WHITE PAPER

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TIMBER FINANCE
SHAPING THE CARBON SINK BUILT ENVIRONMENT

Zürcher Hochschule für Angewandte Wissenschaften
zhaw School of Management and Law

BUILT BY NATURE

MIGROS Pionierfonds

LIECHTENSTEIN BANKERS ASSOCIATION

INVESTING IN THE MODERN FOREST AND TIMBER CONSTRUCTION INDUSTRY

A White Paper on sustainability, value creation, investment profiles and financial products for a systematic and climate-relevant investment in timber.

Liechtenstein Banking Association

Dear Readers,

Climate change is one of the most pressing challenges of our time and it is imperative to use innovative solutions and sustainable resources to reduce greenhouse gas emissions. Achieving Net-Zero also requires a rethink and realignment of our real and financial economies.

Trees absorb CO_2 from the atmosphere as they grow and store it in the form of carbon in their wood. Through the use of timber in the construction industry, this absorbed CO_2 is stored into buildings and infrastructure and thus removed from the atmosphere in the long term. For example, timber not only has a significantly lower CO_2 footprint than concrete or steel and is a more environmentally friendly alternative as a building material, but also acts as a natural CO_2 sink. Although the importance of forestry as a CO_2 sink and sustainable source of raw materials is still underestimated, it is becoming increasingly important. Sustainable forestry and construction help to reduce CO_2 emissions and protect biodiversity. Through targeted investments in sustainable forestry, the conservation of forests and their role as CO_2 sinks can be further supported and promoted.

As a representative of the financial sector and as an organization that cares about sustainability and is actively involved in the fight against climate change, we are convinced of the increasing importance of timber investments. However, sustainable timber production is only possible if it is also financially attractive. In order to achieve this and to open up the great growth of the industry to the financial market, new and innovative timber financing products are needed that enable investments in sustainable forestry and the timber economy along the entire value chain, while at the same time diversifying risks.

There is still a large knowledge and investment gap between the financial market and the modern forest and timber industry. This white paper closes this gap and, for the first time, provides a very comprehensive and scientifically sound basis for a better understanding of the relationships between wood as a raw material, the timber industry as an economic sector and timber financing as an investment instrument. It also highlights the importance of introducing CO_2 certificates for timber buildings, so-called Timber Carbon Capture & Storage (TCCS) certificates. These certificates recognize the climate performance of builders when they build with timber and thus promote the use of Mass Timber in the construction industry. TCCS certificates can act as tradable units, allowing companies that invest in Mass Timber and construct timber buildings to sell their CO_2 savings or count them towards their own climate goals. In doing so, they make an important contribution and support both companies and countries in achieving their climate targets.

We wish you an interesting and inspiring read.

Liechtenstein Bankers Association
Simon Tribelhorn, Managing Director

Zurich University of Applied Sciences ZHAW

Dear Readers,

Investing in the timber industry or in timber projects is in vogue. Due to many technological innovations and interesting demand prospects, an ever broader and deeper universe of investment opportunities in this area is emerging.

This development is also strengthened by the fact that wood has an indisputably large potential to positively contribute to the sustainability transformation. The carbon sink capacity of forests can make an important contribution to CO_2 reduction; wood also serves as a long-term CO_2 storage in buildings, for example, and replaces CO_2-intensive building materials.

But not every timber investment is sustainable per se. An example is the controversial recognition of credits for reforestation projects towards the CO_2 balance and the sale of corresponding certificates. The danger of greenwashing or - even more so - of "*greenwishing*" is correspondingly omnipresent.

If an investment is to make a positive contribution towards sustainability, both the sustainability impact and the financial product must be understood. Such a combined analysis has been lacking so far, which is certainly also related to the complexity of the topic. Accordingly, I am pleased that the present study fills precisely this gap. It discusses both the sustainability impact of timber and the various investment products and is intended to serve as a scientifically sound and practice-relevant reference.

At the ZHAW School of Management and Law, we are intensively involved in research and practical projects in the field of sustainable finance and sustainable real estate. Building bridges between science and practice is in our DNA. Together with the Timber Finance Initiative, we hope that we have once again succeeded in building this bridge.

We hope that reading it will provide you with interesting ideas and inspiration.

ZHAW School of Management and Law
Prof. Dr. Beat Affolter
Head of Center for Corporate Performance and Sustainable Financing

BUILT BY NATURE

When Timber Finance first submitted a project proposal for funding from Built by Nature in 2022, we were intrigued by the possibility of supporting a tool focused on providing the investment community with a comprehensive and credible overview of the opportunities and climate benefits of timber as an increasingly important material in construction.

With the release of this White Paper, Built by Nature and our network are delighted to see this resource come to fruition to advance understanding of timber trends for financial markets. We base this on the understanding that the scalability of timber in construction is directly tied to the willingness of investors and insurers among others to realise its true potential in decarbonising our built environment. For Built by Nature, the investment community is an essential audience for the increased use of timber products.

Built by Nature was launched on a platform of accelerating the timber building transformation, and to credibly demonstrate through our networks the numerous environmental, societal and economic benefits of timber, mass timber and biobased materials in our built environment. To realise this mission, the Buit by Nature Fund provides grants to confront barriers, change perceptions, create knowledge and foster collaboration, objectives which we believe have been met through this project. We look forward to sharing and amplifying the findings of this White Paper -- confident that it will serve as a valuable resource in furthering our goals, and proud to have supported this work.

On behalf of the Built by Nature team, our Board, and network, I would like to congratulate Timber Finance, Zurich University of Applied Sciences, your research partners and contributors for your commitment and collaboration in creating this important asset.

Built by Nature
Amanda Sturgeon, F.A.I.A.

1. INTRODUCTION

Since the institutionalization of timberland investments in the 1980s, the timber sector has evolved and new applications for timber have been identified. The paper and packaging sector should be mentioned first in this respect. Since the Paris Climate Agreement in 2015, timber has increasingly come into focus in the sustainability debate. Possible applications in the fields of energy, textiles, biofuels and also in urban timber construction as part of the decarbonization of the construction industry are highlighted. In addition to CO_2 absorption (sequestration) in forests, timber construction results in CO_2 storage and a substitution effect through the replacement of CO_2-intensive building materials. Each use of timber has different sustainability characteristics and timber should therefore be seen as a versatile raw material.

The aim of this white paper is to provide investors with an overview of investment opportunities and information on sustainability aspects in the timber value chain, which are currently arising from the timber construction renaissance. This is intended to support investment processes, in particular in connection with implementing portfolio-level decarbonization strategies. The white paper relies on a combination of proprietary analyses and the elaboration of scientific studies.

The first chapter positions the topic “timber” in the current sustainability debate. First, the climate benefits of the forest and timber are explained: storage, sequestration and substitution effects. In the subsequent chapter, the timber industry’s value chain is examined in detail and the use of timber in construction is discussed. In particular, the products and processes which contribute to the sustainability of timber construction are discussed. The aim is to illustrate the link between the climate benefits of the forest and to describe the resulting economic potential.

Subsequently, the extent to which current financial products enable direct or indirect investments in timber (timber investments) is analyzed. The aim is to show how the real economy associated with timber is represented in the financial sector. In addition to a discussion of the existing investment products, their opportunities (returns, diversification potential) and risks (volatility, systematic risk) are examined in more detail on a theoretical and empirical level.

2. TIMBER AND SUSTAINABILITY

2.1 Sustainability of wood as a building material and energy source

2.2 CO_2 emissions and removal - an overview of methodologies and concepts

2.3 Introduction to the regulatory environment

2.4 Embedding timber in the real estate landscape

2.1 SUSTAINABILITY OF TIMBER AS A BUILING MATERIAL AND ENERGY SOURCE

Everyone is aware of timber as a renewable and climate-friendly natural raw material. In the context of developing new financial products based on investment opportunities in the forest and timber industry, the analysis of the sustainability characteristics is of great importance. Based on scientific studies, this chapter deals specifically with the question of how timber can be used in an optimal way from a sustainability perspective. The aim is to show investors the uses of timber that are particularly sustainable (e.g. as a building material) as well as to inform them about possible applications whose sustainability aspects are questionable or problematic (e.g. the use of timber from unsustainably managed forests).

Next, the general environmental performance of timber is discussed. Subsequently, the use of timber as a building material and energy source is specifically discussed. Timber is a versatile raw material and has further applications, such as in the packaging sector. However, the discussion of such applications is not the focus of this white paper.

THE CLIMATE PROTECTION BENEFITS OF WOOD

"Climate neutrality by 2050" - Switzerland and the EU have committed themselves to this goal and consequently want to reduce their greenhouse gas emissions to Net-zero (Figure 1). Despite all efforts, it will not be possible to completely eliminate greenhouse gas emissions (e.g., from the agricultural sector) and so-called negative emission technologies will be required to permanently remove CO_2 from the atmosphere, or in other words, natural or technical carbon storage solutions, which can compensate unavoidable emissions. While technological storage options are still in their infancy, forests and timber are a natural CO_2 storage solution (Federal Office for the Environment [FOEN], 2019; Meuli, 2022).

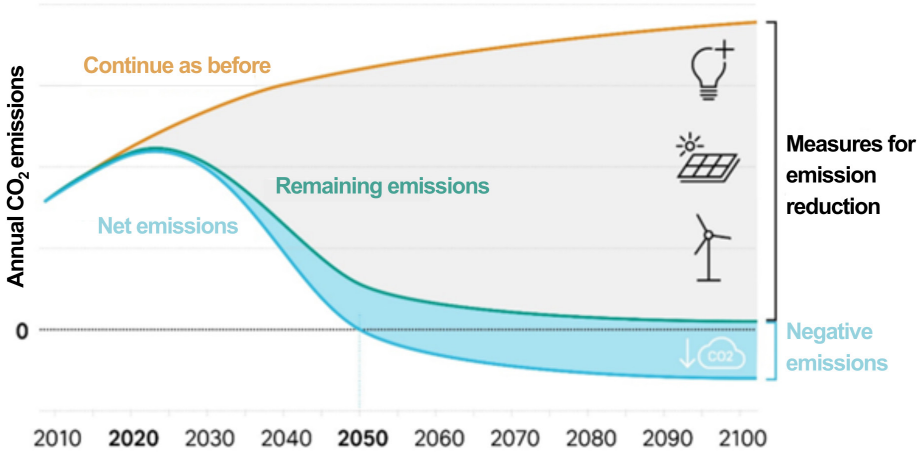


Figure 1: Achievement of the net-zero target by 2050 (FOEN, 2021d). Translation by Timber Finance.

Plants, most notably trees, remove carbon dioxide (CO_2), a greenhouse gas, from the atmosphere. Through the process of photosynthesis, the C (carbon) is separated from the O_2 (oxygen). As the oxygen is released back into the environment, the carbon is stored in the biomass (Bader, 2022; FOEN, 2021b). This removal and storage of carbon, often referred to as **sequestration** (Huber et al., 2021), is the first (1st) of the three climate benefits of trees and forests identified by the academic literature. In addition to this forest-based storage, carbon also remains bound when wood is used as a building material (for example, in the load-bearing structure of buildings). This potentially long-term **storage** of carbon in durable wood products represents the second (2nd) climate benefit. In addition to these storage effects in forests and wood products, the **substitution** of emission-intensive building materials or fossil fuels through the use of wood provides the third (3rd) climate benefit.

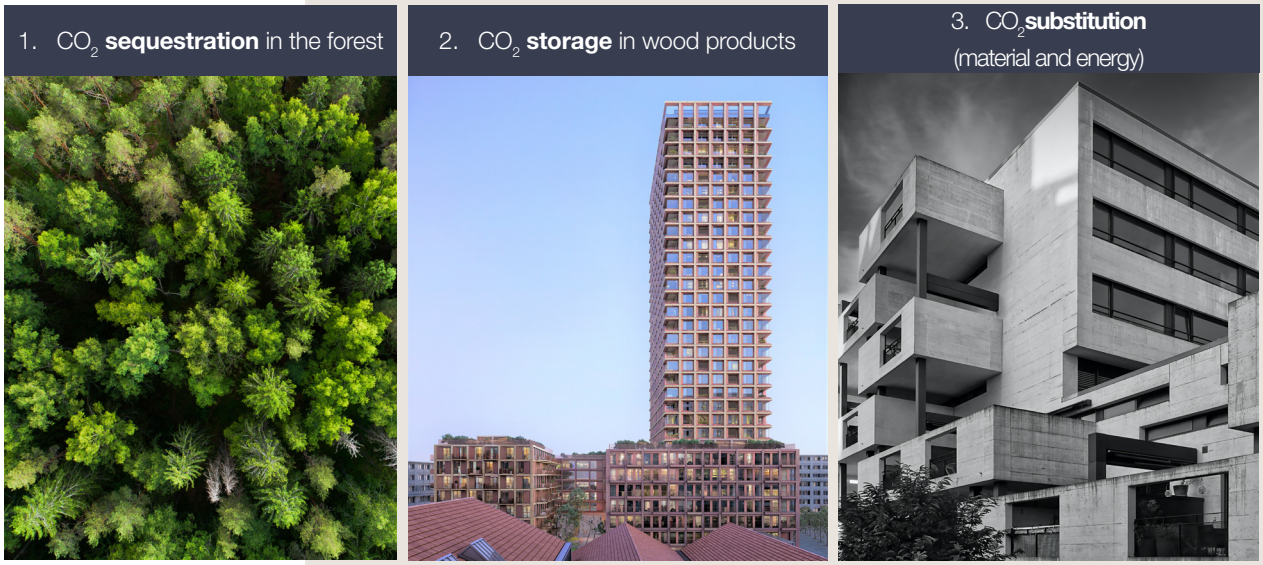


Figure 2: Climate benefits of forests and wood. Illustration by timber finance based on (FOEN, 2021a)

Fossil fuels such as coal, gas or oil are identified as the main cause of the strengthening of the greenhouse gas effect (FOEN, 2021c). In the literature (see e.g., Federal Ministry of Food and Agriculture [BMEL], 2021 and Huber et al., 2021), the substitution effect is divided into a) energy and b) material substitution. As part of energy substitution, fossil and finite fuels are replaced by wood. The use of wood instead of coal, oil or gas (e.g. in the combustion of wood instead of coal) as a source of energy avoids fossil greenhouse gas emissions and replaces them with wood, which is a renewable energy source and through forest growth removes CO_2 from the atmosphere in the future. Material substitution reduces fossil greenhouse gas emissions as **wood products, on average, are less energy-intensive and have a smaller fossil carbon footprint** than building components made of other materials (Hurmekoski et al., 2022).

