Forest and timber in the Alpine Space

an overview on frame conditions for strengthening the use of regional low carbon timber.
With many thanks to the project partners and the European Union.
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Chapter 1: Introduction & Methodology
1.1) Aim of the Project CaSCo

Increasing material flows along processing chains in timber industry considerably contribute to climate change. However, there is a great but unexploited potential for reduction of CO₂-emissions. The project makes these potentials accessible to decision makers and actors. Based on proved innovative cross border working assessment and monitoring tools it intially visualizes the impact of low carbon material flows in timber products on the climate. It develops and establishes policy guidelines in participating communities and provides decision makers with steering instruments to actively trigger climate friendly timber products.

1.2) Purpose of the report

This report resumes the data collection and analysis of work package 1 - „Development of tools“. Is comprises the activity 1.1 - data analysis. Purpose of this activity was mainly to gain a comparable overview about the situation of the forest and timber sector in the participating countries, resp. regions, represented by the project partners. This serves to strengthen mutual understanding and knowledge. As well the information is important to judge, whether the frame conditions for implementing a low carbon timber strategy and the monitoring and assessment tools, provided by Holz von Hier, in the regions and countries, are comparable or eventually need a regional adaptation. The data analysis should answer also the question, whether there are potentials for regionalising material flows and in which field they are most promising. Therefore production and material flows for various key sortiments in forestry and timber industry had been explored. The identification of potential multipliers for the project objectives was a further goal of the analysis, summarized in the „actors analysis“. The findings, presented in this report are closely linked to other WP of the project CaSCo, providing a data basis for communication, and procurement (WP2), development of trainings (WP3) as well as establishing value chains for LCT (WP4). This report and the underlying data analysis does not represent a regular cluster study, as this was not the purpose of this activity. Also, no own scientific investigations should have been conducted, but the report should built mainly on data already existing at different sources. The data to be analysed has been selected tailored to the project objective to reduce transport related carbon emissions in the usage and application of wood.

1.3) Methodology

The conduction of the analysis happened through every project partner in its region, based on templates, developed by Holz von Hier. The single data sets, gathered during the analysis, are stored in a central data base, accessible to all project partners. Holz von Hier developed a guideline for analysis condition as well as excel- and word templates for data collection. Additionally surveys has been prepared for various target groups: communities, architects, timber industry and wood crafting. The surveys had been provided in english and partly - after been translated, in national language. The report contains information, which has been provided by the partners up to November 2017. Some data are lacking and the volume and structure of the data available is highly divers. Therefore it was not always easy to extract relevant information for a sophisticating comparison. Sometimes only for Germany are sufficient data available. Holz von Hier conducted also a statistical evaluation of core data on national level for all participating countries to provide a comparison based on unified data. The data had been provided by the project partners in different ways, sometimes in single table sheets filled, sometimes in a separate report. This report does not represent a stringing together of the partner reports but summarizes an overview containing the several national or regional data, provided by the project partners.
Chapter 2: General aspects as overview

The Alpine Space is an attractive, diverse, nature and culture-rich European region, adapting to reach more sustainability.
2) General aspects as an overview

2.1) Socioeconomic aspects

This chapter shall give a quick overview and comparison on some national key data and indicators, which might be relevant for the project although not directly related to forest and timber processing.

Population

The Alpine space country with the largest population and therefore the biggest customer market is Germany followed by France and Italy (Fig. 2.1). Germany is also the country with highest population density.

Fig. 2.1) Population (Eurostat, 2017).

Income households

The purchasing power of households is an important information for market potentials and pricing of products on the markets. Investment ratios for new consumer products of private households are highest in Germany and France (Fig. 2.2). In Germany also the saving rates of private households are the highest. Live costs are over the European average in nearly all of the Alpine space countries, but the highest in Germany and Austria and only Slovenia is ranging below the European average.

Fig. 2.2) House hold income (Eurostat, 2017).

Part of social benefits from the BIP

Within the invest ratios today there are strong competitions of different expenses. The new car competes with the new kitchen and journeys with a new outer door. What is purchased today in many European countries, especially well developed ones, is not a question of necessities and prices, but to a high degree a question of lifestyle and values. This is also strongly referred to product features.

Within the European Union and the Alpine Space more than 25% of the BIP are expenses for social aspects (Fig. 2.3). Under that public expenses for seniors, kids and social aspects like unemployment and social assistance. Each part of the value chain that is shifted outside the country, or outside the Alpine space could or will increase this national part for social aspects or will lead to increasing leks in this system. The data regarding the participating countries in CaSCo are surprisingly similar.
Part of the social benefits from the BIP (last data from 2013)

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Slovenia</td>
<td>5.14%</td>
<td>6.42%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>7.39%</td>
<td>8.44%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>6.97%</td>
<td>7.97%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>9.04%</td>
<td>10.50%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austria</td>
<td>10.74%</td>
<td>12.08%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EU-28</td>
<td>7.85%</td>
<td>9.08%</td>
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</tbody>
</table>

Data in [%] or [€/capita]

Freight traffic

Lorry transports are the main transportation form of goods within the European Union and the Alpine space (Fig. 2.4). The highest transport volume has Germany followed by France.

Environmental expenses

Environmental budgets of the European Union and the CaSCo countries are between 4% to 10% of the BIP (Fig. 2.5). The content of these budgets probably are very different between the countries. But no country has a focus on the substantial environmental footprint of freight traffic and therefore until now no political programs or financing instruments to lower this impact on the environment, are in place. This today can only be done by information transfer to communal decision markers and customers and by the market especially by responsible companies of the chain of custody.

