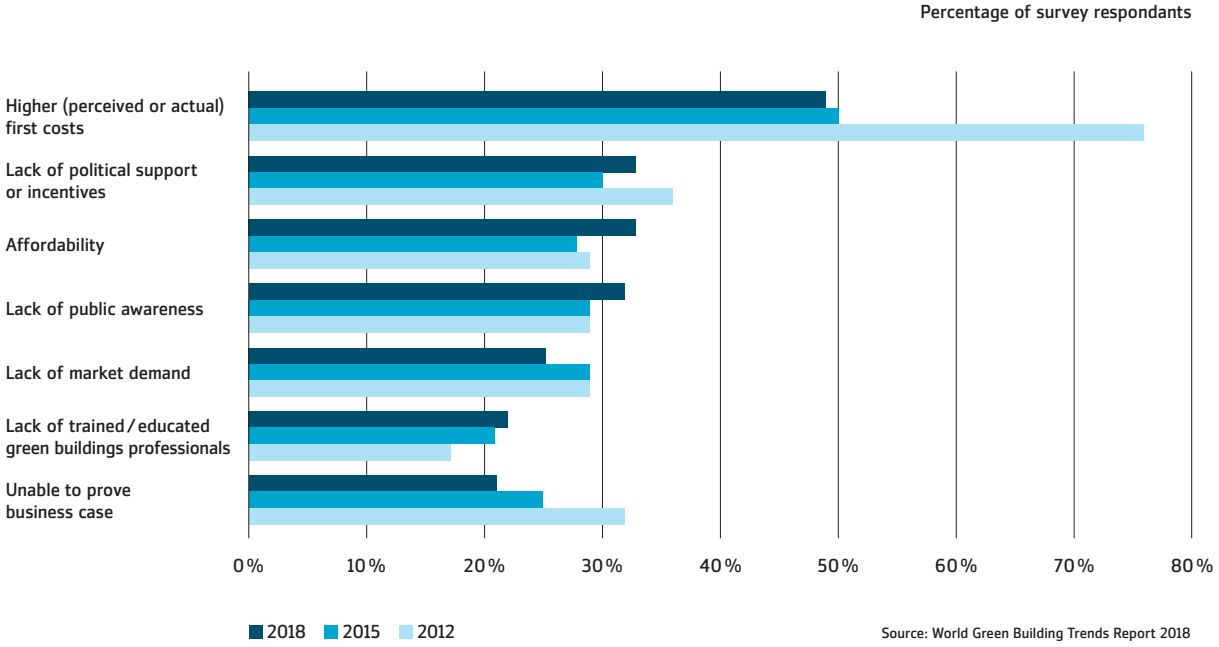
The main problem of providing more sustainable, low-carbon real estate is that the majority of the real-estate stock is already in existence. Most of the existing real estate was built long before green or low-carbon solutions became popular and is therefore not sufficiently energy efficient. As a consequence, the real estate sector is facing the challenge of retrofitting. Retrofitting of an existing building can be quite difficult due to the involvement of various stakeholders, especially tenants. Also, real estate owners face the trade-

Figure 12:
TRIGGERS OF GREEN BUILDING ACTIVITY



Source: World Green Building Trends Report 2018

Figure 13:
BARRIERS TO INCREASED GREEN BUILDING ACTIVITY



Source: World Green Building Trends Report 2018

off between social and environmental aspects: total renovation can lead to a rent increase almost up to the level of new buildings, eliminating previously affordable housing. A specific challenge is also the retrofitting process itself. Both possibilities, i.e. letting the tenants stay inside the building while renovating or terminating their leases before the renovation, can lead to various problems. Furthermore, passing on the renovation costs is quite challenging due to Swiss tenancy law. In addition, tenants only prefer renovated green buildings over new ones if the rent payments remain affordable. These factors could explain why only 37% of green building activity comes from the retrofitting of existing buildings.[6] Nevertheless, the number-based percentage of green projects is rising in general, from roughly 19% in 2015 to 27% in 2018.[7]

This increase in green building activity is mainly driven by commercial factors, regulation and idealism. Figure 12 shows the results of a survey among architects, designers, contractors, builders, specialists, owners, developers, engineering firms, and investors. Client demands and environmental regulations are the most important triggers, followed by healthier buildings, market demands, idealism ("Right Thing to do"), as well as lower operating costs. Interestingly, higher building values or marketing aspects ("Branding/PR") are less important.

On the other side, Figure 13 gives some indication of what constrains the growth of green building activity. The most important barrier is higher (perceived or actual) initial cost, although its importance has declined significantly since 2012 from 76% to 49% in 2018. This decline shows that the perception of green buildings as being expensive without many economic advantages is decreasing. Other major barriers are the lack of political support or incentives, affordability and the lack of public awareness.

Given these drivers of and barriers to green building activity, the question is: What can be done to further promote low-carbon real estate?

Towards greener real estate

As discussed above, one major problem is finding standard sustainability principles for real estate. Labels such as "Minergie" or GRESB are a good starting point, but the principles should go further and encompass everything from the design of a building to end-of-life considerations. This includes the recycling and disposal of the various materials after the demolition of a building, criteria not often included when labels are given. Indirect CO_2 emissions through insufficient connections of green buildings to public transportation is also a consideration that should not be overlooked. Finally, international acceptance is key and the World Economic Forum launched an agenda to develop common practices in 2016.[8]

Next, the barriers to green building and refurbishment activity should be removed, or at least reduced. The most important barrier, i.e. higher initial costs, is the easiest to overcome. High initial costs are irrelevant (or only a financing problem) if the project provides enough financial value. There is evidence that green properties or energy-efficient buildings achieve premium prices in real estate markets, although this may decrease over time.[9|10|11] The reason for these premiums may be due to lower expenditures, higher rents and/or higher occupancy rates. The question remains, however, whether investments in green buildings are net present value (NPV) maximising projects, i.e., if they maximise (long-term) value in a monetary way? If so, there would be no economic rationale against green building projects. Unfortunately, no general answer can be given, because of the project-specific nature of real-estate investments. However, given the size of the premiums for green buildings, the extra initial costs can be between 5% to 31% of the green building value – based on the various results of previous empirical studies[12] – and the green real estate project would still earn a higher NPV than a comparable non-green project. Even taking the lower estimate of the premium of 5%, a sizable amount could be invested in energy efficiency for the project to still pay off. Nevertheless, the value of a building depends on many factors that change over time.

Takeaways for institutional investors

There are different takeaways for both direct and indirect investors (i.e. investors investing in real estate through funds or REITs). However, they both need to define a realistic sustainability strategy and analyse CO_2 emission reduction in the actual portfolio. While direct investors should assess their portfolio regarding their sustainability potential with retrofitting or new projects, indirect investors need to compare traditional funds with sustainable alternative real estate funds. Consequently, direct investors have much more leverage to reduce the CO_2 emissions of their real estate assets. Yet, both types of investors should be critical, weigh their options, and build up knowledge to reconstruct their real estate portfolio. In addition, setting targets and reporting on key figures such as energy consumption or CO_2 emissions per square metre – regardless of the labels employed – are important steps to achieving a low-carbon real estate economy.

1 FOEN (2019). *Climate in brief.* Available at: https://www.bafu.admin.ch/bafu/en/home/topics/climate/in-brief.html

2 UN Environment and International Energy Agency (2017). *Towards a zero-emission, efficient, and resilient buildings and construction sector. Global Status Report 2017.* https://www.worldgbc.org/sites/default/files/UNEP%20188_GABC_en%20%28web%29.pdf

3 World Economic Forum (2016). E*nvironmental Sustainability Principles for the Real Estate Industry.* http://www3.weforum.org/docs/GAC16/CRE_Sustainability.pdf

4 Aeberhard, S. (Januar 2018). Minergie in Zahlen. *Faktor Minergie (47),* 24-25.

5 For more information on SNBS 2.0 see: https://www.snbs-cert.ch/ For more information on SIA norms see: http://www.sia.ch/de/dienstleistungen/sia-norm/

6 Dodge Data & Analytics (2018). *World Green Building Trends 2018. Smart Market Report.* https://www.worldgbc.org/sites/default/files/World%20Green%20Building%20Trends%202018%20SMR%20FINAL%2010-11.pdf

7 Ibid.

8 World Economic Forum (2016). *Environmental Sustainability Principles for the Real Estate Industry.* http://www3.weforum.org/docs/GAC16/CRE_Sustainability.pdf

9 Eichholtz, P., Kok, N., Quigley, J. M. (2010). Doing Well by Doing Good? Green Office Buildings. *American Economic Review 100,* 2494–2511.

10 Salvi, M., Horejájová, A. and Müri, R. (2008). *Minergie macht sich bezahlt.* Zürich: CCRS und Zürcher Kantonalbank.

11 Miller, N., Spivey J., Florance A. (2008). Does Green Pay Off? *The Journal of Real Estate Portfolio Management 14,* 385-400.

12 Baumann, R. (2017). Sustainable Real Estate. In: *Handbook on Sustainable Investments.* Zurich: Swiss Sustainable Finance.

6.1 CASE STUDY

GREEN REAL ESTATE FUNDS

Providing a Future-Fit Portfolio while Reducing Carbon Emissions

This case study highlights the key elements of a sustainable real estate investment strategy, which includes an in-depth energy analysis of real estate properties, provides a multi-year building upgrade programme and explores the potential of each property within a portfolio to lower its carbon footprint, while increasing rental levels and the value of real estate assets.

ALEXANDROS GRATSIAS
Sustainable Real Estate Investments Analyst, J. Safra Sarasin

This case study provides a roadmap derived from sustainable real estate funds with direct holdings. The author describes how to actively manage properties of an investment fund based on a strategy that has provided attractive financial returns over the years, while successfully reducing carbon emissions.

Step 1: Energy monitoring and optimization – focus on renewables and district heating

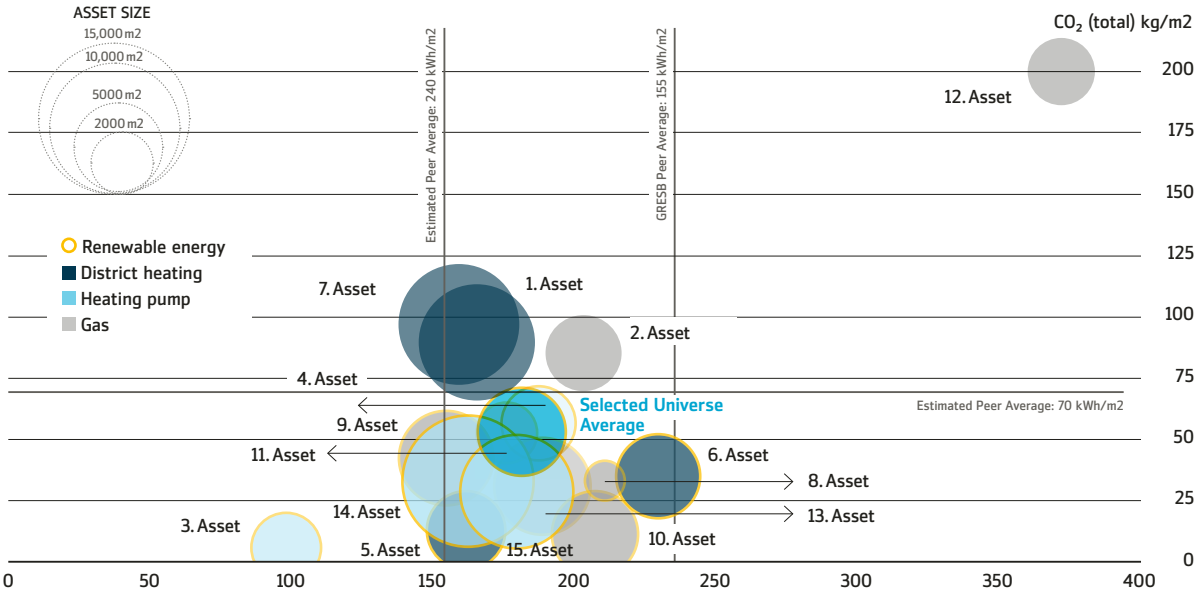
The first step to reduce recurring operational costs, energy consumption and the carbon output of the portfolio is monitoring the properties. Figure 14 presents the annual energy consumption and CO_2 output of selected properties. The analysis is based on accounting data for commercial properties from J. Safra Sarasin Swiss and European real estate funds.

At J. Safra Sarasin, the following observations were derived from the monitoring of properties with a focus on renewable energy and energy efficiency solutions:

- Commercial properties are electricity intensive, while residential properties are heating energy intensive. Thus, our main focus for commercial properties is to improve electricity, lighting and ventilation, while for residential buildings it is on efficient heating systems.
- Proper time frames (e.g. minimum usage during the night or weekends for office space) and reconfiguration of the ventilation and heating pumps may save up to 15% of total energy consumption.
- Expected and actual consumption levels may vary. We identify inefficiencies by benchmarking all properties, based on the previous year's consumption and on design values or energy certificates. This allowed us to identify e.g. electricity pumps that were not properly configured and were subsequently optimised.
- Gas heating systems are CO_2 intensive and eco gas solutions often more expensive than natural gas. Therefore, we prefer heating solutions not based on fossil fuels, such as heating pumps or district heating.
- District heating is efficient, and the proportion of renewable energy consumption within district heating has increased. This is, in our view, the most promising solution to decrease CO_2 emissions, while also supporting the local economy.

By assessing a real-estate portfolio in this detailed manner, funds can better implement an active management strategy, compare their real-estate assets, and identify which assets to concentrate on in order to improve the portfolio energy consumption and CO_2 output levels. Only then is an investor well equipped to move to step 2.

Figure 14:
REAL ESTATE ASSET CARBON EMISSIONS AND ENERGY USAGE MONITORING



Source: Bank J. Safra Sarasin 2019

Step 2: Sustainability strategy & upgrades – focus on automation, ventilation and lighting

Under the Energy Efficiency Directive, EU countries must draw up long-term national building renovation strategies. Switzerland's Federal Council has also developed the Energy Strategy 2050, which focuses on increasing renewables and energy efficiency. We thus anticipate that regulators in Switzerland and Europe will tighten their codes for existing buildings. Future measures will include revised energy efficiency directives and energy audit obligations for investment funds.

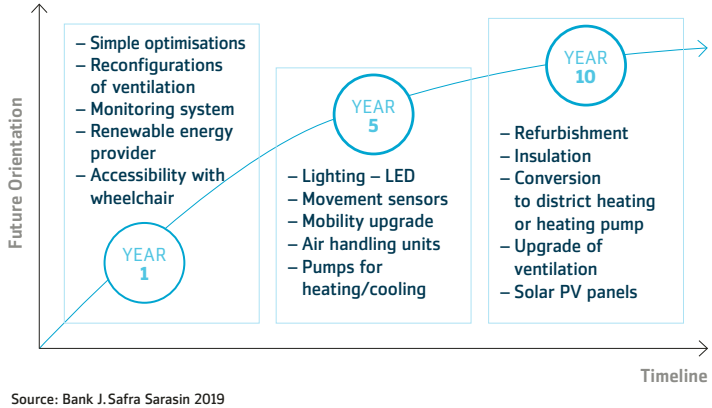
To align with this expectation, a standard 10-year maintenance plan is implemented for properties with low energy ratings (Figure 15). Given that massive energy savings can be achieved by retrofitting existing buildings, the plan below is key to a successful transition to low-carbon real estate.

— **Short term measures – quick wins (1-year time frame)**
This category focuses on simple optimisations with low investment costs, taking into consideration the feedback from building and operational experts. We also invest in the automation of the property, which results in energy and carbon output optimisation.

— **Medium term measures – higher efficiency (5-year time frame)**
In this phase, the investments focus on selective technical upgrades of infrastructure that is close to the end of its life cycle. The optimizations concentrate on lighting systems and local units from the ventilation or the heating system.

— **Long Term Measures – Capex Intensive**
Commercial properties with a low energy rating and no longterm upgrade plan are bound to one-time high capital expenditure (capex). Property funds often face the dilemma to either sell the property at a discount before the main rental contracts expire, or to enter into an extended refurbishment programme. Under such a program, measures focus on a complete refurbishment of the infrastructure, internal space and shell of the building.

Figure 15:
STANDARD 10-YEAR MAINTENANCE PLAN



Source: Bank J. Safra Sarasin 2019

In conclusion, at J. Safra Sarasin, we integrate the above elements on three levels during our investment process. First, by sourcing and selecting the right investments, i.e. properties that are suitable for implementing the above strategy. Second, during acquisition and due diligence, we use the above elements as a framework to create cost/return-based scenarios for the next ten years on a property level. Finally, with active management throughout the lifecycle of the property, in combination with lease expirations or lease renewal options during the holding within the funds. This consistent methodology has, over the years, provided longer lease terms and higher rental levels, resulting in higher property valuations. We believe that future-focused real estate funds can play a key role in the transition to a carbon-neutral future and that a long-term approach helps investors stay ahead of future challenges.

7 ENERGY EFFICIENT MORTGAGES
Supporting Energy Efficiency and Sustainability in Real Estate

Due to the enormous scope for Switzerland to achieve energy savings through upgrading existing properties, the market for services supporting property modernisation has great potential, while current instruments, such as interest-rate reductions on mortgages (e.g. "eco" mortgages) only have limited effects.

The approach of a long-term use and renewal strategy for properties is one way of increasing the renovation rate. This allows for optimal financial planning and appropriate actions to be taken.

DANIEL JAKOBI
Deputy Head Innovation & Development, Raiffeisen Switzerland

Introduction

Swiss banks primarily support energy efficiency and sustainable construction in the mortgage business by offering reduced interest rates for mortgage loans when energy efficiency criteria are met, such as when a property has a MINERGIE certificate or improves to a higher energy standard such as the cantonal building energy performance certificate (GEAK). Examples of this are energy loans from Zürcher Kantonalbank[1] which have been on the market for more than 25 years, the special "renovation" offer from UBS[2] or the "eco discount" from Raiffeisen[3]. The Swiss Federal Office of Energy is providing the basis for issuing energy-efficiency mortgages with its 2050 vision for the stock of buildings[4] and the building label family GEAK, MINERGIE, SNBS and 2000 Watt Areal. In the EU, the Directive on the Energy Performance of Buildings (2010/31/EU) is the basis for implementation in EU countries.[5] In Germany, for example, energy performance certificates have been mandatory for all residential buildings since 2009 because of the Energy Saving Regulation.[6] An increase in transparency in the context of energy efficiency for buildings also seems realistic in Switzerland. The Canton of Fribourg, for example, requires a GEAK for all property transfers.[7] This development shows that transparency and comparability are increasing because of various factors, such as stricter regulations in the context of the federal government's Energy Strategy 2050[8], the digital transformation or the increased availability of data. This is leading to greater public awareness. However, from the viewpoint of the lending banks the proportion of "eco" mortgages is very low compared to overall mortgage loans (Table 5 based on the 2016–2018 ZKB annual reports is an example of this).

One would expect that the price reduction incentive would lead to a correlation between the amount of "eco" mortgages issued and the growing importance of energy efficiency.

Experience with energy efficiency mortgages

Mortgage products are increasingly becoming an exchangeable product. New market participants such as pension funds or comparison portals, as well as the expansion of digital offerings (online mortgages), are diversifying market offers and intensifying the pressure on margins. The persistently low interest-rate environment and declining margins are continuously reducing providers' leeway when it comes to pricing. However, the market for financing renovations has great potential. Three-quarters of all buildings in Switzerland are more than 30 years old[10], and the energy renovation rate is slightly under 1%[11], although renovation projects can currently be financed at a reasonable price. The Energy Strategy 2050 of the federal government provides for a 43% reduction of energy consumption by 2035.[12] About half of primary energy consumption in Switzerland occurs in the area of real estate.[13]

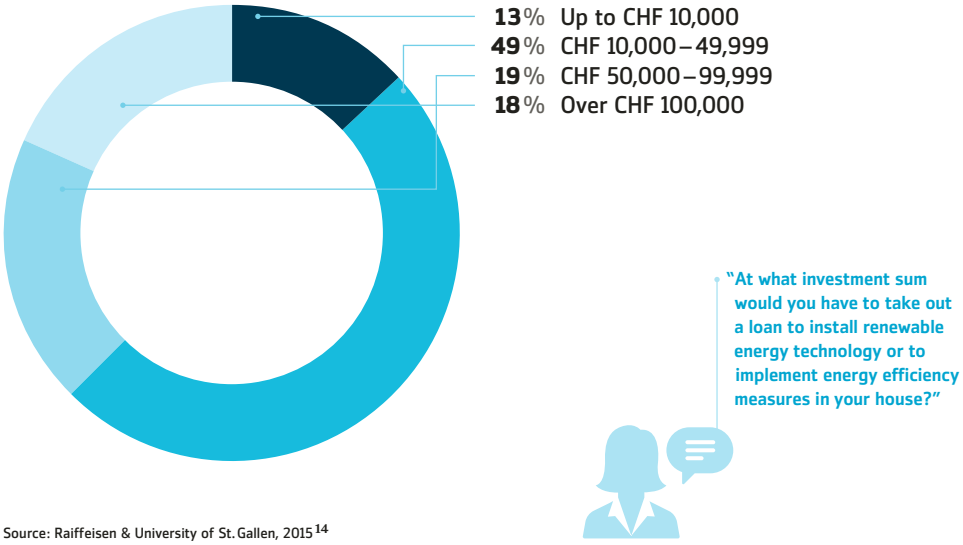
In Raiffeisen's view, barriers for implementing refurbishments include a lack of renovation strategies. Currently, renovation for

Table 5:
PROPORTION OF "ECO" MORTGAGES COMPARED TO OVERALL MORTGAGE LOANS

YEAR	PORTION	TOTAL VOLUME OF ECO MORTGAGES	MORTGAGE LOANS
2018	1.5%	1.2 billion	81.3 billion
2017	1.5%	1.2 billion	79.1 billion
2016	1.5%	1.16 billion	77.3 billion

Source: ZKB Annual Reports 2016–2018 [9]

Figure 16:
FINANCING NEEDS OF HOMEOWNERS FOR RENEWABLE ENERGY TECHNOLOGIES



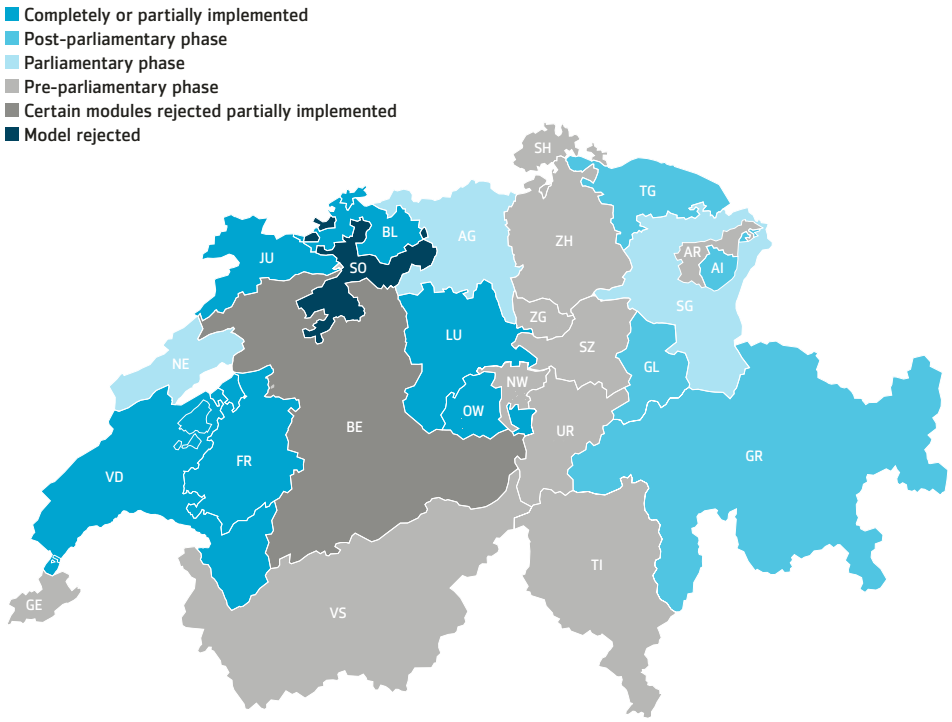
Source: Raiffeisen & University of St. Gallen, 2015 [14]

personal residential property as well as privately owned investment properties is primarily triggered by an event (a damage event such as a defective heating system and remedying the damage by simply replacing the heating system). There is often a lack of overview and corresponding planning for a long-term renovation strategy combined with a use strategy, even when it comes to questions such as housing for senior citizens, selling, or exploiting potential through the addition of levels, or demolition and rebuilding. Associated with this, there is usually a lack of planning for an optimum financing and investment strategy. This becomes especially clear in the context of condominium ownership associations. Contributions tend to be inadequate to ensure long-term, sustainable renovation. In this context, the challenge arises about the best way to increase the renovation fund. If the renovation rate is to be raised because of tighter regulation, a trend which can be observed to some extent, the owners – and thus indirectly the lenders – are confronted with the challenge of raising the necessary investment. According to a survey, banks can play an important role when it comes to financing energy efficiency as Figure 16 shows.

Regulation as a game changer

It is reasonable to assume that in the medium-term the implementation of the federal government's Energy Strategy 2050 will have a substantial influence on the renovation rate and on the need for financial investments in the building sector. Even if the process of transferring the cantonal model regulations into cantonal legislation by 2020 is somewhat delayed (see Figure 17)[15], it is foreseeable that we are in the midst of a transition.

Figure 17:
IMPLEMENTATION OF THE CANTONAL MODEL REGULATIONS IN THE AREA OF ENERGY



Source: AEE Suisse, 2020

At a higher level, the signing of the Paris Climate Agreement is a substantial driver. Switzerland has obligated itself to a reduction target of minus 50% by 2030 compared to 1990, and has ratified the agreement.[16] Because of the complete revision of the CO_2 Act, the reduction obligations in national climate legislation are to be implemented after 2020. At the European level, examples of substantial drivers are the EU Action Plan on Financing Sustainable Growth[17] or the Energy Efficient Mortgages Initiative[18], which is directly connected with "eco" mortgages. The specific goal of this latter initiative is to create a standardised mortgage to provide incentives to building owners to improve the energy efficiency of their buildings or to finance energy-efficient real estate at better financing terms.

Energy strategy opens up business opportunities

Sustainable development of the stock of buildings in Switzerland opens up substantial business opportunities for Swiss banks/lending institutions in addition to bringing benefits to owners such as increases in living comfort, cost savings and greater profitability, value preservation and positive environmental effects:

— Regular income by financing long-term renovation strategies and thus qualitative growth in the mortgage business with a focus on housing stock;
— Solidifying long-term client relationships and thus improving client goodwill;
— Possibilities for cross- & upselling and thus generating income in areas such as the commission business;
— Additional risk reduction in the finance portfolio by better value preservation of collateral (see Figure 18).

Barriers for banks and clients

There are various barriers to using these kinds of business opportunities, not only on the part of owners but also on the part of lending institutions.

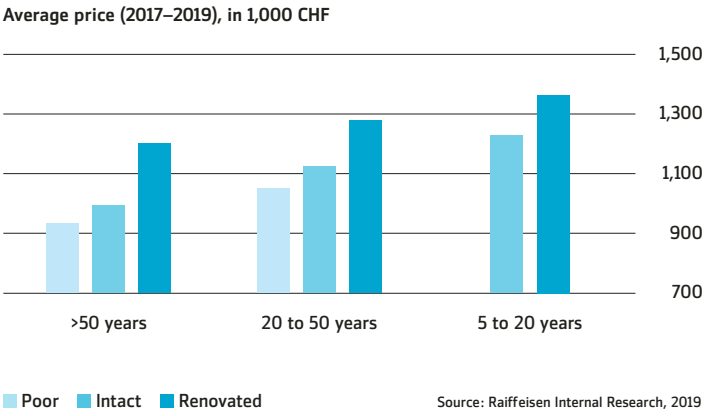
For owners, the lack of a use strategy and an overview for the property are common barriers. There are not enough qualified professionals to help uncommitted owners produce a use and renovation strategy and oversee implementation decisions. Development in this field can already be partially seen, in cases such as the cantonal or municipal energy agencies.