Thanks to the above-mentioned climate benefits, timber can in principle play an important role in the fight against climate change and in achieving the climate targets of the Paris Agreement. Nevertheless, wood is also controversial, there are numerous critics, especially with regard to its use as an energy source and in connection with threats to biodiversity. So how sustainable is timber as a building material and energy source really?

THE ROLE OF TIMBER IN THE PACKAGING SECTOR

The sector within the timber industry, which produces paper and packaging, occupies a large part of the investable universe of the timber industry (see chapter 4.1 – especially Figure 19). Due to its size, this sector is already relevant in connection with sustainability. Wood-based packaging materials have often been seen in many academic studies as a sustainable alternative to conventional packaging materials such as plastic or metal (e.g. Otto et al., 2021). Substitution effects result also from such use. In the context of sustainability, it is often emphasized that wood-based packaging materials are made from a renewable raw material (Kattelmann, 2021). This is particularly advantageous if the wood comes from sustainably managed forests and the companies can prove it. In addition, wood-based packaging can also be recycled (Twede et al., 2014). In particular, the production of wood-based packaging in the context of the cascading wood use is also promising (Husgafvel et al., 2018).

Although, as just described, a certain relevance is assigned to wood in the context of sustainability in the packaging sector, its significance in the current sustainability debate is rather low in comparison to the use of wood as a source of energy and for construction. For example, Steubing et al. (2015) investigated the most ecological uses of wood and came to the conclusion that the substitution effects in the packaging sector are rather small compared to its uses in construction and for the production of heat and electricity. For this reason, paper and packaging are addressed in less detail in this chapter.

SUSTAINABILITY OF TIMBER AS A BUILDING MATERIAL

A simple example of timber being used as a building material and the material substitution effect mentioned previously is provided by wooden windows, which, in contrast to aluminum windows, require less energy for their production and disposal (see e.g. BMEL, 2021 and Huber et al., 2021). According to the German Society for Wood Research (Deutsche Gesellschaft für Holzforschung, 2004), this positive energy balance exists also in other use cases for timber. An example based on the production of three-meter-high columns (with comparable load bearing capacity) shows that the primary energy consumption of reinforced concrete is almost four times higher than that of timber. In the case of aluminum, up to 126 times more energy is required for extraction, processing, and installation than in the case of timber.

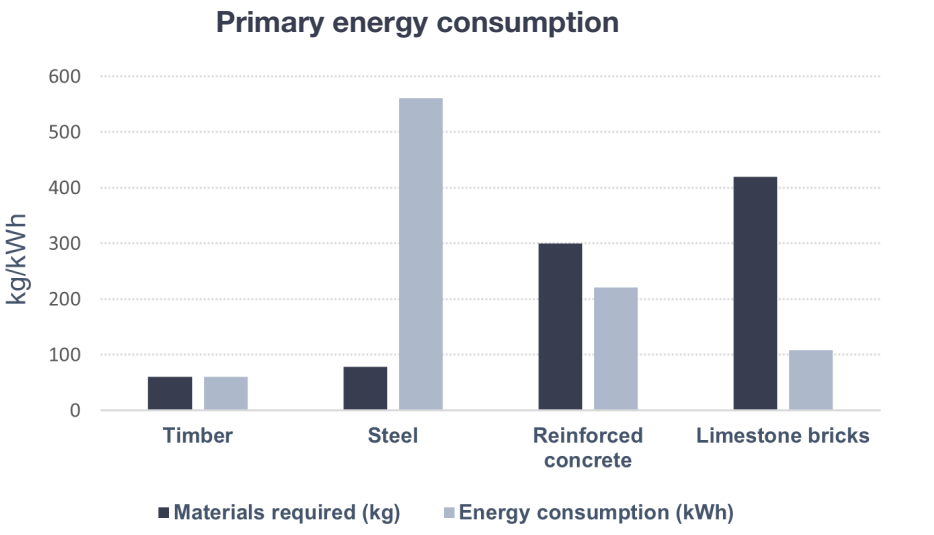


Figure 3: Primary energy consumption for the production of three-metre-high columns (with comparable load capacity); Source: German Society for Wood Research (2004), based on data from the Wood Information Service and the German Society for Wood Research.

Another aspect also concerns waste generation, which could be significantly reduced through the increased use of timber products and also, at the very end, their use for energy generation. This is especially the case in the construction industry, which in Germany [Switzerland] is responsible for over 60 [80] % of the total waste and residue generation: For example, the production and disposal of a house built with conventional materials generates about 75% more CO_2 than a wooden house, and also requires around 60% more fossil energy (German Forestry Council, 2019; Swiss Prime Site, 2020).

However, there is an important distinction to make when considering the environmental footprint of timber as a building material. The **geographic origin** of timber plays an important role in achieving the most positive environmental result. For example, in order to maximize Switzerland's long term CO_2 sequestration , (i.e., to absorb and store it) a high demand for Swiss timber is necessary. Timber construction in Switzerland is booming (Vitelli, 2020), but the majority of the timber being used is imported. Remund (2022) estimates that about 70% of timber components for construction come from abroad. The reason for this is the high production costs in Switzerland and not the lack of timber. The geographical location of production has an impact on the environmental footprint. Specifically for Switzerland, a local research company calculated that the use of processed timber from Germany causes over 50% higher greenhouse gas emissions compared to locally sourced timber, due to the dirtier energy mix in Germany as well as emissions associated with transport. The use of timber from Hungary comparatively leads to even 80% more greenhouse gas emissions. Sustainability labels such as FSC, PEFC or "Schweizer Holz" ("Swiss timber") can counteract this situation (Banz & Bütler, 2023).

In the discussion surrounding the CO_2 storage capacity of timber, it is important to note that the carbon sequestrated in the trees is in the long term released back into the atmosphere when the **tree dies** (e.g., due to age, disease, bark beetle infestation or fire) and the dead biomass remains in the forest and decays (Elsasser et al., 2020). Over their lifetime, products made of timber act as a carbon sink. **When timber is used as a building material, the carbon originally stored in the tree remains stored for a long period of time, which per se is not possible when wood is burnt** (Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection [BMUV], 2022). According to the head of the Wood and Logistics Division of the Bavarian State Institute of Forestry, the storage period in many wood products is considerably longer than if the wood is not used and were to decompose in the forest (Huber, 2010). This applies especially in the case of the so-called cascading use of timber (although there are also critical voices, cf. Ibisch et al., 2020). In this case, timber gets more than just one life: For example, reclaimed wood from buildings can be reused and **recycled**, decades after the initial application, in form of chip- or fiberboard and subsequently as a raw material for cardboard. This not only reduces the consumption of fossil resources, but also keeps CO_2 bound for a longer period (Bader, 2022; United Nations [UN], 2022). Only after several stages of material use (or cascades) does the energetic use of wood take place (Bader, 2022). When burned, only the previously bound CO_2 is released, which can be reabsorbed by newly planted trees (WWF, 2022a).

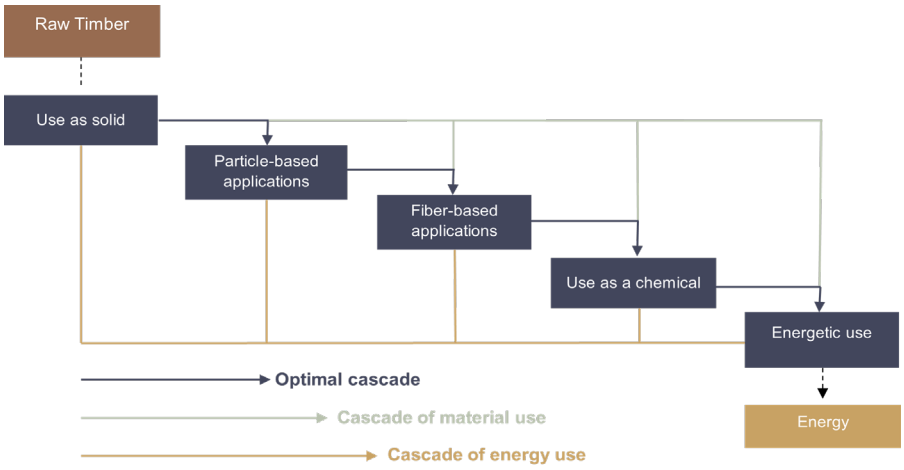


Figure 4: Principle of cascading use. Presentation of Timber Finance based on (BMEL, 2021).

SUSTAINABILITY OF WOOD AS AN ENERGY SOURCE

Since wood products, when burned, only release, at the end of their life cycle, the CO_2 that they stored - CO_2, which in turn would be sequestrated again by regrowing trees - the German Forestry Association speaks of a CO_2-neutral cycle (German Forestry Council, 2019). However, precisely this CO_2 neutrality of wood is controversial. According to the Federal Office for the Environment (FOEN), both in the case of decomposition in the forest when not used, and in the case of burning, the same amount of CO_2 is released, which the trees have removed from the atmosphere in the course of their growth. Therefore, heating with wood would be considered CO_2 neutral and would not contribute to the greenhouse effect but instead relieve the atmosphere by substituting heating oil in terms of CO_2 (FOEN, 2022). The Swiss FOEN is not alone with this view: the EU, USA and Great Britain all classify wood as a climate-neutral energy source (Hirstein, 2022).

But fuelwood also has its ecological dark side.[1] The concept of wood as a climate-neutral energy source is based on the idea that CO_2 emissions generated from the burning of wood can be offset by the total annual carbon storage in the forest (BMUV, 2022). However, the burning of wood happens much faster than the growth of new trees (WWF, 2022a), and the carbon absorption also occurs independently of wood burning (BMUV, 2022). In addition, the combustion of wood pollutes the air via particulate matter emissions and – as the Swiss FOEN also states – causes more air pollutants than, for example, oil and gas combustion (FOEN, 2022 & BMUV, 2022).[2]

The literature agrees that the material **use of timber in durable wood products** is more environmentally friendly than its combustion for energy purposes (see e.g., FOEN, 2022; BMEL, 2021; BMUV, 2022; UN, 2022a and WWF, 2022a). Only contaminated waste wood and wood residues, for which no further material use can be found, as well as by-products such as sawdust, which are produced during manufacturing and are subsequently processed into wood pellets, should be considered for use as a source of energy (BMUV, 2022).

In order to achieve global climate goals, wood is often classified as a climate-neutral energy source, as previously mentioned. As a result, the production of wood pellets has doubled worldwide in the last decade. In Switzerland, too, the amount of energy generated from wood increased by 41% between 2010 and 2021 (Hirstein, 2022). This rush to use wood as a renewable energy source can lead to wrong incentives and cause trees to be harvested earlier or to process sawable wood into pellets (Ell & Huber, 2019; Hirstein, 2022).[3]

In autumn 2022, the EU Parliament decided that energy generated from the combustion of wood from forests will only be considered renewable energy to a limited extent. State subsidies are to be phased out and funding in relation to wood energy shall be available only for damaged wood and wood residues, but not for trees that have been felled specifically for this purpose (Urbansky, 2022; WWF, 2022b). In summary, it can be said that wood as a source of energy offers opportunities in the field of sustainability. However, wood as an energy source can only be considered sustainable if certain conditions are met, for example in the cased of pellets production from wood waste.

[1] This is emphasized by the German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection with the first sentence of its «Thematic page on heating with wood»: "Contrary to popular belief, heating with wood is not climate-neutral."

[2] In addition to particulate matter, the use of wood as an energy source also produces climate-relevant methane, nitrous oxide and CO_2 emissions, with the latter being even greater, per thermal unit produced, than for fossil fuels (BMUV, 2022).

[3] The problem is the economic value, which turns wood waste into a valuable raw material and creates monetary incentives at the expense of the environment. Therefore, in 2021 In an open letter to the heads of state and government of the USA, the EU, Japan and South Korea, more than 500 scientists from Harvard, Stanford, Oxford, Switzerland and Germany, among others, called for the end of the climate-neutral label and subsidies for the energetic use of wood (Raven et al., 2021).

SUSTAINABILITY: SYNTHESIS

How can the question raised about the sustainability of wood as a building material and energy source be answered? Regardless of whether wood is classified as a (to a limited extent) climate-neutral energy source or not, the scientific literature agrees that wood should be used foremost as a material in durable products and only at the end of serval product lifecycles be used for energy purposes (Bader, 2022; BMEL, 2021; UN, 2022a). It is precisely this cascading use, which has already been mentioned, that seems to achieve the best CO_2 effect: always under the premise that forests are sustainably managed, so that as much wood as possible grows back in the long term, for climate reasons **wood should primarily be used as a building material in several material stages before it can then be used as an energy source**. Through multiple material uses in buildings, CO_2 emissions from the production of other materials are avoided, and emissions from fossil sources can be avoided through the subsequent use of reclaimed components and wood waste as an energy source (FOEN, 2020). According to the German Federal Ministry of Food and Agriculture, these substitution effects arising from the use of timber, together with the storage effects in forests and timber, illustrate the climate benefits of using timber as a renewable raw material. It is also important that investments in the forest and timber industry do not create economic incentives which encourage unsustainable forest management, and instead are geared towards **sustainable forest management and the sustainable use of timber.**

2.2 CO_2 EMISSIONS AND REMOVAL – AN OVERVIEW OF METHODOLOGIES AND CONCEPTS

The measurement and publication of companies' CO_2 emissions is a necessary condition for evaluating the sustainability of an investment in the timber industry. Sustainability in this context is now regulated in principle by the Greenhouse Gas Protocol (GHG Protocol) (Kaplan & Ramanna, 2021). The GHG Protocol is a framework that was conceived in the 1990s and further developed over the years. According to the GHG Protocol (2004), a distinction is made between three types of emissions based on their role in the value chain: direct emissions (*Scope 1*), indirect emissions from purchased energy sources (*Scope 2*) and other emissions in the upstream and downstream supply chain (*Scope 3*). The concept of greenhouse gas includes CO_2, CH_4, N_2O, HFC, PFC, SF_6 and NF_3 - these are then converted into CO_2 equivalents (GHG Protocol, 2013). For the timber industry, the GHG Protocol's Land Sector and Removals Guidance is relevant and covers the important concept of CO_2 removal. The CO_2 removal performance of a company engaged in forestry is defined as a transfer of CO_2 from the atmosphere to a carbon sink such as a growing tree. Wood products produced by the same company still contain the carbon, and in this case, according to the GHG Protocol (2022), one speaks of a pure flow (instead of removal) from the biogenic storage (tree) into the product storage (e.g., sawn timber and residuals). In the case of timber companies, their sequestration performance is regulated by the GHG Protocol (2022) within S*cope 3* but is in practice usually reported separately. When analyzing the CO_2 emissions and removals (sequestration) of several companies, the following must be taken into account: The *Scope 2* and *3* emissions of different timber companies may overlap, as the *Scope 2* and *3* emissions from one company are the *Scope 1* emissions from (one or more) other companies, resulting in an additivity problem with related possible overestimation of emissions at portfolio level.