Electricity prices

Electricity prices increased heavily in all CaSCo countries within the last ten years (Fig. 2.6). Especially the prices in Germany are higher than in every other country and are nearly twice as high as in 2005 and twice as high as in France or Slovenia today.

This affects energy intensive production processes, of which some are also found in the timber sector. This exacerbates competition even within the European Union but mainly with outside. Therefore ecological character and features of products are an argument with raising importance for companies in Germany as well as in other Alpine Space regions.

To compensate that disadvantage many producers of timber products in Germany and the Alpine space are using their own wood residues from production for drying processes.

But the EU and the most Alpine space country regulations mainly are rewarding renewable energies like wind energy (e.g. 80% of the KfW funding in Germany are bound in funding of unprofitable land wind parks which have to be supported by the contracts for many decades). In France the low energy prices may be due to the highly subventioned nuclear power plants, but also in France the electricity prices are continuously increasing.
Gas prices

The increase on gas prices between 2005 and 2015 has a similar tendency within the Alpine Space (Fig. 2.7). Today the highest gas prices show Italy and Austria. The gas price especially concern private households and the community sector and influences the use of timber for fire wood and wood fuel.

![Graph showing the increase of the gas price within the last 10 years](image)

Fig. 2.7) Gas prices (Eurostat).

2.2) Environmental aspects

Energy, climate, water and resource footprints of industrial production

The energy, climate, water, resource footprints of the industrial production of the CaSCo Alpine Space countries performs much better than for countries with high export rates into the European Union and into the Alpine Space, like most of the Asian countries, Russia and other (see product environmental App of Holz von Hier, all data from 2016, Fig. 2.8). These good footprints of products and especially timber products with there chain of custody within the Alpine Space are until now not enough honoured by public procurement and customers. Mainly this could be a subject of information transfer and identification, for example by certificates.

![Graph showing energy, climate, water, and resource footprints](image)

Fig. 2.8) Data Holz von Hier (HvH Save database, diff sources).

Resource productivity

The values for resource productivity (in €/kg) gives first suggestions how efficient a country uses its resources to reach good added values and are referred to the BIP. As the BIP itself gives no evidence about how ecological and social compatible the economical status is. It can be high but even at the cost of environment and society. Resource productivity is an indicator, which gives a better indication of environmental aspects. Within the CaSCo countries the resource productivity increased within the last ten years, which shows a general positive development (Fig. 2.9).

![Graph showing resource productivity](image)

Fig. 2.9) Resource productivity raised up within the last 15 years (Eurostat, 2017).

Green house gas emissions: $\text{CO}_2$

Green house gas emissions in the CaSCo countries remained stable within the past 25 years (Austria and Slovenia) or decreased only slightly (Germany). In Italy and France emissions decreased only in the last decade (Fig. 2.10). An important fact is, that sector specific all over emission could be reduced except traffic, which even increased despite all actions towards climate protection (Fig. 2.12). Higher efficiency, better fuels and other measures lead to a dramatic decrease of emissions of $\text{SO}_x$, $\text{NO}_x$, and NMVOC (Fig. 2.13). But increasing transport volume has overcompensated all efforts with regard to $\text{CO}_2$.

![Graph showing green house gas emissions per capita](image)

Fig. 2.10) Greenhouse gas emissions per capita (Eurostat).
Fig. 2.11) Greenhouse gas emissions in total (Eurostat).

Fig. 2.12) Carbon emissions through traffic (EU road map for a sustainable economy 2050).

Fig. 1.13 a,b,c) Decrease of SOx, NOx and NMVOC within the last decade (Eurostat).

Fig. 2.13) Emissions of SOx, NOx and NMVOC through traffic (Eurostat, 2016).
Chapter 3: Actors analysis

Forst Owners, Companies and Organisations: the structure of forest owners and timber companies in the Alpine Space is very divers.
3.1) Forest owners

3.1.1) Forest owners of the Alpine Space in an overview

The Forest owners of the Alpine Space Countries are mainly (45% - 82%) private forest owners (Fig. 3.1). In Germany and Slovenia a third of the forests is owned by the state. Italy, Germany and France have a larger amount of public forest owners like cities and communities that can by addressed for low carbon timber for there public procurements. Yet, in Italy more frequently the best forests are the private ones and public woods often produce low quality timber and are hardly accessible.

Forest owners and key supporters

Key supporters are: (1) country forests, (2) forests of bigger private owners and (3) cities with bigger forests. These three are important partners for the timber market and they sell considerable amounts. It is relevant for the project aims to achieve cities with forests and bigger forest owners, because within the field of low carbon timber, they can be a quick driving force, often more than country forests.

In Italy a specific situation is, that for historical reasons, a large part of Italian public forests is unproductive or (totally or nearly) inaccessible. This is particularly real in north-western Italian regions like Piedmont, while in the North-East wide productive forests could be maintained thanks to an older tradition of forest management. In Italy, best productive woods are mainly private, but unfortunately most of them are held by small or very small owners, who aren’t often concerned with their management or even disregard them, anyway make occasional operations in little areas, prompted by small logging companies.

Small private forest owners

For smaller private forest owners, often with areas below 5 ha, the timber market does not play a role in there decisions. They use there forests for fire
wood. If they get not a roundwood price that is over the oil or gas price and there annual heat demands, they sell no timber. Additionally they often consider there forests as „savings bank“ for bad times. They are not orientated on the market behaviour and there own private situation decides what they are doing with there forests. May private forest owners live far away from there forests and are no farmers. They often have no knowledge or interest on forest management. With small forest areas, management its difficult with minor profit from it. Especially small forest owners often do not recognise that they can earn much more money with on single furniture tree, than with fire for the mass market.