For lenders, the costs of processing a mortgage in relation to the average low investment costs/mortgage volume are a challenge.

The great complexity and diversity of the topic and the lack of knowledge are a challenge for both owners and lenders. In addition to this, there is a somewhat lower return on investment and a longer time horizon.

Not least is the complication that the cantons are responsible for building stock in Switzerland. Thus, there are no standardised nationwide regulations (for example the GEAK obligation). The regional variations in legislation and subsidy policies make it challenging for market participants to develop simple, understandable, scalable products and services for clients on a national level.

Figure 18:
PRICE DIFFERENCES BASED ON THE BUILDING CONDITION



Source: Raiffeisen Internal Research, 2019

Enablers

In addition to classic instruments such as subsidies and tax incentives, there are other options that are perhaps not quite as apparent at first sight to promote sustainable development and to take advantage of new business opportunities:

- Systematic planning of real estate investments – depending on the individual (planned) living conditions of the client (long-term use & renovation strategy);
- Introducing a merit-rating system in credit risk management on a GEAK basis regarding issuing criteria for mortgages;
- Cross-industry, business ecosystems, which bring various actors closer together (owners, industry associations, SMEs and financial service providers). New products, services and business models can develop in combination with a systematic focus on real estate.

Conclusion

Existing instruments like interest rate reductions on mortgages, e. g. "eco" mortgages, have in the past as well as in the present only shown limited effects although the market and renovation potential in the real estate sector are large. In addition to adjusting the underlying conditions, systematic, long-term planning of real estate investments enables optimal financial planning and implementation of actions. Consequently, this increases the renovation rate, risks are reduced, the existing portfolio is optimised and new business models are developed together with additional stakeholders.

1 ZKB (2019). *Energetisch renovieren mit der Zürcher Kantonalbank.* Available at: https://www.zkb.ch/de/pr/pk/finanzieren-eigenheim/alles-rund-um-ihr-eigenheim/eigenheim-newsletter/energetischrenovierenmitderzuercherkantonalbank

2 UBS (n.d.). Mortgages. *Special offer "renovation".* Available at: https://www.ubs.com/ch/de/swissbank/privatkunden/hypotheken/spezialangebote/renovation.html

3 Raiffeisen (2017). *Broschüre Eco-Vergünstigung für Ihre Hypothek.* Available at: https://www.raiffeisen.ch/content/dam/www/rch/hypotheken/pdf/Produktblatt-Eco-Verguenstigung.pdf

4 Bundesamt für Energie (2018). *Factsheet Gebäudepark 2050 – Vision des BFE.* Available at: https://www.bfe.admin.ch/bfe/de/home/news-und-medien/publikationen.exturl.html/aHRocHM6Ly9wdWJkYi5iZmUuYWRtaW4uY2gvZGUvc3VjaGU=.html?keywords=&q=Geb%C3%A4udepark+2050&from=&to=&nr=

5 European Union (2010). *EU Directive on the Energy Performance of Buildings:* Available at: https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=CELEX:32010L0031

6 Bundesamt für Justiz (2007). *Energiesparverordnung.* Available at: https://www.gesetze-im-internet.de/enev_2007/index.html

7 Etat de Fribourg (2014). *Informationsbulletin für Freiburger GEAK-Expertinnen und Experten.* Available at: https://www.fr.ch/sites/default/files/contens/sde/_www/files/pdf66/Message_1_cecb_de.pdf

8 Swiss Federal Office for Energy (n.d.). *Energy Strategy 2050.* Available at: https://www.bfe.admin.ch/bfe/en/home/policy/energy-strategy-2050.html

9 ZKB (n.d.). *Annual Report – Archive.* Available at: https://www.zkb.ch/en/lg/ew/dsc-investor-relations/annual-report.html

10 Bundesamt für Statistik (n.d.). *Gebäude- und Wohnstatistik. Bauperiode.* Available at: https://www.bfs.admin.ch/bfs/de/home/statistiken/bau-wohnungswesen/gebaeude/periode.html

11 SIA (n.d.) *Modernisierung des Gebäudeparks Schweiz.* Available at: https://www.sia.ch/de/themen/energie/modernisierung-gebaeudepark/

12 Bundesamt für Energie (2018). *Slide presentation: Energy Strategy 2050 once the new energy act is in force.* Available at: https://www.bfe.admin.ch/bfe/de/home/politik/energiestrategie-2050/dokumentation.html

13 Schweizerische Energie-Stiftung (n.d.). *Energy consumption in buildings.* Available at: https://www.energiestiftung.ch/energieeffizienz-gebaeude.html

14 Raiffeisen & Universität St. Gallen (2015). *Fifth client barometer for renewable energies.* Available at: https://iwoe.unisg.ch/-/media/dateien/instituteundcenters/iwoe/news/150522_kundenbarrometer2015_e_web.pdf?la=de&hash=52031199CD7532C8CB82732B879FAF5E35C06DCB

15 AEE Suisse. (2020). *Mustervorschriften der Kantone im Energiebereich (MuKEn). Stand 1.1.2020.* Available at: https://www.aeesuisse.ch/de/politik/mustervorschriften-der-kantone-im-energiebereich

16 BAFU (n.d.). *The Paris Climate Agreement.* Available at: https://www.bafu.admin.ch/bafu/de/home/themen/klima/fachinformationen/klima--internationales/das-uebereinkommen-von-paris.html

17 PwC (2019). *Paradigm shift in financial markets. The economic and legal impacts of the EU Action Plan Sustainable Finance on the Swiss financial sector.* Available at: https://www.pwc.ch/en/publications/2019/paradigm-shift-in-financial-market-EN-web.pdf

18 EEM Initiative (n.d.). *Homepage.* Available: https://energyefficientmortgages.eu/

8 DIRECT INVESTMENTS IN NON-LISTED COMPANIES AND PROJECTS

The Entrepreneurial Approach to Supporting the Low-Carbon Economy

Private equity investment managers typically have a strong influence over how assets are developed and managed.

This is particularly true for direct investments, where an active ownership model provides opportunities to work closely with portfolio assets to implement low-carbon initiatives for clean energy and energy efficiency.

CARMELA MONDINO
ESG & Sustainability, Partners Group

For private equity investment managers, investing in the low-carbon economy can take many forms: from acquiring non-listed companies whose products or services help reduce emissions, to developing large-scale renewable energy platforms or public transportation projects. Private equity investment managers are not only ideally positioned to invest in businesses or projects that support the low-carbon transition, but also to better manage the environmental impact of their portfolio assets compared to their public market peers. This is largely due to the nature of private equity investments and their inherent corporate governance advantages. A private equity investment manager typically has a strong influence over how assets are developed and managed. This is particularly true for direct investments, where an active, hands-on ownership model provides opportunities to work closely with portfolio assets to implement sustainability initiatives, such as energy efficiency and waste management programmes.

Assessing the opportunity

As the low-carbon economy is still underdeveloped, it represents an interesting investment opportunity for many investors, as well as the chance to support global action on climate change. For instance, the global shift towards clean and more efficient energy is a key trend that is expected to continue to generate attractive investment opportunities for private equity investment managers for many years to come.

The agreed international goal of reducing greenhouse gas emissions is at the heart of energy policies almost everywhere and is likely to be achieved through a combination of improved energy efficiency and a higher share of renewables in the energy system. It is estimated that USD 11.5 trillion will be invested in new power generation assets between now and 2050, of which 86%, or USD 9.9 trillion, will go to zero-emissions technologies.[1] This means around USD 300 billion is required per year for clean energy investment. The bulk of this investment will happen in non-OECD emerging economies.

Irrespective of any political or policy developments, OECD developed markets will also continue to add new clean energy capacity, fuelled by new demand drivers such as the boom in electric vehicles, among others. Another important contributor to demand is the increasingly competitive cost of renewable energy compared to traditional energy sources. Between 2009 and 2018, the levellised cost of electricity of solar and wind energy dropped approximately 80% and 50%, respectively.[2] Today, these technologies are already cheaper than building new large-scale coal and gas plants in many major markets, including India, Germany, Australia, the US and China.

Going forward, investing in the build-out of clean energy platforms in these markets could enable private equity investment managers to capture the delivery premium available for these projects. According to recent estimates, the premium ranges from 3% to 5%, depending on the geography and type of renewable generation asset. In addition, emerging themes that investors should follow closely within the sector include the internationalisation of offshore wind, energy storage and "direct-to-consumer" renewables.

Besides the build-out of renewable generation capacity, private equity investment managers will also need to focus on investments that tackle the issue of renewable intermittency in order to ensure greater energy reliability. A range of strategies and technologies will be required to tackle the intermittency challenge, including battery storage, additional peaking gas-fired generation, smart meters, and increased interconnection.

Not all of these sub-sectors are attractive from an investment standpoint today. For example, the market for energy storage is gaining significant momentum globally but the technology is still expensive and not yet widely deployed in large-scale projects. Additionally, a key commercial challenge for battery storage projects is developing contract structures and regulatory frameworks that allow these projects to monetise the multiple sources of value they provide in an affordable manner. Nonetheless, the cost of these technologies has decreased rapidly in recent years, similar to the cost declines witnessed for utility-scale renewables. As such, further decreases in the cost of battery storage technologies should unlock opportunities in the future.

Improving the ESG strategies of portfolio companies

While there is a wide range of opportunities for private equity investment managers to support the low-carbon transition through direct investments in these new technologies, the governance structure in private equity also provides the opportunity to optimise the use of resources across all types of assets in a portfolio.

Compared to public markets, private equity firms generally have smaller boards for their portfolio companies that meet more frequently, are more deeply ingrained in the business and work closely with management to direct companies towards value creation. This governance framework means that private equity investors have both the power and the mandate to take the lead on environmental, social and governance (ESG) improvements within a portfolio company.

During the due diligence process, most private market firms would exclude a company that was found to be materially underperforming in its ESG practices. But unlike in public markets, private market firms often make use of the option to invest in and engage with companies that are only moderate underperformers, so that improving these practices becomes a focal point of the value creation plan. In fact, in private equity, a company's ESG practices are typically assessed not only in terms of their potential risk, but also in terms of their value creation potential.

As part of the value creation process, private equity firms may establish ESG engagements with their portfolio companies to improve the measurement and management of material topics that help support the low-carbon transition, such as initiatives to improve energy efficiency, waste management and supply chains. These topics are important for building businesses whose respect for society and the environment goes hand-in-hand with enhanced financial performance.

Assessing impact

Properly assessing the impact of direct investments that have the potential to support the transition to a low-carbon economy requires a suitable impact assessment methodology. For its dedi-

Table 6:
SDG TARGETS WITH A LINK TO THE LOW-CARBON ECONOMY

SDG	SDG TARGET	INVESTABLE UNIVERSE
	**7.2** By 2030, increase substantially the share of renewable energy in the global energy mix	Renewable energy, energy storage
	7.3 By 2030, double the global rate of improvement in energy efficiency	Energy efficiency products or services
	**9.4** By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities	Operational excellence services
	**11.2** By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport	Transport infrastructure

Source: Partners Group; United Nations, April 2020.

cated impact investment strategy, Partners Group has identified the Sustainable Development Goals (SDG) as a useful framework, both simple enough for a wide range of stakeholders to understand, and robust enough to inform an investment strategy. Table 6 includes a list of SDG targets that have a direct link to the low-carbon economy.

Partners Group assesses low-carbon investment opportunities against the SDG targets listed in Table 6 during due diligence, beginning with a logic model that sequences how each company or asset creates impact, both positive and negative. Next, each investment is scored on a five-point scale using our proprietary SDG target rating, which is based on the Impact Management Project's five dimensions of impact (see Table 7).[3] Finally, relevant impact metrics are identified based on the logic model created, the Global Reporting Initiatives' Business Reporting on the SDGs and the Global Impact Investing Network's IRIS metrics.

Once Partners Group has invested in an asset that has been classified as low carbon, within the first hundred days of ownership its ESG & Sustainability team presents the portfolio company management team with the proposed impact goals and metrics, along with risks identified during due diligence. During this time, the team works with the management team to agree on impact metrics, address how to manage risks, and establish systems to collect impact data.

Table 7:
THE IMPACT MANAGEMENT PROJECT'S FIVE DIMENSIONS

DIMENSION	QUESTIONS EACH IMPACT DIMENSION SEEKS TO ANSWER
WHAT?	What outcome(s) do business activities drive? How important are these to the people (or planet) experiencing them?
WHO?	Who experiences the outcome? How underserved are the stakeholders in relation to the outcome?
HOW MUCH?	How much of the outcomes occurs across scale, depth, and duration?
ENTERPRISE CONTRIBUTION	What is the enterprise's contribution to what would likely happen anyway?
INVESTOR CONTRIBUTION	What strategies will Partners Group use to contribute to its portfolio's impact?
RISK	What is the risk to people and planet that impact does not occur as expected?

Source: IMP Partners Group case study, February 2019

Outlook

Today, a wide array of investment themes have the potential to support the transition to a low-carbon economy, offering investors the opportunity to support global action on climate change while generating attractive returns. Private equity investment managers are particularly well placed to develop these opportunities, using their entrepreneurial, hands-on approach to asset ownership and applying internationally recognised frameworks such as the SDGs to quantify the impact of their investments.

In order to enable the further development of private equity investment in this area, it is important to have suitable methodologies to assess and quantify the positive impact of private equity investment on the low-carbon economy in a standardised and comparable manner. Working with best practice impact assessment initiatives such as the Impact Management Project allows investors to understand the impact of their investments while helping build consensus around the requirements investments should meet to be included in the low-carbon category.

1 Bloomberg New Energy Finance (2018). *New Energy Outlook 2018*. Available at: https://bnef.turtl.co/story/neo2018/

2 Bloomberg New Energy Finance (2018). *New Energy Outlook 2018*. Available at: https://bnef.turtl.co/story/neo2018/

3 The Impact Management Project is a forum for building global consensus on how to measure and manage impact, with over 2,000 contributing organisations. https://impactmanagementproject.com/

8.1 CASE STUDY

FINANCING OF INFRASTRUCTURE INVESTMENTS

The Example of Heizwerk Gotthard AG

Clean energy infrastructure funds can make a valuable contribution to sustainable energy production in Switzerland by providing long-term equity capital to private and public companies.

Companies use this capital for the construction, operation or renovation of sustainable infrastructure facilities and energy utilities.

DANIEL ARNOLD
Head Swiss Asset Management, Fontavis AG

CHRISTOPH GISLER
CFO, Fontavis AG

DOMINIK PFOSTER
Head Responsible Investment, Swiss Life Asset Managers

MARTINA TRIULZI
Executive Assistant, Fontavis AG

Clean energy infrastructure funds

The energy transition (Energiewende) and the Energy Strategy 2050 have shaped Switzerland in recent years. In 2017, the revised Energy Law was adopted, with one of its aims being to "strengthen the local renewable energies".[1] Already in 2013, Fontavis, UBS and Mobiliar launched the country's first privately financed clean energy infrastructure fund. The fund invests around CHF 400 million in Swiss energy infrastructure facilities over a period of several years. The capital is provided primarily by 36 Swiss pension funds and insurance companies. The investment portfolio includes investments in 13 Swiss companies that produce renewable energy, contribute to energy efficiency or provide the corresponding infrastructure. The fund thus not only creates an investment opportunity for institutional investors that did not exist before, but also guarantees the provision of long-term equity capital to private and public companies for the construction, operation or renovation of sustainable infrastructure facilities, energy utilities and waste management facilities.

Figure 19 on the following page illustrates the portfolio of the first clean energy infrastructure fund managed by Fontavis.

Heizwerk Gotthard AG

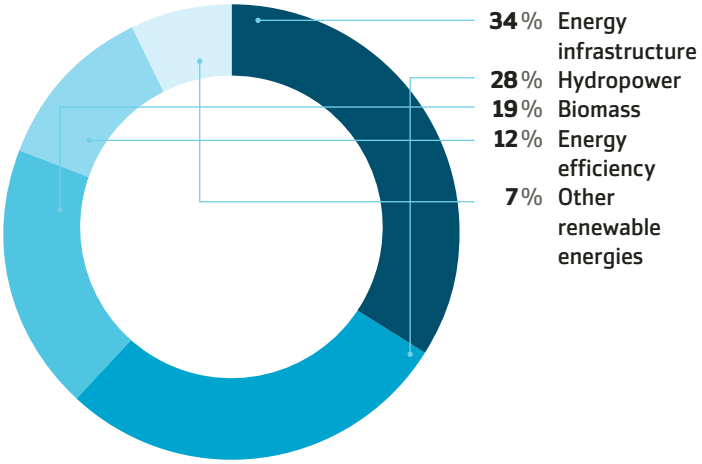
One project financed is the wood heating plant in Göschenen, UR (Heizwerk Gotthard AG), which produces heat for the village of Andermatt, army properties in Andermatt and the entire local tourist resort (ASA – Andermatt Swiss Alps).[2] In the coming years, the village of Göschenen and the construction barracks and crew accommodation for the construction of the second Gotthard road tunnel will also be heated by the wood heating plant.[3] The central wood heating plant in Göschenen is the heart of the heating network and provides the heat for both Göschenen and Andermatt.[4] The grid company Andermatt distributes the energy to the consumers from the distribution centre in Andermatt. The heating plant is operated with natural wood, sourced mainly from the canton of Uri, and from the neighbouring northern Ticino. This ensures that the proportion of grey energy is reduced to a minimum.[5]

Ecological impact of the heating plant

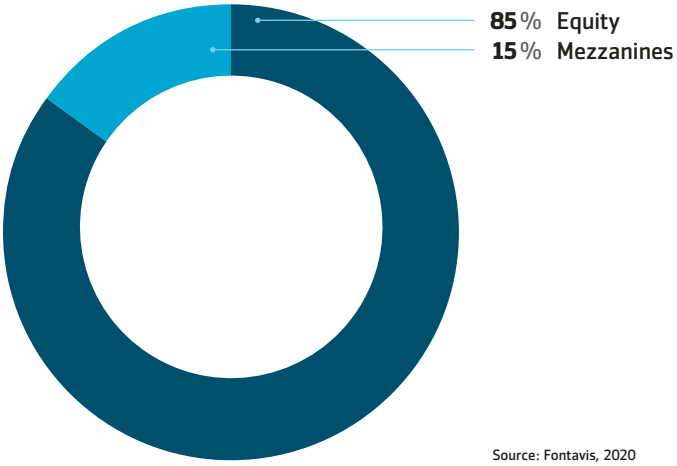
Wood is a sustainable energy resource in multiple ways. First and foremost, every tree releases on average the same amount of CO_2 during combustion as it absorbs while growing. The use of wood for energy generation is therefore carbon neutral.[6] In addition, the wood used for the heating plant in Göschenen comes directly from the immediate region and is not subject to long-distance road transport. The use of local forests and those in the neighbouring canton of Ticino increases the respective regional added value, thus reducing external dependency.[7] In addition, good forestry management is essential for ensuring forest ecosystems.[8] With the wood-fired heating plant and the affiliated heating network, sustainable and

Figure 19:
SOURCES OF ENERGY AND INSTRUMENT TYPES OF THE CLEAN ENERGY INFRASTRUCTURE FUND MANAGED BY FONTAVIS AS PER 31.03.2020

ENERGY SOURCE/TECHNOLOGY



INSTRUMENT TYPE



Source: Fontavis, 2020

reliable energy production can be ensured and dependency on energy imports from abroad reduced. The 22 GWh_{th} of wood energy produced replaces almost 6,000 tons of annual CO_2 output compared to oil heating systems – which equals ten Zurich – New York return flights.[9]

Finance structure

Infrastructure assets have a long lifetime and are characterised by a high capital intensity and high initial investment. For a project such as the wood-fired heating plant in Göschenen, it takes on average at least 5–10 years until it reaches a long-term sustainable business volume, capital can be amortised and accruals can be made for future replacement investments. The network company is structured in such a way that the municipality of Andermatt holds the majority stake and Heizwerk Gotthard AG is a minority shareholder. In order to be able to supply customers with inexpensive energy and provide a reasonable return on capital, a hybrid financing structure was selected. An adequate mix of equity capital and subordinated loans was determined most efficient in order to allow a certain minimum interest rate (immediate cash inflow shortly after commissioning) during the first years. The loans were staggered over time and will be refinanced gradually after they reach maturity. In the meantime, the Clean Energy Infrastructure Fund holds a majority stake of 77.13 percent in Heizwerk Gotthard AG. The remaining stake is still held by the project developer, which is important to align the interests of the shareholders and the operator of the plant.

Summary

Heizwerk Gotthard AG is an example of how sustainable energy can be promoted and financed in Switzerland through a public private partnership (PPP) involving Swiss pension funds and insurance companies. Wood-fired heating plants have a particularly good ecological balance sheet. In addition to the fact that the protection forests are maintained and carbon-neutral energy production is guaranteed[10], the heating plant also promotes regional value creation, nearly 50% of it remains locally.[11]

Since October 2019, Fontavis is a member of Swiss Life Asset Managers and supports Swiss Life Asset Managers commitment to responsible investments. Heizwerk Gotthard AG is only one of a total of over 20 renewable and sustainable investments that Fontavis has financed as an investment manager of private infrastructure funds, but it is one of the first of its kind. The lessons and the experience gained during the process of construction and financing of the wood heating plant in Göschenen are scalable. This made it possible for Fontavis to implement similar projects in other municipalities. Through the projects created, Fontavis contributes to increasing regional added value and to supplying Swiss municipalities with sustainable energy.

1 Eidgenössisches Departement für Umwelt, Verkehr, Energie und Kommunikation Website (n.d.). *Energiestrategie 2050.* Available at: www.uvek.admin.ch/uvek/de/home/energie/energiestrategie-2050.html

2 Heizwerk Gotthard Company Website (n.d.). *Das Heizwerk Gotthard.* Available at: www.heizwerk-gotthard.ch/index.php/das-heizwerk-gotthard

3 Ibid.

4 Ibid.

5 Heizwerk Gotthard Company Website (n.d.). *Energieholz Netzgesellschaft.* Available at: www.heizwerk-gotthard.ch/index.php/energieholz-netzgesellschaft

6 Ibid.

7 Ibid.

8 Ibid.

9 Myclimate Website (n.d.). *CO_2 Calculator.* Available at: https://co2.myclimate.org/de/flight_calculators/new

10 Heizwerk Gotthard Company Website (n.d.). *Energieholz Netzgesellschaft.* Available at: www.heizwerk-gotthard.ch/index.php/energieholz-netzgesellschaft

11 Heizwerk Gotthard Company Website (n.d). *Fernwärme Netzgesellschaft.* Available at: www.heizwerk-gotthard.ch/index.php/fernwaerme-netzgesellschaft

9 VENTURE CAPITAL INVESTMENTS
The Role of Early-Stage Capital for Low-Carbon Solutions

Start-ups play a vital role in developing and testing innovative solutions for reducing the resource- and carbon-intensity of today's economy, and early-stage capital is an important catalyst for such businesses.

As direct investments in early-stage ventures are linked to high risks, bundling such companies into funds makes this asset class investable for institutional asset owners and can channel further capital into low-carbon start-ups.

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Managing Partner, Übermorgen Ventures

ADRIAN BÜHRER
Managing Partner, Übermorgen Ventures

Technological and business-model innovation is key to reduce the resource- and carbon-intensity of today's economy. Start-ups play a vital role in developing and testing such innovative and scalable solutions under real market conditions. Compared to other innovation processes in corporate or scientific environments, for example, start-ups can develop and test a multitude of innovative ideas within very short time horizons, which is absolutely crucial for our economy to be able to move towards decarbonisation, especially if the timeline of the Intergovernmental Panel on Climate Change (IPCC) is to be met (i.e. a carbon-neutral economy by 2050).

It is in the early stages of a business that capital can have the greatest impact in developing new solutions, because it is allocated very effectively. On the one hand, it can catalyse successful solutions that tackle the current climate crisis. On the other hand, companies that offer products and services that fail to find demand are forced to rapidly change course ("pivot") or shut down quickly. Early-stage capital is thus crucial for supporting entrepreneurs in their attempt to disrupt "business as usual". This is of course related to significant risk, especially when investing in the very early stages, where funding is often scarce. However, the reward can be high, not only climate-impact wise, but also financially.

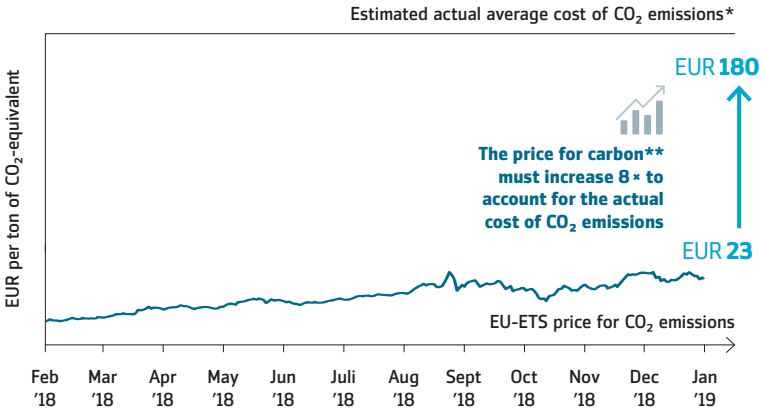
Given the current political and regulatory environment, regulation and taxation on carbon emissions are expected to increase in the next two decades. This creates a megatrend which makes it highly likely that investments in start-ups that help to mitigate climate change and decarbonise our economy will have a high chance of being profitable, as Figure 20 shows. Based on this premise, this chapter looks at typical investment phases and respective sources of financing for such start-ups, opportunities in specific industries, and shows how early-stage venture capital funds can channel capital into low-carbon start-ups.

The different phases of investing in start-ups (from seed money to venture capital investments)

The process for investing in start-ups is usually as follows: A founder team comes up with a business model idea/ technological innovation and develops an investment case (usually in the form of a pitch presentation) and a business plan around it. This idea/innovation is then tested with friends, family and business angels (private investors that usually contribute between EUR 25k and EUR 100k). There are numerous start-up competitions founders can participate in (e.g. Climate KIC[1], which play a vital role in low-carbon innovations in the European start-up world), in order to approach potential business angels and early-stage investors. If interested, potential investors revise the ventures' pitch presentation and business plan and try to assess the feasibility of the business model – important indications are team, market size, technology (including intellectual property rights), competition, marketing strategy, a clear path for further investments and exit options, among others.

If a group of investors is willing to invest, a first finance round will be structured. The valuation of the start-up is usually in the so-called *seed stage* (see Figure 21) between EUR 1 to 5 million, for

Figure 20:
COST OF CO_2 EMISSIONS



If the true cost of CO_2 emission were fully taken into account, the global economic system would radically change:

- **Carbon-intensive products and services** (e. g., plastics, ceement, fossil fuets, beef, aviation) **will become more expensive,** leading to a decline in demand.
- **Infrastructure investments for carbon-intensive industries need to be written off** (e. g., fossil fuel production infrastructure, airports).
- **Products and services that are carbon-neutral or poor** an thus, independent of high carbon prices, **become more profitable** (e. g., plant-based proteins, e-mobility, renewable energy).
- **Infrastructure investments enabling climate protection** (e. g., renewable ernergy infrastructure incl. energy storage, carbon capture and storage) **will become profitable**.