A new approach, which is not (yet) an official concept within the GHG Protocol, is so-called *Scope 4* emissions (CDSB, 2020). This concept is about avoided emissions at the product level. In the case of timber companies, these would be mainly emissions that have been avoided thanks to the substitution in buildings of cement and steel with timber. In order to estimate *Scope 4* (avoided) emissions, substitution factors are used in practice. While the estimation of such substitution factors is complex, Leskinen et al. (2018) show that studies largely estimate positive (climate-friendly) substitution performance.

2.3 INTRODUCTION TO THE REGULATORY ENVIRONMENT

According to a report by the Intergovernmental Panel on Climate Change (IPCC), the climate policy goals of the UN Framework Convention on Climate Change (Paris Agreement) can only be achieved if global greenhouse gas emissions fall immediately, and a net-zero target for the main greenhouse gas CO_2 is achieved by 2050 (IPCC, 2018). According to the United Nations, more than 130 countries have now set their goal of reducing their emissions to zero by 2050 at the latest (UN, 2022b; Carver, 2021; UN, 2020). Of the top ten emitters, responsible for more than two-thirds of global greenhouse gas emissions, only Japan, Canada and the EU have legally binding net-zero commitments. China, being the largest emitter with more than a quarter of global greenhouse gas emissions, has set the goal of achieving carbon neutrality by 2060, although this is not legally binding. The second-largest emitter, the U.S, with around half of China's greenhouse gas emissions, has committed to achieving net-zero emissions by 2050, but, like China, has not set a legally binding target (The United States Department of State, 2021; Carver, 2021).

According to a study by the sustainability rating agency ISS ESG, the EU is also at the forefront of regulating sustainable investments. Since 2020, the European Taxonomy Regulation (EU 2020/852), which defines and classifies environmentally sustainable economic activities, and, since March 2021, the Sustainable Finance Disclosures Regulation (SFDR, EU 2019/2088), which has defined information duties relating to the sustainability of financial products and services, have been in force. Switzerland is at the bottom of the report's index, but is nevertheless mentioned positively in the report because, together with the EU, the USA and seven other countries, it is in the process of developing or already has relevant regulations or guidelines (Stühff, 2022; Sandner & Cherki, 2022). In line with global efforts to limit warming to 1.5 °C, Switzerland has also committed itself to the goal of climate neutrality by 2050 in a political document (so far without legal obligation) (Energy & Climate Intelligence Unit, 2023).

SUSTAINABILITY IN THE SWISS FINANCIAL CENTER

In another respect, Switzerland also wants to live up to its responsibility and is stepping up its efforts: With new guidelines on sustainability in the financial sector, the Swiss Federal Council in mid-2020 set the goal of becoming a leading location for sustainable financial services (Federal Council, 2020), and in particular with its position on the prevention of greenwashing in the financial sector at the end of 2022, the Federal Council is taking the next step (Federal Council, 2022). Accordingly, **financial products** or services will only be considered sustainable in the future if 1) they are aligned with at least one specific sustainability goal or 2) contribute to its achievement. Financial products or services are not considered sustainable if they pursue purely financial goals, such as the reduction of ESG risks. While the environmental protection organization WWF generally considered the Federal Council's approach to sustainability strategy to be correct but still too timid, it welcomed the Council's position on the prevention of greenwashing (WWF, 2022c). In any case, a high degree of credibility is a prerequisite for a financial center to play a leading role in the field of sustainable financial services (Federal Council, 2022).

Figure 5: Sustainability criteria for financial products and services according to the Federal Council, 2022.

In addition, the Federal Office for the Environment (FOEN), in cooperation with the State Secretariat for International Financial Matters (SIF), periodically conducts the climate compatibility test of the Paris Agreement Capital Transition Assessment (PACTA) for Swiss financial institutions to evaluate the climate compatibility of financial flows (PACTA & Wüest Partner, 2022). It analyses the extent to which institutional portfolios with exposure to emission-heavy industrial sectors are aligned with the Paris climate targets. Among the emission-heavy sectors, steel and cement production are considered in the PACTA methodology (PACTA & Wüest Partner, 2022) – timber companies can thus offer investors a more sustainable alternative.

Even though Switzerland produces only a small proportion of global emissions (<0.1%), it could still play an important role in decarbonization through its role as an international economic and financial center. For example, a study by McKinsey in collaboration with economiesuisse and WWF estimates that the country has an impact of 7 to 10 times the domestic emissions, arising from the directly controlled and import-related emissions of international companies based in Switzerland. The emissions related to financial flows from Switzerland would also amount to 14 to 18 times domestic emissions. Therefore, it is important to support Switzerland's efforts to maximize its decarbonization potential (McKinsey & Company, 2022). **Through the climate benefits already discussed, timber can make an important contribution to reducing CO_2 emissions.** The Swiss Federal Council also recognizes that timber used as a building material has great climate potential, although this potential is currently used cautiously (Swiss Parliament, 2021). At the financial product level, timber investments which contribute to the reduction of CO_2 emissions can play a role in sustainable investment products.

Excursus: Other players in the field of sustainability in the Swiss financial center

Public institutions are responsible for defining the framework conditions. Relevant public institutions for the subject of sustainability include the Parliament, the Federal Council and the State Secretariat for International Financial Matters (SIF). In addition, many associations and interest groups are also actively involved in shaping the sustainability of the Swiss financial center. These include, in particular:

- Asset Management Association Switzerland (AMAS): AMAS aims to strengthen the central role of the Swiss asset management industry in the field of sustainable finance and improve the framework conditions for the management of sustainable collective assets. In this context, AMAS has published various position papers, including on the subject of Greenwashing (AMAS, 2022).

- Swiss Bankers Association (SBA): The Swiss Bankers Association has launched various initiatives to make the Swiss financial center an international leader in sustainable finance. The SBA is committed to improving the framework conditions for sustainable financial products, including the new self-regulations (SBA, 2022a and SBA, 2022b).

- Swiss Sustainable Finance (SSF): SSF is the leading Swiss association in the field of sustainable finance with over 200 members and partners, including banks, asset managers, institutional asset holders, service providers, research and education providers and other organizations. Founded in 2014, SSF is based in Zurich and is also present in Geneva and Lugano. The SSF publications range from market studies (e.g., SSF, 2022) and manuals to focus papers (e.g., Affolter et al., 2022).

Excursus: Sustainability in the Liechtenstein financial centre

In Liechtenstein, with its small economy by international standards, the financial sector is an important economic sector. So far, there is no quantitative estimate of greenhouse gas emissions financed by the Liechtenstein financial sector. However, according to an estimate based on data from Switzerland, the financial sector in Liechtenstein finances around 300 times more emissions (mainly abroad) than households and companies cause domestically (Weber, 2021). Based on the climate target of the MSCI index (MSCI ACWI low carbon target), Liechtenstein has the potential to reduce 200 times more financed emissions than are caused domestically on the basis of the assets managed by the banks alone. With the Financial Centre Strategy 2019 (RdFL, 2019), the Liechtenstein government has reaffirmed that sustainable action should be taken. This commitment was further strengthened with the Government Programme 2021-2025 (RdFL, 2021) and the Roadmap 2025 of the Liechtenstein Bankers Association (LBA, 2021). Liechtenstein has also ratified the Paris Agreement. As an EEA member, Liechtenstein has already adopted the EU regulations for a taxonomy and disclosure obligation for climate-friendly finances by means of the EEA Sustainability Implementation Act

Several sustainability assessments of the Liechtenstein financial center have been carried out (CSSP, 2016; UNEP, 2019; PACTA & 2° Investing Initiative, 2021), which recognize its sustainability efforts. Central to this is the participation in the international PACTA initiative coordinated by Switzerland as early as 2020. The results of this first PACTA assessment show that awareness of sustainable financial investments has grown strongly in the last years, but that much more effort is needed, and a large potential remains untapped (PACTA & 2° Investing Initiative, 2021).

2.4. EMBEDDING TIMBER IN THE REAL ESTATE LANDSCAPE

The environmental impact of the construction and real estate sector is high, as this sector is currently responsible for around 40% of global CO_2 emissions and also significantly contributes to the consumption of energy and natural resources (United Nations Environment Program [UNEP], 2022a). According to UNEP (2022a), almost three-quarters of the aforementioned CO_2 emissions are attributable to buildings' operational emissions, with the remaining share attributable to construction.

SUSTAINABILITY ISSUES IN THE CONSTRUCTION AND REAL ESTATE SECTOR

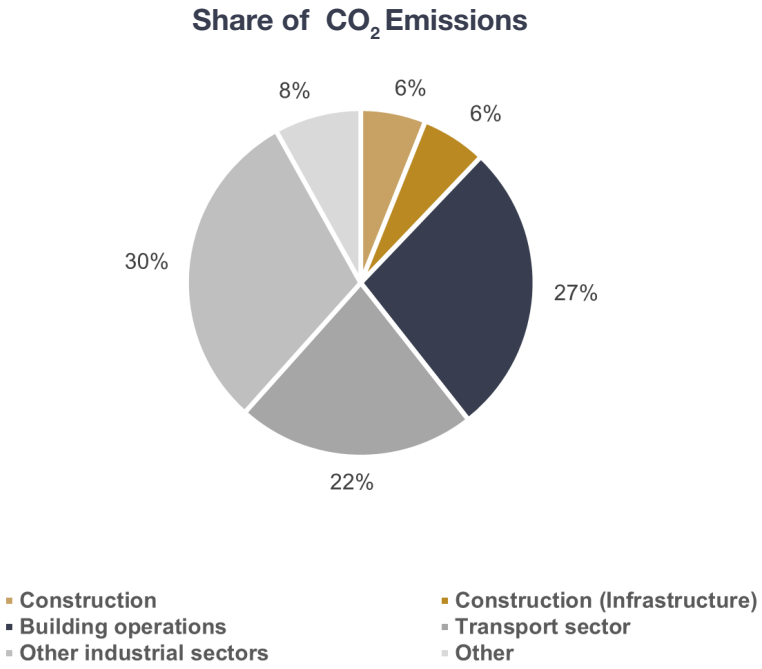


Figure 6: Share of global CO_2 emissions by sector. Adapted from UNEP (2022b).

A particularly serious problem in the construction industry is the high proportion of embodied energy, i.e., the cumulative energy consumption for raw material extraction, production, processing and disposal, including the associated transport, and the resulting emissions from the non-renewable share of energy consumption, called **embodied carbon** (EnergieSchweiz, 2017; Swiss Federal Office of Energy [SFOE], 2014). According to the Swiss Energy Foundation (Energiestiftung, 2023) and SFOE (2014), this is often significantly higher than the operational energy of a building, especially in new minimum-energy or even zero-energy buildings, and should therefore be viewed critically. The exact calculation of embodied energy is often difficult, but in general it can be said that the higher the amount of embodied energy, the higher the environmental impact. It is estimated that embodied energy accounts for almost half of the total energy consumption over the entire life cycle of a building (in Switzerland) and is therefore a significant factor to consider (Moneta, 2022).

The waste associated with construction activities is also problematic. In Switzerland, the construction sector is responsible for more than 80% of the total waste (Swiss Prime Site, 2020). Although there is an increasing focus on recycling, circular economy principles and cradle-to-cradle principles, there is still a lot of room for improvement. According to the Swiss Contractors' Association (Schweizerischer Baumeisterverband, 2022), although around 75% of construction waste is currently recycled, this still results in 18.5 million tons of non-recyclable waste per year. In this context, it should be noted that the use of recycled concrete is also associated with high CO_2 emissions due to the additional cement consumption (Baublatt, 2018).[4] In recycled steel, only the primary production is replaced, the CO_2-intensive melting process remains.[5] Timber can therefore also be advantageous in the recycling phase when compared to existing alternatives such as steel and concrete.

TIMBER CONSTRUCTION AS A SUSTAINABLE ALTERNATIVE

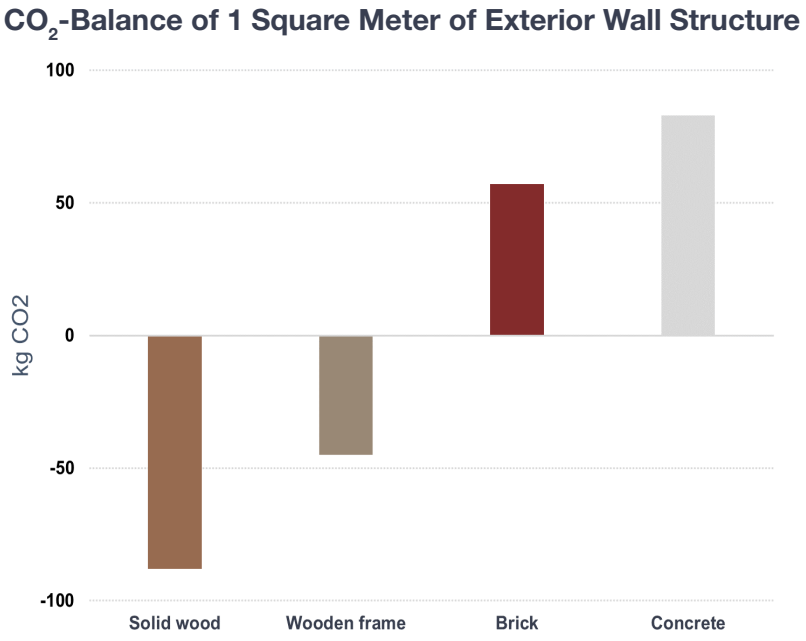
Timber can, for example, act as a substitute for concrete or steel. With new products, such as cross-laminated timber (CLT), large surfaces can now also be produced with timber. For the first time, timber ceilings elements can be joined together without the need of a beam, according to the motto "think in concrete, but build in timber" (see, for example, Timbatec, 2020a or Pfeifer, 2023). Also worth mentioning is the company Fagus Suisse SA, which manufactures high strength timber columns made of Swiss hardwood with structural characteristics close to those of steel. The columns are used for the construction of high-rise buildings up to 100 meters high and require no structural support from steel and concrete – for example the Zwhatt site in Regensdorf ZH (Boltshauser, 2023; Swiss Wood Review, 2022). A study also shows that around 106 gigatons of CO_2 could be saved by 2100 if new buildings were to focus on timber construction methods (Mishra et al., 2022). For this to happen, the areas commercially forested and timber harvest rates would have to increase, but according to the study, this is possible (although in Switzerland the available area is a limiting factor, see above). Globally, it is estimated that an increased use of timber in buildings would be accompanied by an increase in harvest of 2-4% depending on the region (Pasternak et al., 2021). As an alternative to increasing the forest area, optimized and climate-oriented forestry practices (Climate Smart Forestry) are possible solutions. By improving the management of ageing forests in Western countries, and especially in Switzerland, a doubling of growth rates could be achieved. With higher timber prices, wood from difficult locations could also be made available for further processing (Flückiger, 2023). Comparing the CO_2 balance of different building materials for the production of one square meter of exterior wall structure, the pattern shown in Figure 7 emerges (pro:Holz Austria, 2022).[6]

[4] On the positive side, the short transportation distances should be highlighted, which at least partially compensate for this disadvantage (Baublatt, 2018).