In Austria, Germany, France mainly the middle private owners merged in private forest organisations, which help them to manage the forests and to bundle a part of the roundwood for the market. In Italy these organizations are still weak, but they are growing and increasing, because they are encouraged by national and regional laws and policies. They often gather both public and private ownerships.

### Data provided by

Slovenia: BSC Kranj, E-Zavod, Ptuj, RAS Development agency Sinergija, Moravske Toplice

France: Auvergne-Rhonealpe Energie et envernement, Villeurbanne

Italy: ENVIPark, Turin, ARPA Piemonte (Federal Environmental agency), Turin, UNIONE MONTANA DEI COMUNI DELLA VALSESIA

Austria: Regio-V, Vorarlberg, LAG Joglland, Styria

Germany: Holz von Hier, Creußen/Bayreuth

### 3.1.2 Austria

#### a) Organisations

Important organisations in the forest sector are:
- Austrian Federal Ministry of Agriculture, Forestry, Environment Water Management (bmlfuw.gv.at).
- Austrian Federal Ministry of Science, Research and Economis (en.bmwf.w.gv.at).
- Regions Vorarlberg and Steiermark, Abt. Forst.
- Landeslandwirtschaftskammern Vorarlberg and Steiermark (incl. relevant Bezirksskamommern).
- Waldverband (no profit association for supporting of (small) private forest owners.
- Land & Forstbetriebe (landforstbetriebe.at).
- Österreichischer Forstverein (forstverein.at).
- Arbeitsgemeinschaft Waldveredlung u. Flurholz anbau (waldveredlung.at).
- Kooperationsplattform Forst Holz Papier (forstholzpapier.at).
- Pro Holz Austria (proholz.at).
- Kuratorium Wald.
- PEFC Österreich.
- FSC Österreich.
- Österreichischer Biomasse Verband.

On regional level following organisations are important as potential multipliers:
- Land Vorarlberg, Abt. Forstwesen.
- Landwirtschaftskammer Vorarlberg.
- Agrarbezirksbehörde Bregenz.
- Waldverband Hartberg- Fürstenfeld.
- Vorarlberger Waldverein.
- Agrarbezirksbehörden Bregenz, Hartberg Fürstenfeld und Weiz.

#### b) Single actors

The biggest forest owners in Austria are (data from Vorarlberg and Joglland):
- Bundesforste: 511,000 ha (National Forest)
- Stadt Wien: 28,000 ha (Public)
- Meyer-Melnhoff: 27,400 ha (Private)
- Esterhazy GmbH: 22,600 ha (Private)
- Schwarzenberg: 19,000 ha (Private)
- Abtei Admont: 16,700 ha (Church)
- Gut Persenbeug: 12,700 ha (Private)
- Land Steiermark: 12,200 ha (Public)
- Forstbetrieb Stift Vorau.
- Stadt Dornbirn
- Agrargemeinschaft Nenzing
- Agrargemeinschaft Rankweil
- Stand Montafon - Forstfonds
3.1.3) France

a) Organisations and b) Single actors

According to data from Auvergne-Rhone-Alpes Energie et environnement, there are 76 forest organisations and forest owners in the region Auvergne Rhone Alpes. More data are not available.

3.1.4) Germany

a) Organisations

On national level relevant administrative institutions regarding forest and environmental issues are:

• The Federal Ministry of Food & Agriculture (BMEL) reinforces the sector of forestry and agriculture (bmel.de).
• The Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) decides about topics like climate friendly (building)-products, sustainable consume, buildings, climate and environmental goals (bmub.de).
• The Federal Ministry for Economic affairs and Energy (BMWI) is concerned with the topics of production, material flows, imports and exports, logistics, industry 4.0 or public procurement (bmwi.de).
• In all federal states there are corresponding regional ministries.

The Ministries partly have coordinating agencies:
• The Federal Office for Agriculture and Food (BLE) is responsible for research in these fields and assessing the implementation of FLEGT regulation.
• The Federal Agency for renewable raw materials (FNR) is an operator for project funding programs and is concerned with public relations regarding renewables.
• The Federal Environmental Agency (UBA) is charged with the enforcement of the environmental laws, information transfer and public relation activities to these issues.

Important national forest organisations
• German Forest Council
• Working group of German associations of forest owners (AGDW)
• Association of forest owners in every fed. state
• Alliance of German foresters
• Protection Communion German Forest
• „Wald-wird-mobil“

To some of the organisations Holz von Hier is in close contact, so that a dissemination about the project can be achieved.

National organisations of for the environment
• Deutscher Naturschutzing
• NABU Deutschland
• BUND Deutschland
• Deutscher Nachhaltigkeitsrat
• WWF Germany

b) Single actors

In Germany private owners (45%) and the state (31%) are the big forest owners. In some Germans federal states the biggest share is in private owners and in some under state ownership (Fig. 3.2). In Baden-Württemberg have communities the biggest share, which is a special situation (Tab. 3.1).

<table>
<thead>
<tr>
<th></th>
<th>national forest</th>
<th>federal state</th>
<th>communi-</th>
<th>privat</th>
<th>churches</th>
</tr>
</thead>
<tbody>
<tr>
<td>BW</td>
<td>0,5%</td>
<td>23,6%</td>
<td>39,7%</td>
<td>36,1%</td>
<td>k.a.</td>
</tr>
<tr>
<td>BY</td>
<td>2,2%</td>
<td>30,1%</td>
<td>13,5%</td>
<td>54,2%</td>
<td>k.a.</td>
</tr>
</tbody>
</table>

Tab. 3.1 Forest owners in Baden-Württemberg (BW) und Bavaria (BY). Data Destatis.

Fig. 3.2) Forest ownership in the different federal states in Germany. Data for Holz von Hier, data from Destatis and surveys.