* Umweltbundesamt Deutschland

** based on carbon pieces of the EU-ETS Source: Umweltbundesamt Deutschland, Markets Insider

Source: Übermorgen

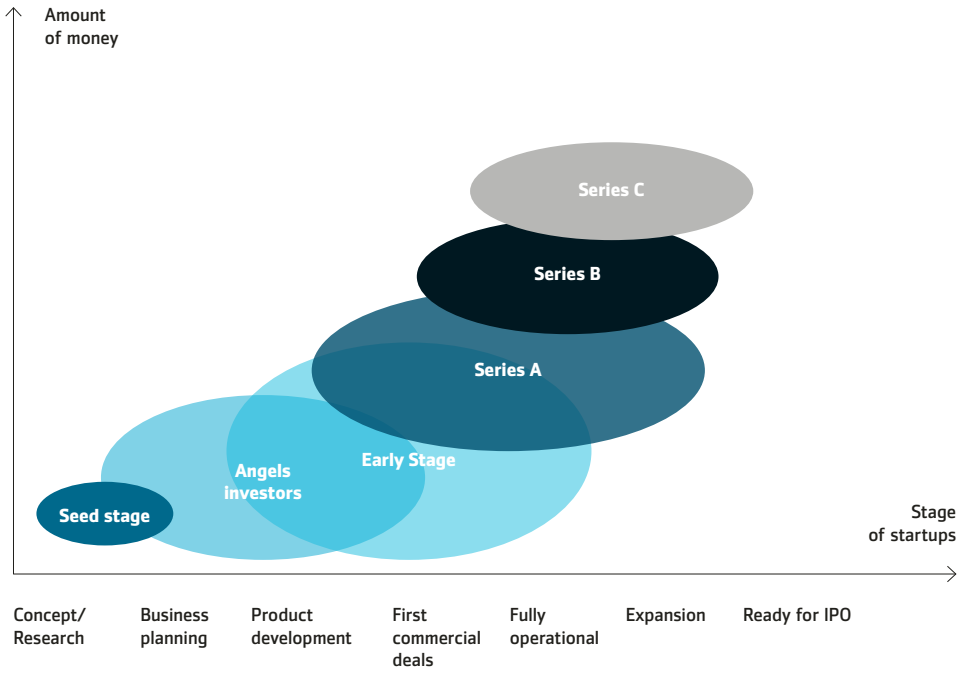
which the investors receive usually between 20% and 35% of the company's equity. This seed funding should suffice to finance a start-up's operation for at least a year. In the seed phase, the start-up tries to pilot a finished product and start with market testing. Preferably, initial sales are made to show existing and new investors that there are customers willing to pay for the respective product or service.

After a successful seed stage, a new financing round takes place – *Series A*. Start-ups try to raise between EUR 1 to 10 million at valuations that can be between EUR 5 to 50 million. After a Series A, new investors usually are professional venture capitalists, family offices and ultra high net worth individuals (UHNWIs). The next phase of a start-up is the so-called *Growth Phase* – which corresponds to *Series B* and *Series C* finance rounds. The biggest challenges are showing that a certain product or service can be scaled up in a way that costs can be brought down, and that there is a path to profitability and/or strong market growth.

After this very critical phase there might be another one or two finance rounds necessary until the company is in a position to either pay out a substantial dividend to its shareholders or to find a path to *exit*, which preferably would be the sale of its shares to a potential buyer or through an initial public offering. This is usually the time when all the existing shareholders cash out and the founders, who also get a fair share of the proceeds, often enter a working contract for up to three years to ensure a successful handover of the business to its new owners.

It is important to note that this process carries high risks for investors and that at best only about 2 to 3 out of 10 start-ups make it to a successful exit. Usually there is only one or two start-ups in any given portfolio that really make a high financial impact, return-

Figure 21:
VENTURE CAPITAL INVESTMENT STAGES



Source: Start-up Freak, 2013[2]

ing more than 10×, sometimes even more than 50× or 100× the invested capital.[3] However, the innovation creation process is highly efficient and the learning curve for the founders and investors, even in those start-ups that do not succeed, is highly valuable. This knowledge is not lost, but deployed in multiple impactful ways as the founders and investors move on to other companies and/or projects.

The impact of venture capital

Finding solutions to mitigate climate change requires a broad range of innovations to transition to increased resource efficiency, more circular use of resources, the deployment of renewable energy sources and more sustainable consumer behaviour. Venture capital investments, unlike other asset classes, channel funds into innovative projects allowing investors to have a high additionality of their investments – meaning that they are able to directly support innovation processes, which have no easy access to capital otherwise.

For climate change mitigation specifically, several high-impact investment areas exist, including FoodTech and AgriTech (e.g. advanced biotechnologies, agribusiness marketplaces, farm management and automation and alternative protein sources), clean energy and transportation (e.g., renewables in power generation, distributed energy resources, energy storage, electrification of transportation or alternative fuels) and sustainable industrial processes (e.g., better recycling technologies, carbon capture for production and process emissions, alternative materials for plastics or construction materials, for example).

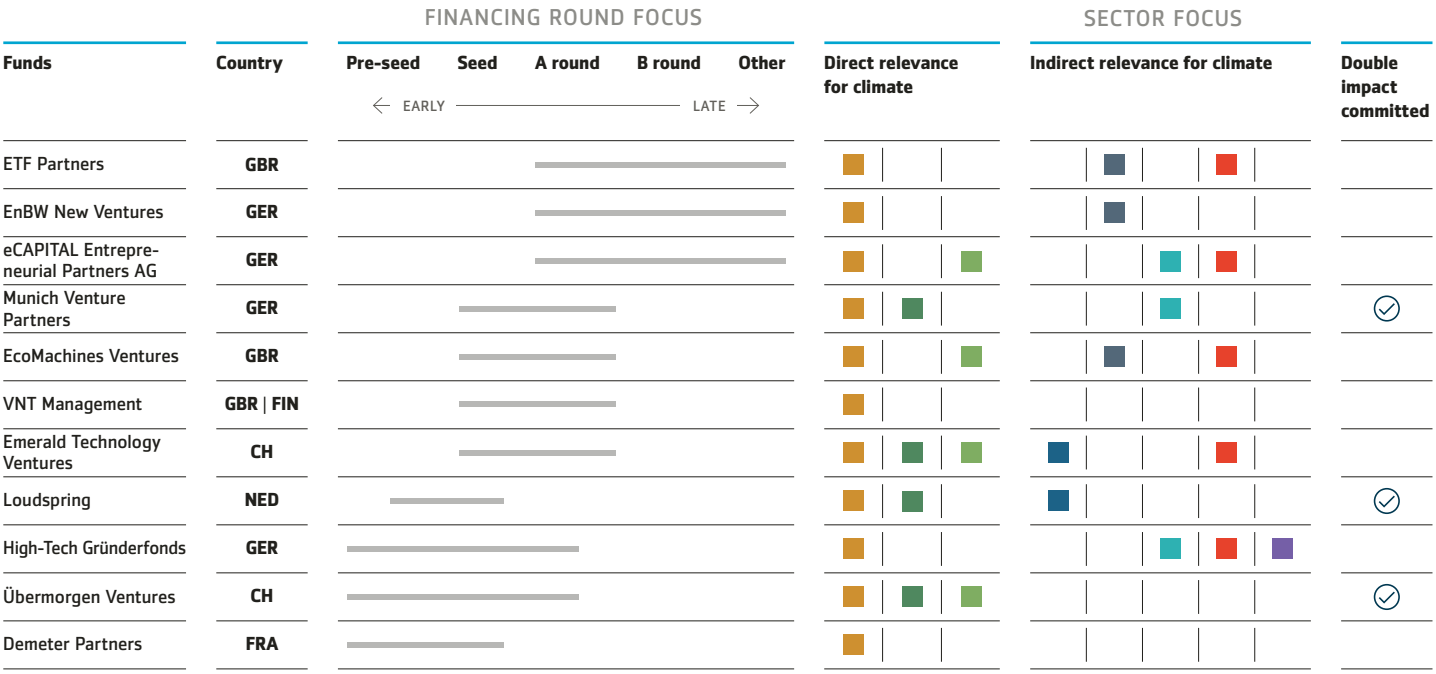
A successful start-up contributing to a low-carbon economy always delivers a double impact: it creates value for society by providing a marketable product or service (hence creating financial returns) while also reducing greenhouse gas emissions. A good example is Beyond Meat, which started as a classical start-up, exited through an IPO and has since increased its value fivefold. It delivers a product that replaces classical meat-based hamburger patties with a plant-based alternative, saving thousands of tonnes of CO_2. It is profit-oriented ventures like these that offer our best chance for the transition of our planet to a low-carbon economy.

Early-stage venture capital funds

As discussed, investment in early-stage start-ups can be very risky and should only be made by professionals with experience in this particular financing space. However, the innovative role that start-ups can and must play in solving climate change and decarbonising our planet cannot be underestimated. Therefore, more instruments are needed to funnel money into the very early stages of start-ups.

Early-stage VC funds are a way to diversify risks and make this investment class accessible for institutional investors such as pension funds and foundations, as well as governments. A number of climate impact oriented VC funds in Europe are listed in

Figure 22:
EXAMPLES OF CLIMATE IMPACT ORIENTED VENTURE CAPITAL FUNDS IN EUROPE



Source: Übermorgen

Figure 22. They reduce risks by investing in 20 to 50 start-ups and therefore help diversify the risk of early-stage investing across the investment portfolio. Also, such funds usually have specific expertise when it comes to dealing with the specific challenges facing those very early-stage start-ups. These challenges often are not related to the actual product or service itself, but to more fundamental aspects, such as finding the right co-founder, developing effective marketing strategies, choosing the right IT framework, focusing on the most promising business opportunities, navigating through the legal challenges, finding the right investors and generally just raising enough money to continue operations.

Successful early-stage venture capital funds usually have a strong entrepreneurial mindset and a hands-on approach. They are also well connected and can make valuable introductions for the founders to other start-ups, potential investors, future clients and corporations. Rather than just making an investment decision and watching the progress of a company, early-stage investors should be willing to contribute more than just cash, but also experience, network, time and resources.

A big challenge for investors is properly assessing early-stage start-ups and guiding them through the oftentimes messy first years, when most are likely to fail. Many UHNWIs, family offices and foundations that might be very skilled at growth-stage financing, frequently fail in the early stages of venture financing as they underestimate the amount of time and dedication that is needed to help start-ups through the first vital phase of their existence. However, with the global rise of early-stage venture capitalists, there is an effective and proven model for channelling money to early-stage start-ups while diversifying risks and generating positive financial returns. This expertise is encapsulated in early-stage venture capital funds.

Conclusion

To conclude, VC investing plays an important role in fostering innovative solutions for a low-carbon economy, developed and tested by start-ups. However, direct investments in such early-stage ventures are linked to high risks. Therefore, bundling such companies into early-stage venture funds makes this asset class investable for institutional asset owners and offers the opportunity to channel additional funding into such innovative start-ups. Additional funding to early-stage start-ups active in decarbonisation is not only sorely needed to develop innovative solutions towards a low carbon economy – it also presents a very profitable investment opportunity.

1 See: www.climate-kic.org/

2 Startup freak (31 July 2013). *What does Series-A, Series-B and Series-C funding mean in Startups*. Available at: https://startupfreak.com/what-does-series-a-series-b-series-c-funding-mean-in-startups/

3 Henry, P. (18 Feb. 2017). *Why Some Startups Succeed (and Why Most Fail)*. Entrepreneur. Available at: www.entrepreneur.com/article/288769

9.1 CASE STUDY

VIRTUAL POWER PLANTS

Delivering Flexible Renewable Energy to the Grid

The significant increase of renewable energy sources in the global energy mix, coupled with information technologies, is disrupting the energy value chain and bringing about investment opportunities in clean-tech start-ups and smart utility business models.

One such model is a Virtual Power Plant (VPP), which harnesses the power of information technology to virtually aggregate a diverse set of distributed renewable energy assets into a platform, operating them as a unified resource.

QENDRESA RUGOVA
Managing Director, Enfinit Sàrl

Deployment of renewable energy is pivotal to achieving a 2°C compliant economy, with the global share of renewables expected to be over 60% by 2050.[1] A significant portion of energy will be generated and stored on-site by end consumers, through local installations such as rooftop solar or large-scale industrial installations, referred to as Distributed Energy Resources (DER).[2] Coupled with energy storage and IT solution systems, DERs are disrupting the energy value chain and challenging the traditional utility business models. Many start-ups focusing on solutions for optimising energy resources are emerging, creating investment opportunities for venture capital firms and traditional investors with exposure to energy, clean-tech and utility stocks.

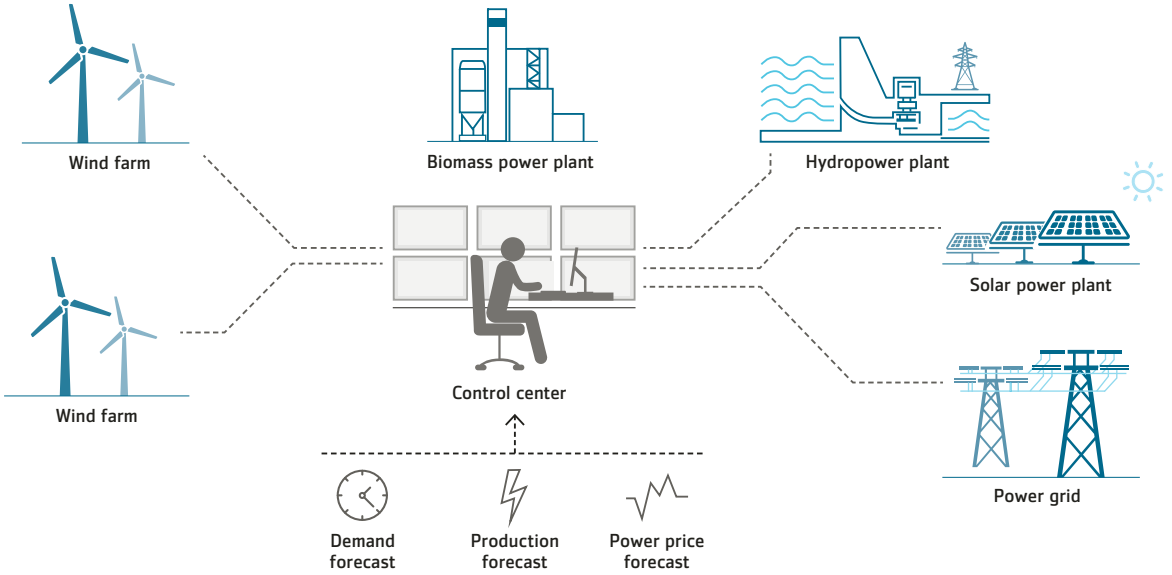
A challenge linked to renewable energy is that it is often less predictable and intermittent in supply due to dependency on weather conditions. This has raised concerns over the effects renewable energy has on the overall stability of the grid. In addition, managing distributed renewable energy generation, as opposed to traditional centrally planned power plants, requires significantly more coordination of information and energy flows. To address this, innovative business models such as Virtual Power Plants (VPP) have emerged, which harness the power of information technology to virtually aggregate a diverse set of distributed energy assets into a platform. By operating the energy assets as a unified resource, the VPP addresses some of the challenges mentioned.

A VPP can contain almost any power generating technology, including biogas, biomass, combined heat and power[3] (CHP), wind, solar or hydro. It also incorporates storage solutions as well as demand response programmes[4]. The centrepiece of a VPP platform is the control centre which digitally connects, operates and manages thousands of individual assets spread geographically, as if they were a single power plant (Figure 23). The assets are coordinated and optimised through algorithms that consider a variety of technical and market signals such as weather forecasts, price signals and technical requirements, allowing the operator to efficiently participate in the energy market.

The application of VPPs can bring about many benefits. Firstly, intermittent power generation from renewables can be combined with more flexible generation capacities such as biomass or CHP to generate power with much greater predictability compared to renewables in a stand-alone scenario. VPPs can also participate in the balancing markets to provide short-term flexibility to the grid operator. This makes VPPs a powerful tool with the potential to transform variable renewable energy into a predictable and flexible energy resource.

Furthermore, integration of VPP platforms also brings value to utilities whose business model is being challenged by independent distributed energy producers. Utilities face shrinking profit margins as consumers shift from being traditional consumers to also producing energy for self-consumption. In fact, according to a survey done by Accenture in 2017, almost 60% of utility executives ranked distributed generation as the biggest disrupter to their busi-

Figure 23:
VIRTUAL POWER PLANTS



Source: ABB, 2014

ness.[5] Utilities are thus facing the need to reinvent themselves through digitalisation and shift their value from asset ownership to service-based business models. VPPs allow utilities to incorporate distributed energy resources in their value chain and expand their service offering to managing such assets and optimising resources. It is therefore not surprising that energy companies are making significant investments in digital transformation, with Bloomberg NEF estimating that USD 590 billion will be invested between 2017 and 2025.[6]

The VPP market is driven mainly by utilities, storage technology developers, energy service companies or municipalities aiming to capture some part of the value of the supply chain. Optimisation platforms are developed by technology companies such as Next-Kraftwerk, Virtual Power Solutions, AutoGrid or Enbala, who often operate their own VPPs or offer their products through SaaS[7] agreements. In Switzerland, Virtual Global Systems has developed an optimisation system with VPP capabilities. Many utilities or energy service companies apply these technologies to their portfolios. The Norwegian utility Statkraft operates a portfolio of 12GW in Germany and plans to add another 2 GW in the UK.[8] Japan also aims to aggregate 10,000 distributed energy assets into a VPP. Finally, Tesla launched a 50,000-home virtual power plant in Australia last year.[9]

Transitioning to a low-carbon economy requires a digital transformation of the energy sector so that it can accommodate a high share of distributed energy resources, storage facilities, electric vehicles and demand response programs, while maintaining security of supply. Advanced technologies like VPPs thus bring forth numerous opportunities for investors seeking innovation to deliver on sustainability-related goals. Venture capital firms and thematic funds have the opportunity to support clean-tech start-ups that are developing innovative platforms focused on digitalisation of energy systems. The Swiss investment firm SUSI Partners, for example, announced in late 2019 that it plans to invest $50 million in a residential solar-plus-battery storage VPP project in Australia. More traditional investors with exposure to energy and utility stocks can support this transformation through positive screening of utilities that have embraced such disrupting solutions in their business model.

1 Bloomberg NEF (n.d.). *New Energy Outlook 2019*. Available at: https://about.bnef.com/new-energy-outlook/

2 Ibid.

3 Combined heat and power (CHP) is a system in which steam produced in a power station as a by-product of electricity generation is used to heat nearby buildings.

4 Demand response programmes aim to reward end consumers for lowering their consumption at peak times.

5 ABB (2017). *White Paper Virtual Power Plants. Distributed generation is not a threat, it's an opportunity.* https://search.abb.com/library/Download.aspx?DocumentID=8VZZ000328T0000&LanguageCode=en&DocumentPartId=&Action=Launch

6 Bell Ventures (n.d.) *Power to the People. How digital is disrupting the energy industry – Top 4 Trends*. Available at: https://bell.ventures/insights/power-to-the-people-top-4-trends-disrupting-the-energy-industry

7 Software as a Service (SaaS)

8 Deign, Jason (21 March 2019). Statkraft Looks to Virtual Power Plants as Renewable Energy Demand Surges. *Greentech Media.* Available at: www.greentechmedia.com/articles/read/statkraft-looks-to-virtual-power-plants-as-renewable-energy-surges#gs.tp96n9

9 Smart Energy International (25 June 2019). *Japan developing world's largest behind-the-meter VPp*. Available at: www.smart-energy.com/industry-sectors/business-finance-regulation/japan-developing-worlds-largest-behind-the-meter-der-system/

10 INSURANCE SOLUTIONS
Energy Savings Insurance Removing Barriers to Energy Efficiency Projects

High upfront costs, perceived risks and lack of access to finance often hinder investments in energy efficiency, especially among SMEs.

In order to increase investments in energy efficiency, the Energy Savings Insurance (ESI) model has been developed to reduce the risks, by offering a policy to cover clients in case the energy savings guaranteed by the technology provider are not delivered.

The model has been developed in Latin America and is currently under implementation in Europe.

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Energy efficiency and the low-carbon economy

Energy efficiency (EE) is an essential element of the low-carbon economy. It is a highly effective and economic way to reduce global greenhouse gas (GHG) emissions. The International Energy Agency (IEA) demonstrated that energy efficiency measures could deliver more than 40% of the GHG emissions abatement required to reach the Paris Agreement goals in an Efficient World Scenario.[1] Improvement in energy efficiency results in using less energy for the same output or producing more with the same energy input, thus increasing productivity and competitiveness. Besides that, energy efficiency also reduces air pollution, lowers spending on energy, enhances energy security and provides many other socio-economic and environmental benefits.

The relevance of energy efficiency is growing as global energy demand increases, particularly in developing economies. According to the IEA, by 2040 the world will be home to 20% more people, will contain 60% more building space and will have twice the current gross domestic product (GDP). With this growth, global energy demand is expected to increase, resulting in a huge need, but also a huge opportunity for energy efficiency gains. However, investments in energy efficiency are not currently happening at the rate needed, hindered by barriers such as high upfront costs, lack of access to finance, high perceived risk, lack of trust in new technologies, competing investment priorities, lack of knowledge and awareness, and split incentives.

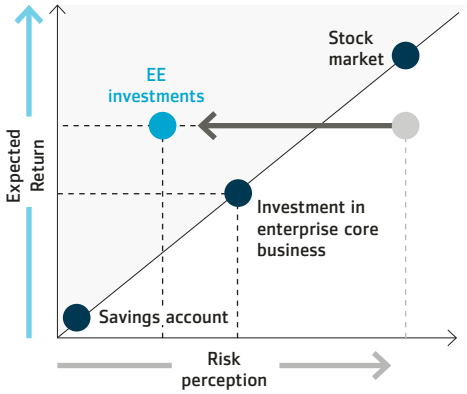
Many of these barriers can be overcome, at least in significant part, with well-designed financing mechanisms such as the Energy Savings Insurance model. Together with complementary measures such as policies, regulations, awareness-raising activities and behaviour-changing initiatives, financing mechanisms and business models for energy efficiency have a sustained long-term impact, as demonstrated below.

The Energy Savings Insurance Model

The Energy Savings Insurance (ESI) model is typically designed to drive investments from small and medium-sized enterprises (SMEs) in efficient technologies. In Europe, enterprises employing fewer than 250 persons represent 99% of all enterprises and therefore present a significant market opportunity for EE improvements, e.g. solar water heaters and photovoltaic systems, electric motors or air compressors. Energy use constitutes a substantial proportion of production costs for many SMEs, particularly in energy-intensive sectors that rely on heating or cooling for their processes or the provision of their services. However, within SMEs decision-makers are comparatively price sensitive and tend to have limited financial resources or access to credit. Decision-makers in SMEs display a disproportionally high risk perception of investments in energy effi-

Figure 24:
RISK PERCEPTION OF EE INVESTMENTS BY DECISION-MAKERS IN SMES

Reduction of the risk perception of energy efficiency (EE) investments with the ESI model



Source: Stiftung BASE, 2020

ciency compared with the expected returns and competing investment opportunities. Therefore, despite the large potential for EE improvements in SMEs, this opportunity remains largely untapped.

How does it work?

The ESI is a financing model that includes a risk coverage product insuring against a technology provider failing to deliver the contracted energy savings. It consists of different elements that aim to drive demand and motivate SMEs to invest in EE, by reducing the perceived risks (as illustrated in Figure 24) and creating trust between key actors (e.g. technology providers, enterprises, financial institutions). Setting up a typical ESI (see Figure 25) involves four phases.

PHASE 1: Preparation: An energy-efficient technology provider offers a project, with the promised energy savings guaranteed. The ESI elements are contained in the simple, standardised contract that is signed between the technology provider and client. This contract offers a clear and transparent framework for negotiations between key actors (SMEs and technology providers) on how a project's energy savings are guaranteed. It is based on a standardised turnkey contract, which includes a guaranteed savings clause, and distributes the remaining risk to appropriate actors, namely the independent technical validation entity and the insurance company.

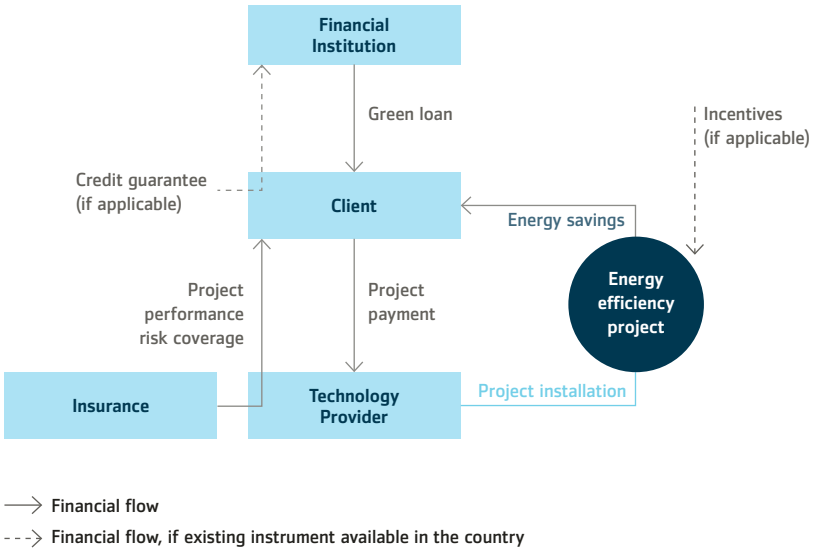
PHASE 2: Contract activation: An independent technical validation process is integrated into the model, to overcome the perceived high performance risk of EE projects. This is done by an independent validation entity, which evaluates the capacity of the project to deliver promised energy savings, verifies the installation, and acts as an arbitrator at the savings monitoring stage, if required.

The insurance company issues the insurance for the validated savings. This is usually a surety insurance, which forms part of the guarantees offered by the technology provider to the SME in the contract. After the validation of the project and issuance of the insurance, the contract is activated. Investments in EE projects with guaranteed savings can support access to a green loan, if required. It is also possible to link existing financial instruments (e.g. credit guarantees for SMEs or "green lines") to enable EE projects using ESI.

PHASE 3: Installation and operation: The technology provider installs the new energy-efficient equipment and the validation entity verifies that the installation is in accordance with the contract. The operation of the new equipment results in reduced electricity costs, improved performance, and higher productivity and sustainability. Maintenance services by the technology provider ensure that the equipment is operating optimally, delivering the savings.

PHASE 4: Savings monitoring: The energy savings are measured and periodically reported by the technology provider and the client can check and approve them. If there are disagreements on the savings achieved, the validation entity steps in and acts as an arbiter. If the savings are not achieved and the technology provider is not able to respond, the insurance steps in to cover the promised savings.

Figure 25:
ESI FINANCING STRUCTURE



Source: Stiftung BASE and ESI Europe[2]

What are the benefits of the ESI model?

Technology Providers: The ESI model helps quality energy-efficient technology providers gain the trust of clients and sell more energy-efficient products. High-quality technology typically competes with cheaper products, therefore the challenge lies in convincing clients to invest more upfront capital in higher quality equipment for future cost savings. Hence the guaranteed savings covered by insurance added to the providers' offer presents a new business opportunity.

SMEs: Beyond the general benefits from investing in EE, such as increased competitiveness and improved environmental sustainability, the ESI model creates trust and is presented as a comprehensive package with independent technical validation and insurance coverage of the guaranteed savings and facilitated access to financing. When contracting an EE project built on the ESI model, SMEs can also benefit from competitive credit conditions, favourable loan tenors, and support in accessing collateral.