[5] See Helmus and Randel (2014) for details on recycled steel. In addition to recycling, steel can also be reused..

[6] The source states the following about the calculation details: "1 square meter of exterior wall construction in solid wood provides net savings (CO_2-binding in the wood minus CO_2 emissions in the manufacturing phase) approximately equivalent to the same amount of CO_2, which a comparable wall structure made of concrete would cause instead» (pro:Holz Austria, 2022).

Figure 7: CO_2 balance of one square meter of exterior wall structure (own illustration, data pro:Holz Austria, 2022).



Furthermore, timber is also attractive due to its CO_2 storage function, since trees, as described above, bind carbon by photosynthesis and thus remove carbon dioxide from the atmosphere and store it. When durable wood products such as columns, beams or ceilings are produced, the CO_2 remains stored in the wood and in the best case, withdraw CO_2 from the natural cycle for centuries (Lignum, 2023). One example is the “Krokodil” house in Winterthur’s Lokstadt, which is intended to remove and store almost 6’500 tons of CO_2 from the environment (Timbatec, 2020b). However, it must be noted that in the event the timber is not reclaimed, the stored CO_2 is released again if the timber construction elements are incinerated at the end of the building’s life.

A simple alternative to the incineration of waste wood, is the pyrolysis of wood. Initial findings from a study by the ETH Zurich (Pittau et al., 2022) show that through innovative processes such as pyrolysis, about 40% of the carbon remains stored in the residual product and can be permanently mixed and stored elsewhere as an inert material. This would mean a **net negative greenhouse gas potential for timber construction.**

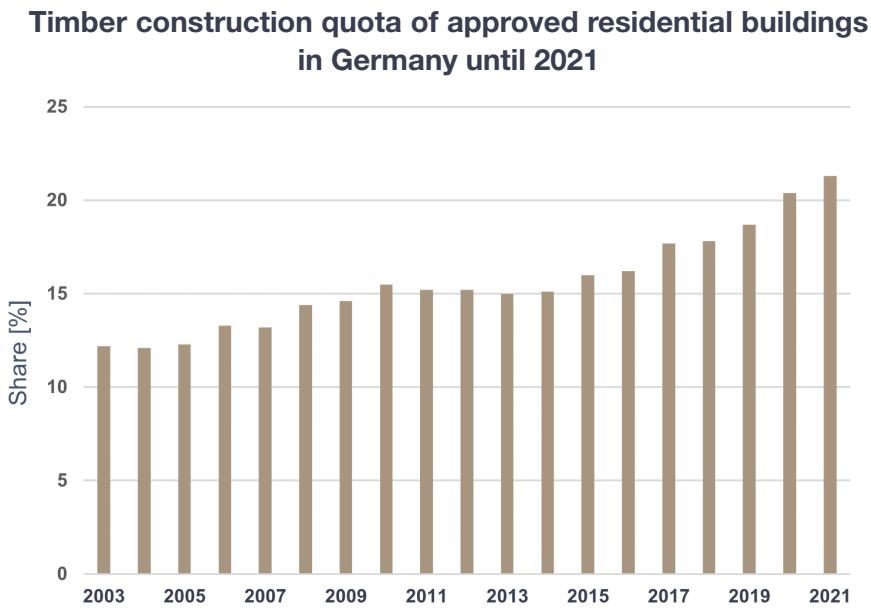
Despite these promising aspects, it should not be forgotten that factors such as the degree of processing and the origin of raw materials also play a decisive role in timber construction and can have a negative impact on its climate impact, which is why transparency is particularly important.

Overview of timber buildings in practice

The timber construction movement is gaining momentum and projects are being realized in Switzerland and abroad. In Winterthur's Lokstadt, for example, the world's tallest timber skyscraper, the 100-metre-high "Rocket", is currently being built (Lokstadt, 2023). This should be ready for occupancy in 2026. The Zurich Airport is planning a new airport dock to be built in the next ten years with timber and will contribute to reducing the airport's CO_2 emissions (Zurich Airport, 2022). UBS is also planning a new timber office tower in Zurich-Altstetten, which will host around 2,700 workplaces (Lignum, 2022). Internationally, the situation is similar: Examples are the "Roots" in Hamburg/Germany, the "HoHo" in Vienna/Austria, the "Mjøstårnet" in Brumunddal/Norway or the "Dutch Mountains" in Eindhoven/Netherlands. A spectacular project is also currently being designed in Tokyo, Japan – to be built by 2041, the "Plyscraper W350" should reach a total of 70 floors with a planned height of 350 meters (Wohnglück, 2019).

Thanks to the many positive attributes of timber construction, it is not surprising that the timber construction rate in Switzerland has already reached a considerable level and is currently around 15% (Kind et al., 2022). However, as the previous sections illustrate, there is untapped potential both on the resource side (timber supply) and on the construction side (timber construction quota). Figure 8 uses Germany as an example from 2003 to 2021 to show the increase in the timber construction rate for approved residential buildings (all segments of residential buildings).

Figure 8: Proportion (%) of approved residential buildings in timber construction in all approved residential buildings in Germany from 2003 to 2021 (own presentation, data Statista; Timber construction Germany, 2021).

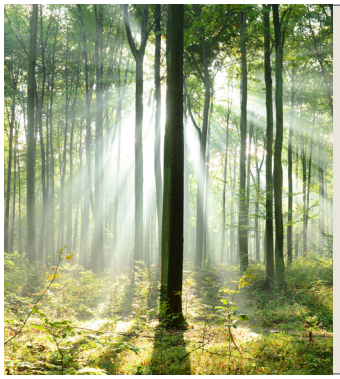


The newest timber construction efforts for the **circular economy** assume that large beams, columns and solid wood ceilings in larger urban buildings will no longer be destroyed and burned at the end of the building's life, but will be dismantled and reinstalled in other buildings. This is also an ecological potential of timber construction, thanks to the fact that it is not poured like concrete: structures can be dismantled thanks to modern connection technology. For this reason, we are now seeing the first timber manufacturers offering take-back guarantees on selected timber elements at the minimum price level of the bioenergy generation potential. Furthermore, it can be assumed that in 20 years all major thermal incinerators will be equipped with CO_2 capture capabilities (Klimaforum Bau, 2021; Cobbler and Vulture, 2021; kva Linth 2021; Geoengineering Monitor, 2021), which would significantly reduce emissions from waste wood incineration.

3. REAL ECONOMY

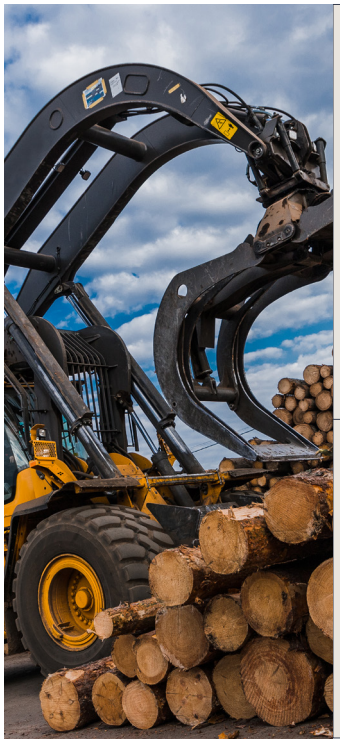
3.1 VALUE CHAIN

The focus of this chapter is on timber construction. As already analyzed, timber construction offers a long-term storage solution that is more sustainable than using wood for short-lived products such as paper or bioenergy. The timber construction ("forest-to-frame") value chain goes from wood in forests over the processing stage in sawmills and finally to the installation of load-bearing structures in buildings. This value chain enables the sequestration of CO_2 from the atmosphere through natural processes in forests and through industrial processes to durably store the same CO_2 in buildings. Companies in the timber industry can be classified according to different stages of the value chain; Figure 9 shows the estimated value added along the supply chain.



Forest

Since the 1980s, forest investments have been understood as direct investments in timberlands (Chudy & Cubbage, 2020). The monetization of the forest occurs through the sale of timber (see also forestry companies). The primary products from the forest are divided into high-quality roundwood or logs (structural timber, furniture, etc.); inferior assortments of industrial timber (Oriented Strandboard [OSB], fiber); logging residues, etc. for wood chips and pellets to produce bioenergy, for biochar production or for the extraction of lignin used in biopolymers.



Forestry Companies

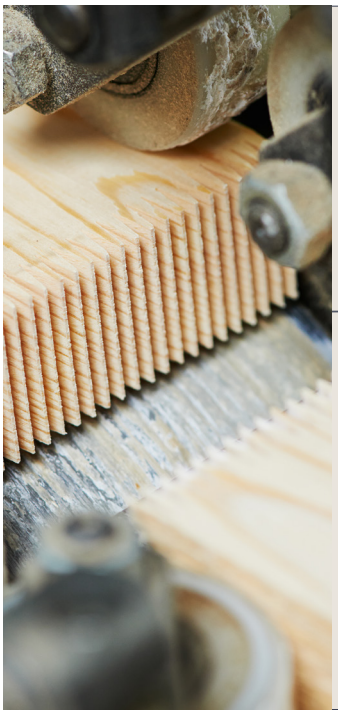
Forestry companies own, manage or market forests on behalf of third parties. Forests in industrialized countries are managed (where permitted) with an economic orientation (commercial forestry) in order to optimize the production of forest products. Sustainable forest management is an important factor in ensuring the long-term storage potential of forests or the optimization of the temporary storage potential.

Examples: Among the largest private forest owners and managers are companies such as the Finnish "Stora Enso" and the American company "Weyerhaeuser". In Switzerland, an example is "Zürichholz AG".

Forestry Equipment Manufacturers

The timber harvests are carried out with specialized forestry machines and by trained professionals. Harvesters are used to cut down trees and forwarders are used to transport logs for further processing.

Examples: Companies such as the Japanese company "Komatsu" and the American company "John Deere" are leaders in the manufacturing of forestry machines.



Sawmills

Sawmills process harvested logs by cutting or peeling them to create geometric, regular shapes. At this stage we are no longer talking generically about timber, but about lumber.

Examples: Listed companies such as the Finnish "Stora Enso" and the Canadian "Canfor"; unlisted companies include the Swiss "Schilliger Holz" and the Austrian "Binderholz". Often, sawmills are vertically integrated and also own or lease timberland assets.

Engineered Wood Products

Engineered wood products are value-added products made from statically inhomogeneous timber raw material (sawn timber, wood chips and veneers) and are assembled and glued together to form large, high strength and standardized elements such as beams and columns (APA, 2012). Examples of structural engineered wood products are cross-laminated timber (CLT) and glue-laminated timber (glulam or GLT). These (and others) are used for structural timber engineering.

Examples: Listed companies such as the Canadian "Mercer International"; unlisted companies are, for example, the Swiss "Schilliger Holz", the "neue Holzbau AG" and, in the field of hardwood, "Fagus Suisse SA".

Marketing

Timber products are either sold directly from the manufacturer to the end customer (construction company) or distributed through wholesale distribution channels. Direct sales usually involve bespoke manufacturing (Muszynski et al., 2022). Distribution in the wholesale sector is limited to more standardized products and those products that can be adapted to specific customer needs to a limited extent.

Examples: The listed companies "Builders FirstSource" and "Doman Building Materials", which operate in NorthAmerica and distribute timber products. The company «Boise Cascade» distributes and manufactures itself. In Europe, wholesalers include the unlisted company "Kuratle & Jaecker".

Timber Construction

Construction companies can focus on timber construction or combine timber with conventional building materials and methods. Construction companies need to reduce their CO_2 emissions (Temple-West, 2023) and timber construction is one way to achieve this goal. Promising decarbonization solutions for construction companies are modular timber construction, structural timber elements and prefabricated building systems made using industrially manufactured wooden components.
Examples: Construction companies from Switzerland and Europe, such as "Bouygues Construction", "Implenia Holzbau ", "Erne Holzbau" or "CREE".