But „private forest owners“ summarizes a very heterogenous group with a wide range of interests. The big ones (> 1000 ha) are market oriented. Mainly the middle sized ones are organised in 14 federal state private forest associations and 4.700 local private forest organisations with nearly 430.000 members and a forest area of 3. Mio. ha. More than 30% of the forest area in Germany is organised in these organisations (waldbesitzerverbaende.de). Depending on the federal state, between 17% and 90% of the forest areas and between 2% and 97% of the forest owners are organised there. In BW there are 180 private forest owners organisations that organise 20% of the owners and 60% of the private forest areas. In Bavaria are 176 local private forest organisations that organise 20% of the private owners and nearly 70% of the private forest areas. About 90% of the private forest owners in Bavaria and Baden-Württemberg hold areas below 5 ha. This can not be
a target group of the project because to reach them within the time scale of the project is not possible.

In Germany also 8.459 communities are owners of 2,19 Mio. ha forests, most of them in Bavaria (1,247) and Baden-Württemberg (2,154). Only 6% of the communities owning 44% of the community forests (Fig. 3.3). In Bavaria 0,29 Mio. ha and in Baden-Württemberg 0,51 Mio. ha forests are community owned. This group are very interesting potential multipliers and stakeholders at the same time, as they manage the resource and rule the procurement.

Fig. 3.3(a-b) Number and forest area of German communities with own forests. Data Destatis 2017.

To following big forest owners in the Alpine Space region Holz von Hier maintains good relations:

• Thurn und Taxis
• Evangelische Stiftung Pflege Schönau
• Isle of Mainau

Cities with bigger forests within the Alpine space regions of Germany are:

• Baden-Baden
• Villingen-Schwenningen
• Freiburg
• Tuttlingen
• Freudenstadt
• Rottenburg
• Reutlingen
• Mengen
• Lahr
• Oberndorf
• Augsburg
• München
• Gemünden
• Ingolstadt
• Donauwörth

3.1.5) Italy

a) Organisations

On national level relevant administrative institutions regarding forest and environmental issues are:

• Ministry of policies for agriculture and forestry. The Ministry is responsible for development and implementation of general policies regarding forestry. The Ministry is structured in Departments and Sectors; the sector for rural development includes following offices of interest for CaSCo project: Forestry policies (DIR III), Research (DIR IV).

• National Federation of Forest Communities (abbr. Federforeste). Federforeste was founded in 1981 with the aim of coordinating, protecting and enhancing the work of the Forestry Consortia and special agencies (syndicated and/or individual) in the sound management of agro-forestry-pastoral property owned by both private and public bodies. The Federation also promotes the establishment of new Forestry Consortia of private wooded property, to recover the rational management even those private forests plagued by the typical land pathology phenomenon, represented by fragmentation, pulverization and dispersion of this property esp. in the mountains

• PEFC Italia
• FSC Italia

Important organisations in the forest sector in the Piemont region are:

• Regione Piemonte as the public body who is responsible for forestry local policies, but which is also the principal public owner with 15.300 hectares of agro-forestry surfaces all over the region.

Principal owners’ associations for associated forest management:

• Federforeste Piemonte
• Consorizio Forestale Alta Valle di Susa
• Consorizio Forestale del Canavese
• Associazione Monte Rosa Foreste
• Associazione Forestale dei Due Laghi
• Consorizio Forestale delle Montagne Biellesi
• Consorizio Filiera Forestale del VCO
• Consorizio Forestale di Villar Focchiardo
• Consorizio Forestale Monte Armetta
• Forest offices organized by several Mountain Unions

Associations of poplar plantations owners and producers:

• Associazione pioppicola FORAGRI
• As.Pro.Legno e Ambiente
b) Single actors

The forest sector of the region Piemonte is responsible for legislation activities (law, implementing regulations) and programming in the forestry sector, coordination of planning, management, economic development, research, communication, training. The region Piemonte in particular coordinates:

- a network of 60 territorial forestry offices
- the management of the regional official list of forestry operators

In Italy, the main public forests owners are usually little mountain municipalities, with few inhabitants but a wide surface territory. Single cities are not particularly important as actors in forest management, except for (big and small) municipalities which have joined together to create associated bodies such as the ones showed in the list above; in Piedmont, Consorzio Forestale Alta Valle di Susa, in the area of Turin, is the oldest and the most structured of them. Some single private owners have a certain importance, such as Oasi Zegna (near Valsesia, in Northern Piedmont), noble or religious properties, private bodies having no interest in timber commerce. A high amount of forest surfaces are possessed by a lot of ancient collective ownerships, descending from historic local communities’ rights of use, called “partecipanza”, “consorzio”, “quinta”, “comunanza” and so on. Most of them are functioning no more, due to mountain abandonment, but officially they still exist and it should be very useful to bring them back to life, both for forestry and for social reasons. In Valsesia a specific project promoted by Monte Rosa Foreste is working to try and do it.

3.1.6) Slovenia

a) Organisations and b) Single actors

According to the Slovenian partners there is no overview on forest owners available.
3.2.1) Timber industry in the Alpin Space at a glance

The diversity of wood processing chains and companies is a special strength of the sector, a sustainability pledge for the regions supporting a broad market for forest owners.

The timber sector in the Alpine Space inhabits a great variety, it is regionally linked, sustainable and environmental oriented. This can not be claimed by the timber industry of all countries. The Alpine Space timber sector comprises industry, SME, crafters and companies of adjacent sector. In the field of industry there are wood based materials, pulp and paper industry, packaging industry, furniture industry and others. Among SME there are saw mills, veneer and parquette producers, wrights and carpenters, interior products and others. Important as well is timber traders and retailers. Not to forget publishers and printing houses, companies of bio energy, logistics and others. The cluster comprises as well the service sector like planners, Designers, disposal companies and contracting operators and others.