Banks and financial institutions: Financial institutions benefit from the ESI mechanism because it reduces the credit risk of their borrower due to the guaranteed savings covered by insurance. The business opportunity for banks in the ESI model is the increase in the demand for financing, allowing them to mobilise "green" financial products (or create new green products) to support these projects. The independent technical validation and insurance coverage for the guaranteed energy savings can also result in better tenor and loan conditions, due to the reduced risk of the project failing and the client being unable to repay the loan.

ESI in practice: Examples from Latin America and Europe

The Energy Savings Insurance model has been developed and implemented by the Inter-American Development Bank (IDB)[3], with the support of BASE.[4] ESI was recognised by the Global Innovation Lab for Climate Finance as one of the most promising instruments to mobilise private sector investments in EE.[5] ESI also features in the G20 EE Investment Toolkit.[6]

At the moment, there are on-going projects in several countries. In Colombia and Mexico alone, the model is expected to mobilise over USD 45 mn in SME investments in EE technologies, while in Europe the figure is around EUR 60 mn in Portugal, Italy and Spain. The ESI model is currently being developed and implemented in Argentina, El Salvador, Chile, Brazil, Nicaragua, Paraguay, and Peru by the IDB and supporting partners. In Europe, the ESI model is being developed by BASE with funding from the European Commission's Horizon 2020 Research and Innovation Programme.[7]

Despite being an additional cost to SMEs, the insurance and validation process of the ESI model is designed to be standardised and does not have a significant impact on the return of investment in EE projects, projects that would otherwise not be invested in due to the high perceived risks (see Figure 24). In the ESI model implementation in Latin America and Europe, those additional costs vary from 2% to 5% of EE project investments, which are typically in the range of USD 100,000 or above. Technologies for which the ESI model has been adapted include solar water heaters, air conditioning, electric motors, air compressors, co-generation, boilers, refrigeration, and solar photovoltaic systems.

A pipeline of EE projects in Italy, Portugal and Spain is underway to operationalise the ESI model under the Horizon 2020 funded project, ESI Europe.[8] To further build trust, the ESI implementation also relies on a management information system using blockchain technology, guaranteeing traceability and reliability of EE projects. The project also involves dissemination efforts to promote the model more broadly across Europe and the development of long-lasting training tools, such as the "ESI Europe toolkit" and short videos to enable the roll-out of the model in other interested countries and sectors.

Challenges and opportunities

The implementation of the ESI model requires initial funding for the development of the programme. Development agencies, governments, or private actors can provide the required funding. Beyond funding, other components are necessary, such as engagement of key actors, proper identification of key sectors with EE investment potential and initial targeted marketing campaigns. Adequate support throughout the implementation, e.g. capacity-building for key market stakeholders, communication and marketing activities, and support to build initial pipelines of EE projects, is thus crucial.

The ESI model is an existing market-based solution that enables resources to be leveraged from multilateral development or governmental agencies, mobilising demand and stimulating private investments in EE. For the future development of ESI projects, a big advantage is that the ESI model is compatible with other EE instruments and can be supported by existing credit guarantees for SMEs, commercial green credit lines or on-bill financing schemes. In the long run, the model will be taken up by the market and is expected to be self-sustaining. The ESI model thus represents an effective way to increase investments in EE urgently needed to deliver the Paris Agreement goals and achieve a low-carbon economy, and offers different stakeholders a new tool for action.

1 International Energy Agency (2018). *Energy Efficiency 2018- Analysis and outlooks to 2040.* Mark. Rep. Ser. 1–143 (2018). doi:10.1007/978-3-642-41126-7

2 The ESI model drives investment in energy efficiency through energy savings insurance in Europe. See: https://www.esi-europe.org/financing/

3 Inter-American Development Bank. Latin American and Caribbean Green Financing (n.d.). *Energy Savings Insurance Program.* Available at: https://www.greenfinancelac.org/our-initiatives/esi/

4 Basel Agency for Sustainable Energy

5 Global Innovation Lab for Climate Finance (n.d.). *Energy Savings Insurance.* The Lab: Driving Sustainable Investment. Available at: https://www.climatefinancelab.org/project/insurance-for-energy-savings/

6 G20 Energy Efficiency Finance Task Group (2017). *G20 Energy Efficiency Investment Toolkit.* Available at: https://www.unepfi.org/wordpress/wp-content/uploads/2017/05/G20-EE-Toolkit.pdf

7 European Commission – Horizon 2020 (n.d.). *Project Information ESI Europe.* Available at: https://cordis.europa.eu/project/id/785061

8 ESI Europe (n.d.) *Project Page.* Available at: https://www.esi-europe.org/

11 ENERGY PERFORMANCE CONTRACTING
Scaling Energy Efficiency Investments through Tested Financing Models

Energy efficiency investments face unique barriers, such as high up-front costs, long pay-back periods and small scale of individual investments, all of which contribute to the investment gap needed to reach the climate goals set in the Paris Agreement.

Energy Performance Contracting (EPC) carries the potential to address some of these financing barriers by aggregating investments into portfolios to achieve the required scale.

Receivables from EPCs are sometimes sold to institutional investors who appreciate their alignment with their long-term liabilities.

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Energy efficiency is an integral part of global energy policy as it is widely recognised as a cost-efficient means of reducing energy demand, thereby curbing greenhouse gas emissions. The International Energy Agency (IEA) estimates that energy efficiency could provide more than 40% of the abatement required by 2040 under the Paris Agreement.[1] However, despite the clear environmental and economic case for energy efficiency, current annual investment volumes are significantly below policy targets. This chapter provides an overview of the trends in energy efficiency investments and presents Energy Performance Contracting (EPC) as a tested and mature model for channelling investments into energy efficiency.

Energy efficiency investment trends

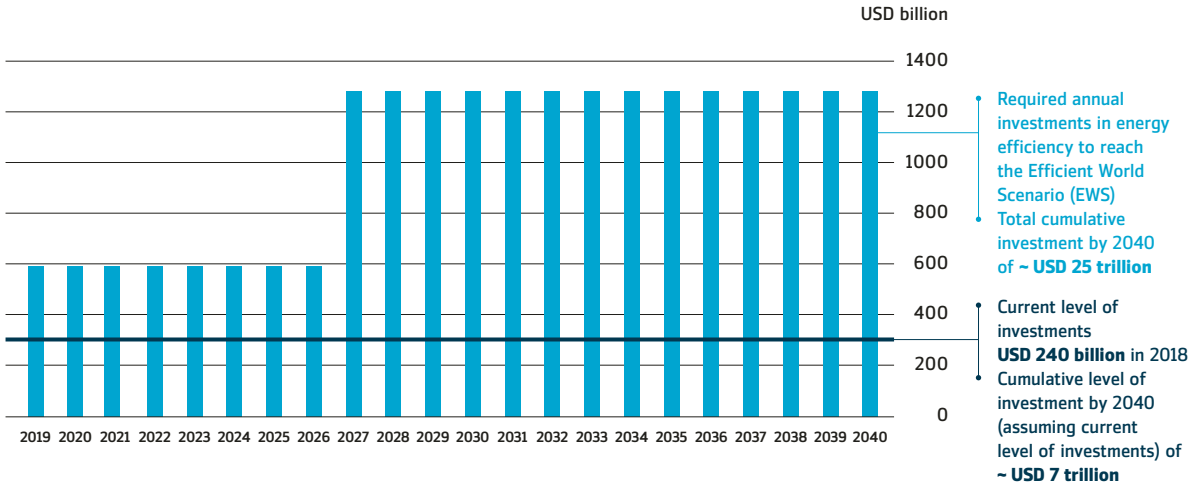
Energy efficiency has the potential to play an important role in achieving global climate targets. However, global investments in energy efficiency in 2018 only equalled USD 240 billion, a marginal 3% growth on the year before.[2] The current level of capital deployment is well below the required level to deliver on climate commitments. According to IEA's estimates, annual investments should run at USD 584 billion per year between 2017 and 2025, more than double today's level, and will further increase to USD 1.3 trillion per year up to 2040. This investment gap is depicted in Figure 26 on the following page.

The sluggish progress is mostly due to investment barriers that are unique to energy efficiency, such as the diverse nature of investment measures both in terms of technology as well as sector (building, transportation, industry), high up-front costs, long pay-back periods and small scale of individual investments, among others. Such barriers result in low demand for developing projects and consequently weak supply of financing, with the former being the key driver of the process. Delivering the necessary scale of investments requires a favourable policy that incentivises efforts to develop projects and generates the necessary pipeline, as well as innovative business models that address specific financing challenges particular to energy efficiency.

Delivering scale through Energy Performance Contracting

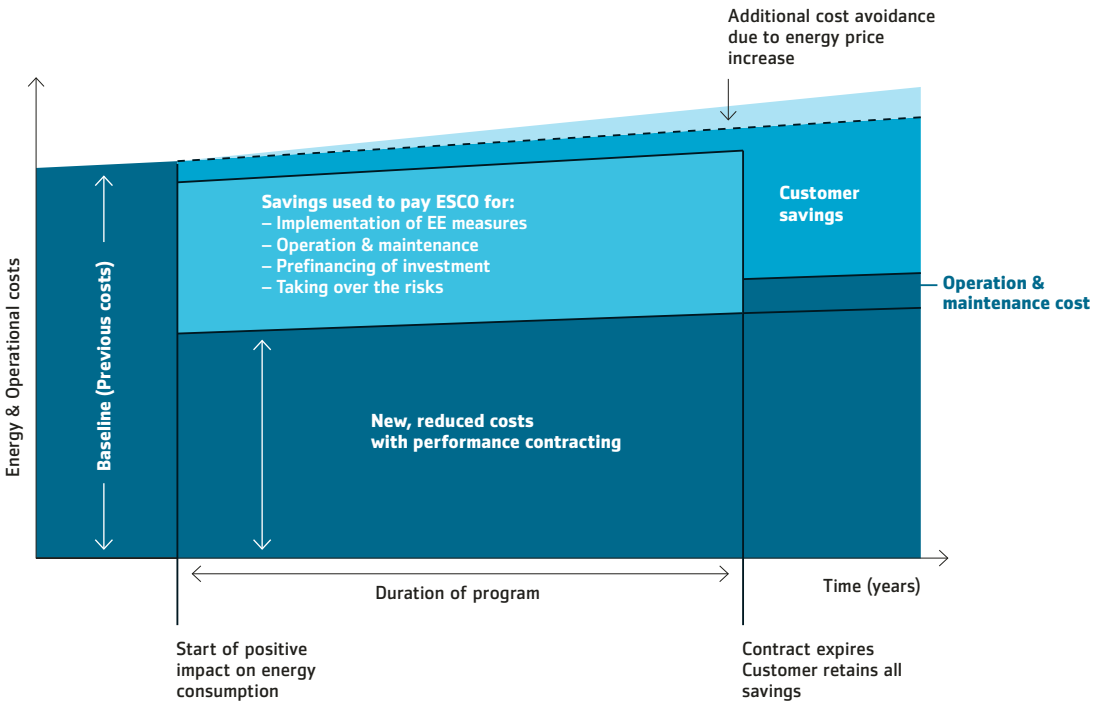
One business model that is relatively mature and has proven to be successful in addressing such challenges is Energy Performance Contracting (EPC), which is essentially a contractual agreement between an Energy Service Company (ESCO), a third party that is specialised in delivering energy savings solutions, and the end user. This model allows a third party such as an ESCO to undertake the implementation of energy efficiency measures on behalf of the end user through an EPC, which often provides a guaranteed level of energy savings to the end user and furthermore allows for the sharing of additional savings between both parties. As such, the remuneration of the ESCO is tied to the energy savings achieved.

Figure 26:
ENERGY EFFICIENCY INVESTMENTS IN 2018 AND REQUIRED INVESTMENTS UP TO 2040



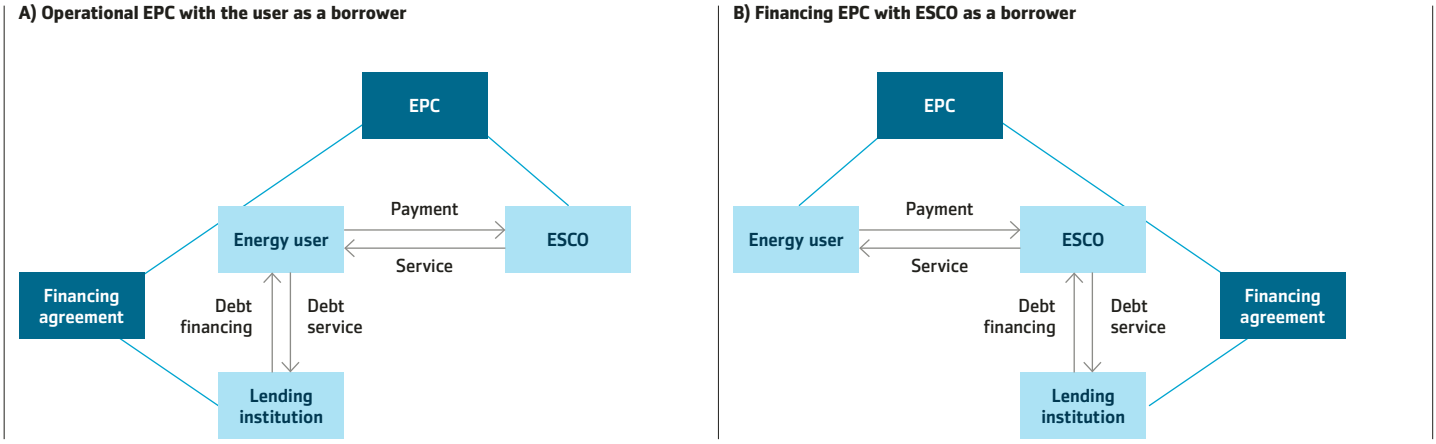
Source: IEA (2018), Author's analysis

Figure 27:
ESCO MODELS WITH ENERGY PERFORMANCE CONTRACTING



Source: Renovation Hub (2019)[3]

Figure 28:
ESCO MODELS WITH OPERATIONAL AND FINANCING EPC



Source: European Commission, Joint Research Center (2015)

Figure 27 depicts an example of how an EPC structure delivers value to the consumer through the savings generated during the duration of the project after the implementation of concrete energy efficiency measures, such as a public lighting project or the retrofitting of commercial real estate assets. The end user enjoys full benefits of savings after the project is completed.

ESCOs may or may not provide for the financing of the up-front costs. A distinction is often made between two types of EPC contracts with ESCOs: "financing Energy Performance Contracts" and "operational Energy Performance Contracts".[4] A schematic overview of the two options is presented in Figure 28. The key difference between the two lies in the arrangement of financing.

In operational EPCs, the end user is the borrower and the financing agreement is established between the user and the lending institution, on the basis of the EPC between the user and the ESCO, which guarantees a sufficient level of energy savings to service the debt. In this case, the ESCO's role is more operational, which mitigates technical risks, and acts as a savings guarantor.[5]

In financing EPCs, ESCOs initiate the project, arrange third-party financing, implement the efficiency measures and monitor the project. For large projects, such a centralised role is extremely beneficial as the ESCO serves as the main counterparty for the financiers as well as the beneficiaries.[6] In such cases, ESCOs enter into debt agreements with a lending institution, again based upon the EPC signed between the end user and the ESCO. However, debt servicing obligations fall to the ESCO and not the end user.[7]

The EPC model addresses some of the challenges associated with energy efficiency investments. Firstly, one EPC contract typically aggregates a portfolio of projects which are ideally structured jointly and ready to be financed. Financiers (debt or equity) are accustomed to financing large projects. High transaction costs do not always make it worthwhile for investors to focus on individual small-scale projects. In most cases, aggregation is therefore necessary to reach critical mass for the projects to become attractive from a financing point of view.

Furthermore, ESCOs are equipped with the technical know-how needed to assess and implement energy efficiency measures. This is particularly important for energy efficiency investments, as due to their cost-saving nature (as opposed to cash-flow generation), each project needs to establish base-line measurements on current consumption levels on which basis future savings are calculated.[8] As such, measurement, reporting and verification (MRV) as well as quality assurance processes are required continually throughout the investment period to document the savings generated and essentially create associated investment returns.

In addition, implementation of energy efficiency measures requires significant up-front capital, which may not always be available to end users. EPC structures can address this challenge, since an ESCO can attract third-party financing, which allows end users to participate in such programmes without the need to deploy significant up-front capital. To date most efficiency projects are delivered through means of self-financing. However, delivering the ambitious climate targets requires mobilisation of third-party capital at scale, which can be achieved through use of financing models such as EPCs.

ESCOs typically finance energy efficiency projects with their own capital and on-balance-sheet debt. This often limits their ability to undertake more projects due to debt ratio restrictions. In order for ESCOs to implement more projects, they often sell receivables from EPCs to secondary buyers and thereby free up their balance sheets. EPC portfolios are typically sold to institutional investors or thematic funds who find such investments to be in line with their investment criteria. Receivables from implemented energy efficiency projects are de-risked in terms of technical implementation and also have an established operational track record that demonstrates concrete achieved savings. Furthermore, EPCs are considered to be low-risk, long-term assets with stable returns, thereby matching institutional investors' long-term liabilities. SUSI Partners, for example, a Zurich-based infrastructure fund manager, has a dedicated energy efficiency fund which collaborates with ESCOs on such off-balance sheet investment structures.

ESCO market in Europe and Switzerland

According to an IEA report, the European ESCO market was estimated to be EUR 3 billion in 2017 representing about 10% of the global ESCO market with China and the United States leading the way.[9] The level of market development is influenced by opportunities in energy savings from energy efficiency in various geographies, as well as enabling policies that support such investments. Within the EU, Germany is considered to be the most mature market, along with France, Austria, the UK and the Czech Republic.[10] In Switzerland, the ESCO market is relatively new compared to its neighbouring countries. The development of the market in Switzerland is championed by *swissesco,* an association founded in 2015 by industry leaders with the aim of promoting the application of EPC contracting within Switzerland.[11]

To date, there have been about 20 EPC projects implemented in Switzerland, most of which are based in the French-speaking region of the country. One example worth mentioning is the energy efficiency investment at the Hôpital Universitaire de Genève (HUG) for which an EPC contract was signed between HUG and Services Industriels de Genève (SIG). The latter is acting as the ESCO and invests over CHF 1.2 million in efficient lighting. Energy savings during the duration of the contract are shared between the two parties. According to *swissesco,* one of the biggest challenges in Switzerland with regards to the further development of the EPC market is lack of awareness about the business model and the benefits it delivers to stakeholders. As such, it is imperative that more efforts are made to raise awareness in the country and communicate the contribution it makes towards achieving Swiss policy targets.

Conclusion

EPCs carry the potential to address some of the existing financing barriers in energy efficiency by aggregating investments into portfolios to achieve the required scale. EPCs also enable third-party financing, which can act as a catalyst to drive investment levels in energy efficiency closer to the climate targets set by the Paris Agreement. Institutional investors can get involved by purchasing receivables, which would allow ESCOs to undertake more energy efficiency projects. Policymakers, in conjunction with other stakeholders such as the financing community and project developers, should ensure that favourable policies are put in place to enable the development and financing of energy efficiency projects.

1 International Energy Agency. (2018). *Energy Efficiency 2018, Analysis and outlooks to 2040.* IEA: Paris

2 International Energy Agency. (2019). *World Energy Investment, 2019.* IEA: Paris

3 Laffont-Eloire, Karine. (2 October 2019). *Energy Performance Contracting (EPC).* Renovation Hub EU. Available at: https://renovation-hub.eu/business-models/energy-performance-contracting-epc/

4 Energy Efficiency Financial Institutions Group (EEFIG). (2014). *How to drive new finance for energy efficiency investments – Part 1: Buildings (Interim Report).* Available at: www.unepfi.org/fileadmin/documents/EnergyEfficiencyInvestment.pdf

5 European Energy Efficiency Platform (E3P). (n.d.). *Energy Performance Contracting.* Available at: https://e3p.jrc.ec.europa.eu/articles/energy-performance-contracting

6 Wilson Sonsini Goodrich & Rosati. (May 2012). *Innovations and Opportunities in Energy Efficiency Finance.* Available at: www.wsgr.com/publications/PDFSearch/WSGR-EE-Finance-White-Paper-14.pdf

7 European Energy Efficiency Platform (E3P). (n.d.). *ESCo Financing Options.* Available at: https://e3p.jrc.ec.europa.eu/articles/esco-financing-options

8 International Energy Agency. (2014). *World Energy Investment Outlook 2014.* IEA: Paris.

9 International Energy Agency. (2018). *Energy Service Companies (ESCOs). At the heart of innovative financing models for efficiency.* Available at: www.iea.org/reports/energy-service-companies-escos-2

10 Boza-Kiss, B., Bertoldi, P. & Economido, M.. (2017). *Energy Service Companies in the EU. Status review and recommendations for further market development with a focus on Energy Performance Contracting.* Available at: https://publications.jrc.ec.europa.eu/repository/bitstream/JRC106624/kjna28716enn.pdf

11 See www.swissesco.ch for more information on the association

12 COMMUNITY FINANCE
Renewable Energy Cooperatives

Community finance can provide funding for renewable energy projects and allow small-scale retail investors to invest in renewable energy.

The number of such projects is expected to further increase while prices of renewables are expected to further decline, which will support the creation of a profitable investment environment.

Besides financial benefits, community energy projects increase electricity-customer engagement with renewables, customer satisfaction and loyalty, and community well-being.

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Introduction

For the purpose of this chapter, we define community finance broadly as a participation scheme that allows individuals, i.e. small-scale retail investors, to invest in renewable energy (RE) projects and receive compensation in the form of electricity, certificates of origin and/or interest payments. Compared to other countries, such as the US, community-financed energy projects are still relatively uncommon in Switzerland, but their number is increasing every year.[1]

Overview of existing forms for community finance in renewable energy

At present, there are various ownership models for renewable energies which open up a variety of different opportunities for private investors. The most basic form of consumer ownership is direct ownership of a generating facility. Despite being the most widespread form of RE ownership, it has the disadvantage of making co-ownership dependent on the available infrastructure, e.g. the availability of an appropriate rooftop for a solar power installation, which excludes a large portion of the population, such as tenants, from RE co-ownership.

Another form of co-ownership is the indirect ownership model, which allows electricity customers to participate financially in a renewable energy project. In Switzerland, cooperatives are already well-established vehicles for consumer (co-)ownership both at the national and regional levels (cooperative model).[2|3|4|5] A cooperative is an organisation with "the primary purpose of promoting or safeguarding the specific economic interests of the society's members by way of collective self-help"[6]. It is open to private individuals, as well as to corporate and state actors.[7] Since 1990, more than one hundred new RE cooperatives have been founded, most of them active in the production of electricity from solar photovoltaics and heat from wood chips.[8|9] Instead of electricity, these cooperatives offer in most cases financial shares in their projects, with annual return rates between 1.5 and 2.5% to their members.[10]

In recent years, consumer co-ownership has provided new opportunities for partnerships (partnership model). For example,

an installer, often a non-for-profit start-up, develops a RE project and partners with a utility to sell the project shares to the utility's clients. The utility, in turn, delivers the produced 'green' electricity to their clients through their grid and manages the billing. In this set-up, the consumer does not have to be a property owner, which might prove attractive to a wider segment of the population, especially tenants. New partnership schemes can also involve a public entity (e.g. a cantonal or federal agency in charge of promotion of RE) and a non-energy company that promotes RE as part of their new business strategy (e.g. IKEA's solar business[11]) or corporate social responsibility (e.g. retailer Coop[12]).

Alternatively, consumer co-ownership projects can also be directly initiated by the utility itself (utility-based model). Instead of partnering with another entity, the utility plans and realises the renewable energy project, which is in most cases a solar power project. In most cases, the utility offers shares in forms of solar panels to its customers.

Access of private funding for low-carbon solutions: Examples from Switzerland

I. **Cooperative model: Energiegenossenschaft Schweiz (EGch)** was founded in 2012 with the aim of setting up the largest decentralised solar power plant in Switzerland by creating 'electricity commons' *(Stromallmende)* consisting of small energy producers and consumers.[13] The annual general assembly of EGch acts as an exchange platform for certificates of origin, where electricity consumers and producers negotiate a price for purchase and sale. In 2017, the certificates cost 0.07 CHF/kWh for the consumer, of which 0.05 CHF/kWh were received by the producer and 0.02 CHF/kWh by EGch to cover its administrative costs.[14]

II. **Partnership model:** Another example of a partnership that promotes citizen co-ownership of renewable energies is the collaboration between Sunraising Bern, a non-profit start-up founded in 2015, and the electricity utility Energiewerke Bern (EWB).[15] As its name suggests, *Sunraising* stands for a combination of solar power and fundraising, offering the residents of Bern the possibility to buy a share representing a certain number of square metres of a locally installed solar plant. As compensation, the customers of *Sunraising* receive a respective share of electricity from solar power for 20 years, which roughly corresponds to the life cycle of a solar plant. In this set-up, *Sunraising* is in charge of installing the solar panels and their maintenance, as well as selling the shares of the solar plant. The produced solar power is fed into the electric grid managed by the EWB, which delivers the electricity to the *Sunraising* customers. As of today, *Sunraising* produces 262,400 kWh of local solar power per year.

III. **Utility-based model: Elektrizitätswerke Zürich (EWZ),** a utility of the city of Zurich, has offered its customers the possibility to purchase shares of locally installed solar plants since 2014.[16] After buying a certain number of 'square metres' of a chosen solar plant, EWZ customers annually receive 80 kW/h of solar electricity per purchased square metre, for the duration of 20 years. If the consumer wants to cancel their contract due to moving house or other circumstances, these shares can be sold back to EWZ. The model's success is evident from the fact that within a matter of days EWZ sold out the shares of six large solar plants (between 1,000-2,500 m²).[17] As of 2018, there were several more examples of municipal solar schemes in Switzerland.[18]

Regulatory environment regarding energy co-ownership in Switzerland

The year 2018 brought about a number of changes to the existing federal support policies for RE. Since 2009, electricity production from renewable sources has been supported through the payment of a feed-in tariff *(Kostendeckende Einspeisevergütung, KEV)*. Updated legal provisions stipulate that new projects may be considered for

the feed-in-tariff payments until the end of 2022, while existing electricity producers that already receive KEV will continue receiving the payments as planned.[19] Starting from January 2020, larger electric producers with an installed capacity of over 100 kW will need to start direct marketing of the generated electricity (*Direktvermarktung*), allowing the producers to receive the negotiated price and a feed-in-premium (*Einspeiseprämie*).

Another important legislative provision is the possibility to form 'self-consumption communities' (*Eigenverbrauchsgemeinschaften*) on adjacent plots of land, given that the community's electricity-generating capacity amounts to at least 10% of the connected load.[20] The law stipulates that the grid operator shall regard such a community as a single consumer. Thus, large self-consumption communities with electricity consumption of more than 100,000 kWh a year could enter the liberalised Swiss energy market for large consumers. This provision opens new opportunities to community ownership projects, when neighbouring landowners or tenants in multi-occupancy homes pool their demand for electricity and take advantage of self-consumption models or even electricity trading.