Real estate

As analyzed in chapter 2.4, buildings whose structures are built with timber act as a long-term carbon storage. Real estate investors, real estate developers, owners and managers have started to integrate timber buildings into their portfolios. Specific real estate funds with a focus on timber real estate have already been launched.[7]

[7] *Already in 2019, the European asset manager ICAMAP launched a low-carbon real estate fund with explicit reference to construction with CLT (Ivanhoé Cambridge, 2019). In 2021, Australia's Cromwell Property Group announced the launch of a European timber real estate fund (IPE, 2021) and Australian developer and property manager Lendlease started a collaboration with Finnish leader Stora Enso with the aim of developing timber construction projects in Milan (Stora Enso, 2021). The demand for such alternative investment products also ultimately leads to demand for structural timber, which can lead to positive effects on the entire value chain.*

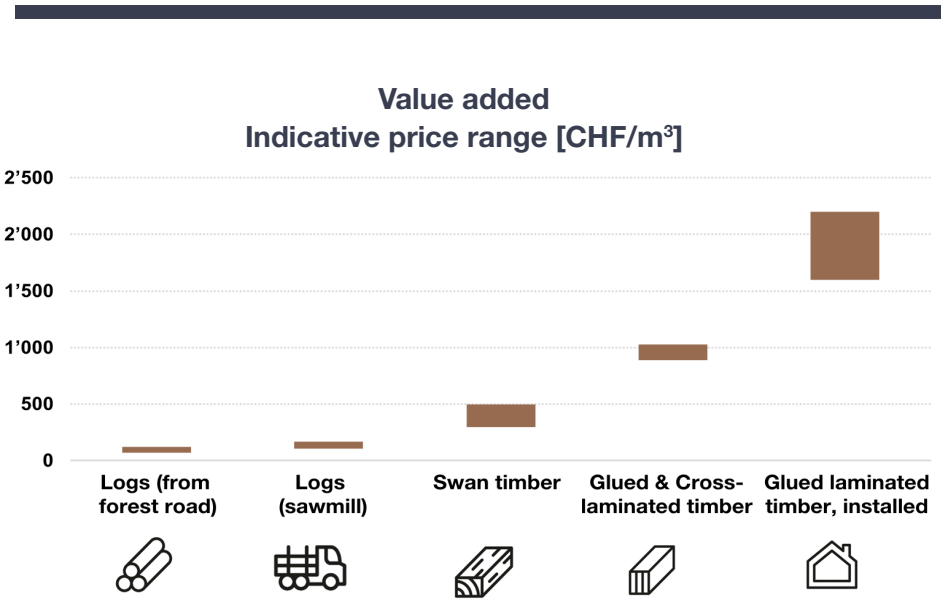


Figure 9: Development and classification of value creation using the example of the Swiss forest and timber industry. Sources: Holzmarkt Ostschweiz (2023), Holzindustrie Schweiz (2023), Balteschwiler (2019), Timbatec (2016), Timber Finance. Illustration by Timber Finance.

3.2 TECHNOLOGICAL PROGRESS

Nowadays, timber construction has a large potential thanks to technological advances in the sector. These enable the construction of structures that could previously only be designed and built with concrete and steel. Switzerland's modern timber engineering market is well positioned, with a timber construction rate of 9% for multi-storey buildings (Kind et al., 2022) – in comparison, Germany is significantly lower at 4.5%, while Austria is the leader at 19%. Traditional solid wood products cut from a single log do not have sufficient structural load bearing capability and technological innovations were required to enable the use of timber in multi-storey construction. For structural reasons, architects need homogenized, i.e. standardized, reliable, glued beams, columns, wall and ceiling elements that can be built with so-called "engineered wood products" such as *cross-laminated timber* (CLT) and *glue-laminated timber (glulam)* (Kuzmanovska et al., 2018). Intensive research around engineered wood products and timber construction continues, among others at the Institute of Structural Engineering of the ETH Zurich, in collaboration with the Bern University of Applied Sciences (Zöllig et al., 2016). In addition to the type of timber used, the connection technology and joinery is also crucial in multi-storey timber construction, since timber, unlike concrete, is not poured into forms but assembled. Switzerland is also innovative in this area, e.g., with the Timber Structures 3.0 (TS3) technology developed since 2020, which enabled timber ceiling elements to be glued together with load-bearing joints, thus creating new possibilities for larger timber structures (Franke & Zöllig, 2020). Fagus Suisse (Lehmann, 2020) industrially produces high strength hardwood products from Swiss mixed forests. These products approach the strength of steel and have the potential to replace steel in some applications. At the beginning of the 20th century, engineered wood products technology evolved from solid wood products to *glue-laminated timber,* consisting in the bonding of wood laminations with durable adhesives. In the 1970s and 1990s, as described by Vlosky et al. (1994) and Falk (2013), further innovations such as *Laminated Veneer Lumber* (LVL) and Cross-Laminated Timber were introduced thanks to improvements in adhesive technologies. These engineered wood products have become the standard in multi-storey timber construction, and are also the market segment with the fastest expected growth, see e.g. *Food & Agriculture Organization (FAO) Global Forest Sector Outlook 2050.*

3.3. ECONOMIC CYCLES AND TIMBER CONSTRUCTION

Global sawn timber production has grown significantly faster than the historical average over the past decade (Figure 10a). In the case of pulp, which is mainly used for the production of paper and packaging materials, the highest growth rates occurred instead in the 1960s until the early 1970s and have steadily declined in the subsequent decades. The global production of wood used for bioenergy has been stable and stagnating. In Europe we have a similar situation (Figure 10b), whereby the production of wood fuel, especially in form of pellets used in incineration facilities, as summarized in the first chapter with advantages and disadvantages from a sustainability perspective, has significantly increased in the last two decades and reached new, historic highs.

Figure 10: Growth rate of wood production (wood fuel, pulp, lumber) on a 10-year rolling basis for (a) world, (b) Europe. Source: FAOSTAT. Calculations and presentation: Timber Finance.

IMPACT OF BUILDING ACTIVITY, MONETARY POLICY AND GEOPOLITICAL FACTORS ON THE TIMBER INDUSTRY

Timber construction is strongly dependent on the construction industry and is therefore cyclical. Historically, timber construction has experienced three major cycles over the past 40 years to 2022, broadly coinciding with the growth and recession phases of the global economy. In Figure 11, the monetary tightening and easing phases are highlighted and we see relatively clearly how the tightening phases – where interest rates are raised by central banks (in this case, the Federal Reserve) – lead to a sharp slowdown in building activity, which recovers in the subsequent easing phase.

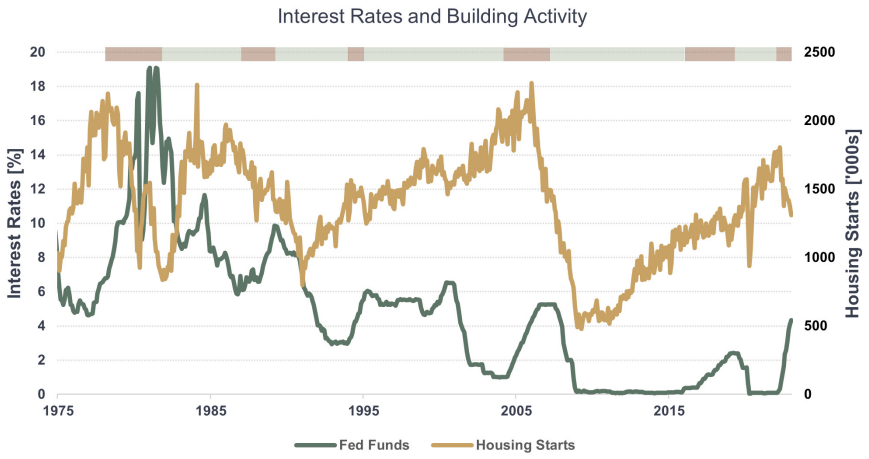
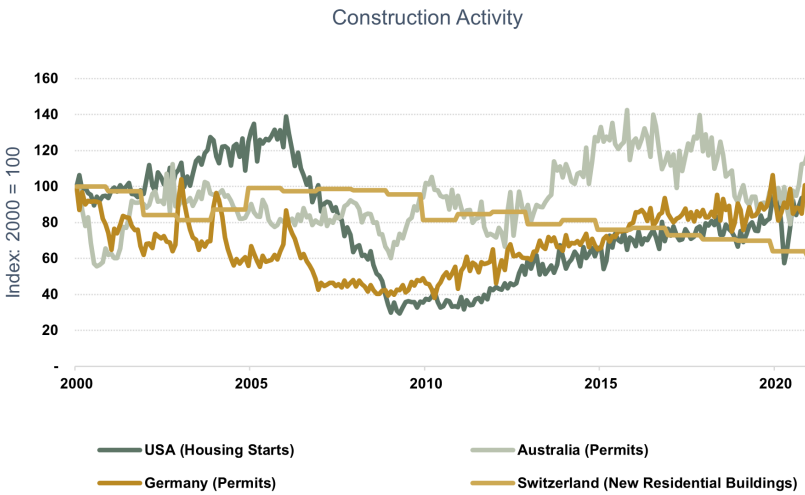


Figure 11: Monetary Policy and Building Activity. Sources: U.S. Census Bureau and U.S. Department of Housing and Urban Development, Board of Governors of the Federal Reserve System (US), retrieved from Federal Reserve Bank of St. Louis. Illustration by Timber Finance.

The U.S. construction market recovered rapidly from the recession in 1981-1982, after aggressive monetary tightening in response to the inflationary 1970s, until reaching its peak in 1987. The economic slowdown led again to a reduction in demand for timber in construction and culminated in another recession in the USA and Europe in 1990 and 1991. In 1992, import duties on timber imports from Canada to the USA were introduced in North America by the US Department of Commerce (Rahman & Devadoss, 2002). These, together with the recovery in construction activity, led to a sharp recovery in the price of timber (Shull & Zager, 1994). The (softwood) lumber dispute between the U.S. and Canada officially started in 1981 with a petition by U.S. lumber producers against the Canadian timber industry. In Europe, demand for timber fell with the recession. Especially when the Soviet Union collapsed in Eastern Europe and Russia (ex-USSR) in 1991, the decline in demand for wood was evident. After the turbulence in the early 1990s, the economy went through a long and stable expansion phase. The recession in 2001 (Internet Bubble) did not have a significant impact on the timber industry. Thereafter, the timber construction industry suffered greatly during the 2007-2009 U.S. subprime mortgage crisis. The crisis, with its global effects, led to an extremely sharp slowdown in construction activity in the U.S. and worldwide.

Figure 12: Construction activity in the USA, Australia, Germany and Switzerland. Sources: U.S. Census Bureau and U.S. Department of Housing and Urban Development, OECD, Federal Statistical Office, by Federal Reserve Bank of St. Louis. Illustration by Timber Finance.



The harvest and production of timber in the U.S. West, one of the most important regions for the industry, fell by more than 40% between 2005 and 2009 (Keegan et al, 2012). The overcapacity of sawn timber production in this region was partly sold on other markets such as Asia and, in particular, China. This also shows the important role of global commodity trading in balancing supply and demand. Compared to the US and Europe, the Swiss construction industry showed a remarkable resilience in construction activity and real estate prices, during the crisis of 2007-2009. From 2011 to 2022, the construction and timber industries were able to recover and enjoyed a prolonged period of growth. As usual with cyclical industrial sectors, cyclical behavior poses a risk, but it also offers great opportunities during recovery and growth phases. The cyclical nature of the construction market will continue to characterize the timber industry. Nevertheless, we are currently and in the coming years confronted with other factors that will have an impact on the construction sector and on the timber industry, in particular the sustainability of building materials and the potential to sequestrate and store CO_2.

3.4 HORIZON 2030: POTENTIAL AND RISKS

If we look 10 years ahead, we see several factors (see below) that speak for the medium to long-term economic potential of the timber industry - in particular the necessary and planned decarbonization of the economy in general and specifically of the construction sector in connection with the GHG emissions of buildings.

DECARBONIZATION OF THE BUILDINGS SECTOR

Mass Timber (i.e., wood products from the engineered wood category, such as the above-mentioned CLT and Glulam) is generally recognized as a high-potential sector (see FAO 2050). Mass Timber already today offers a competitive solution for climate-friendly construction with respect to CO_2 emissions. Construction companies are under pressure to sharply reduce their CO_2 emissions by 2030 in order to meet the Paris climate targets (Temple-West, 2023). **Timber construction** is increasingly being recognized as part of the solution, as demonstrated by leading construction companies integrating timber construction into their climate strategy. Not only the construction of buildings but also their energy consumption plays a major role: CO_2 emissions can be reduced by wood-based products such as insulation materials and biomass (with advantages and disadvantages). While the largest market share for **building insulation** according to Pavel & Blagoeva (2018) is dominated by products such as mineral and glass wool as well as fossil-based products such as EPS, wood-based insulation products are a niche market with potential and all the advantages of the circular economy (Steico, 2022). One example is provided by construction companies such as the French construction giant Bouygues Construction, which have defined explicit goals for timber construction: in this respect, the European construction division of Bouygues, Bouygues Bâtiment France Europe, plans to build 30% of its future construction projects with timber.

MONETIZATION OF CO_2 SEQUESTRATION IN THE FOREST

The CO_2 sequestration of forests can be directly monetized through reforestation and afforestation projects or by combining crops with trees as part of agricultural activities, as well by applying agricultural techniques that enhance CO_2 stored in the soils (European Commission, 2019). In 2021, the European Commission officially defined specific financing programs and CO_2 sequestration targets in its Sustainable Carbon Cycles document (COM 2021 800): Carbon farming is expected to contribute around 42 Mt CO_2-eq by 2030. Companies that manage forests provide sequestration benefits through reforestation and sustainable forest management (Climate-Smart Forestry, Nabuurs et al., 2017).

MONETIZATION OF CO_2 STORAGE IN CONSTRUCTION

Durable wood products act as CO_2 storage technology and facilitate the long-term storage of CO_2 in buildings(Figure 13). The UNFCC Concept Note (2022) identifies three main categories of CO_2 removal activities: (1) biosequestration (mainly through forestry and agriculture), (2) removal through chemical or engineering methods (e.g., direct air capture) and (3) storage: this last category includes, among others, bio-based products and specifically timber in construction.