Importance for employment and education

Within the forest and timber sector most of the people are employed in SME (e.g. German cluster study). Besides the industrial level all these SME form an important pillar of the wood sector in general. Losing them would lead to a loss of tax yields, jobs and apprentice opportunities. According to definition of the EU regarding SME, companies with up to 1,000 employees and a volume of 250 mio. € annually are stated as SME. This is seen independently from sectoral considerations. This has consequences also with regard to distribution of suventions and funding and is not appropriate to the structure of the timber industry where companies of 1,000 employees are hardly to be found. In rating lists of banks and loan institutes enterprises with less than 20 employees are not even listed. In Germany however 90% of the sector refers to this category.

In wood working enterprises much has been changed in the past decades. Generally a shift can be recognized from classical fabrication processes to a high degree of specialisation as well as to incorporate trading activities with industrial products. The supply and range of timber companies and DIY supermarkets more and more are overlapping. Besides classical processing companies an increasing part of mixed enterprises arise. Even in their own production highly specialised companies integrate a trading branch with industrial products, which sometimes are far from the former core issue of the company. The purchase and delivery relations become more complicated herewith.

3.2.2) Austria

a) Organisations

On regional level there are following organisations representing the timber sector, which may be addressed as potential multipliers for the project:

• Vorarlberger Holzbaukunst
• Network ‘Vorarlbergholz’
• Cooperation and regional initiative ‘TANNO’
• Cooperation with forest owner organisations
• Wood craft: Kammer Hartberg-Fürstenfeld, Weiz.
• Impulszentrum Vorau
• Jogllandwirtschaft
• Joglland best practice projects.
• Wirtschaftskammer Österreich and its regional departments.
• Cooperations with the timber industry and SME.

b) Single actors

National level

There are nearly 300,000 employments within the Austrian forest-timber-paper-print-cluster with 172,000 enterprises. The Austrian timber industry has 1,286 enterprises with 1,044 sawmills and 47 bigger companies of the furniture industry (Tab. 3.3).

<table>
<thead>
<tr>
<th>Sortiment / Product / type</th>
<th>Vorarlberg [no°]</th>
<th>Joglland [no°]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building timber products</td>
<td>?</td>
<td>-</td>
</tr>
<tr>
<td>Carpenters</td>
<td>239</td>
<td>15</td>
</tr>
<tr>
<td>Components</td>
<td>?</td>
<td>-</td>
</tr>
<tr>
<td>Floors</td>
<td>?</td>
<td>-</td>
</tr>
<tr>
<td>Fuel wood</td>
<td>?</td>
<td>-</td>
</tr>
<tr>
<td>Furniture industry</td>
<td>?</td>
<td>-</td>
</tr>
<tr>
<td>Hand crafters</td>
<td>?</td>
<td>-</td>
</tr>
<tr>
<td>Wood houses / wrights</td>
<td>115</td>
<td>4</td>
</tr>
<tr>
<td>Prefabricated houses</td>
<td>?</td>
<td>-</td>
</tr>
<tr>
<td>Particle boards</td>
<td>?</td>
<td>-</td>
</tr>
<tr>
<td>Plywood</td>
<td>?</td>
<td>-</td>
</tr>
<tr>
<td>Sawmills</td>
<td>37</td>
<td>5</td>
</tr>
<tr>
<td>Solid timber boards</td>
<td>?</td>
<td>-</td>
</tr>
<tr>
<td>Traders</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td>Veneer</td>
<td>?</td>
<td>-</td>
</tr>
<tr>
<td>Sum</td>
<td>407</td>
<td>24</td>
</tr>
</tbody>
</table>

Tab. 3.2) Timber sector in the austrian CaSCo regions.

As peer companies for the Project are identified as peer companies, potentially to be addressed for the establishment of low carbon timber processing chains.

In Vorarlberg 30 companies have been identified as peer companies, potentially to be addressed for the establishment of low carbon timber processing chains.

3.2.3) France

a) Organisations

In the Auvergne Rhone Alpes regione no organisation was identified. More data are not available.

b) Single actors

In the Auvergne Rhone Alpes region are located:

• 381 sawmills (cutting capacity 1,858,000 m³ sawnwood per year, 1,681,000 m³ conifer wood, 158,000 m³ deciduous wood).
• 176 producers of chips (1,400,000 tons).
• 15 producers of pellets (345,000 tons)
• 700 producers of firewood (800,000 tons).
• No producers of: laminated wood, parquette, veneer, compoenents (windows, doors), boards.
• 26 wood house bilders / wrights.
• 398 carpenters.
• No floorers, no furniture industry, no hand crafters or other.
3.2.4) Germany

a) Organisations

On national level following organisations are important players in the timber industry:

- Deutscher Holzwirtschaftsrat
- Zentralverband des Deutschen Handwerkes
- Bundesverband pro Holzfenster (HvH Partner)
- Deutscher Verband der Säge- und Holzindustrie
- Deutscher Schreinerverband
- Deutscher Zimmererverband
- Dt. Verband Holz u. Kunststoffverarb. Industrie
- Verband der Deutschen Möbelindustrie e.V.
- Verband der Dt. Polstermöbelindustrie e.V.
- Arbeitsgemeinschaft Moderne Küche e.V. (AMK)
- Deutsche Gütegemeinschaft Möbel e.V. (DGM)
- Initiative Furnier + Natur e.V.
- Verband Deutsche Küchenmöbelindustrie e.V.
- Fachverband Serienmöbelbetr. Handwerks e.V.
- Verband Dt. Wohnmöbelindustrie e.V.
- Gütegemeinschaft Paletten e.V.
- European Pallet Association e.V. (EPAL)
- Bundesverband Holzpackmittel (HPE)

Some of them are already partner of Holz von Hier or good relationships are maintained.