Opportunities, barriers and enablers

Consumer co-ownership of REs might be hindered by the absence of electricity market liberalisation in the small-consumer segment (i.e. less than 100,000 kWh per year). Due to a stable customer base, as small consumers do not have the freedom to switch providers, an interactive relationship between customers and municipalities local utilities is rare.[21] Moreover, the incumbent utilities have significant market power when negotiating with new market entrants, be it an interconnection issue or a power purchase agreement.[22] New market entrants offering consumer co-ownership of REs must collaborate with the local utilities to dispatch the produced electricity to private consumers via the local power grid. It is likely that with market liberalisation and increased consumer co-ownership of REs, the utilities will change from product-oriented towards more service-oriented organisations, paying more attention to customer satisfaction and retention rates.[23]

Even though financial motives lag behind other considerations (such as supporting the environment), about a fifth (21%) of Swiss consumers regard financial returns as one of the two main reasons for investing in RE projects.[24]

Generally, consumer surveys identify considerable market potential for community projects in Switzerland: about 60% of respondents said that they would be interested (or maybe interested) in investing in a community-owned REs.[25|26] On average, potential investors tended to have higher levels of education, be more optimistic about RE achieving grid parity, believe in a future without fossil fuels, and be more welcoming to wind energy projects in their communities.[27] However, the market still has a lot of room for growth, with only about 1.9% of the German- and French-speaking population in Switzerland having already invested in community finance (compared to 7% in Austria).[28|29]

Outlook

One of the major changes will be the replacement of the current feed-in-tariff system with a steering policy, which could include an energy steering charge (Lenkungsabgabe). The Swiss Federal Department of Finance is also considering an ecological tax reform. It is yet to be seen whether these policy proposals would have a positive or negative impact on community finance. Similarly, it is unclear whether liberalisation of the electricity market, as currently discussed in the Swiss parliament, would address the current challenges faced by community RE projects. However, community energy projects are expected to further increase in number while prices of renewables are expected to further decline, which will support the creation of a profitable investment environment.

Further reading

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1 More details on this topic can be found in the book chapter "Consumer (Co-) Ownership in Renewables in Switzerland" written by Broughel, A. E., Stauch, A., Schmid, B., & Vuichard, P. (2019) in the book *Energy Transition* (pp. 451–476) from Palgrave Macmillan.

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6 Swiss Code of Obligations (SR 220), Art. 828

7 Ibid., Art. 828, Art. 926

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9 Typically, these new cooperatives invest in a photovoltaics installation on a large rooftop of a school or a municipal building (ibid.). The produced electricity and the certificates of origin can be subsequently sold to the grid operator, the cooperative members for self-consumption or to other individual actors.

10 See for example www.solar-sg.ch

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12 See: www.taten-statt-worte.ch/de/nachhaltigkeitsthemen/umweltschutz/energie-und-klimaschutz.html

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14 Ibid.

15 SunRaising (2017). *Die Solardach Challenge: Dein Solarstrom, Anleitung, FAQs, Über Uns.* Retrieved from: https://sunraising.ch/challenge/anleitung/

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17 Ibid.

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20 Energiegesetz (EnG) vom 30. September 2016 (SR 730.0)

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29 Gamma et al. (2017).

12.1 CASE STUDY

A PROMISING INVESTMENT MODEL FOR A CITY TO FOSTER SOLAR POWER

The experience of Lausanne City Council

This case study shows how the city of Lausanne set up a company to successfully implement and invest in rent-a-roof models to develop solar photovoltaics.

This leasing model can deliver attractive returns for the investor company and allows building owners to install PV and benefit from renewable energy without high upfront costs.

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Deputy CEO, Swiss Sustainable Finance

RICHARD MESPLE
Former Director, SI-REN

How Lausanne City Council is harnessing solar potential

SI-REN SA is a wholly owned subsidiary of Lausanne City Council.[1] The company was set up in 2009 to deliver the council's target of increasing electricity generation from solar photovoltaic (solar PV), wind, biomass, geothermal and other renewable sources to 100 GWh per year. By 2019, solar panels had appeared on rooftops across the city thanks to the model, including schools, factories, offices and sports complexes. These 53 solar PV plants, totalling installed capacity of 10.96 MW, generate 12 GWh of electricity annually – and a further 42 projects are in the pipeline. The council's long-term ambition is to increase output to 30 GWh per year, with solar PV plants covering one-third of eligible rooftops on large buildings.

Model 1: Rent-a-roof and compensatory feed-in remuneration

SI-REN, working with the School of Management and Engineering Vaud (HEIG-VD), produced a map of all roofs in Lausanne over 25 sq m in size with the correct orientation for solar PV. The mapping exercise, which was funded by the council's Energy Efficiency Fund (FEE), revealed solar potential of over 100 GWh per year.

SI-REN aims to tap into this potential using the "rent-a-roof" model: the company approaches building owners and offers to rent suitable rooftop real estate in return for a fee. SI-REN takes care of the logistics, from assessing solar potential, to sourcing the solar panels and installing the plant.

SI-REN then sells the generated electricity to Services industriels de Lausanne (SiL), the city's energy supplier, under a deal that delivers a return on its investment. The agreed price covers shareholder payouts, third-party debt costs, staffing costs and rental fees paid to building owners. This model worked especially well under the old compensatory feed-in remuneration scheme, when the Swiss government offered a guaranteed price, fixed for 20 years, which provided fair compensation for the initial investment.

Model 2: Rent-a-roof and private-consumption community

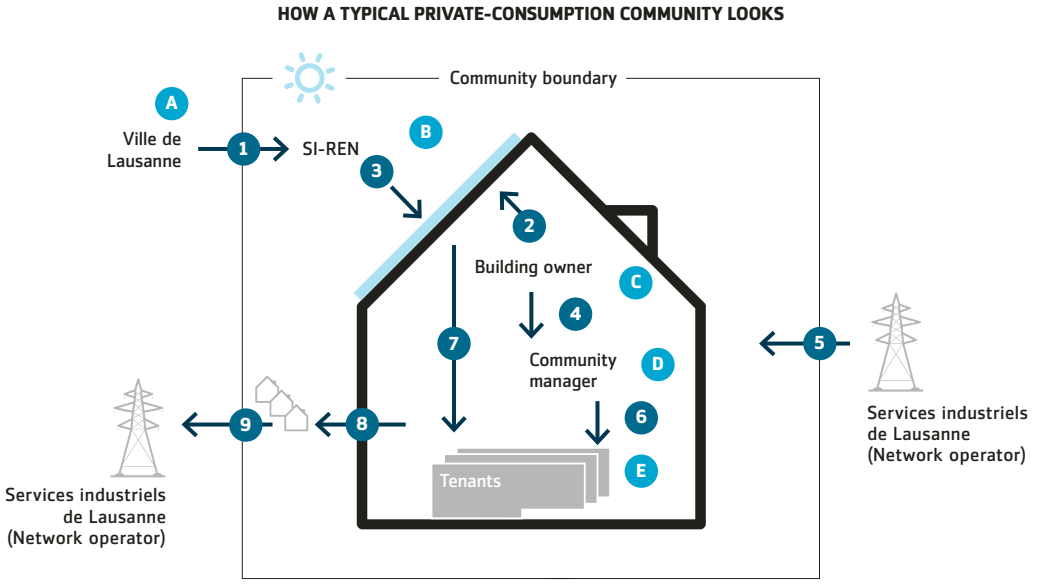
A recent rule revision means that owners of buildings with solar PV plants can now consume the electricity they produce, and sell any surplus power to other neighbouring properties connected to a private local grid. Under SI-REN's new model, which reflects the change in the law, owners can now benefit on two levels. First, they receive a rental fee for use of their roof space. Second, they also benefit from a private tariff for the self-generated electricity which is lower than the tariff they would have to pay to the distribution network operator (DNO), thanks to the absence of infrastructure construction and maintenance costs.

The 2018 Swiss Energy Act (EnA) introduced the "private-consumption community" concept in a drive to increase solar adoption and promote private consumption.[2]

SI-REN's private-consumption community model: How it works

Figure 29 on the following page gives an overview of a typical private-consumption community, showing all the relevant parties and energy flows.

Figure 29:
MODEL ILLUSTRATION OF PRIVATE-CONSUMPTION COMMUNITY MODEL



Source: SI-REN, 2019

Legend and comments

A. **The owner of the investor.** In this case, SI-REN (the investor) is a wholly owned subsidiary of Lausanne City Council (the owner), which set up the company to deliver its target of generating electricity from renewable sources.
B. **The investor.** SI-REN invests in the solar PV infrastructure.
C. **The building owner.** SI-REN leases the roof from the building owner. The company deals with many different types of owners. If the owner is also an electricity consumer, SI-REN has more options at its disposal.
D. **The community manager.** If the building is a block of flats, the property management company might decide to manage the community alongside the building's heating, as well as taking care of billing. Alternatively, management responsibility could be outsourced to a third-party provider.
E. **Tenants.** In the past, tenants had no option but to source electricity from their local DNO. In a private-consumption community, tenants have private meters and enjoy cheaper bills because they pay no standing charges, or any other charges, on the solar power they use.

Setting up a private-consumption community step-by-step

1. The owner of the investor (in this case, SI-REN) gives the green light.
2. The building owner signs a roof lease agreement with SI-REN.
3. SI-REN's project managers draw up the plans, and the company appoints an installer to fit the solar PV plant to the roof.
4. The owner appoints a community manager (the property management company or a third-party provider).
5. The distribution network operator (DNO) continues supplying electricity to a single customer (the community), but no longer deals directly with individual members (former captive customers).
6. The community manager bills members according to how much electricity they use (solar and mains).
7. SI-REN sells the solar power to community members (via the community manager), but does not feed it into the mains grid (operated by the DNO).
8. Surplus solar power is sold to neighbouring properties (if they are connected to the private-consumption community).
9. Any remaining surplus is injected back into the grid at a negotiated or predetermined feed-in tariff.

Conclusion

Lausanne City Council set up a standalone company (SI-REN) to generate more electricity from renewable sources in and around the city. Ten years on, the company has outperformed all expectations: developing unparalleled expertise in solar PV plant installation, achieving its output targets, and demonstrating the flexibility to adapt to sweeping changes in the legal landscape. Moreover, steadily falling solar production costs mean the company has a viable business model going forward.

The model is also good news for building owners who, since the private-consumption community model was introduced into Swiss law, have effectively been able to lease a solar PV plant, and benefit from the electricity it generates, without the upfront investment costs (SI-REN finances the infrastructure).

1 See company website: www.si-ren.ch/solaire/
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13 FUNDAMENTALS OF CARBON CREDIT MARKETS
Opportunities, Barriers and Enablers

With companies stepping up their efforts to mitigate their carbon-intensive activities and set science-based emission reduction goals, global carbon markets are likely to provide a natural bedrock for policy development and financial innovation, especially in light of the recovery from the COVID-19 pandemic.

As a result, financial institutions are increasingly applying carbon pricing scenarios in their disclosure of climate-related risks and opportunities in a variety of sectors, from banking to insurance underwriting and asset management.

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In 2015, the Paris Agreement marked the world's first high-level commitment on the mitigation of climate change. It focused on two key areas: (1) the development of targeted national energy and climate policies to achieve average temperatures well below 2° C above pre-industrial levels, and (2) a significant increase of capital market flows to fund a low-carbon transition including, among others, the development of climate-resilient infrastructure. As companies mitigate their carbon-intensive activities and set science-based emission reduction goals, global carbon markets are likely to provide a natural bedrock for policy development and innovative climate finance solutions available to the global investment community. While the outbreak of COVID-19 in the first quarter of 2020 may have slowed down the impact of carbon pricing mechanisms, governmental resilience packages remain focused on supporting net-zero emissions by 2050.

The evolution of carbon trading

Over the last 10 years, carbon emissions trading has become a primary instrument of climate change policies and one of the most innovative commodity markets to-date. First proposed by the European Commission in 1999, trading of carbon emission certificates is based on the establishment of an Emission Trading Scheme (ETS). For the most part, it relies on a "cap and trade" setting for which tradable units are exchanged according to pre-set supply limits (i.e. number of available certificates, also known as "allowances" and "caps").[1] This market-based mechanism aims at incentivising emitters to reduce carbon dioxide (CO_2) emissions by directly assigning a cost to carbon-emitting operations. The term "carbon credits" refers to tradable certificates of one ton (t) of CO_2 or its equivalent greenhouse gases (GHG - tCO_2e). There are 31 ETSs currently in place globally.[2] The most well-known ETS is the European Union ETS (EU ETS) established since the Kyoto Protocol in 2005. As financing solutions to climate change entail the assessment of existing pools of investments for the reduction of GHG emissions across portfolios, investors welcome the introduction of financial instruments that effectively price and mitigate systemic exposures to carbon risk and unveil investment opportunities in green technologies.

According to the World Bank Group, over 70 market participants ranging from regional, national and subnational entities have participated in carbon pricing initiatives in 2019, covering nearly 22% of global GHG emissions. They generated an excess of USD 45 billion carbon pricing revenues, a USD 1.0 billion annual increase versus the previous year.[3] Yet, the total supply of allowances granted under each scheme (i.e., the number of tradable emission *credits* or *offsets* that a company may receive by operating yearly within its

emission cap) has a direct impact on the overall depth and effectiveness of the market. A common example of their use is that of a corporation which offsets GHG-intensive processes with direct investments in emission-saving projects in order to adhere to emission regulations and avoid monetary sanctions. This is the case, for example, for the automotive sector in Europe (starting from 2019) or the chemicals sector in China as of 2017.[4] For automotive manufacturers, the rollout of electric vehicles introduced a "net credit" component towards exceeding CO_2 limits, since it encourages production and consumption shifts towards carbon neutrality.

Regulatory shift: From emission caps to a green taxonomy

The numerous legislative efforts surrounding climate change have presented various barriers to the growth of carbon markets. Most notably, the need of market participants to have access to customised contracts to minimise carbon risk is meeting investors' demand for centralised and transparent, exchange-based solutions to reduce the GHG emission profile of portfolios. In addition, they also help to fund the development of new technologies. Starting in 2017, policymakers have shifted their attention to turning the initial barriers into enablers. The regulatory updates emphasise the structural advantages of ETSs, such as access and liquidity. The most impactful reforms have prioritised the reduction of total supply of carbon credits by steadily lowering caps, and by positioning each scheme level in line with the Paris Agreement thresholds post 2020. The introduction of the EU Green Deal in December 2019 and its 2050 carbon neutrality pledge is expected to be a catalyst for additional carbon pricing initiatives affecting economic sectors beyond the ones currently covered by the existing ETSs.

While it is premature to argue policy convergence, recent reports on the progress of the EU ETS in cutting emissions point to a steady path toward achieving a 40% reduction in GHG emissions by 2030.[5][6] The EU ETS was the first cap-and-trade programme for GHG emissions and is now the cornerstone of the EU climate policy. In 2017, Switzerland and the EU agreed to link their emissions trading schemes, which will give Switzerland access to the large and more liquid EU CO_2 trading market starting in 2020.[7] As of June 2019, China established the largest carbon pricing initiative in the world with the launch of the National Carbon Emission Rights Trading Market for the Chinese power generation industry. Even as its effectiveness is still to be tested, it has given a strong market signal with respect to the country's commitment to climate adaptation and mitigation policies.[8]

Concurrently with the launch of the Chinese ETS in June 2019, the European Commission released its classification system for sustainable activities, also known as the EU taxonomy. The taxonomy is a series of technical screening criteria for economic activities and will bring more clarity and comparability to the assessment and pricing of the environmental impact of different economic activities. In the absence of more homogeneity in the technical criteria established by global regulators, financial market participants are prioritising compliance with climate transition and Paris-aligned standards. That poses another near-term headwind to effectively incorporate carbon trading as a way to design consistent low-carbon transition pathways in portfolio allocations besides leveraging carbon pricing in scenario planning activities.

Pricing carbon: The fair price of emissions

In light of the historical peaks in GHG emissions in 2018[9], the pricing of carbon emissions has become an essential public finance tool to execute low-carbon transition plans. Approximately half of the signatories of the Paris Agreement have submitted pledges in the form of Nationally Determined Contributions (NDCs) as of June 2019. While national climate policies reference carbon pricing (i.e., the price associated with a permit to emit one metric ton of CO_2), only 20% of global GHG emissions are covered by a pricing scheme, of which less than 5% exhibit pricing levels in line with the regional pledges needed to fulfil the Paris Agreement (see Table 8).

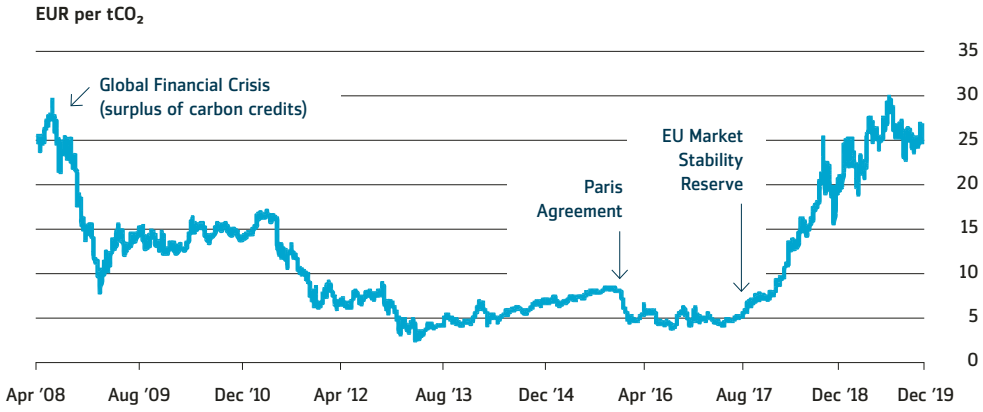
Since 2015, broader intervention at the national level has continued to put upward pressure on the price of carbon permits (allowances) which tend to be positively correlated with the price of energy as a way to reduce demand from traditional energy sources. As an example, under the EU ETS, National Allocation Plans (NAPs) determine the total quantity of carbon allowances that member states grant companies to buy or sell over a specified time horizon. The 2008 economic downturn resulted in a structural oversupply of allowances in the market. As of 2018, the EU ETS was reformed to include a discretionary increase in the annual reduction rate of the

Table 8:
CARBON EMISSION PRICING IN LINE WITH THE PARIS AGREEMENT

BY 2020	BY 2030
USD 40 to USD 80 per CO_2 ton	USD 50 to USD 100 per CO_2 ton

Source: CPLC, Report of the High-Level Commission on Carbon Prices, May 29, 2017. Any opinions, projections, forecasts or forward-looking statements are valid as of the date indicated, and are subject to change.

Figure 30:
HISTORICAL EU ETS CARBON PRICE (APRIL 2008 – DECEMBER 2019)



Source: Bloomberg Commodity Pricing; Generic Carbon Future Contract "MO1 Comdty". For illustrative purposes only.
We are not soliciting or recommending any action based on this material.

emissions cap and, effective January 2019, the implementation of a rule-based supply-side control, the Market Stability Reserve (MSR) which targets an increasingly reduced volume of authorised permits. The MSR is likely to result in price hikes of an estimated 30% in 2050 (see Figure 30).[10]

However, while carbon pricing under these schemes varies widely, over 50% of the emissions covered by the existing ETSs price a metric ton of carbon at less than USD 10, underpinning the limited efficacy of carbon markets in assisting effective climate action to date.[11] The implementation of carbon pricing initiatives remains a key challenge to reaching fair pricing conditions and closing the gap with Paris-aligned levels or those set by new climate transition benchmarks.

Recent dialogue on the targeted climate policy outcomes has focused on more stringent climate change policies. In fact, while ETS mechanisms focus on setting an *"explicit"* price for carbon emissions, *"implicit"* pricing associated with pollution abatement and incentives to reduce the footprint of carbon intensive processes and operations are increasingly setting viable reference points to address the issue (e.g., fossil fuel subsidy or fuel tax reforms).[12]

The road ahead: Innovations in carbon pricing

At the international level, there continues to be renewed interest in cooperating to reduce the cost of implementation of carbon emission markets alongside promoting intergovernmental action on sustainable development. However, the current fragmentation of carbon trading schemes poses structural liquidity issues for private capital to be put to work in a cost-efficient manner. Furthermore, as evidenced during COP25 in Madrid, rules and procedures for effective deployment of carbon markets mechanisms are still not fully settled. For example, the issue of properly accounting for emissions reductions and avoiding potential double-counting remains unsolved.

In 2017, the final recommendations were released by the Task Force on Climate-Related Financial Disclosures (TCFD). As a result, capital allocation decisions are increasingly driven by the need for transparency. That extends to both market mechanisms and financial instruments which price carbon, and therefore climate risk, through market-tested standards.[13] Financial institutions are more and more likely to employ carbon-pricing scenarios when disclosing climate-related risks and opportunities in their activities. This applies to banking, insurance underwriting and asset management,

but also specifically to areas that encompass overall business strategy or risk management policies as detailed by the TCFD. Responsible investors will continue to adopt carbon pricing as a stress-testing tool to gauge economic exposures and transition portfolio allocations to meet climate mitigation targets set by local regulators.

Conclusion and outlook

Looking ahead, carbon finance is set to drive two main streams of innovation: (1) the decarbonisation of financial assets relating to the transition of carbon-intensive economic activities to low-carbon alternatives in line with climate scenarios well below 2°C, and (2) the design and functioning of a *sustainable* financial system where economic growth is compatible with the socio-economic changes necessary to mitigate climate emergencies and enable a balanced cycle of production and consumption of natural resources.[14] While the harmonisation of international carbon pricing mechanisms is far from a global reality, carbon pricing will continue to be an essential policy lever in meeting climate targets. The future role of carbon finance ultimately depends on its ability to incorporate climate mitigation targets in the direct pricing of carbon risk and raise it to significant levels.

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8 Zhang, Y., Harris, J., Li, J. (Apr. 2018). *China's Carbon Market: Accelerating a Green Economy in China and Reducing Global Emissions.* GDAE Working Paper No. 18–01, Tufts University. Retrieved from: https://sites.tufts.edu/gdae/files/2019/10/18-01_ZhangHarris_ChinasCarbonMarket.pdf

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13 TCFD. (June 2017). *Recommendations of the Task Force on Climate-Related Financial Disclosures.* Retrieved from: www.fsb-tcfd.org/wp-content/uploads/2017/06/FINAL-TCFD-Report-062817.pdf

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Disclosure
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13.1 CASE STUDY

CHALLENGES AND OPPORTUNITIES FOR TIMBER BUILDINGS IN THE SWISS REAL ESTATE MARKET

The Role of Carbon Credits

Timber buildings can potentially generate additional cashflows from carbon credits, which can increase the attractiveness of timber real estate investments compared to traditional building materials such as concrete and steel.

This attractiveness is however highly dependent on the assumed carbon credit price and developments on the regulatory level.

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In this case study, we present an economic and environmental prospective analysis for the use of timber buildings in Switzerland. Wood building materials can avoid emissions caused during concrete and steel production processes and tie up CO_2 for decades. Our analysis assess the effects of applying carbon storage credits to such timber projects.[1] We first calculated the environmental impact and CO_2 storage for timber buildings using a Life Cycle Assessment (LCA).[2] LCA is a well-established methodology and proposes an input-output relationship between human activities and the environment.[3|4|5|6] For the economic assessment, we developed discounted cash flow (DCF) models, considering factors such as rents, operational costs, renovation and refurbishing funds. We collected a sample of over 11,000 properties in Switzerland to develop the prospective models. The results are relevant for real-estate analysts seeking to accurately estimate opportunities in timber buildings.

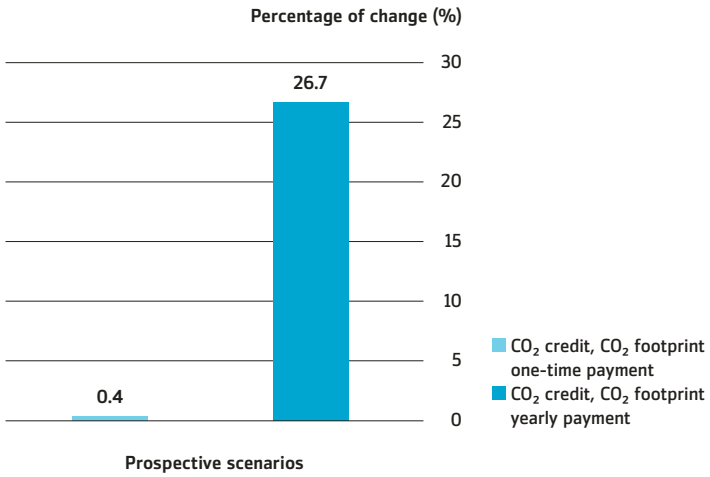
Prospective environmental analysis

We developed LCA models for typical residential buildings in Switzerland in order to estimate the amount of CO_2 that could be potentially stored by building with timber. Moreover, we calculated the CO_2 emissions associated with the transport and production of construction materials required for a timber building. With this information we calculated the CO_2 balance (carbon footprint) for each property in our sample. A positive balance means that the CO_2 emissions from the production and transport of construction materials are lower than the CO_2 stored in the timber parts of the buildings.[7] If this condition was met, we then assigned a carbon credit for each ton of CO_2 stored during each year of the ten-year DCF calculation. In our case the carbon credit has a value of CHF 120[8] based on the carbon tax levels proposed by the Swiss Federal Office for the Environment. The results from these calculations were then transferred to the DCF models as an additional cash flow.

Prospective economic analysis

For this analysis, we calculated the Discounted Cash Flows (DCF) for each building in the sample, over a period of ten years. DCF analysis is a method of valuing a project using the concept of the time value of money and is widely used in investment finance and real-estate management.[9] DCF analysis computes the net present value (NPV) of a project by taking cash flows and a discount rate as inputs. For our calculations, we used real data for each of the 11,000 properties in our sample. To understand the effect of a carbon credit for the

Figure 31:
PROSPECTIVE SCENARIOS: (I) ONE-TIME CARBON CREDIT PAYMENT AND (II) YEARLY CARBON CREDIT PAYMENT



storage of CO_2 in timber buildings, we developed two prospective scenarios: (i) considering a one-time carbon credit payment for CO_2 storage and (ii) considering an annual carbon credit payment for CO_2 storage. For each scenario we incorporated the CO_2 storage credit value in the cash flows of each building.

Results and discussion

The results from the environmental prospective analysis showed that on average 0.19 t CO_2 equivalents (CO_2eq) are emitted for the production of materials while 0.56 t CO_2eq are stored in timber elements per square metre constructed. This means that in the proposed scenarios the properties had a positive CO_2 balance. Consequently, each square metre of timber buildings in Switzerland stores approximately 0.37 t CO_2eq. On the prospective economic scenarios, this will represent an additional cash flow from carbon credits of 44 CHF/m². To better understand these dynamics, we calculated the percentage of change of the DCFs for the scenarios of one-time and yearly carbon credits payments as presented in Figure 31.

From Figure 31 it is clear that the scenario with yearly carbon credit payment has the highest Percentage of Change (PoC), with a potential increase up to 39% higher than the DCF without the carbon credits. Furthermore, the scenario with a one-time carbon credit payment does not reach the 1% PoC. If we consider that timber buildings have a higher initial investment – around 2% in comparison to concrete buildings – it becomes clear that a carbon credit scheme for the storage of CO_2 requires either a yearly payment or a higher valuation of the carbon credits, or a combination of these factors, to make it economically interesting. This is a very challenging situation, since currently only emitters are charged and so far there is no scheme to compensate for the storage of CO_2, even if it is a relevant commitment from the Paris Agreement.[10] If such a scheme were put into place, this could make investment in timber real estate more attractive and provide a carbon sink.

Our results show that a consistent economic policy is required to support the development of the timber industry and compensate for the additional environmental service, CO_2 storage, provided by timber buildings. Moreover, a clear financial infrastructure is required to handle carbon credits for emitters and CO_2 stores. We can conclude that in the case of timber buildings, carbon credits can provide a sustainable way to finance the transition towards a low-carbon economy in Switzerland.