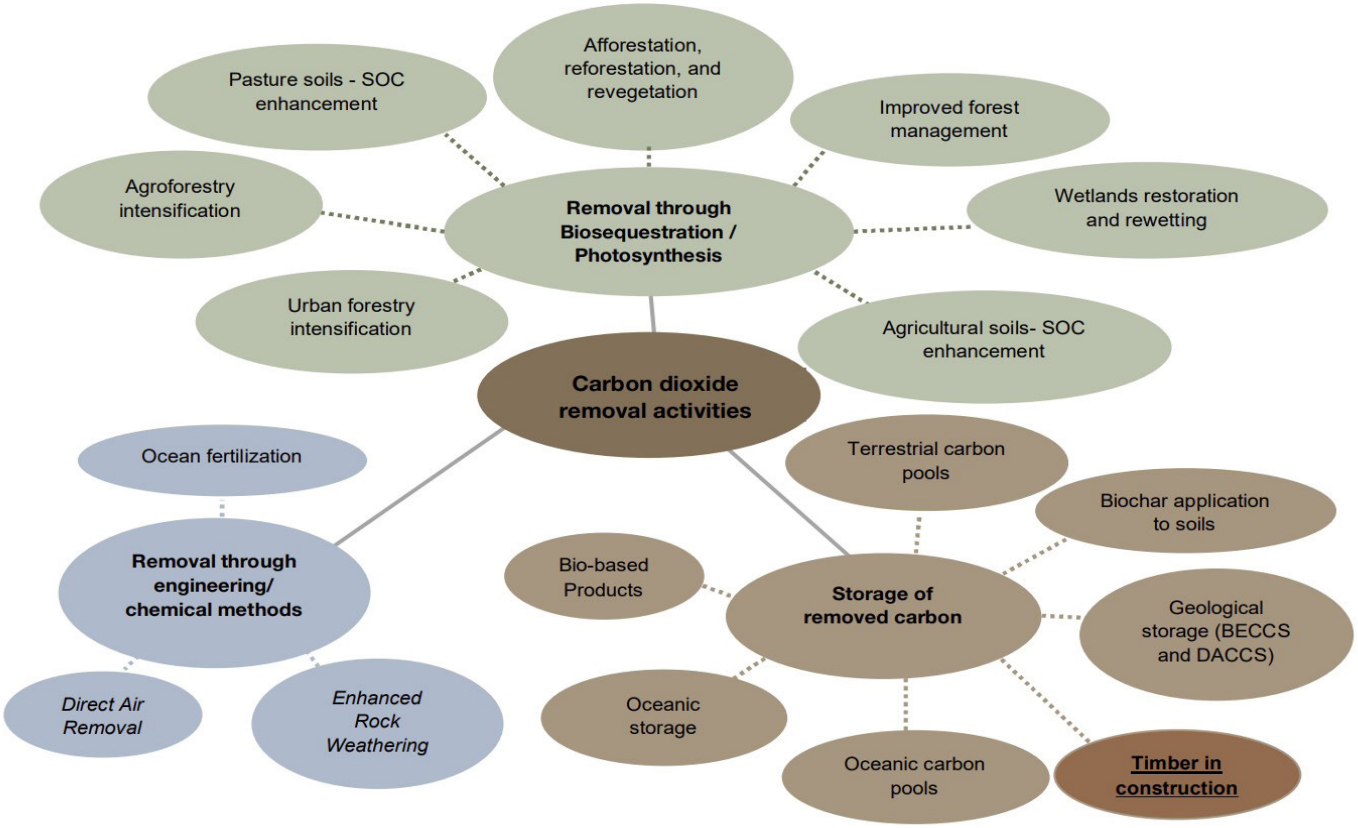


Figure 13: Illustration by Timber Finance based on the UNFCC Concept Note on CO_2 removal activities.

The recognition of durable wood products as an official carbon sink may create the opportunity to monetize carbon stored in buildings through carbon credit markets and create demand for timber construction. So far, on the forest side there have been various CO_2 programs worldwide, such as Natural Climate Solutions from the Verified Carbon Standard (VCS, Verra, 2023). Since 2022, a VCS methodology for CO_2 storage in timber construction has been developed (Green Canopy Node, Timber Finance 2022). This would make it possible to monetize the long-term carbon storage capacity of timber construction, while the forests would only be credited with the sequestration performance, taking into account the risks associated with bark beetle and fire (particularly strong in 2021 – University of California Irvine, 2023). The EU Commission is expected to adopt delegated acts in 2024-2025 for the certification of CO_2 removal and CO_2 storage in wood products (COM (2022) 672). Since 2014, Switzerland has recognized the carbon sink performance of wood products through the program *Crediting the (carbon) sink performance of Swiss wood as a CO_2 compensatory measure* (Klik, 2023). The program monetizes the climate performance of the timber industry via the Foundation for Climate Protection and CO_2 Compensation *(Anrechnung der Senkenleistung von Schweizer Holz als CO_2-Kompensationsmassnahme, Klik, 2023)*, which is financed by legally defined compensation funds from fuel importers (FOEN, 2021c).

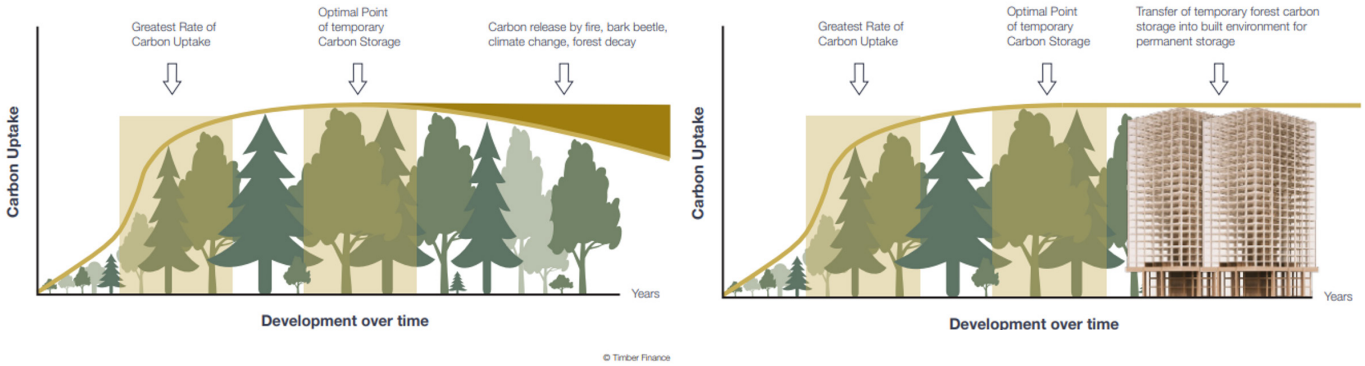


Figure 14: Left: Conventional forest approach, i.e. CO_2 storage in the forest. This temporary storage cannot be guaranteed due to the risk of wildfires, bugs, etc. Right: Timber construction approach, showing the transfer of the sequestration capacity and the temporary CO_2 storage in the forest to the permanent CO_2 storage in multi-storey timber construction. Source: Timber Finance, own illustration.

BIOCHAR AND PYROLYSIS

As mentioned in previous chapters, the combustion of wood as a carbon-neutral energy source should be seen critically, as the CO_2 stored in the wood is immediately emitted during combustion. Other processes – such as pyrolysis – can store CO_2 in the soil for a longer period. Biomass is transformed by pyrolysis into biochar and bioenergy products such as biofuels and synthetic gas. Biochar can act as a long-term carbon sink in soils and increase agricultural productivity, while biofuels and synthetic gas can be burned as an energy source (Woolf et al., 2010). Biochar production has risen sharply since 2019, with production capacity in Europe growing at an annualized rate of 56% (CAGR) over 2019-2022 (ECI, 2023). Puro.earth has already published a methodology for biochar removals in 2019 (Puro.earth, 2023). Verra's methodology was published in 2022 as part of the Verified Carbon Standard (VCS) (Verra, 2022) and includes worldwide biochar projects acquired by leading international companies as part of their CO_2 removal efforts (Microsoft, 2021).

LOCAL VALUE CREATION

The timber industry, from forests to the production of wood and paper products, employs over 33 million people globally, according to the International Labour Organization (ILO, 2022) (together with the FAO and the Thünen Institute). It is estimated that Europe owns 25% of the world's forests, but only 11% of the global timber industry workforce is employed in the European timber sector. In Switzerland, the forest and timber industry employs around 95,000 people according to figures from the Federal Office for the Environment (2021) and generates around 1% of the gross domestic product.

LOW-CARBON STEEL AND CONCRETE

A potential risk to the growth of the modern timber industry is the medium-term development of steel and concrete with lower (but not negative, as in the case of wood thanks to sequestration) CO_2 emissions. In steel production, one can either work with Carbon Capture & Storage (CCS) systems that capture CO_2 or produce steel with renewable electricity respectively green hydrogen (Eurofer Low Carbon Roadmap, 2019). Both will probably lead to an increase in the price of steel in the short to medium term (International Energy Agency, 2022 and Ito, 2021) and make timber more competitive as a building material. In cement production, the levers are similar: CCS can be applied when burning fossil fuels, or alternative energy sources can be used. However, other technological innovations are also currently being developed, from alternative cement binders to 3D printing of concrete, as described by Adesina (2020). In any case, the renewable nature of timber and its ability to sequestrate and store CO_2 remain unique.

REGULATION

Regulation plays an important role through support initiatives (e.g., creating incentives for biogenic and circular building materials) or in the case of restrictions and guidelines. In Switzerland, the Federal Office for the Environment (FOEN) has defined general guidelines for supporting timber construction and wood as a raw material (FOEN, 2021b). In the canton of Zurich, a postulate was submitted in 2021 by the Commission for Economic Affairs and Taxation regarding the use of timber in cantonal buildings. In 2022, a study on the promotion of timber as a building and raw material in the canton of Zurich was published (Odermatt et al., 2022), which defines further necessary steps for the implementation of supporting measures. The revised Federal Law on Public Procurement newly introduced sustainability as an explicit award criterion (Fedlex, 2022).

Denmark (Ministry of Interior and Housing, 2021) has published a detailed strategy for the sustainability of buildings. It includes a maximum value for the CO_2 footprint starting from 2023 and a progressive reduction of the CO_2 limits between 2023 and 2030. In France, a legislative proposal (N. 5166) was presented in 2022 that includes a minimum quota of 50% for the use of biomaterials in the construction of public buildings from 2030. In 2020, France had introduced the so-called *Réglementation Environnementale* (Environmental Regulation), which has been in force since 2022 and requires a detailed measurement of the CO_2 footprint of the buildings and the limits for various building elements (*Ministère de la Transition Écologique et de la Cohésion des Territoires*, 2020). In the UK, the Grenfell case is exemplary for regulatory risks and insurance issues: after the Grenfell Tower fire, in which extruded plastic insulation burned on the façade, combustible materials were banned for construction in buildings over 18m (*UK Government*, 2018).

GROWTH ESTIMATES

According to FAO/UN estimates (Figure 15), the demand for primary wood products, i.e., lumber, veneer, plywood, particle board, fiberboard, and wood pulp will grow ca. 37% between 2020-2050, representing a compound annual growth rate (CAGR) of 1%. The demand for veneer and plywood as well as particle and fiber board for the international timber frame markets should grow faster than average, namely 2.4% and 1.8% per year, respectively. FAO also recognizes the potential of Mass Timber and CLT as a more climate-friendly alternative technology for structurally demanding, multi-storey, urban construction and as a substitute for steel and concrete. The market potential is estimated at 40-120 Mm3 by 2050. This corresponds to approx. 20-70 billion. USD if we take 600 USD/m3 as the average price. The growth rate for timber used in construction is significantly higher than the expected, stagnant growth rate for pulp, which is used for the production of paper and packaging materials.

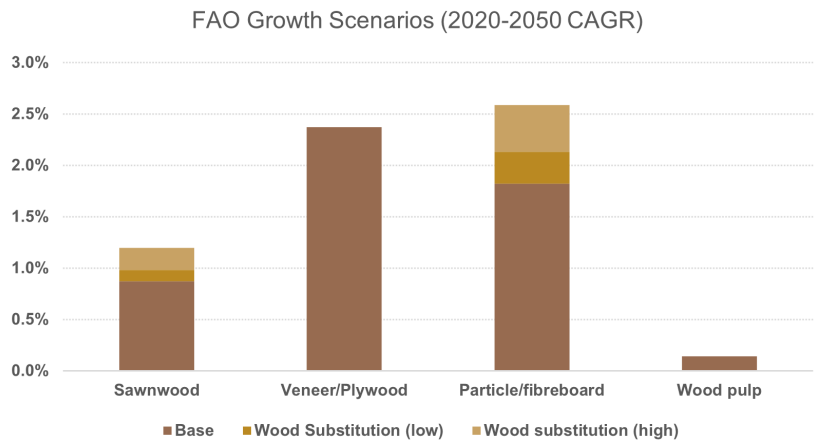


Figure 15: Estimation of the annual growth rates of the different categories of wood products. Source: FAO, calculations by Timber Finance

According to the Swiss Federal Office for the Environment (FOEN, 2021b), less wood is harvested than grows back in Switzerland, especially in private and mountain forests, which represents an untapped potential on the supply side. On the demand side, Savi & Klingler (2022) described different scenarios ("baseline scenario", "timber construction support scenario" and "maximum wood use") for timber construction in Switzerland. In the hypothetical "support scenario", the demand for wood is assumed to double between 2020 and 2030. After 2030, the study expects demand to remain stable. According to Odermatt et al. (2022), this leads to an increase in the harvest of approximately 150%.

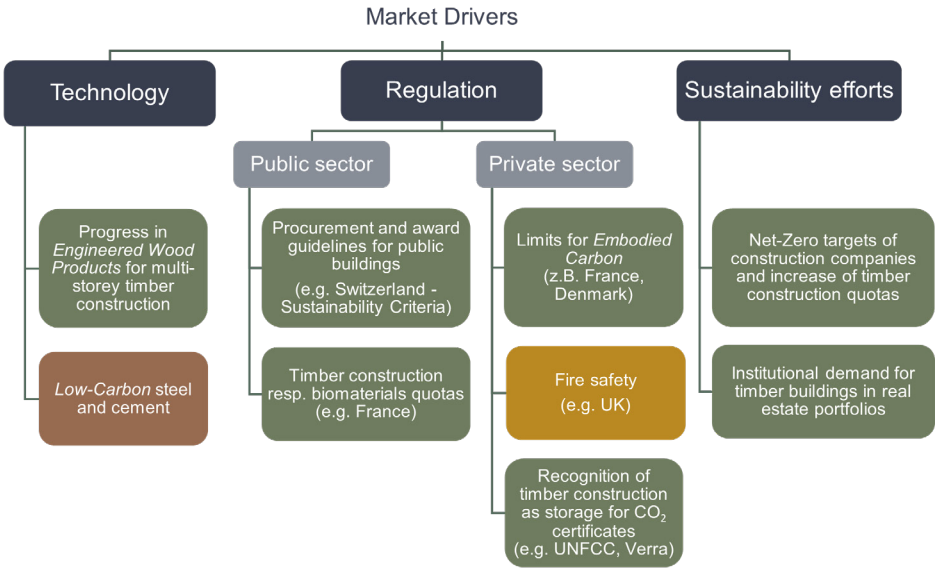


Figure 16: Summary of drivers. Illustration by Timber Finance. Green = potential, red = risk, orange = potential or risk, depending on development.