On regional level (Alpine Space) following organisations are important players in the timber industry, to which Holz von Hier maintains close partnership:

- VSH Verband Säge-/Holzindustrie
- Fachverband des Schreinerhandwerks
- Union of craft chambers Baden-Württemberg

b) Single actors

National level

The timber industry in Germany is highly divers and represents an important economical factor in German economy (Tab. 3.3) and in the Alpine Space regions Bavaria and Baden-Württemberg (Tab. 3.4).

<table>
<thead>
<tr>
<th>enterprises</th>
<th>number</th>
</tr>
</thead>
<tbody>
<tr>
<td>sawmills</td>
<td>3.108</td>
</tr>
<tr>
<td>panels producers</td>
<td>323</td>
</tr>
<tr>
<td>wood packaging industry</td>
<td>883</td>
</tr>
<tr>
<td>wrights</td>
<td>13.570</td>
</tr>
<tr>
<td>industrial building industry</td>
<td>8.270</td>
</tr>
<tr>
<td>carpenters</td>
<td>25.282</td>
</tr>
<tr>
<td>furniture industry</td>
<td>11.825</td>
</tr>
<tr>
<td>timber traders and importes</td>
<td>2.592</td>
</tr>
<tr>
<td>other timber processors</td>
<td>2.474</td>
</tr>
<tr>
<td>pulp industry</td>
<td>69</td>
</tr>
<tr>
<td>paper industry</td>
<td>469</td>
</tr>
<tr>
<td>paper processing industry</td>
<td>1.762</td>
</tr>
<tr>
<td>publishing houses</td>
<td>7.826</td>
</tr>
<tr>
<td>print houses (84 % with &lt;20 empl./enterpr.)</td>
<td>12.432</td>
</tr>
</tbody>
</table>

Tab. 3.3) Companies in the timber industry and crafting in Germany (Thünen Institut, Becher & Weimar, HZBL, Jan. 2016).

<table>
<thead>
<tr>
<th>Sortiment / Product / type</th>
<th>Baden-Württemberg [no°]</th>
<th>Bavaria [no°]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building timber products</td>
<td>35</td>
<td>11</td>
</tr>
<tr>
<td>Carpenters</td>
<td>230</td>
<td>2770</td>
</tr>
<tr>
<td>Components</td>
<td>60</td>
<td>56</td>
</tr>
<tr>
<td>Floors</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Fuel wood</td>
<td>?</td>
<td>3</td>
</tr>
<tr>
<td>Furniture industry</td>
<td>85</td>
<td>80</td>
</tr>
<tr>
<td>Hand crafters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>wood houses / wrights</td>
<td>570</td>
<td>1330</td>
</tr>
<tr>
<td>prefabricated houses</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Particle boards</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Plywood</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Saw mills</td>
<td>135</td>
<td>156</td>
</tr>
<tr>
<td>solid timber boards</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Traders</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Veneer</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Sum</td>
<td>1.173</td>
<td>4.470</td>
</tr>
</tbody>
</table>

Tab. 3.4) Timber sector in the German CaSCo regions.

Mapping the wood producing industry shows a clear prevalence in the southern parts of Germany, where most of the saw mills, but also producers of veneer and glue laminated wood are located (Fig. 3.4/a-f).
3.2.5) Italy

a) Organisations

On national level following organisations are relevant for the project CaSCo:

- ITACA

Born in 1996, under the impulse of the Italian Regions, the „Institute for transparency, updating and certification of procurement“ , has adopted the ITACA protocol. The ITACA Protocol is a tool for assessing the level of energy sustainability and environmental impact of buildings. Among the most popular rating systems, the Protocol allows to test the performance of a reference building not only regarding consumption and energy efficiency, but also taking into account its impact on the environment and human health, thus promoting the realization of more innovative buildings, zero energy, at reduced consumption of water, as well as materials in their production involving low energy consumption and at the same time ensuring a high comfort. The Protocol was adopted by a number of regions and municipalities in several initiatives to promote and encourage sustainable construction through: federal, building regulations, procurement, urban planning, etc..

- Federlegno arredo.

Federlegno Arredo is the hub of Italy’s wood and furniture industry. It represents the entire sector, from raw materials to the finished product, in Italy and throughout the world, with 2800 member companies from industry leaders to small businesses. Federlegno is structured in several associations, the main of them are: (a) Federlegno – Assolegno (wood industry and timber construction companies), (b) Federlegno – Assoimballaggi (wooden packing, pallets, cork and logistical services sectors), (c) Federlegno – Edilegnoarredo (construction industries and street furniture), (d) Federlegno – Assopanelli (companies manufacturing panels and semi-finished wood products), (e) Federlegno – Fedecomlegno (timber importers, traders and agents), (f) Federlegno – Assocofani (coffins and funerary accessories manufacturers). Federlegno is also working on the project of a new national training center on wood topics.

On regional level following organisations are relevant for the project CaSCo:

- Union camere Piemonte is the regional network of the chambers of commerce supporting SMEs.

- The Turin Chamber of Commerce is promoting the protocol “Sustainable Living” with the aim of encouraging the exchange of good practices between the local stakeholders.
b) Single actors

On national level no data are provided. On regional level following companies are registered (Tab. 3.5).