1 CO_2 storage credits as a policy instrument do not yet exist in Switzerland. However, the Federal Office for the Environment (FOEN) is assessing the potential of timber buildings for CO_2 storage. The authors would like to acknowledge FOEN's Action Plan Wood (AP HOLZ) for financing the research activities around this topic. The results presented in this article are part of a FOEN-mandated project *(Entwicklung von DCF- und LCCA-Datenbanken und Modellen für den Holzbau. Ökonomische Bewertung von biogenem CO_2 im Holzbau und Integration in DCF und LCCA)*, which was finalised in November 2019 (Final report as of Jan. 2020 not publicly available). The pre-study on timber buildings *"Immobilienwirtschaftliche Lösungsansätze zur Ausschöpfung des Holzbaupotenzials."* is available under: www.bafu.admin.ch/bafu/de/home/themen/wald/fachinformationen/strategien-und-massnahmen-des-bundes/aktionsplan-holz/projektuebersicht-und-ergebnisse-des-aktionsplans-holzo/ergebnisse-klimagerechtes-bauen.html

2 Hellweg, S. and Canals, L.M.i. (2014). Emerging approaches, challenges and opportunities in life cycle assessment. *Science, Vol. 344* (6188): p. 1109–1113.

3 The authors used the software OpenLCA [see endnote 4] the database EcoInvent v3.5 [see endnote 5] and the evaluation method IPCC2013 [see endnote 6].

4 GD (2017). *OpenLCA. The open source life cycle and sustainability assessment Software.* Available at: http://www.openlca.org/.

5 Ecoinvent Association (2017). EcoInvent Database. Ecoinvent Association. Available at: http://www.ecoinvent.org

6 Edenhofer, O., et al.. (2014). *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge, United Kingdom & New York, NY, USA.

7 Zea Escamilla, E., Habert, G., and Wohlmuth, E. (2016). When CO_2 counts: Sustainability assessment of industrialized bamboo as an alternative for social housing programs in the Philippines. *Building and Environment, Vol. 103:* p. 44–53.

8 Bundesamt für Umwelt BAFU, Abteilung Klima (2018). *Faktenblatt Wirkungsabschätzung und Evaluation der CO_2-Abgabe auf Brennstoffe.* Bern, Switzerland.

9 Fernandez, P. (2017). Valuing companies by cash flow discounting: ten methods and nine theories. *Managerial Finance,* Vol. 33 (11): p. 853–876.

10 UNFCCC (n.d.). *The Paris Agreement.* Available from: https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

14 BLENDED FINANCE
Building on Partnerships for Effective Climate Finance

Blended finance is the concept of using capital from public or philanthropic sources to de-risk transactions, which helps mobilise private capital into investments aiming to achieve targeted impacts.

Traditionally employed in development finance, blended finance has proven to work well in climate finance, especially for renewable energy and climate mitigation projects, due to its robust track record, linked project cash flows and government support.

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This chapter explains the practice of blended finance – the mixing of public and private capital – and outlines its specific application to climate finance. Of all transactions that use blended finance, climate finance is clearly the most important. This outcome is driven by factors such as a successful investment track record, improved technology and increased government support.

However, two critical areas need to be addressed to reach more scale. First, pipeline development must be improved to create more investible projects. Second, investment products need to be adapted in terms of size, liquidity and currency to attract international and local institutional investors. Finally, blended finance cannot replace macroeconomic and structural reforms to support private investment in climate finance. Real sector change is required.

What is blended finance?

A new trend has taken hold in the development community: blended finance or blending. The Economist calls it a 'cocktail of public, private and charitable money'.[1] This cocktail is not an asset class but rather a structuring approach, mixing different pools of capital with different return expectations. While public capital may or may not have a commercial return expectation, private capital expects commercial returns, and charitable capital may seek capital preservation or is prepared to assume losses.

Convergence, a blended finance platform sponsored by the Canadian government, has identified four types of common blending structures (see Figure 32). In these structures, the public or philanthropic capital typically helps to reallocate risk by accepting lower returns, providing a guarantee or a grant for project preparation or design phase. Blended finance is also employed on the return side in so-called results-based financing schemes (e.g. in impact bonds) to pay for a specific social or environmental outcome.

Today's interest in the approach is driven by the UN Agenda 2030 and its Sustainable Development Goals (SDGs). The estimated SDG investment gap in developing countries is USD 2.5 trillion per annum; for SDG 13 Climate Change the annual gap is estimated at USD 440–780 billion.[2] How can the existing pool of Official Development Assistance (ODA) raise the overall volume of financing for development and climate objectives by mobilising private capital? That is where the concept of blended finance comes into play.

When to use blended finance from a public perspective?

If public capital is put into one of the four blending structures, this usually implies some form of subsidy. Hence, the public benefit must exceed the return to private investors. That can be the case when there are market failures (e.g. overcoming the gap between actual and perceived risk), information asymmetries or externalities not yet priced into the market. The latter argument is typically used to justify blending in climate finance transactions.

Blended finance should not end up subsidising private profits and it should not replace government policy (or reward a policy failure). A blended finance solution needs to be a realistic remedy to a problem only after other policy options have been exhausted. For example, it has been suggested that donor funds could top up elec-

tricity tariffs to offer appropriate returns to private investors, i.e. to make a project bankable. This type of blending is very questionable from a public policy perspective. A better solution would be to first adjust tariffs and then use public capital to support the poor through targeted subsidies, rather than providing a subsidy to investors.

Hence, the OECD and Development Finance Institutions (DFIs) have adopted general principles regarding the use of blended finance to avoid market distortions.[3] They stress principles like minimum subsidies and exit from donor support. The goal is to achieve a self-sustaining market.

Data for benchmarking to identify an efficient mix for the blended finance cocktail is only now emerging. Based on existing data, three key characteristics of a 'good' blended finance transaction include:

— A blended finance transaction should generate a positive environmental and/or social impact. This impact is often expressed in terms of the SDGs. In that sense, blended finance is related to impact investing. However, there is not yet a single and definite taxonomy of impact and there tends to be more consensus on the process of impact investing than on the content.[4] Yet climate finance is quite advanced in its content, thanks to substantial efforts to develop a taxonomy or classification system on what is green and what is not green.[5]

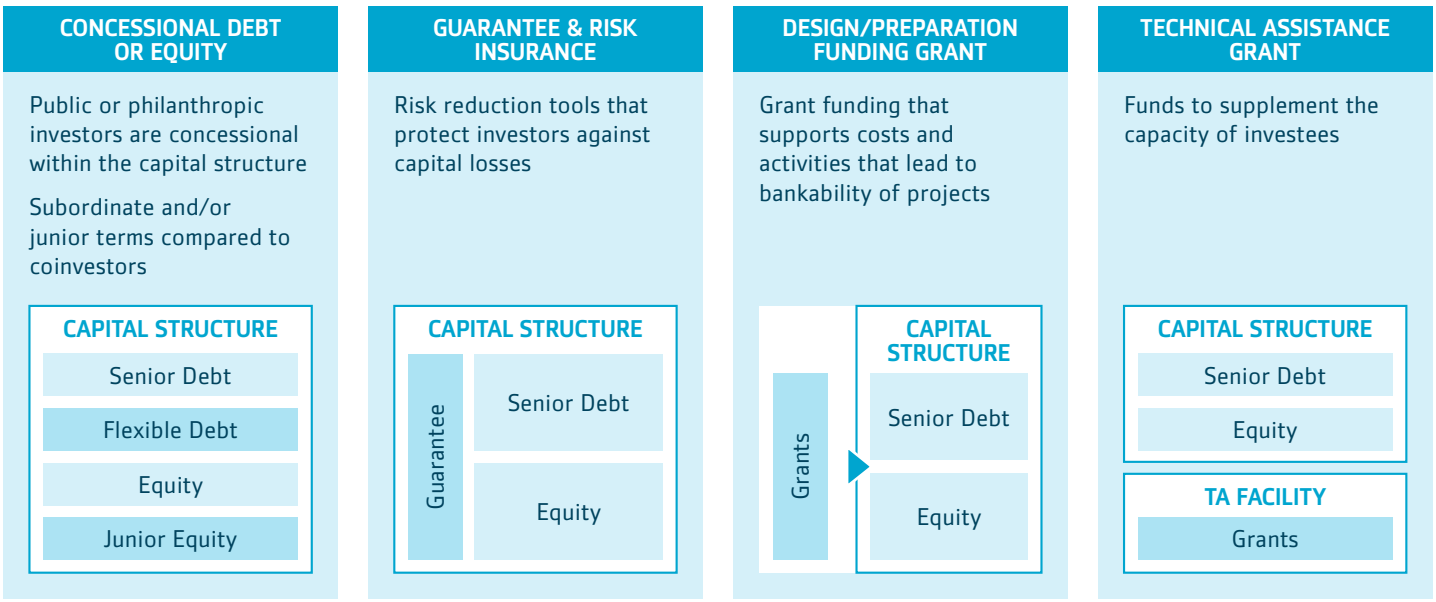
— A blended finance transaction should mobilise private capital that would otherwise not have been available, also referred to as additionality. If there is no additionality, by definition, there is no mobilisation. While this sounds straightforward, measuring mobilisation can be rather difficult. What should be avoided, however, is to compare leverage ratios only. While these help to get a notion of efficiency, they do not say much about additionality and may vary considerably depending on the type of transaction, objective and context.

— A blended finance transaction should achieve a positive financial return. While these returns range from concessional to market rate, the idea is to catalyse a market that is self-sustaining, i.e. will not require further subsidies. This perspective is important to mobilise private investors and to move from individual transactions to transforming markets, thus generating scale.

How is blended finance applied to climate finance?

While blended finance remains a niche compared to the size of financial markets, it has worked well in the field of climate finance. Total financial volumes for blended finance are estimated to range from USD 60 billion[6] to 140 billion[7] of blended finance transactions. According to Convergence, energy accounts for roughly 45% or over 220 blended finance transactions, with a strong focus on renewable energy and energy efficiency projects. The OECD similarly finds that 60% of the surveyed blended finance investment vehicles are mapped to climate finance particularly geared towards climate mitigation rather than adaptation. Investor surveys also confirmed that blended finance helps to overcome some barriers associated with climate finance.[8]

Figure 32:
MAIN ARCHETYPES AND INSTRUMENTS USED IN BLENDED FINANCE



Source: Convergence, 2018

Several factors have driven this outcome:

— Blended finance solutions require projects with a positive cash-flow from operations to pay back investors. Renewable energy and energy efficiency projects – SDG13 – often have this characteristic. This has proven to be more difficult to find in sectors such as water and sanitation. Blended finance can work for some, but not for all SDGs.

— Renewable energy technology has become very competitive. With production prices as low as USD 6 cents per kWh, it beats CO_2-intensive alternatives even in developing countries. Renewable energy solutions are also a cost-efficient alternative for providing energy to remote areas instead of expensive grid expansion.

— There is a positive investment track record emerging, thanks to substantial efforts by governments and development banks over the past decade to set up the required frameworks to attract private investments in energy projects. These frameworks have proven to work relatively well, although unexpected changes, for instance in off-take agreements, remain a key risk.

— Governments, in compliance with international commitments, have stepped up their support. The Swiss Federal Council, for instance, has emphasised the role of mobilising blended finance in reaching its climate finance targets.[9]

— Finally, the externalities in the field of climate change are more clearly identifiable and methodologies are more advanced than in other impact investing markets. The Greenhous Gas Emission (GHG) indicator provides a relatively objective benchmark to justify a public subsidy in a transaction.

Table 9:
EXAMPLES OF BLENDED FINANCE PROJECTS FOR CLIMATE FINANCE

BLENDED FINANCE PROJECT	GOALS	BLENDING ELEMENTS
AMUNDI PLANET EMERGING GREEN ONE[10]	To facilitate the financing of the energy transition through the creation and development of a green bond market in emerging and developing countries. With over USD 1.42 bn, it is the largest emerging market green bond fund.	Type I: IFC and other multilateral development banks (MDBs) provide a credit enhancement in the form of a first loss or junior tranche position, helping attract institutional investors, pension funds and insurance companies at scale. Type IV: The technical assistance programme (implemented by IFC) supported by Luxembourg, Sweden and Switzerland supports the development of green-bond policies, builds capacities for local financial intermediaries to issue green bonds and helps countries to implement the Green Bond Principles.
ACCESS TO CLEAN POWER FUND BY RESPONSABILITY[11]	To provide debt financing to fast-growing companies, which promote access to households and companies through decentralised renewable energy solutions in Africa and Asia.	Type I: Shell Foundation and IFC, on behalf of the Clean Technology Fund, provide a junior first loss tranche. IFC, foundations and other commercial investors provide funding in the senior tranches. Type IV: The Technical Assistance Facility, supported by a foundation and Switzerland, strengthens the operational capacity of potential or invested companies in order to ensure sustainable practices and support impact.
PRIVATE INFRASTRUCTURE DEVELOPMENT GROUP (PIDG)[12]: THE FIRST KENYA SHILLING GREEN CORPORATE BOND, CROSS-LISTED ON THE LONDON STOCK EXCHANGE	To finance the construction of green-certified purpose-built student properties to create clean, safe and affordable accommodation for 5,000 students in Nairobi.	Type II: PIDG provides a 50 % local currency credit guarantee. Type III: A partial returnable grant by the PIDG Technical Assistance Facility helping to contribute towards the costs of the loan note issue, which created a significant enabling effect for this transaction. Uses donor-supported market infrastructure: The IFC Excellence in Design for Greater Efficiencies (EDGE) for the green certification.[13] EDGE has been built with donor support, including from Switzerland, over the past years and is accessible to the entire market.

How to increase climate finance via blended finance?

There is room for further scaling-up of climate investments using blended finance. With a median of USD 90 million, climate finance transactions with blending are already relatively large and therefore ready to scale up. Beyond a traditional climate infrastructure lens, there is also a lot of untapped potential in resource-efficient production in pursuit of SDG 8 Decent Work and Economic Growth.

However, there are some limitations to the approach. First, blended finance can address some, but not all risks. It works very well for reallocating financial risks but not for other risks such as sponsor (e.g. integrity), market and macroeconomic risks. To address these risks governments need to undertake policy and investment climate reforms. Second, blended finance projects need to be calibrated carefully so as not to distort markets, otherwise they would lose their catalytic quality. That is important to keep in mind, particularly as climate technology improves and costs decrease.

In order to reach more scale in relation to blended finance and climate finance, there are two key areas, relating to lack of investible projects and investment products, to be addressed:

— Attention needs to shift to a more efficient and coordinated effort in project pipeline development. There has been good progress in de-risking investment vehicles, but investible projects remain scarce. Investible projects refer to projects, which are compliant with ESG and integrity requirements, free of corruption, financially sound and climate compatible. Without a larger universe of investible projects, an increased volume of blended finance cannot be reasonably absorbed.

— Investment products and structures need to be adapted. Critical obstacles to tap into the capital of larger institutional investors are ticket size, liquidity and currency. Many funds remain too small to absorb large investment tickets that institutional investors want to place. New ways to aggregate small projects and reduce costs are required. Most of the products are in private markets characterised by limited liquidity. If there is no exit, investors have restricted entry. Developing country currency risk is shunned, which favours a hard currency solution with relatively expensive hedging. Dollar-denominated funding is not necessarily the ideal source of funding from a development perspective (e.g. currency misalignment). Local currency options to tap into domestic pools of capital are an alternative that would also foster a more balanced growth path.

There is still a lot of room for growth to cover the climate financing gap. In order to achieve growth, blended finance can certainly be a valuable tool, but the barriers or perceived barriers described above need to be overcome. Actors can proactively sponsor initiatives to improve climate project assessment, facilitate best practice in climate impact disclosure and reduce investment barriers through blended finance vehicles.

1 The Economist (23 April 2016). *Trending: blending. The fad for mixing public, charitable and private money.* Available at: www.economist.com/finance-and-economics/2016/04/23/trending-blending

2 UNCTAD (2019). *SDG Investment Trends Monitor.* Available at: https://unctad.org/en/PublicationsLibrary/diaemisc2019d4_en.pdf

3 OECD Blended Finance Principles and IFC Blended Concessional Finance Principles for Private Sector Projects

4 See for instance the IFC's Operating Principles for Impact Management: www.impactprinciples.org/

5 For example the EU Taxonomy or the Climate Bonds Initiative (CBI)

6 Basile, I. & Dutra,J. (2019). Blended Finance Funds and Facilities: 2018 Survey Results. *OECD Development Co-operation Working Papers, No. 59.* OECD Publishing: Paris. https://doi.org/10.1787/806991a2-en

7 Convergence (2019). *The State of Blended Finance 2019.* Available at: www.convergence.finance/resource/13VZmRUtiK96hqAvUPk4rt/view. The Convergence dataset looks at a broader universe of transactions, while the OECD survey is limited to collective investment vehicles.

8 In the report Blue Orchard Report *Rethinking Climate Finance,* results show that as many as 80% of survey participants consider blended finance structures as a suitable instrument to overcome investment barriers in climate finance. See: www.blueorchard.com/wp-content/uploads/BlueOrchard-Academy-study_Rethinking-Climate-Finance-1.pdf

9 Bundesrat (10 May 2017). *Internationale Klimafinanzierung. Bericht des Bundesrates in Erfüllung des Postulats des Aussenpolitischen Kommission des Nationalrats 15.3798 vom 2. Juli 2015.* Available at: www.newsd.admin.ch/newsd/message/attachments/48209.pdf

10 Amundi Asset Management (16 March 2019). *IFC and Amundi successfully close world's largest green bond fund.* Available at: www.amundi.lu/professional/Local-Content/News/IFC-and-Amundi-successfully-close-world-s-largest-green-bond-fund

11 responsAbility (14 January 2020). *Press Release: responsAbility launches USD 200 m climate fund.* Available at: www.responsability.com/en/responsability-launches-usd-200-m-climate-debt-fund

12 PIDG (n.d.) *Homepage.* Available at: www.pidg.org/

13 See: www.edgebuildings.com/

15 GREEN STATE INVESTMENT BANK
An Effective Climate Policy Tool

Research has shown that public banks, such as state investment banks (SIB) with a clear mandate, can be an effective tool to mobilise private investment.

SIBs typically have three key roles: de-risking projects or providing direct investment capital, contributing crucial knowledge through specialised risk assessment and due diligence teams, and providing signals to the market.

There are multiple examples of SIBs with a green mandate across the world. Switzerland could build on these experiences and leverage domestic finance skill sets to develop a Swiss SIB model for climate investments.

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Introduction

Private capital markets make investment decisions according to expected risks and returns. While this paradigm has led to an efficient allocation of capital for many purposes, some of the largest societal challenges struggle to attract financing because investors have few incentives to consider societal benefits or avoided cost. In economics jargon, private investors seldom consider negative externalities, such as carbon emissions, or positive externalities, such as knowledge and experience creation. For instance, private capital markets have long hesitated to finance novel low-carbon technologies, such as solar photovoltaics (PV) or wind.[1] The main obstacles to financing these unknown technologies included the lack of a technology track record, of data, of internal expertise and of a network of support services, such as law firms or technical advisories.[2]

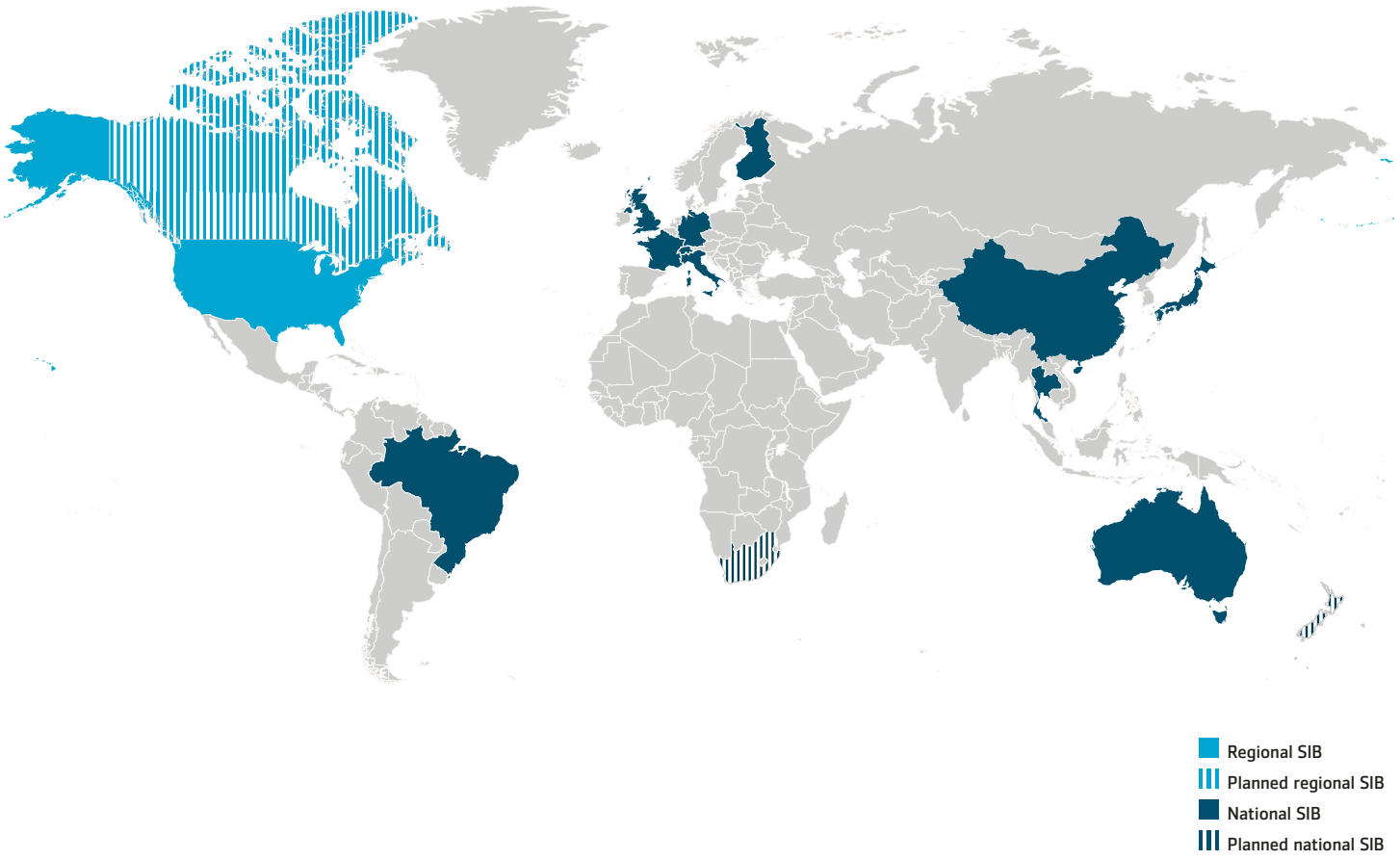
Research has shown that public banks, such as state investment banks (SIB), can be an effective tool to mobilise private investment.[3] In practice, the definition of SIBs varies. Here, we use a common definition based on three characteristics. SIBs are majority public-owned, have a mandate to pursue a socioeconomic mission and focus on geographical areas or market segments according to their mandate.[4] In these markets, SIBs then use repayable financial instruments to enable investments aligned with their mission.

In doing so, SIBs have typically played three key roles.[5] First, they de-risked projects via guarantees and other instruments or provided direct investment capital to projects aligned with their mandate. SIBs have often co-financed early-stage projects, which generated the much-needed experience to crowd-in private investors. Second, through that process, they provided crucial knowledge (e.g. tools and standards) to the market through their specialised risk assessment and due diligence teams. Third, in providing these assessments, the market attributed a signalling role to the SIBs' actions. Put differently, in some instances it was enough that SIBs approved a project from a technical point of view, without being involved as an investor, for private actors to invest. For instance, SIBs have played a crucial part in designing early bankable offshore wind projects that were considered too risky and too unfamiliar for the private sector to invest in without a public actor.[6] In providing the technical due diligence and setting up a viable financing structure in novel investment fields lacking the volume to make it profitable for private investors to build up internal teams, SIBs have often been successful in attracting private finance without taking first loss or junior tranches.

State investment banks in practice

Many regional, national and international public entities have been operating or plan to operate SIBs. Figure 33 gives an overview of existing SIBs with a green mandate.

Figure 33:
EXISTING AND PLANNED SIBS WITH A GREEN MANDATE



Source: Author's illustration.
Note: The map includes the most prominent green SIBs[7,18] and all SIBs that are members of the Green Bank Network, the Coalition for Green Capital and the American Green Bank Consortium.

For instance, European Commission President Ursula von der Leyen has revealed her plan to transform the European Investment Bank (EIB) into a Climate Bank. French President Emmanuel Macron previously championed the idea, and it is likely that the project will re-activate momentum in Europe for similar plans (e.g., the European Green Deal). First results on a European level include the new EIB strategy, which brings to an end fossil fuel energy financing by 2021 and unlocks EUR 1 trillion for climate action up to 2030.[9] Other European countries have long experiences with SIBs (e.g. Germany) or they have privatised previously public SIBs (e.g. United Kingdom). The case of the German KfW is described in more detail in the box below. The United Kingdom founded its Green Investment Bank in 2012 and capitalised it with GBP 3 billion to mobilise private capital for low-carbon projects. In 2017, Macquarie Group acquired the bank and turned it into the first large-scale *private* green investment bank (Green Investment Group Ltd.). On a smaller scale, Scotland and New Zealand are currently setting up their own SIBs as well. Scotland plans to have its bank operational by 2020 and committed GBP 2 billion over 10 years to capitalise the bank. The New Zealand Green Investment Finance Ltd. was incorporated in April 2019 with an initial government capitalisation of NZD 100 million. Both examples demonstrate that green banks are a tool used by small countries too.

In the United States, SIBs remain a regional phenomenon to date. At least eight federal states currently run banks or bank-like funds with green mandates.[10] The scope and mandates vary substantially from larger state-wide SIBs, such as the Connecticut Green Bank or the New York Green bank, to smaller regional entities

The German KfW and its changing missions

In 1948, Germany founded the Kreditanstalt für Wiederaufbau (KfW), which today is one of the largest SIBs[11]. Since 2000, KfW has played an instrumental role in implementing the German energy transition, providing low-cost renewable energy technologies to the world – a prime example of positive spillovers. Initially, KfW was the main institution for disbursing the United States Marshall plan funding to rebuild European infrastructure and provided credit at discounted rates. In 1961, the mandate of the bank changed for the first time and its operations were extended abroad as part of the German development cooperation, co-financing large projects such as the Bosporus Bridge in Istanbul. Over time, KfW has built up a strong reputation and received an AAA rating in 1986, which it has kept ever since and which allows it to raise money on the USD capital market at low rates. 1989 marks another turning point for KfW's activities. After the reunification of East and West Germany, KfW became a key institution for disbursing credit to businesses, local administrations and households. With the decision of the German government to support the deployment of renewable energy technologies from 2000 onwards, KfW was transformed into one of the largest green SIBs. In 2012 for example, KfW co-financed 94% of German wind parks, in 2014 it issued a green bond for the first time and by 2018 it had become one of the largest green banks globally.[12]

KfW demonstrates how a mission-oriented public bank can be an effective tool for implementing a variety of public policy goals using a market-based logic. It is 100% publicly owned (80% federal, 20% states) and has been used in development cooperation, export assistance, business promotion, student loans, renewable energy deployment, energy efficiency and refugee assistance.

such as the Montgomery County Green Bank or the Baltimore Climate Access Fund, both in Maryland. Finally, there is also an emerging national debate in the United States around a Federal Green Bank or significant state-led climate investments. Experiences from other countries indicate that the United States may have substantial opportunities to create new jobs with a smart public investment strategy to push new technologies.[13]

Moreover, there are concepts for more specialised SIBs with green mandates too. For example, realising low-carbon projects or climate adaptation projects in cities requires specialised knowledge that national or international green banks sometimes cannot provide. Given the spread of urbanisation, the need for city-level project creation and financing structures may increase in the future. Responding to this need, a recent working paper proposed a Green Cities Development Bank.[14]

Conclusion and opportunities for Switzerland

SIBs with a green mandate are a growing phenomenon and their set-ups differ widely. Some have local business creation mandates, while others put their emphasis on international finance. These set-ups are versatile and can adapt over time, responding to political priorities (see the history of KfW). In general, SIBs have a good track record, can borrow at low cost from international capital markets due to their government guarantees, and operate on an economically viable basis – albeit not with the goal of *maximising* profit. In the case of the United Kingdom, the green investment bank had explicit revenue targets (3.5% minimum) and was acquired by a private investor after just five years of operation. Besides being effective investment vehicles for societal priorities, SIBs often gain support across the political spectrum. While in the United States, they are typically founded when Democratic governments are in charge (7 out of 8), the Scottish SIB received unanimous approval from the Scottish Parliament's Economy, Energy and Fair Work Committee, the UK green investment bank was founded with bi-partisan support and the German KfW has been used as a policy tool over the past 70 years irrespective of the government in charge.