4. FINANCE

4. Finance

4.1 Timber Investments – Overview of investment products and markets

4.2 Timber Investments – Return and diversification potential

4.3 Long-term investing – Return and risk

4.4 Demand for investment products and investment knowledge

4.1.TIMBER INVESTMENTS – OVERVIEW OF INVESTMENT PRODUCTS AND MARKETS

Investors can get exposure to the timber sector through investments in listed and private market instruments. In private markets, direct investments in timberlands, which were institutionalized as an asset class through Timber Investment Management Organisations (TIMO) in the 1980s (Chudy & Cubbage, 2020), are possible. Investments into alternative funds also exist, which either own timberland (real assets) or invest in timber companies. Alternatively, direct investments can be made into single companies.

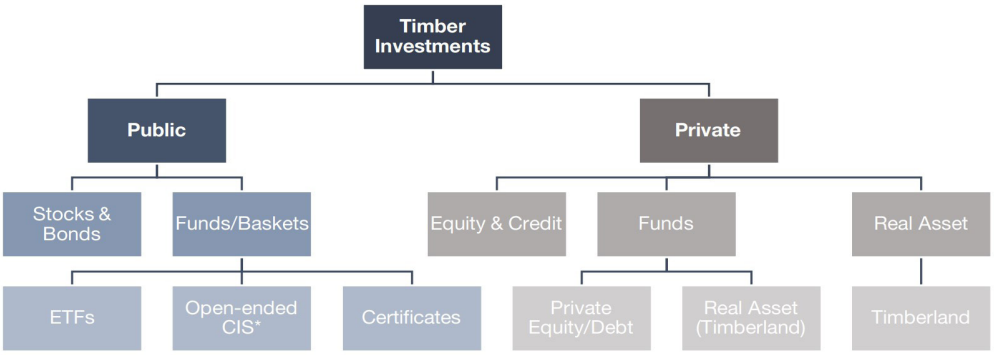


Figure 17: Investment opportunities and categories. Source and presentation: Timber Finance.

** open-ended CIS = open-ended collective investment schemes*

Investment opportunities in the private segment are illiquid and usually require a higher minimum investment amount (also for regulatory reasons) than listed financial products. In the listed segment, investors can buy (and sell) shares or bonds of timber companies directly or invest in funds (such as today's largest timber equity fund - Pictet Timber, according to Bloomberg, Timber Finance, 2023) and certificates that own (respectively track) shares of timber companies. The investment style can be active or, as in the case of exchange-traded funds (ETFs), passive. As shown in Figure 18, publicly traded Timberland REITs have existed in the U.S. since 1999 (Baral & Mei, 2022). These are forest owners structured as REITs and tradable as listed shares. The first was Plum Creek (Baral & Mei, 2022), which was acquired by another publicly traded Timber REIT (Weyerhaeuser) in 2015.

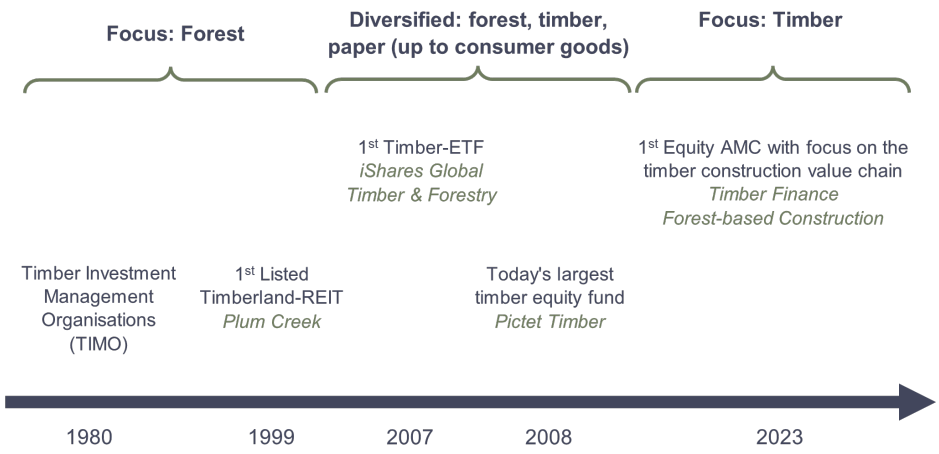


Figure 18: Evolution and character of timber investments. Sources: Baral & Mei, Financial Times; Pictet, Timber Finance. Illustration by Timber Finance.

INDICES

Established index providers own Timber Benchmarks, which cover a wide range of stocks in the timber and paper sectors. S&P Global and MSCI timber indices have been used as the basis for ETFs since 2007 (Financial Times, 2007) (iShares, 2023; Invesco, 2022). In 2022, Timber Finance developed an index focused on the durable wood products value chain and timber in construction, which serves as the basis for a listed investment product. On the unlisted side, the NCREIF Timberland Property Index provides a benchmark for private forests in the U.S. and is updated quarterly with input from market participants (NCREIF, 2023).

LISTED FINANCIAL PRODUCTS AND LIQUID FUNDS

The investable (defined here with a minimum capitalization of USD 50 million) listed global equities within the *Forestry, Paper & Wood Products* sector classification largely include companies that produce pulp and paper (Figure 19).

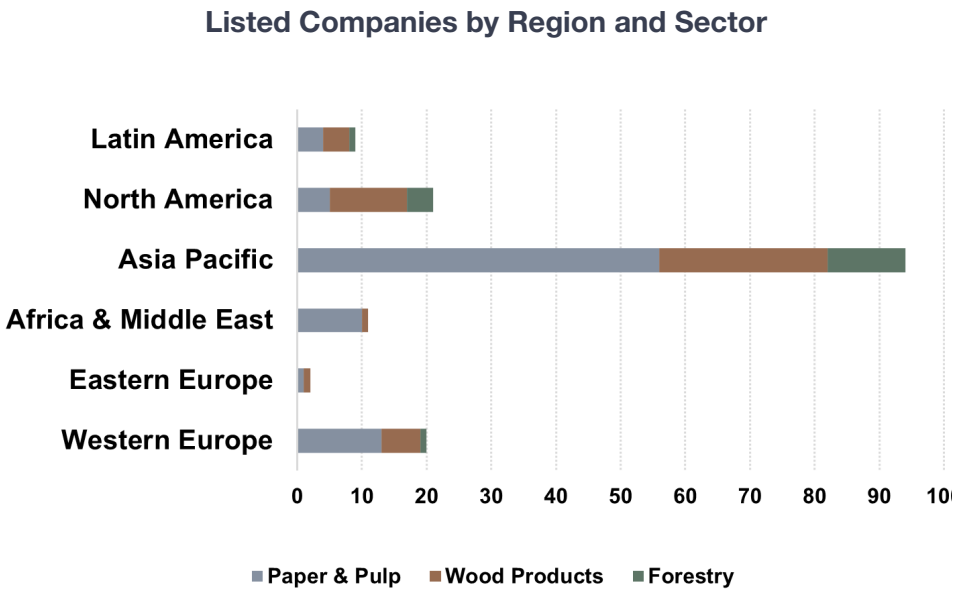


Figure 19: Distribution of listed companies in the forest, timber and paper sectors. Source: Bloomberg. Illustration by Timber Finance.

For structural market and classification reasons, existing liquid, listed and diversified financial products cover the entire range of the combined paper and timber sector, usually with a relatively large exposure to the paper and packaging sector (Figure 20). Investments are made in a rather non-specific and generalist manner in companies in the timber and forestry industry, which, among other things, also produce short-lived products such as cardboard or newsprint paper. The market for liquid timber funds is dominated by Pictet Timber (USD 1,487 million – Pictet, 2023). It is complemented by smaller, passive ETFs such as the iShares Global Timber & Forestry (USD 214 million – iShares, 2023) and Invesco MSCI Global Timber (USD 61 million – Invesco, 2022).

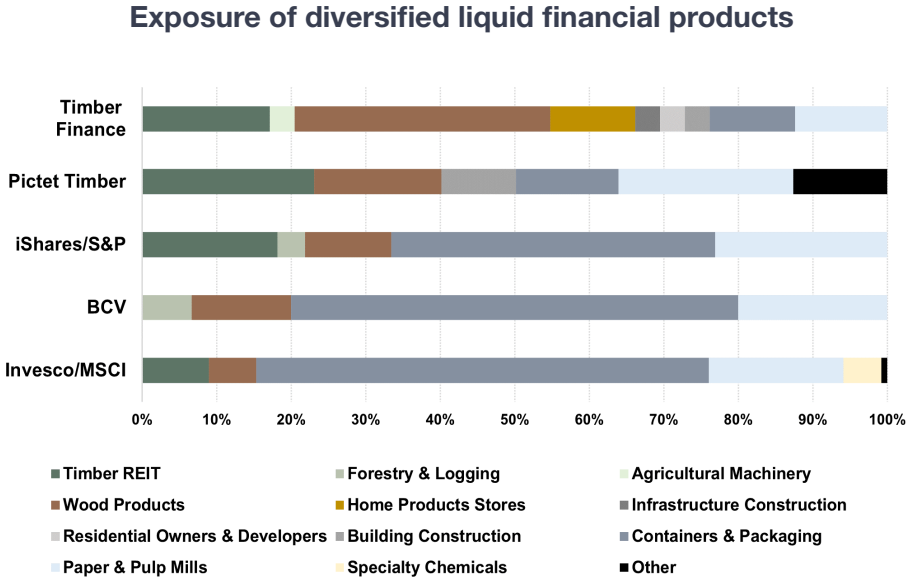


Figure 20: Sector exposure of diversified, liquid financial products to timber stocks. Sources: BlackRock, Invesco, Pictet[8], Timber Finance, BCV, Bloomberg; classified according to focus on durable, CO_2-storing wood products. Illustration by Timber Finance.

ALTERNATIVE PRODUCTS

On the private markets side, there are illiquid investment opportunities in forests through timberland funds, which are generally only available to institutional investors with a long-term investment horizon. They give investors access to the first section of the timber value chain – the forest – and are characterized by lower volatility compared to listed timber REITs, as valuations are usually adjusted on a quarterly or even annual basis, following a professional, external appraisal. One example is Aquila Capital's timber fund, which aims to enable institutional investors to invest in certified forests (Baare, 2022). Currently, there are no investment vehicles that invest specifically in timber companies from the DACH region. However, several leading non-listed timber companies are active in the region, offering opportunities for private equity and private credit investors: In recent years, two private equity investors from the UK and Northern Europe have completed multiple transactions. In 2020, a British (BSW Group, 2020) timber company was acquired and later sold to the Austrian timber company Binderholz (BSW Group, 2021). In 2018two Swedish (Bergkvist-Insjön, 2018 and Siljan Group, 2019) timber companies were acquired, merged, and subsequently sold to the Austrian company Mayr-Melnhof Holz (Bergkvist Siljan, 2022). Consolidation potential and investment requirements for growth are realistic fundamental drivers for an investment strategy in the non-listed sector.

[8] Pictet Timber's sector exposures have been estimated based on Pictet's own classifications and where not univocally comparable to the Blooomberg Industry Classification System (BICS) classifications, were classified under Other.

4.2. TIMBER INVESTMENTS – RETURN AND DIVERSIFICATION POTENTIAL

Timber is increasingly becoming a popular investment theme. Baral and Mai (2022) currently estimate the market value of commercially operated forest land at approximately USD 460 billion. The low correlation with other asset classes is seen as advantageous, for example.

DIVERSIFICATION POTENTIAL OF TIMBER INVESTMENTS

Sun and Zhang (2001) examine the sensitivity of the returns of the NCREIF Timberland Index (National Council of Real Estate Investment Fiduciaries) compared to those of the S&P 500 using the Capital Asset Pricing Model (CAPM). The results show that the sensitivity (beta) is comparatively low. Clascio and Clutter (2008) come to a similar conclusion in another study. In addition, cointegration analyses by La and Mei (2015) also show that there are no general trends between historical Timber REIT prices and the S&P 500 index. Therefore, the authors of the study conclude that Timber REITs offer long-term diversification opportunities.

This conclusion is also supported in principle by Restrepo et al. (2020). This study also finds that the correlations between timber investments and other assets are low. By using different techniques for portfolio optimization, the study establishes that timber investments can in many cases help to make multi-asset portfolios more efficient, depending on the optimization technique and the period under consideration. However, the study also identified some challenges. For example, it has also been found that the correlations, as usual, are time-varying. This means that the optimal portfolio weights of timber investments can change over time. It should also be mentioned that timber investments offer some protection against inflation (Nuveen, 2022). Samitas et al. (2022) also speak of positive hedging properties of timber investments.[9]

[9] *The study shows that «timber and, especially, water, display a more neutral pattern through the transmission mechanism with respect to the other sample markets, connoting potential opportunities for investment portfolio diversification» (Samitas et al., 2022)*

4.3. LONG-TERM INVESTING – RETURN AND RISK

Over the past twenty years, timber investments have been able to generate robust returns (Figure 21). Historically, listed timber investment vehicles have not been focused on timber construction, but rather on the paper and packaging sector. The S&P Timber & Forestry Net Total Return Index, which consists of listed companies from developed and emerging countries, has generated an annual return of over 6% per annum. The NCREIF Timberland Index, which tracks the total return of pure, institutional timberland investments in the U.S., has generated an annual return of 7% per annum. Launched in February 2022, the Timber Finance Carbon Capture & Storage Index, which focuses on the timber construction value chain, delivered a theoretical 5-year return of over 8% per year, taking into account the backtested performance since 2016, which is significantly higher than the industry-standard timber benchmarks. While such backtested performance can be influenced by hindsight bias in index construction, it shows the potential for differentiation within the sector.[10]

The timber sector has historically been more volatile than global equity markets, which can be explained by (and correlated with) reduced internal diversification and the strong cyclical nature of the sector.