<table>
<thead>
<tr>
<th>Sortiment / Product / type</th>
<th>Piemonte [no°]</th>
<th>Valsesia [no°]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Components</td>
<td>485</td>
<td>no data</td>
</tr>
<tr>
<td>Floors</td>
<td>13</td>
<td>no data</td>
</tr>
<tr>
<td>Fuel wood (pellets)</td>
<td>94</td>
<td>no data</td>
</tr>
<tr>
<td>Furniture industry</td>
<td>662</td>
<td>no data</td>
</tr>
<tr>
<td>wood houses / carpenters</td>
<td>961</td>
<td>no data</td>
</tr>
<tr>
<td>Veneer, plywood, boards</td>
<td>311</td>
<td>no data</td>
</tr>
<tr>
<td>Traders</td>
<td>706</td>
<td>no data</td>
</tr>
<tr>
<td>Others (pack., pallets, small objects a.s.o.)</td>
<td>354</td>
<td>no data</td>
</tr>
<tr>
<td><strong>Sum</strong></td>
<td><strong>3612</strong></td>
<td></td>
</tr>
</tbody>
</table>

Tab. 3.5 Timber sector in the Italian CaSCo regions.

In the region of Torino about 353 companies have been identified as peer companies, potentially to be addressed for the establishment of low carbon timber processing chains. They represent mainly bigger enterprises with more than 5 employees.

Italian forests’ owners are not usually concerned in timber commerce and they can be considered as passive subjects, while small and micro-business timber loggers play a very important role in involving the owners in the production chain. Very small loggers companies (1 to 5 workers) buy standing trees from the owners and process them to produce roundwood, which they sell to sawmills, to bigger traders or directly to the industry. In wood fuel supply chain, loggers companies are also retail dealers, selling final products to a large quantity of local private end users; so they cover the great majority of the Italian wood fuel market. This segment is particularly significant in Italy, but it is permeated with plenty of small illegal operators, which are unfair competitors of regular enterprises. This negative, very extensive phenomenon has grown even more serious after the 2009 crisis, because of unemployed workers coming from the construction sector.

In general, small logging enterprises must be regarded as key actors in timber production chain. No strategy of development can be planned without paying particular attention to these subjects, which are at the same time a weak ring of the chain. Moreover, these operators have not a precise fiscal definition in Italy, as they are an across-the-board group, including farmers, craftsmen, traders, builders, cooperatives; so, it is very difficult to describe them by statistical data and the informations about them are not precise. In Piedmont, we estimate nearly 2500 operators. In Valsesia there are abut 70 forestry workers in 40 micro-business enterprises, but only 5 to 10 have more than one salaried worker; more frequently single self-employed cooperate in occasional or permanent partnerships.

3.2.6) Slovenia

a) Organisations

There are no organisations in this field, found by the Slovenian partners.

b) Single actors

On national level from statistics following numbers for timber industry are recorded:

- 771 sawmills
- 9 wooden floor producers
- 675 wood handcrafters

Forest logging enterprises associations are:

- Confcooperative Fedagri Piemonte
- Coldiretti Piemonte
- CIA Piemonte
- Confartigianato
- CNA
- Associazione Imprese Forestali Piemontesi
- AReB (Associazione Regionale Boscaioli del Piemonte)
3.3) Architects

3.3.1) Architects in the Alpine Space at a glance

Target group architects

Under the umbrella „architects“ several different branches are summarized, like engineers, stress analysts, construction architects, designers, interior architects, landscape architects and others but keeping in mind, that all these group probably need a different proceeding in addressing them. Sustainability aspects are no issue in education and advanced training of architects so far. The fact, that ecology and sustainability aspects are barely part of the curriculum, leads to fallacies and weak competence in sustainability decisions and developing respective call for bids. Through this important environmental relief potentials remain unexploited. This is confirmed from many associations, chambers or bigger planner companies. Many architects are technical professionals in their favourite materials, but have difficulties to determine the environmental impact of them. Even bigger architectural firms struggle with the assessment and comparison of different materials, their origins and construction ways in their impact on environment. Its kind of a paradox situation, that sustainability has become a core issue in society and one of the most important demand of customers to products (actual trend study OTTO group) as well as a political top theme (planetary boundaries) but not yet arrived in daily practice.

Climate protection goals are sparsely realised in procurement and public construction.

Despite regional and communal climate goals in public construction and call for bids important climate aspects are not implemented. Political programs and strategies mostly focus on energy saving concept on the level of red energy (that means energy consumption in the usage phase). Approaches to integrate aspects of grey energy, consumed during the production processes of materials are no matter of funding programs and procurement so far. With regard to this the pre processing chains and transportation play an important role. Again in production material flows and transportation are, heavily underestimated. Holz von Hier emphasises in projects and actions initially the full meaning of origin and transport of raw materials and products for climate and biodiversity, sustainability aspects, whose planetary boundaries are since longer time exceeded.

With the certificate of origin, architects have initially the possibility to implement low carbon optimization of timber products in call for bids. With the environmental footprint calculator they can compare the influence of different origin of timber products on climate and environment. With the product environment traffic light they may evaluate various construction products regarding several sustainability criteria. Only if customers and communities demand and request low carbon timber products and buildings and architects integrate this in planning, purchasing and building, in the field of construction an enhancement regarding grey energy may be achieved. A key position in this environmental communication have planners and architects. They advice principals and communities, they elaborate the call for bids, they propose certain construction materials and further more. Because of wide spread lacking specific education and training modules however they are not yet prepared to this responsibility, as they mostly fail in assessing, what characterises a product as resource efficient, climate and environmental saving.

A core objective of the CaSCo project is through developing a comprehensive training concept to facilitate fundamental sustainability aspects like climate, water, energy, biodiversity, health.