While the Swiss Technology Fund is considered for Figure 33 because it is mentioned by the OECD in Ref. 8, it fulfills only the first role of an SIB. Building a fully operational SIB, beyond providing guarantees, would present a two-fold opportunity for Switzerland. On the one hand, Switzerland is struggling to achieve its climate targets. Upcoming popular initiatives, such as the Gletscherinitiative, may put further pressure on the government to act. An SIB – both domestically and internationally – tailored to Swiss needs could be an interesting proposition for liberals and social democrats alike to advance the climate agenda. On the other hand, an SIB could leverage the existing expertise in the finance sector. Besides banking, skills from insurance, reinsurance and commodity trading may prove valuable in setting up a public-private SIB – perhaps based on the existing technology fund.[15] Experiences in other Western countries point to an interesting opportunity to exploit. The good news is that institutional support for setting up SIBs and green banks is growing, as the recently launched "Green Bank Design Platform" demonstrates.[16] Switzerland could tap into this easily accessible knowledge pool in order to develop ideas for a Swiss model.

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11 The discussion of KfW milestones is based on the leaflet "Zeitstrahl 70 Jahre KfW (1948–2018)" available in the section "Geschichte der KfW" on www.kfw.de

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16 See https://greenbankdesign.org/

16 TRANSFORMATION CAPITAL
A Systemic Investment Logic

Climate change is a systemic problem. To address it, the IPCC calls for the transformation of the socio-technical systems that constitute modern civilisation.

The axioms, paradigms and structures of today's capital markets mean that traditional investment approaches are ill-suited to drive this type of change.

This chapter describes a systemic investment logic at the intersection of systems thinking and finance practice. Its hallmarks include new notions of value, a strategic blending paradigm, the deliberate engagement of tipping points and alignment with levers of change controlled by other actors in society, such as policy-makers and philanthropists.

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To avoid the most dangerous consequences of global warming, the Intergovernmental Panel on Climate Change (IPCC) is calling for the "rapid and unprecedented" transformation of the systems that constitute modern civilisation: energy, land use, infrastructure, industry, and cities.[1] This implies that we must change not only the technologies used to extract, convert, allocate, and recycle resources within our economy. We also need to shift individual and collective values and behaviours, and create a balance of political, cultural and institutional power in society.[2]

As financial capital is an important lever of change in socio-technical systems—such as national economies, industrial supply chains, regional transportation systems and urban built environments—the way money accumulates and flows within these systems has a significant impact on our ability to reduce greenhouse gas emissions and build a climate-resilient society.

Given the *complex adaptive* nature of these systems[3], achieving the type of transformation the IPCC is calling for requires more than a portfolio reallocation towards more responsible or more sustainable companies and projects. It requires an entirely new investment logic; one that deploys capital with a different intent and mindset, and with different methodologies, structures, capabilities and decision-making frameworks.

The limitations of today's financial industry in transforming systems

Today's financial industry is ill-positioned to finance transformational change for at least four reasons. First, capital is allocated to maximise short-term gains.[4] Transformational change, however, often requires patient, long-term capital.[5] Second, most capital movement happens in secondary markets. In contrast, transformational change requires direct investments in infrastructure, products and services—hence in the *real economy* where emissions occur and resilience emerges. Third, the deepest pockets in our financial system are risk-averse—only a small fraction of the capital market has a risk appetite geared to the notion of transformative change (e.g. venture capital). For example, the insurance sector is the largest institutional investor group in Europe, managing close to EUR 10 trillion, or 60% of the EU's GDP.[6] Yet, the fiduciary duties of insurance companies impose a bias of prudence on their investment strategies, which acts to preserve the status quo. Finally, investors assess and select investments along a *single asset paradigm*—one

stock, one bond, one project—and without considering the strategic synergies across investment opportunities.

As a consequence, the world faces a massive investment gap and reallocation challenge to achieve a transition to a sustainable society. While estimates of that gap vary by source, the consensus is that it reaches into the trillions of euros per year.[7] We argue that this gap will not disappear by maintaining the current investment logic. Nor will it be addressed by "sustainable finance" models seeking incremental adjustments to the traditional investment orthodoxy, such as ESG investing or impact investing.

Towards a paradigm shift in deploying capital

Introducing the concept of *systems thinking* into the discipline of investing leads to a need to re-conceptualise almost all existing paradigms of capital deployment.

An important starting point is to evolve our notion of *value* to consider the context of our living conditions. The logic is simple—possessing financial wealth in a world that is economically, socially and environmentally stable is more desirable than owning such wealth in a world strained by extreme weather events, food system failures, social unrest and forced mass migration. Once value is contextually enriched, investments in the real economy—as opposed to secondary market transactions—become a strategic opportunity to shape living conditions and make financial wealth more valuable.

Investors can influence the evolution of systems by constructing strategic portfolios, blending multiple assets to maximise their synergistic potential to affect systems change in respect to a specific transformation agenda. What matters in constructing such strategic portfolios is not so much an individual asset's merits, but its potential to unlock or accelerate transformational effects in combination with other assets in the portfolio. This implies a move away from the single asset paradigm to a strategic blending paradigm.

Building strategic portfolios requires an understanding of the actors and forces present within a system, of the pathways a system can take to transition to a new state and of the dynamics that individual investments—and the portfolio as a whole—can unleash. Strategic blending is particularly effective when private-sector investors forge investment partnerships with public sector actors and when policy and regulation are adjusted to create enabling conditions for the system to transform itself.

By attempting to create new markets in this way, *systemic risk*—in the meaning of Harry Markowitz's *Modern Portfolio Theory*—is no longer purely exogenous to the decision of investors but partially rests within their sphere of influence. Portfolio construction thus becomes more than just a risk diversification exercise. Consequently, investment success can now be reconceptualised not only along financial dimensions but also in consideration of the scale and direction of the transitional effects that investments trigger within a system.

Engaging tipping points strategically

That still leaves the question of *what* to invest in. Not all interventions in a system—whether investable or not—have the same potential to catalyse change. Therefore, it is critical to identify *sensitive intervention points*—those places in the system where a relatively small change can trigger outsize effects and where non-linear feedbacks can act as amplifiers.[8] The goal here is to lead a system to a *tipping point,* after which the self-organising properties of a system take control to direct it to its intended future state.

Today, there is scant practical experience in triggering tipping points with real economy investments. However, there are well-documented cases that provide cues. Tipping points are best understood for the trajectory of renewable energy costs. As has been documented in multiple different contexts, once economies of scale and learning effects push these technologies down the cost curve, their uptake accelerates significantly. Deployment policies that incentivise demand–such as Germany's renewable energy law for solar power[9] or Norway's point-of-purchase subsidy scheme for electric vehicles[10]—have been instrumental in enabling this development. They create the necessary revenue certainty for new technologies to start large-scale production at a time when these technologies are still more expensive than their competitors.[11] Systemic

investors can attempt to identify places in the system that are close to such tipping points and deploy capital strategically to act on these levers.

Where capital alone is not enough to reach these tipping points, systemic investors should align themselves with actors engaging other *levers of change* in the system such as policy and regulatory frameworks, social norms and behaviours, skills and capabilities, individual and collective narratives, and production and consumption paradigms. The ultimate purpose of this approach is to construct portfolios of multiple real asset investments within a broader set of systems interventions, all designed for their collective, synergistic ability to generate transformative dynamics. In that sense, *systemic investing* is a decision-support framework for designing and combining the instruments described in this publication: green bonds, direct investments in companies and projects, energy efficiency mortgages and sustainable real estate investments, to name just a few.

Mainstreaming systemic investment principles

Systemic investing presents an opportunity to create public goods and private value in a symbiotic relationship. This provides an impetus for government to be at the forefront of incorporating systemic investment considerations when developing public spending or capital raising plans. Governments should always make sure their own investment activities as well as those of private sector actors are well coordinated with other, non-investment-related interventions. Similarly, there is an opportunity for *progressive capital*—philanthropic funds, impact investors, family offices and the like—to act as first movers, thereby accelerating the mainstreaming of a system-transformative investment logic.

What is needed to bring Transformation Capital to life is further conceptual work combined with real-world prototyping. Above all, however, the world needs asset owners with ambitious transformation agendas and the genuine intent to use their capital to create a better future.

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17 SWISS ENVIRONMENTAL LEGISLATION
A Brief History and Analysis of Effectiveness

Building on the polluter pays principle (PPP), Switzerland has in the past introduced a number of legislative measures that use market signals to achieve the desired environmental outcomes. However, the implementation of effective environmental market-based instruments continues to be challenging and new tax incentives often fail to obtain political majorities.

Substantial improvements are expected with the revision of the Swiss CO_2 Act, which aims to halve GHG emissions by 2030 compared to 1990 levels. Nevertheless, in order to achieve the Swiss net-zero goal by 2050 further legislative action will still be necessary.

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Introduction

In order to implement financing instruments for a low-carbon economy, local conditions and existing frameworks for the entire economy – not just the financial industry – need to be considered. The following overview of the history of Swiss environmental policies can thus be helpful for both Swiss investors and policymakers.

With 8.5 million inhabitants, Switzerland is a small country that historically has had an open economy. The country is too small to offer large markets for new technologies, which is why Swiss companies usually take the role of suppliers for companies based in neighbouring EU and other countries. This is reflected by an export quota of goods and services that stood at over 65 percent in 2019. Although there are many Swiss companies that have developed sophisticated environmental technologies, many of these solutions are often not yet applied widely enough in the real world.

Moreover, Switzerland is a country devoid of any significant raw materials. Large amounts of energy, metals, minerals, and foodstuffs therefore have to be imported. Those imports leave considerable environmental impact abroad, where they contribute to climate change, loss of biodiversity, and water shortages. According to the Swiss Federal Office for the Environment (FOEN) "domestic greenhouse gas (GHG) emissions decreased between 2000 and 2015. This reduction was, however, partially offset by additional emissions abroad. At around 14 tonnes of CO_2-equivalents per capita in 2015, Switzerland's GHG footprint was significantly above the European average. It is estimated that 0.6 tonnes per capita would be within the planetary boundaries."[1]

According to the National Inventory Report (NIR), Swiss GHG emissions (emitted within Swiss borders) have fallen by 14 percent since 1990 to 5.4 tons of CO_2 equivalents per capita by 2018.[2] This number does not include emissions from shipping and aviation, which actually grew by 84 percent since 1990.[3] Kerosene is not subject to taxes, as neither VAT nor the CO_2 levy have to be paid on it – in contrast to other fossil fuels. However, in 2020 the bar was raised after the revision of the new CO_2 Act won a parliamentary majority stipulating, amongst others, a plane ticket levy of CHF 30 to 120. The Act will likely be subject to a national referendum.

Swiss environmental policy: focus on innovation

In Switzerland, "industry policy" has historically been a taboo, given a strong aversion to direct support of companies. This is an important premiss for the structure of Swiss environmental policy, which is built on a number of different instruments.

The polluter pays principle (PPP) is an important tenet of Swiss environmental legislation. However, it can be tricky to win majorities for new PPP-based levies or incentives in Switzerland. Even small PPP- charges, such as waste disposal fees or CO_2 levies that are reimbursed to the population, are unlikely to pass a referendum

unless they are properly explained and based on multi-party agreements. In practice it is therefore difficult to enforce this principle, as efficient as it may be.

Instead, promotion and financing of innovation is a key element of Swiss environmental policy, as illustrated by the CHF 250 million spent every year by "Innosuisse", the Swiss Innovation Agency. In addition, the Swiss Federal Office for the Environment (FOEN) provides a maximum of CHF 4 million to support new technologies helping to reduce pollution. A technology fund further provides credit guarantees (max. CHF 25 million/year) to Swiss companies whose products or activities offer CO_2 reductions in Switzerland or abroad.

Prevalent environmental policy instruments

Market economies spawn new products every day, while competition ensures that market participants work efficiently. However, competition only works for costs paid for production goods such as labour, material or capital. Externalities, so-called "social and environmental costs" at the expense of third parties, are seldom priced in correctly and hence not determined by market forces, nor do they appear in expense statements or balance sheets.

Besides the conventional command-and-control approach through rules and standards, legislative measures in environmental policy therefore often use market signals to achieve the desired environmental outcomes. Such market-based environmental policy instruments aim to price externalities properly, improve market efficiency, incentivise new business models and reduce environmental damage. Pricing environmental costs leads to processes, products and services being delivered in a more efficient way. If a government decides to regulate, ration or tax externalities this may also create opportunities for innovative financing instruments.

However, environmental policy instruments differ in terms of the extent of internalisation they achieve, as illustrated in the box on the right. In the long run, avoidance activities should be auctioned to maximise cost reductions, as already practised by different countries for renewable energy.

Difference in internalisation effects of various policy instruments

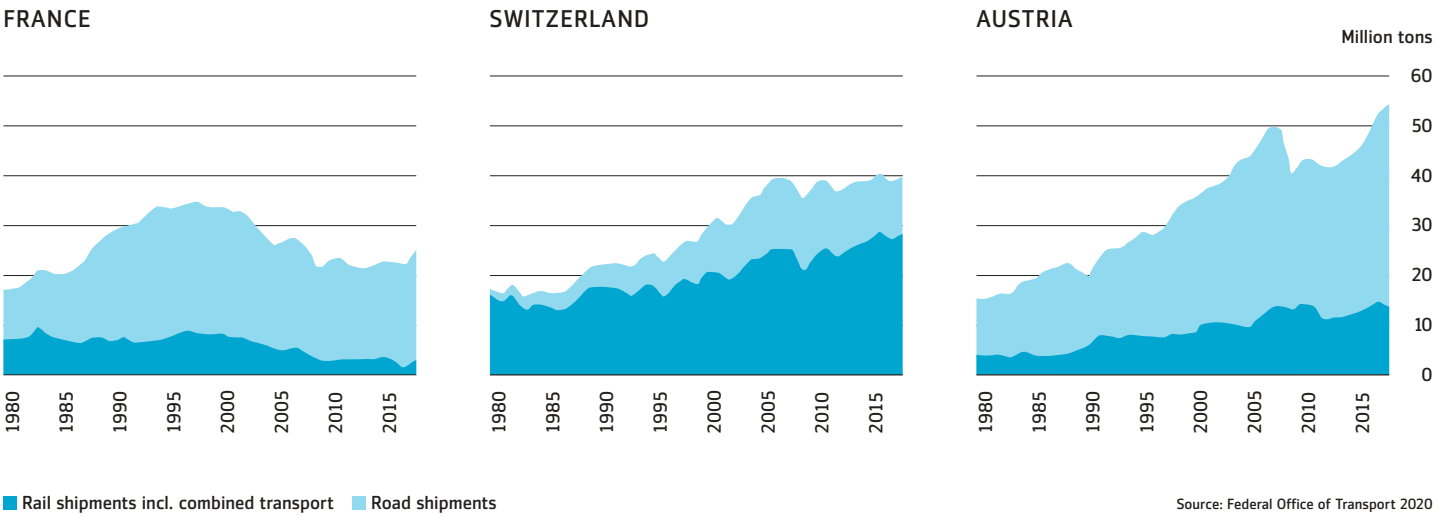
Rules and standards do not account for externalities. By imposing limits for emissions, polluters are forced to implement avoidance activities that they add to product costs. Standards have a similar, but more gradual impact. For both rules and standards, residual emissions are not subject to any charges. Therefore, the incentive to reduce unpaid residual externalities is modest and governments are often reluctant to fully internalise remaining externalities, especially as imported products or services usually stay uncharged.

Subsidies and tax reductions can deliver economic incentives to protect the environment. But they come at a cost, while ignoring the polluter-pays principle. They may cheapen a product perceived as "green" and help accelerate innovation – through tax deductions for renewable energy, for example. Subsidies have the potential to reduce emissions and negative environmental impacts. However, incentives are limited in case governments fail to charge polluting products for externalities. Support for innovation often comes with a considerable regulatory risk because subsidies may be slashed when political majorities change, given that such schemes are expensive and state budgets limited. Feed-in tariff systems in Europe were reduced or cancelled retroactively in Spain, the Czech Republic and Switzerland, and investors were hampered by retroactive changes.

Levies, eco-taxes, liability provisions, emissions trading and combined levies for minimum compensation can be considered as preferable PPP solutions in environmental policy and have the potential to trigger a high degree of internalisation. However, their implementation can be challenging. For many years, emissions trading in the EU was insufficient due to a surplus of emission permits, a weakness that was addressed when a market stability reserve (MSR) was introduced to reduce the volume of authorised emission permits.

Levies have a particularly strong innovation potential when designed as "feebates": A small fee on harmful products is used to finance avoidance activities, thereby ideally initiating learning curves and cost reductions. Successful examples are the German Renewable Energy Act (EEG) or the Swiss waste reduction programmes, where learning curves helped to encourage steep cost reductions for new technologies.

Figure 34:
ALPINE FREIGHT TRANSIT TRAFFIC: SHARES OF RAIL AND ROAD



Source: Federal Office of Transport 2020

Current Swiss environmental legislation

Switzerland has over time successfully introduced some economic instruments encouraging a positive effect on the environment, mainly in the form of levies, emissions trading and feebates.

The levies for high sulphur heating oil (1997) and for volatile organic compounds (VOCs, 1998) are two successful examples of pure incentive mechanisms. The levies created an incentive to reduce the use of high sulphur heating oil or products containing VOCs. The resulting revenues, combined with the revenues from the CO_2 levy, are distributed equitably to the population by reducing health insurance premiums.

While there is a limited number of pure emission reduction incentive schemes, mixed systems are the dominant form of instrument applied in Switzerland. Levies are often combined with earmarking and partial reimbursement of revenues, as is the case for the "carbon dividend".[4] The goal of this approach is to reduce negative social effects by reducing the tax level, especially for low-income households.

A number of environmental levies are fully earmarked, such as waste levies that are used to cover recycling and waste disposal costs. The performance-based heavy goods vehicle levy (HGVL) for freight transport (2001), feed-in tariffs (FiT) for renewable energy power generation (2008) and the CO_2 levy on fossil combustibles including a carbon dividend (2008) are prominent examples of mixed systems and will be covered in the paragraphs below.

Performance-based Heavy Goods Vehicle Levy (HGVL)

Switzerland has so far had difficulty reducing road traffic emissions. The use of sport utility vehicles (SUVs) and other large vehicles and motorbikes has grown massively over the past decades, which is one of the reasons for CO_2 emissions from road traffic remaining high. Nevertheless, transport policy is on the move. Consumer behaviour has gradually changed more recently towards more efficiency, especially in urban and semi-urban areas, where abundant public transport, active management of parking slots, the promotion of bicycle traffic and car-free inner cities have provided suitable incentives. Technological innovation in e-mobility may contribute to substantial CO_2 reductions in road traffic in the near future. Financial incentives can play a major role as well, as illustrated below for the heavy goods transport sector.

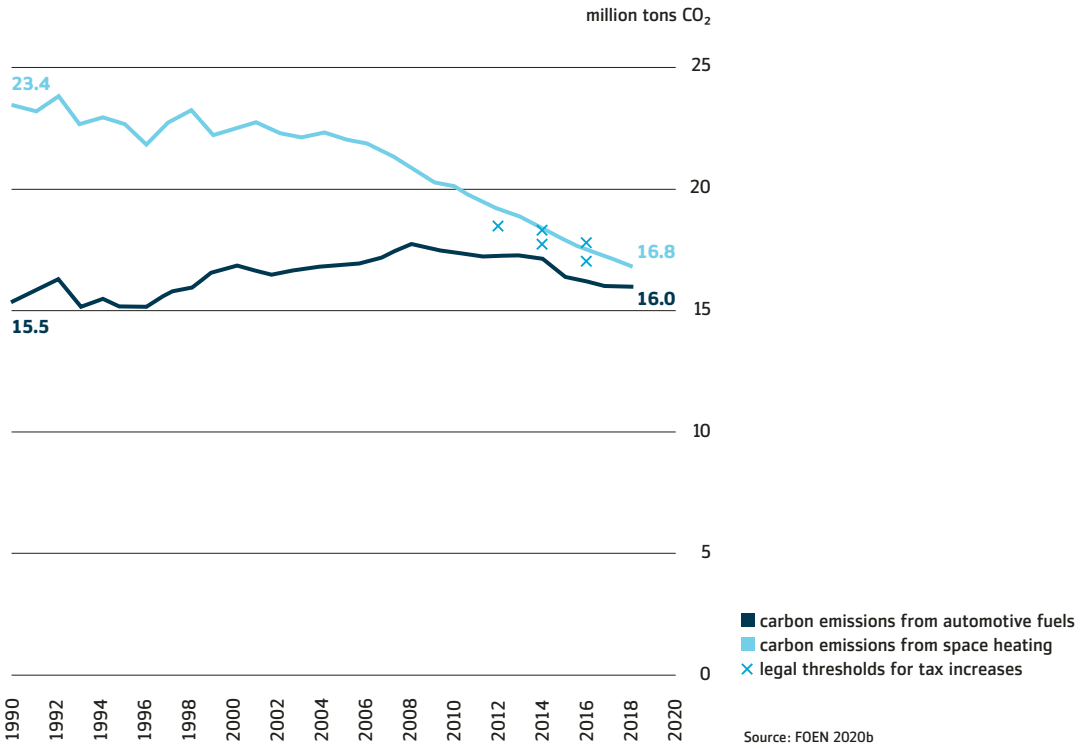
A performance-based Heavy Goods Vehicle Levy (HGVL) was introduced in Switzerland in 2001. It consists of a combined levy charged on heavy transports within Switzerland. Vehicles with a nominal weight of more than 3.5 tons pay a levy based on specific air emissions, kilometres travelled and their nominal vehicle weight. The main share of revenues is used for investments in and support of border-to-border rail systems. The objective was to use the revenues primarily to extend and refurbish the rail infrastructure for goods, which had positive side-effects on passenger railway transport as well as on road traffic, thanks to reduced road traffic and lower congestion. This transport policy, creating a modal shift, won strong majorities in a series of voting on popular initiatives.[5]

As a result of these policies, the number of truck transits fell from 1.4 million (2001) to 0.94 million (2018). The railway system improved and managed to gain market shares after its modernisation, unlike in other neighbouring countries (see Figure 34).

Feed-in tariffs for electricity from renewable sources

Switzerland used to be a pioneer in solar energy. In 1991, the city of Burgdorf (located in the Canton of Bern) was the first to introduce a cost-covering feed-in tariff for photovoltaic power generation. As a

Figure 35:
CO_2 EMISSIONS FROM COMBUSTIBLES AND FUELS IN SWITZERLAND



Source: FOEN 2020b

result of considerable academic and private research and development efforts, solar companies such as Solarmax (Biel, until 2015) or Meyer Burger (Thun) were established in Switzerland. Some of them have gained an international reputation for innovative products such as PERC[6] solar cells that are now used globally.

Federal feed-in tariffs for "clean electricity" were implemented in 2008 and financed through a surcharge on power from the grid. A modest fee of 2.3 cents/kWh was confirmed by a referendum in 2017. This was used to finance renewable power generation projects, with a small part of revenues used for energy efficiency projects. Per capita consumption of electricity has been declining in Switzerland (reduction of 12.1% from 2006 to 2018) while primary energy consumption from fossil fuels started to decline in 2010.[7]

In Switzerland, traditional large hydro power stations supply 55 to 60 percent of the total electricity consumed. New renewables meanwhile have a share of close to 10 percent. More recently, solar power investments have enjoyed accelerating growth. Due to on-going solar and wind power cost reductions, a 100 percent renewable supply is within reach and could be achieved by 2030, provided tender systems are included in the Swiss Energy Act in the course of the 2020 revision.

Combined CO_2 levy

The CO_2 levy is a pragmatic model first proposed in 1990. It took 18 years until the charge was levied, starting with small fees of just CHF 12 per metric ton of CO_2 back in 2008. This corresponded to CHF 0.03/litre of heating oil and CHF 0.025 per m3 of natural gas. Over ten years the levy continuously increased to CHF 96 per metric ton of CO_2.

In general, politicians paid much attention to ensuring that levies do not impose any disadvantages on export industries. Production facilities emitting greenhouse gases can be exempted from the tax through special arrangements. Exempted companies, in turn, must deliver an emission reduction commitment or become part of the emissions trading system (ETS). A cooperation between the Swiss and European ETS was achieved in 2017 allowing for a transfer of emission allowances between the two systems. As a result, Swiss companies can now buy emission rights of EU counterparties. The ETS now includes aviation and thermal power plants, in line with EU regulations.

The CO_2 levy today is levied on 51% of all CO_2 emissions from fossil combustibles, but not on transport fuels. Around 33% of emissions are regulated under the ETS and 16% stem from companies with target agreements.[8] Where the levy is in place, two-thirds of revenues are returned to the population through a reduction of health insurance fees (the so-called "carbon dividend"). The CO_2 levies paid by the industry are directly reimbursed through reductions of payroll taxes. One-third of revenues is used for a building renovation programme.

Domestic CO_2 emissions from fossil heating combustibles have fallen by 29.1 percent (2018) compared to 1990 (see Figure 35). CO_2 emissions from road transport fuels have risen by 2.9 percent, not including the consumption of aviation fuel, which has increased much more. This clearly shows that regulatory deficits persist.

No CO_2 levy exists for fossil mineral inputs of materials such as plastics or cement. In addition, companies exempted from CO_2 levies agree on "voluntary" CO_2 reductions; these are not yet in line with the Paris Agreement nor with the government's "net zero" goal by 2050. Finally, the levy is only charged on CO_2 emissions from fossil energies emitted within Swiss borders. The ecological footprint caused by exploration and extraction activities or transport of oil, coal and gas (including methane) are not charged. The same goes for emissions incorporated in imported goods or services.

Waste levies covering costs of recycling and waste disposal

There is hardly any other country in the world producing more municipal waste per resident than Switzerland.[9] This is not surprising, given the high income level in Switzerland. The recycling rate is at 53 percent and incineration is mandatory for residual waste and mostly performed by waste-to-energy plants.

Since 1997, the Environmental Protection Act has given the government the legal power to require companies to ensure recycling, waste disposal treatment and prevention. The law gave private-sector responsibility a high priority – with producers, importers and vendors responsible for avoidance and recycling activities. Recycling is declared a "voluntary measure", yet, contrary to the semantics, these activities are far from being voluntary; it is up to the business sector to decide the best way of complying with legal standards. For product categories for which recycling or waste management is not in place, the government can decide on sector-specific or product-based fees.

High acceptance of combined or compensated levies

Today, the polluter-pays principle is applied most effectively in recycling, wastewater treatment and waste disposal management. After volume-oriented levies were introduced, buying behaviour changed and waste avoidance activities were observed.