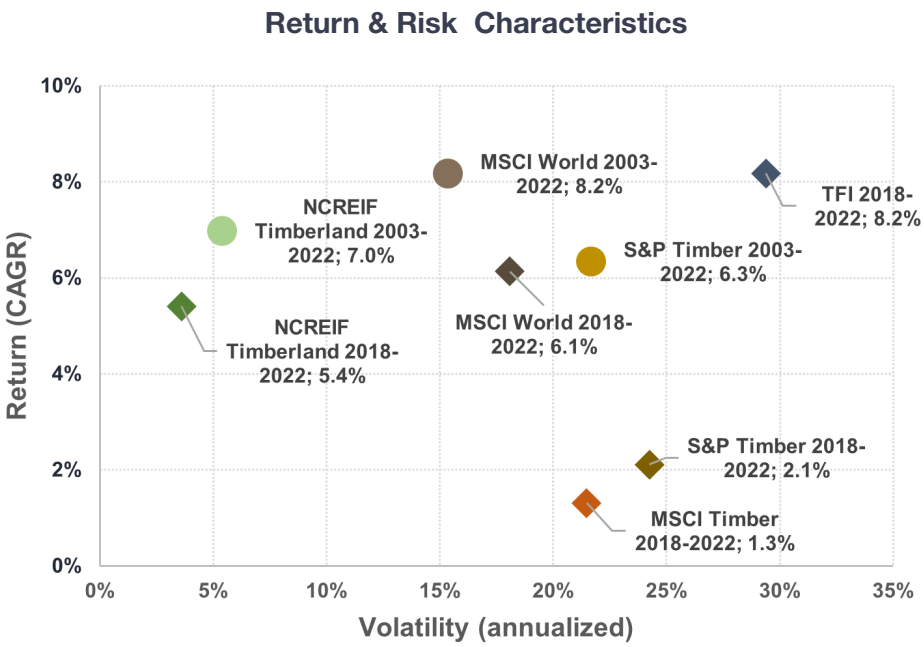


Figure 21: Return and volatility of timber indices.

MSCI Timber = MSCI ACWI IMI Timber Select Capped Index.

S&P Timber = S&P Global Timber & Forestry Index.

TFI Index = Timber Finance Carbon Capture & Storage Index.

NCREIF Timberland = NCREIF Timberland Index. Sources: Bloomberg. Calculations: Timber Finance.

The low volatility of the NCREIF Timberland Index is typical of unlisted, private markets[11] and the index is only representative for institutional forest investments. Based on its performance, the average return of (institutional and non-institutional) general timberland investments can be overestimated, but at the same time the index shows what type of returns can be achieved from professionally managed forest investments in industrialized countries such as the USA.

[10] The Timber Finance Carbon Capture & Storage Index was launched on 22/02/2022 (inception date). The performance before the launch date is hypothetical, based on back-testing by the calculation agent Solactive, based on the index methodology applicable on the date of inception. The performance calculated through back-testing reflects the application of an index methodology and the selection of the index constituents with a hindsight advantage and with the knowledge of factors that may have had a positive impact on the performance of the index and in some cases Survivorship/Look-Ahead/Hindsight Bias (distortion). Nevertheless, the back-testing shows that it is possible to strongly differentiate within the sector.

[11] The low volatility in these cases can be partially explained by a delayed update of appraisals due to Stale Pricing and Managed Pricing (Lahr, 2010)

4.4. NEED FOR INVESTMENT PRODUCTS AND INVESTMENT KNOWLEDGE

The current market seems to be geared towards investors who want to diversify their portfolio or make it somewhat more sustainable with timber investments (see chapter 4.2). This is because most timber funds include companies that are active in wood processing and also produce short-lived products. As a result, the CO_2 storage function of timber in particular is neglected in many cases (see previous discussion).

Investors looking to invest (exclusively) in durable wood products precisely for the long-term storage capabilities and substitution effects of timber construction, are confronted with very limited investment opportunities, since such specific products hardly exist at the moment.

It can also be challenging for interested investors to obtain information, partly because some fundamental aspects have not yet been sufficiently researched (see, e.g., Chudy & Cubbage, 2020; Chudy et al., 2020; Beljan et al., 2022). For example, with regard to timber investments, there are significant knowledge gaps in ESG criteria, excess returns or systematic risk (Chudy & Cubbage, 2020), which creates potential for further research in this area.

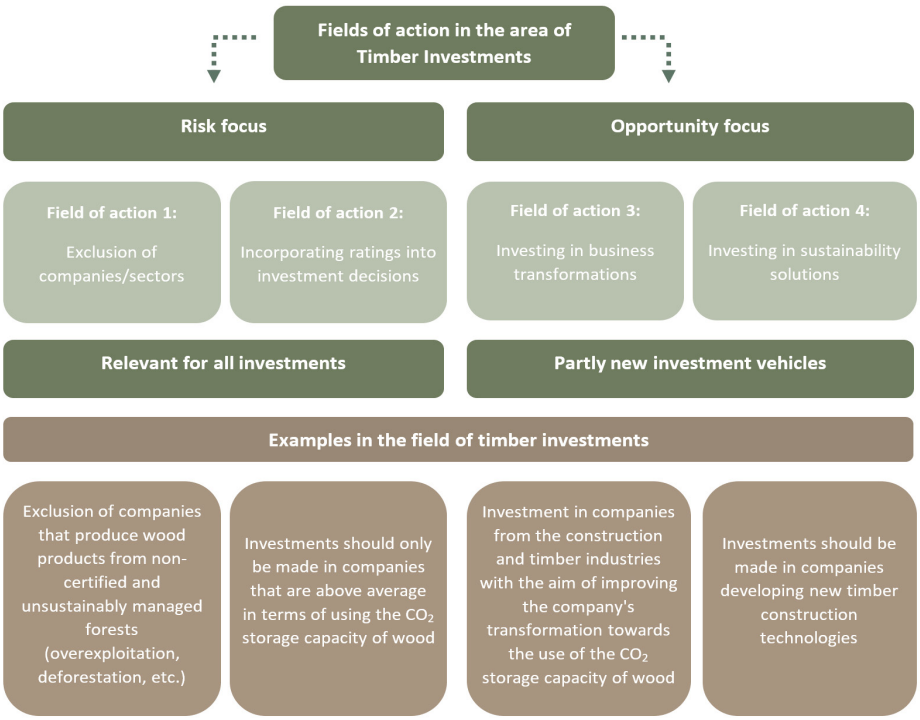


Figure 22: Fields of action in the area of timber investments; Illustration by ZHAW based on Affolter et al. (2022).

Innovative and, above all, transparent investment opportunities are therefore needed for investors whose focus is on the storage or substitution capabilities of timber, and thus on sustainability. This view is also shared by some forestry experts with expertise in the financial sector (Begemann et al., 2023).

Figure 23 provides a summary of the investment and sustainability characteristics of different timber investment categories, taking into account, as mentioned, a significant gap represented by the lack of products in the areas of private equity and private credit with a focus on the timber industry.

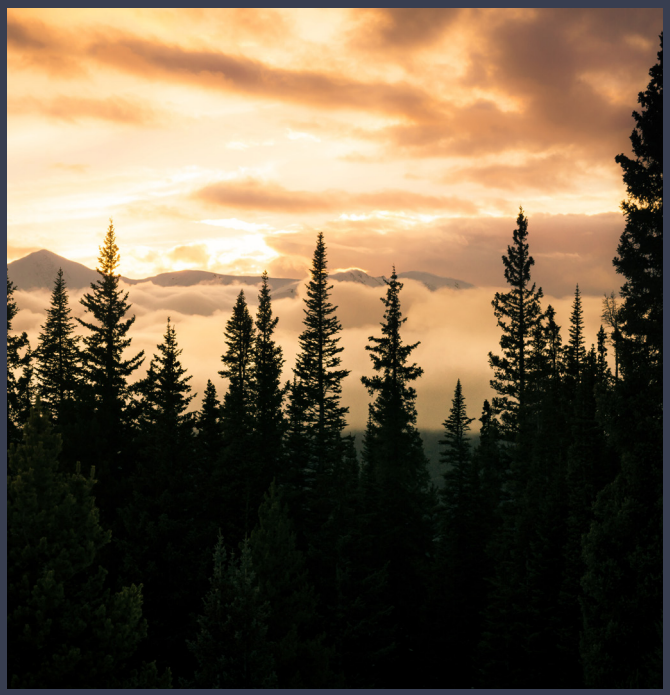
Figure 23: Selected characteristics of different timber investment categories. Illustration by Timber Finance. Sources: Bloomberg (liquidity, volatility) and Timber Finance calculations.

From a theoretical perspective, the strategies proposed above for avoiding risks or exploiting opportunities associated with the storage capabilities of timber (based on Affolter et al., 2022) can be proposed. In some cases, however, their implementation is difficult in practice, as it is difficult to identify companies from the timber or construction industry that manufacture products related to the storage potential of timber, and requires expert knowledge.

Exclusions as described in field of action 1 can be achieved, for example, by excluding timber investments that are not certified for sustainable forest management by independent third parties (e.g., through the *Sustainable Forestry Initiative or the Forest Stewardship Council*).[12] In order to execute the strategy in field of action 2, investments could be made in the future, for example, in an index product based on the Timber Finance Carbon Capture & Storage Index. The Swiss company Timber Finance launched an equity index in 2022 and a liquid investment product in 2023 with a greater focus on the long-term storage function of timber (Timber Finance Carbon Capture & Storage Index). For fields of action 3 and 4, private equity investments in companies in the timber industry are currently most suitable, but they require significant effort in order to collect non-public information.

	Long-term CO_2 storage capacity in wood products	Forest sequestration and storage capacity	Substitution effects	Liquidity	Volatility
Listed Timberland REITs	**Low**	**High**	*Not applicable*	**High**	**High**
Other Timber Stocks	Focus on *timber construction*: **High**	Focus on *Integrated Forest Owners*: **High**	Focus on *timber construction*: **High**	*Microcaps*: **Deep**	**High**
	Focus on *Paper & Packaging*: **Low**	Other: **Deep**	Focus on *Paper & Packaging*: **Low to High**	*Other*: **Medium to High**	
Timber Equity Funds	*Wide Spectrum*: **Low**	**Low to Medium**	Wide Spectrum: **Low to high**	**Medium to high**	**Medium to high**
	Orientation towards *timber building products*: **Medium to High**		Orientation towards *timber building products*: **Medium to High**		
Timberland Funds	**Low**	**High**	*Not applicable*	**Low**	**Low**
Private Equity / Private Credit	Focus *on Paper & Packaging*: **Low**	**Low**	Focus on *Paper & Packaging*: **Low to High**	**Low**	**Low**
	Focus on *timber building products*: **High**		Focus on *timber building products*: **High**		

[12] *Further information e.g. at: https://www.reit.com/timberland-reits-standing-tall.*



5. CLOSING REMARKS

5. CLOSING REMARKS

Investment opportunities in the timber value chain are heterogeneous. They range from alternative investments with a focus on timberland to listed companies with diversified activities in the timber sector and have very different risk and return profiles. Timber's ability to durably store CO_2 in buildings, while trees regrow and sequestrate CO_2, provides an important environmental benefit that stands out from short-term carbon storage options, such as paper products. Technological developments, which today make it possible to build multi-storey buildings with timber, provide growth potential for timber companies and create investment opportunities. Simultaneously, durable wood products can replace materials in the construction sector with a worse environmental footprint, such as cement or steel. Due to the return potential of timber investments and the natural climate benefits of wood, investments in the timber value chain can be a promising option for sustainability-focused investors. Sustainable use of timber as a raw material, and the economic potentials described above, make timber an important tool for achieving the global net-zero goals.

This white paper has created a basis for systematic, climate-relevant and sustainable investment in timber. Further work and investigations will follow.

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SHAPING THE CARBON SINK BUILT ENVIRONMENT

Founded in 2021, the Timber Finance Initiative is a financial intermediary and centre of excellence for timber investments. We promote sustainable investment opportunities in the forest and timber industry through the development of new financial products, carbon credits, white papers and advisory services with the aim of bridging the gap between investors and the timber industry. The Timber Finance Initiative is supported by Built By Nature as a funding partner and the Migros Pioneer Fund as an innovation partner.

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The Zurich University of Applied Sciences (ZHAW) is one of the leading universities of applied sciences in Switzerland. By combining research, teaching and practice, it makes an active contribution to solving societal challenges. The Department of Banking, Finance, Insurance of the School of Management and Law (SML) deals with the topics of sustainable real estate, sustainable financing and sustainable investments in teaching, research and further education. In addition to its own training products and in-house training for banks, the focus is particularly on application-oriented research and innovation projects. The SML is represented in renowned rankings of the business newspaper “Financial Times” and meets the high standards of the Association to Advance Collegiate Schools of Business (AACSB). The SML also maintains numerous cooperations with over 190 selected partner universities worldwide.

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The Liechtenstein Bankers Association (LBA) was established in 1969 and is the domestic and international voice of the banks operating in and out of Liechtenstein. As a member of the European Banking Federation (EBF), the European Payments Council (EPC) and the European Parliamentary Financial Services Forum (EPFSF), the LBA is an important member of key committees at European level. Since 2017, the LBA has also been a member of the Public Affairs Council (PAC) with offices in Washington and Brussels and since 2018 a member of the international network “Financial Centres for Sustainability” (FC4S). With the Roadmap 2025, the LBA has placed an even stronger strategic focus on the two topics of “sustainability” and “digitalisation”. As a result, in 2021, the LBA joined the two initiatives, each a leader in its field – the Net-Zero Banking Alliance (NZBA) and the Canada-based Blockchain Research Institute (BRI), an independent, global think tank in the field of blockchain technology.

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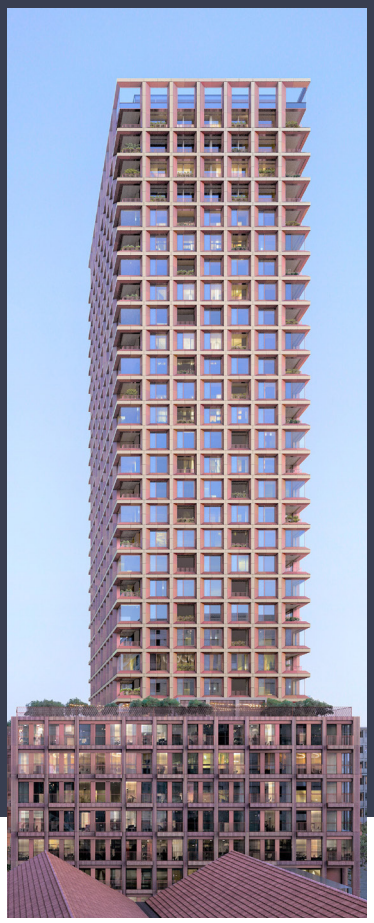

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