Earmarked and mixed levies were introduced successfully where avoidance activities were perceived as credible and could visibly contribute to prevent ecological damage: carbon emission reduction and air pollution control, energy efficiency programmes, increasing renewable energy shares and more besides. However, severe violations of environmental laws still occur, especially in the areas of climate policy, drinking water protection, clean air policy and biodiversity goals.

The implementation of market-based instruments in environmental policy continues to be challenging. New tax incentives regularly fail in Switzerland when goals are not specified clearly enough or when negative impacts for households with small and medium income are not neutralised: A people's initiative for "internalisation of external costs of energy" was rejected in a referendum, with a record 92 percent of No-votes (2015); the initiative tried to replace existing VAT with taxes on non-renewable energies. Long-term fiscal distributional impacts were not transparent. A constitutional norm for an energy incentive levy launched by the Swiss government failed across all party lines (2017) and was abandoned. It was not clear what purpose the tax should serve. Renewable energy was supposed to be taxed, while non-renewable fuels for transports was touted to win exemptions.[10]

New milestones coming with the revision of the Swiss CO_2 Act

In the past decade, Switzerland benefited considerably from the German energy transition ("Energiewende") and the drop in renewable energy prices. The Swiss energy transition itself however lags far behind its German counterpart. An important milestone is being set with the revision of the Swiss CO_2 Act, which aims to halve GHG emissions by 2030 compared to 1990 levels.

For the transport sector, carbon regulations for new vehicles will be tightened towards EU levels. Emissions from road transport fuels must be "compensated" which may lead to an increase of diesel and gasoline charges of up to CHF 0.12 per litre by 2025. For public transport systems, the mineral oil tax exemptions will be reduced to promote e-busses.

In the building sector, the CO_2 tax on combustibles for heating can be increased to CHF 210/t of CO_2. For old buildings, an annual CO_2 limit per square metre of living space will apply when heating systems are replaced.

A levy of CHF 30 to 120 will be imposed on plane tickets. The revenues generated will be refunded to the population via the existing "carbon dividend", and used to create a new climate fund. This new fund will provide financial assistance for research and innovation, particularly in the aviation sector, but also reduce liquidity bottlenecks by securing and standardising energy contracting solutions for smaller buildings and hedge the risks of investments in the eco-friendly modernisation of buildings, for example.

Additionally, in the article outlining the purpose of the Act (Art.1), the revised CO_2 law stipulates that financial flows need to be aligned with climate targets. No concrete measures have been adopted regarding the investments or involvement of the Swiss financial sector, but the proposed law does require the Swiss Financial Market Supervisory Authority (FINMA) and the Swiss National Bank to review the micro- and macro-prudential financial risks of climate change.

Outlook on Swiss climate policy

If put into force[11], the new CO_2 law will set a more ambitious and concrete framework for Switzerland to achieve its climate goals and thus also send an important signal to financial market players. The question of whether the environmental costs of CO_2 emissions will be sufficiently "internalized" by the new measures cannot be answered conclusively in view of the high pace of global warming. Also, it is not fully clear whether polluters will bear the full costs of the externalities because a large part of the revenue from the CO_2 tax is redistributed as a "carbon dividend". More important is the dynamic effect of the increase in the price of CO_2, which leads to:

— a change in relative prices of carbon intensive products and services compared to those with low carbon intensity, which will only become apparent in the long term;
— an improvement of market opportunities for *existing* low-carbon substitutes, for example e-mobility, heat pumps or efficiency measures in the regulated sectors;
— innovation processes and learning curves for *new* low-carbon technologies that can be financed through revenues from the carbon tax by accelerating research, development and market introduction followed by cost reductions.

Despite these improvements introduced with the new Swiss CO_2 law, final outcomes will depend on the willingness and capability of responsible authorities and agencies to enforce the legislation. Indeed, a number of loopholes persist. Under the new law all private companies can obtain exemptions from the carbon levy by making "voluntary agreements" on emission reductions. These privileges may be abused if stringent enforcement is missing. Emission reductions should strictly be in line with the Swiss "net zero" goal and a close monitoring of emission reductions for tax exemptions will be key.

In the future, continuous political efforts are necessary to remove such loopholes step by step and further raise the bar, notably in the following areas:

— Agricultural lobbies demonstrate strong opposition to climate and environmental policy efforts in many areas. Where "net zero" cannot be achieved by emission reductions, compensation measures should be created, tested, charged and applied *within Swiss borders* to accelerate technological innovation. This may create new products and markets for farmers and for agriculture, forests and land management in general. Carbon compensations can be created through bio-energy with carbon capture and storage (BECCs), or through the integration of timber in buildings as carbon sinks – thereby reducing policy resistance against climate protection efforts.
— So far, CO_2 levies are charged based on emissions from fossil energy consumed only *within* Swiss borders. They do not take account for the ecological footprint of emissions from production, transport, and storage outside of Switzerland. Swiss CO_2 levies hence should cover carbon emissions of fossil fuel delivery chains that include emissions beyond Swiss borders. Declarations of origin therefore should be introduced and also include other greenhouse gasses such as methane.
— To reduce non bio-degradable waste and create an incentive for recycling and biomass-based substitutes, fossil ingredients of chemicals and products should be taxed equally.
— With the rising availability of electric vehicles, the traffic sector should carry equal CO_2 levies as is the case for heating systems of buildings. A harmonization of CO_2 levies and carbon prices over all sectors would reduce policy loopholes and increase regulatory efficiency.

Although the new CO_2 law can be considered an important first step, it is, in light of accelerated global warming, far from sufficient for reaching the Swiss 2050 net zero emissions goal. More ambitious action has to follow soon.

1 Swiss Federal Council/FOEN (2018). *Environment Switzerland 2018, Report of the Federal Council,* p. 9. Available at: https://www.bafu.admin.ch/bafu/en/home/documentation/reports/environmental-report-2018.html

2 FOEN (April 2020). *National Inventory Report (NIR). Including reporting elements under the Kyoto Protocol.* Available at: https://www.bafu.admin.ch/dam/bafu/en/dokumente/klima/klima-climatereporting/National_Inventory_Report_CHE.pdf.download.pdf/National_Inventory_Report_CHE_2020.pdf

3 Ibid., p. 88.

4 "Carbon dividend" is a term used to describe the revenue from the CO_2 levy that is redistributed to all residents or households. In Switzerland, each person receives the same amount, regardless of his or her consumption. The distribution of the revenues is carried out by health insurance companies and the amount is settled against the health insurance premium. The system incurs low enforcement costs. In 2021, the redistributed CO_2 levy ("carbon dividend") combined with redistributed tax on VOC is CHF 87.– per year and per person. For more information see: https://www.bafu.admin.ch/bafu/en/home/topics/climate/info-specialists/climate-policy/co2-levy/redistribution-of-the-co2-levy.html

5 Examples are the popular votes on the following referenda: New rail-rail link through the Alps (1992), Protection of Alps (1994), introduction of a performance-based heavy goods vehicle levy (1998), financing of major railway projects (1998), further expansion of railway infrastructure (2014)

6 Passivated Emitter and Rear Contact

7 Swiss Federal Office of Energy: Overall energy statistics 2018 and Electricity statistics 2018

8 FOEN (2017). *Evaluation of incentive effect of emissions trading scheme.* Available at: https://www.efk.admin.ch/en/publications/security-and-environment/transport-and-environment/2737-evaluation-of-incentive-effect-of-emissions-trading-scheme-federal-office-for-the-environment.html

9 FOEN (n.d.). *Circular economy.* Available at: https://www.bafu.admin.ch/bafu/en/home/topics/economy-consumption/info-specialists/circular-economy.html

10 Swiss Federal Council (2015). *Bundesrat verabschiedet Botschaft über ein Klima- und Energielenkungssystem.* Available at: https://www.admin.ch/gov/de/start/dokumentation/medienmitteilungen.msg-id-59257.html

11 The Act will likely be subject to a national referendum.

18 CONCLUSION
Identifying and Tackling Barriers for Low-Carbon Financing Instruments

The chapters and case studies in this report demonstrate that there are many ways in which the financial sector can allocate capital to low-carbon solutions and thereby facilitate the transition to a low-carbon economy. Leveraging this broad set of financial instruments, which cover different asset classes and perform different functions across the investment chain, is key to supporting the shift from carbon-intensive to low-carbon business models.

However, in order for proven financial instruments as well as innovative financing forms to unfold their potential and have a significant impact, certain challenges must be addressed, and barriers removed. In particular, concerns have been expressed about the scalability of solutions at the brisk pace required, but also about the access and availability of suitable low-carbon investment opportunities, as well as regulatory uncertainty.[1] In the following sections, we examine in detail what is hampering the uptake of the different instruments and provide an outlook on how financial service providers, policymakers and economic actors from other sectors can address improvements to the framework for low-carbon finance.

Investments in liquid markets (listed equity)

Public markets have steadily gained importance for targeted low-carbon investment strategies, partly due to the growing size of the renewable energy sector, but also due to the necessity for all sectors to transition.[2] This has allowed considerable expansion of the offering of low-carbon financial products in public markets. Today, there are a number of proven methods through which investors can address climate change in their listed public equity investments, as shown by the examples of **thematic investments,** or **low-carbon indices** and **climate engagement** for **non-thematic investments.** Also, by participating in **IPOs** of sustainable companies, equity investors provide the necessary expansion capital for cleantech solutions. Nevertheless, in order to improve the effectiveness of such methods and further scale them, the following barriers need to be overcome:

— For **thematic listed equity,** the main barriers lie on the level of investor perception. The historical experience many clean energy investors made in the early 2000s, with significant losses due to boom and bust cycles, led to doubts whether such investments could achieve reasonable risk-adjusted returns. Since then, however, renewable energy has become a competitive and cheap solution for many segments of the economy: it often no longer relies on government subsidies and offers competitive risk-adjusted returns.[3] Communicating these advantages more proactively would help to address the concerns of still sceptical investors.

— Additionally, low-carbon thematic listed equity investments may be a challenge for some institutional investors, since they do not fit into their traditionally regional-focused asset allocation strategy. One way to address this issue is for institutional investors to create a special attribution for satellite investments within their investment strategy.

— For investments in **non-thematic listed equity,** data availability is one of the most hotly debated issues. Company level carbon data (scope 1, 2 and in particular scope 3[4]) and corporate reporting on other key sustainability indicators are often

insufficient or incomplete. To improve data availability, public authorities or financial market infrastructure players like stock exchanges could require better reporting practices. The Swiss stock exchange SIX could expand the scope and binding nature of its opt-in clause on sustainability reporting.[5] As a basis for all of this, an open-source registry as suggested for the EU would be very beneficial for corporate data availability. In addition, the Swiss financial market regulator FINMA could incentivise financial institutions to develop specific KPIs and adequate measurement processes to assess carbon risks.

— Even with improvements in data availability, the lack of standardisation remains a key challenge for many investors. This problem is illustrated in the case of **low-carbon indices.** Such indices often have different underlying methodologies, which has created considerable disparity in the industry. The EU Regulation on low-carbon benchmarks is expected to alleviate this to a certain extent. It is therefore important for Switzerland to join international initiatives that promote alignment of such indicators and methodologies.

— Finally, with regards to **climate engagement,** a lack of resources can sometimes be a barrier, especially for smaller asset managers. However, today there are many ways to team up with other investors and mobilise common resources, be it in the form of collaborative engagement initiatives such as Climate Action 100+ or by using the offering of an engagement service provider.

Bond market

Green bonds are a well-established instrument internationally to attract funds for low-carbon projects. They are mainly used to finance or refinance clean energy and energy efficiency projects. However, the market is deepening and has also supported the emergence of a number of dedicated green bond funds.[6] This has brought certain challenges, listed below:

— The biggest impediment to further developing green bond markets is not the willingness of investors, but the availability of respective securities. Issuers can find the verification process complicated and higher costs may hinder them from issuing green bonds, especially in an environment of capital surplus. Moreover, in Switzerland there are few service providers that can support an issuer during the structuring and certification process, due to the relatively small market.
To help develop the market in Switzerland, public entities could lead the way and issue green bonds for projects that deserve such a label.[7] For more structural support, stock exchanges could provide favourable listing conditions and the government could incentivise the issuance of green bonds by covering some of the extra costs in the verification process. Finally, industry associations can inform the market about the advantages of issuing green bonds through best-practice dialogue and case studies.

— Despite the popularity of green bonds, a broader set of capital market instruments, such as transition bonds or sustainability-linked bonds, will be required to support the transition away from carbon-intensive business models. It is therefore important not to focus solely on strictly green bonds.

Real estate

Real estate is a popular asset class for many Swiss investors. Given that the building stock in Switzerland accounts for around a quarter of greenhouse gas emissions in the country[8], promoting low-carbon real estate investments is an effective way to support the transition. In addition, given that real estate is not associated with

cross-border mobility or trade, emissions are directly manageable for Swiss investors.[9] To do so, many instruments with a proven track-record such as **direct and indirect sustainable real estate investments, labels, eco mortgages** or the more recent example of **refurbishment mortgages** exist. Nevertheless, challenges can arise from differences in cantonal regulation for the building sector, property manager and tenant behaviour, or also a potential long-term change of macroeconomic factors (e.g. energy prices) and resulting market preferences:

- For **direct real estate investments,** the lack of comparable data on the energy efficiency and consumption of individual buildings remains a problem. As of today, there is no nationally-implemented mandatory Swiss energy performance certificate (EPC)[10] This can make it difficult for institutional investors to anticipate and compare different properties. A mandatory EPC in all cantons would provide more transparency on energy efficiency and fossil fuel exposure, which would make it easier for investors to assess the building value holistically at the point of purchase and/or when refurbishing. A first step towards more transparency already underway in the real estate sector is the PACTA climate alignment test initiated by the Swiss government, which as of 2020 is also applicable to real estate investments.
- In general, traditional real estate valuation models still focus too heavily on short-term cash flows. On the side of banks for example, sustainability factors should be integrated into standard **mortgage credit analysis** and the results disclosed to clients, thus providing long-term oriented price signals and models. In the current market environment with very low interest rates, it will be difficult to further scale up **eco mortgages.**[11] Instead, the assessment of all buildings should be more specific about environmental criteria.
- Given that buildings are among the longest-lived assets in the real economy, retrofitting the existing building stock is urgently necessary in order to meet the Paris Agreement targets. Effective financing solutions and r**efurbishment mortgages** can support building upgrades, but the lack of consulting and know-how on well-planned refurbishment financing can make this difficult. The patchwork of cantonal rules further complicates the matter.
- In addition, energy-efficiency investments may be challenging, as the benefits from the savings in energy bills accrue to tenants, who may not own the building, and it can be difficult for the investor/owner to pass on the costs to the tenant in the form of higher rents in the current environment of real estate surplus in many areas of Switzerland.

Direct investments into non-listed companies /venture capital

Non-listed investments in low-carbon companies or projects with an explicit or integrated approach to a low-carbon economy are well-positioned to support the transition. They also offer the possibility to gain exposure to regions, markets and industries of the future that drive the low-carbon transition process.[12] **Venture capital** and early-stage clean technology investments in particular can provide the necessary funding for innovative and disruptive business models. Many of the barriers for this segment are not limited to low-carbon investments, but are of a general nature:

- Switzerland does not have a strong culture in the field of private market investments. Structural challenges such as limited exit options and ticket sizes that are too small in volume [13] further hamper the attractiveness of such investments. Evergreen structures or yield-cos could address some of the issues. Furthermore, with digital finance gaining ground, the opportunities to tokenise assets and thereby reduce minimum ticket sizes could facilitate the attractiveness of private market investments for private clients.

Beyond low-carbon investments within commonly deployed asset classes and traditional lending, innovative instruments can help finance the transition. These are not limited to traditional financial players, but address new forms and structures relevant to other actors, too, as outlined in the following sections.

Blended finance

Blended finance has proven to be a suitable structure to improve the appeal of low-carbon investments with unattractive risk-return profiles or risks that go beyond the risk appetite of private investors. Switzerland already possesses considerable know-how in this field and should now focus on promoting blended finance solutions for energy efficiency and renewable energy in emerging markets, where risks often constrain traditional investments. Room for improvement and scale mainly lies on the following two levels:

— For blended finance investments to be successful, a targeted focus would need to be put on fostering strong regional and local networks necessary to develop high-quality project pipelines.

— In addition, broadening know-how on the opportunities and building expertise in blended finance projects could further increase interest among Swiss investors. This can be fostered by a Swiss blended finance / impact investment knowledge platform.[14]

Insurance

Besides traditional insurance solutions for large renewable energy infrastructure, innovative models such as **energy savings insurances** (ESI) can drive investment into energy efficiency for smaller customers (SMEs) that would otherwise perceive such undertakings as too expensive or too risky. The ESI model has so far been applied in Latin America as well as Spain, Portugal and Italy. For the model to grow, the following points need to be addressed:

— The implementation of the ESI model still requires initial funding for the development of the programme. The Swiss government, or private actors in Switzerland, could support such models or provide initial design funding for replicating it in other countries.

— For the ESI model to work, adequate support throughout the implementation, e.g. capacity-building for key market stakeholders, communication and marketing activities, as well as support to build initial pipelines of EE projects, is crucial. Capacity-building therefore should not be neglected, in order to make the model self-sustaining in the near future.

Energy performance contracting

A similar financing model to the one above is **energy performance contracting** (EPC). Through this contractual structure, **energy service companies** (ESCOs) can de-risk and aggregate energy performance projects. Nevertheless, the EPC market in Switzerland is relatively new compared to neighbouring countries:

— One of the biggest challenges in Switzerland is the lack of awareness about this business model and the benefits it delivers to stakeholders. As such, it is imperative that greater efforts are made to raise awareness and communicate the contribution EPC can make towards achieving Swiss policy targets. The standardisation of such contracts could make the instrument easier to adopt.[15]

— For ESCO companies, debt ratio restrictions may limit them in undertaking more projects. The creation of structures that bring the EPC receivable to secondary buyers, i.e. capital markets, can help address this issue.

Figure 36:
KEY RECOMMENDATIONS FOR SCALING LOW-CARBON FINANCE SOLUTIONS

- → **Address the significant data gaps, increase availability of decision-useful data** *(market players and government)*
- → **Create standards and aligned definitions for low-carbon investments** *(market players and government)*
- → **Build and disseminate know-how and expertise in low-carbon finance** *(market players and government)*
- → **Encourage a holistic approach that considers the integrated investment chain** *(market players)*
- → **Ensure accurate pricing signals within the current system** *(government)*
- → **Create incentives/de-risk** *(government)*

Community finance

For small-scale retail investors, community finance structures such as **renewable energy cooperatives** can allow them to actively invest in renewable energy. In Switzerland, cooperatives are an established structure, but the market for consumer co-ownership of renewable energy is small, with only 1.9% of the Swiss population having used this tool, compared to 7% in Austria, for example. Difficulties for the model persist mainly on the level of the overarching energy framework conditions:

— The absence of electricity market liberalisation in the small-consumer segment may hinder consumer co-ownership. Related constraints are the fact that the costs attributed to the local user community by the incumbent utility is high (includes international grid costs), and the current feed-in tariffs are low.

— Lack of economies of scale could be addressed through standardised contracts, with the ultimate aim of getting more players to form such consumer co-ownership cooperatives.

Carbon credit markets

The Swiss **carbon credit market** currently does not generate enough incentives for companies to reduce their emissions to the necessary levels.[16] To make the system more efficient, framework conditions will have to be adapted in several ways. Most importantly, the Energy Agency of the Swiss Private Sector[17] needs to break down its sector targets to adequately reflect the Federal Council's net zero 2050 goal. Additional instruments that could create incentives for negative emissions should be considered (e.g. a **CO_2 storage credit system**).

Green state investment bank

An additional climate finance instrument covered in this report is green state investment banks (SIB), a form of public financial institution that facilitates private investment in low-carbon solutions. Green SIBs can not only de-risk projects and provide capital, but also contribute crucial knowledge through specialised risk assessment and due diligence teams. To date, such an institution does not exist in Switzerland.[18] Before advocating the creation of such Swiss green SIBs, however, its added-value compared to existing banks that finance green projects would need to be demonstrated. In any case, the creation of a Swiss green SIB would entail an in-depth political process and require a decision from the Swiss legislative.

Conclusion

A wide array of options exist for different types of investors to play their part, some for the usual mainstream asset classes, others for more innovative structures that go beyond traditional finance. Financial players need to deploy these instruments to replicate existing solutions on a scale that encourages a shift away from a carbon-intensive economy towards a low-carbon, climate-resilient economy and society.

What is hampering the wide-scale implementation of low-carbon financing instruments? Naturally, different financial players have different roles and different risk capacities and culture. However, common barriers observed over multiple instruments are the lack of standards and data for measuring and monitoring key climate indicators, lack of awareness of these instruments and insufficient expertise.

In addition, despite the abundance of many low-carbon business opportunities, the transition away from carbon-intensive business models may also create financial risk. Some assets in the real economy are long-lived and curtailing their lifetime early may lead to financial losses or be financially unattractive, as the section on real estate investments shows. These problems are not something financial players can solve on their own, but require well-designed policies for all sectors and a willingness of the government to internalise environmental costs adequately (see Figure 36).

A more substantial challenge, which financial players willing to support a low-carbon society regularly face, is that the real economy has not yet developed competitive low-carbon solutions in some sectors. The universe of low-carbon investment opportunities can therefore be limited. Industries such as the heavy-duty trans-

port sector often do not yet offer viable investment opportunities for low-carbon investors. Ultimately, the development of sustainable business models in key industries, in Switzerland and abroad, is crucial. Public policies are needed to incentivise this development, as well as corresponding finance and investment through carbon pricing, R&D and other tools. However, this is not an easy task. Designing, implementing and enforcing effective environmental policies is a highly complex matter, and adverse incentives persist, as the last chapter on Swiss environmental policy developments has shown.

To conclude, this report shows that the financial sector can play a crucial role and mobilise the funding needed for change. However, only an intense dialogue and close cooperation between all stakeholders, namely financial players, regulators and real economy representatives, can build the effective framework conditions for a fast transition to a low-carbon economy.

1 PRI (6 June 2018). *How to invest in the low-carbon economy.* Available at: https://www.unpri.org/climate-change/how-to-invest-in-the-low-carbon-economy/3210.article

2 As clean energy projects have increasingly come to resemble traditional infrastructure investments rather than risky alternatives, a larger pool of investment capital has emerged. Source: https://data.bloomberglp.com/company/sites/55/2019/09/Financing-the-Low-Carbon-Future_CFLI-Full-Report_September-2019.pdf p. 40.

3 Imperial College Business School and International Energy Agency (June 2020). *Energy Investing: Exploring Risk and Return in the Capital Markets.* Available at: https://imperialcollegelondon.app.box.com/s/f1r832z4apqypwofakk1k4ya5w30961g

4 In particular, the absence of scope 3 data is still a big challenge.

5 More on the SIX sustainability opt-in clause: https://www.six-group.com/exchanges/shares/companies/sustainability_reporting_en.html

6 PRI (13.06.2018). *How to invest in the low-carbon economy. Green and climate-aligned bonds.* Available at: https://www.unpri.org/climate-change/low-carbon-investing-and-green-and-climate-aligned-bonds/3284.article

7 In Switzerland, multiple cantonal entities have already issued green bonds, e.g. the Canton of Geneva in 2017 or the Canton of Basel-Stadt in 2018. In 2020, the telecom operator Swisscom published a Green Bond Framework, setting the way forward as a large government-owned company.

8 The Swiss building stock accounts for about 50% of primary energy consumption and for 24% of greenhouse gas emissions. See: www.energiestiftung.ch/energieeffizienz-gebaeude.html

9 WWF and Credit Suisse (2012). *Decarbonizing Swiss Real Estate. The Credit Suisse Case Study.* p. 7. Available at: https://www.wwf.ch/sites/default/files/doc-2017-11/2012-08-study-decarbonizing-swiss-real-estate-the-case-study-of-credit-suisse.pdf

10 The GEAK (Gebäudeenergieausweis der Kantone) is not mandatory on a national level. For more information see: https://www.geak.ch/de/der-geak/anwendungsbereiche/

11 A consortium of banks, industry associations and other stakeholders in Europe aim to promote a standardised "energy efficient mortgage" under the Energy Efficient Mortgage Initiative: https://eemap.energyefficientmortgages.eu/

12 PRI (13 June 2018). *How to invest in the low-carbon economy. Unlisted strategies and assets.* Available at: https://www.unpri.org/climate-change/low-carbon-investing-and-unlisted-strategies-and-assets/3285.article

13 Asset managers and asset owners generally prefer to allocate larger sums per transaction than the typical clean energy investment allows, a survey suggests that a minimum asset finance deal of $100 million is likely required for direct investment. Source: Climate Policy Initiative (March 2013). *The Challenge of Institutional Investment in Renewable Energy.*

14 SECO is currently preparing a feasibility study for such a platform.

15 See example in France: https://www.ecologique-solidaire.gouv.fr/sites/default/files/Pr%C3%A9sentation%20g%C3%A9n%C3%A9rale%20-%20Clausiers%20CPE.pdf

16 See p. 3 of EFD report (2017): "However, actual trading activity in the ETS has been minimal in the first three years of the commitment period from 2013–2020." Source: www.efk.admin.ch/images/stories/efk_dokumente/publikationen/evaluationen/Evaluationen%20(51)/16393BE.pdf

17 See: https://enaw.ch/en/?nocache=1

18 Switzerland's Technology Fund is considered by some as a green SIB-like entity, but does not have the institutional standing. See: www.technologyfund.ch/

LIST OF ABBREVIATIONS

Capex	Capital expenditure
CBI	Climate Bonds Initiative
CHF	Swiss franc
CO_2	Carbon dioxide
COP	Conference of the Parties
CVaR	Climate Value at Risk
DCF	Discounted cash flow
DER	Distributed energy resources
DFI	Development finance institution
EE	Energy efficiency
EIB	European Investment Bank
EnA	Swiss Energy Act
EPC	Energy performance certificate
EPC	Energy performance contracting
ESCO	Energy services company
ESG	Environmental, social and governance
ETF	Exchange traded fund
ETS	Emission Trading Scheme
EU	European Union
EUR	Euro
EV	Electric vehicle
FINMA	Swiss Financial Market Supervisory Authority
FOEN	Federal Office for the Environment
G20	Group of Twenty (Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, UK, US, EU)
GBS	Green Bond Standard
GDP	Gross Domestic Product
GEAK	Gebäudeenergieausweis der Kantone
GHG	Greenhouse gas
GRESB	Global Real Estate Sustainability Benchmark
ICMA	International Capital Markets Association
IEA	International Energy Agency
IFC	International Finance Cooperation
IPCC	Intergovernmental Panel on Climate Change
IPO	Initial public offering
KfW	Kreditanstalt für Wiederaufbau
kWh	Kilowatt hour
LCA	Life Cycle Assessment
LEED	Leadership in Energy and Environmental Design
MDB	Multilateral development bank
NPV	Net present value
OECD	Organisation for Economic Co-operation and Development
PPA	Power purchase agreement
PPP	Polluter pays principle
PPP	Public private partnerships
PRI	Principles for Responsible Investment
PV	Photovoltaic
R&D	Research and development
RE	Renewable energy
SDG	Sustainable Development Goal
SI	Sustainable investment
SIB	State Investment Bank
SME	Small and medium-sized entreprise
SNBS	Standard nachhaltiges Bauen Schweiz
SSF	Swiss Sustainable Finance
TCFD	Task Force on Climate-Related Financial Disclosures
TEG	Technical Expert Group
UHNWI	Ultra high net worth individuals
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
USD	US Dollar
VC	Venture capital
VPP	Virtual power plant

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