3.3.2) Austria

a) Organisations

On national level following organisations are important for the project:

- ZV - Austrian Architects Association. This association is already observer in the project CaSCo, ensuring a dissemination and multiplication of the project tools and results.
- FH Salzburg. The FH as educational organisation in wood building and construction is already observer in the project.

b) Single actors

In Vorarlberg there are 33 architects offices which are supporting timber construction. Four of them have been identified as peer companies, to be addressed for supporting the project objectives. In the Joglland all wood specific architects are involved by the TAN-NO-group (compare 3.2.2.).

3.3.3) France

a) Organisations and b) Single actors

There could not be found data in this sector by the French partner.

3.3.4) Germany

a) Organisations

On national level following organisations are important for the project objectives:

- Bundesverband der Innenarchitekten und Designer BDIA (HvH partner)
- Bundesarchitektenkammer (close contacts)
- On regional level following organisations are important for the project objectives: BDIA section Baden-Württemberg (HvH partner)

b) Single actors

On national level following actors are important for the project objectives:

ATP. ATP is one of the biggest architects company in Germany (ATP) is already observer in the project CaSCo. This office has important influence in sustainable building certification as well as in training and education of planners and architects.

On regional level there are around 300 architects in Baden-Württemberg registered and 265 architects in Bavaria. This may be added by 6 engineering offices in BW and 66 in Bavaria. However these figures may underestimate the total number of architects offices by far.

In Baden-Württemberg 40 architects office are detected, which are working explicitly with wood as construction material. They will primarily be addressed through the developed target group specific surveys. An identification of specifically timber dedicated architects is not possible in Bavaria.

3.3.5) Italy

a) Organisations

On regional level following organisations have identified as important for the project:

- Turin Architects Foundation. The foundation already is observer within the project CaSCo, ensuring a dissemination and multiplication of the project tools and results.
- Regional and Departmental councils of architects, engineers and other professionals.

This group of actors includes the official regional councils of architects and engineers. The regional council of architects has created a regional Foundation, which is in charge of all training activities and of the promotion of quality and innovation in architecture. Beside these, the group of stakeholders includes also other private associations of professionals working on the topics of high quality building design and green building solutions.

On national level a relevant organisation is:

- ANAB - Associazione Nazionale Architettura Biocologica

b) Single actors

No data available.

3.3.6) Slovenia

a) Organisations and b) Single actors

There could not be found data in this sector by the Slovenian partners.
3.4) Communities

3.4.1) Sustainable communities in the Alpine Space

Green public procurement: european goal. The Europeans consume double as much resources as are potentially available. The way of living, the products we purchase and the way we build has essential influence on the consumption of resources and energy and the impact on environment through hazardous substances. Regarding this on product level all life cycle stages are important, thus mostly only the usage phase is regarded. It is an important national and european goal, to raise awareness regarding these interrelations and to foster sustainable consumption patterns in consumers as well as in communities. A lever is the signing and labelling of products with information regarding their environmental footprint and fostering the request for environmental friendly products. Public authorities has through the instrument of sustainable procurement an important function to achieve these goals because of the amount of purchased goods and the model function. Public procurement is stated as growth trigger and effective instrument for protection of climate and environment.

How to procure sustainable? From political decision to concrete projects. The clear committment and the political decision are crucial. They are expression of being concerned with the meaning of sustainable procurement. Only this way in longterm perspective sustainable procurement will become prevalent in communities. Sustainable procurement is no self purpose but aims to contribute to protection of climate and environment which go beyond the usual. Those communities, who took a political decision and defined an internal political guidance, in long term will try to exhaust the possibilities.

Political decision. Sustainable procurement is the easier, the more support the specialized department experience from the political governance. In the principle a political decision is not mandatory to enable purchasers in communities to procure sustainable, but is of great advantage. If for instance climate protection is a defined core object of the community, expressed in a political guidance, respective criteria could be more easily defined in call for bids.

Internal information transfer. All relevant departments need to be equally informed about the political objectives and the opportunities for procurement of low carbon timber. Often several departments have to collaborate, as the specialized department, the finance and the procurement department.

Market survey. Another important aspect for a successful implementation of climate friendly low transportation timber is a market survey in front of planning and call for bids. This help avoiding, that a definition of sustainability criteria later raise conflicts with technical criteria.

Project planning and awards. In the case of construction plans or bigger procurements all starts with a planning process. Therefore already in this stage sustainability criteria should be defined. In construction and greater procurement plannings are the first step. Here switches are set which influence the options of sustainability criteria in the later procurement. With regard to low carbon timber already in the planning and projecting stage respective criteria shall be considered. Fostering the public procurement of low carbon timber is the main goal of the project. The current state of the art and future potentials are described in the report for WP 2.

3.4.2) Austria

a) Organisations

On regional level, following organisations representing the public sector are important as partner and multiplier for the CaSCo project:

- Umweltverband Vorarlberg
- IG Kraftspendedörfer Joglland

b) Single actors

On regional level, following cities are important as multiplier or potential stakeholder for the CaSCo project and will be addressed directly:

Vorarlberg
- Stadt Dornbirn
- Agrargemeinschaft Nenzing
- Agrargemeinschaft Rankweil
- Stand Montafon - Forstfonds

Joglland
- Waldbach - Mönichwald
- Stankt Jakob im Walde
- Wenigzell
- Vorau (inkl. Ortsteile Puchegg, Riegersberg, Schachen bei Vorau, Vornholz)
- Grafendorf bei Hartberg (inkl. Ortsteil Stambach)
- Fischbach
- Ratten
- Rettenegg
- Sankt Kathrein am Haunenstein
- Birkfeld (Gschaid, Haslau, Kogelhof, Waisenegg)
- Miesenbach bei Birkfeld
- Strallegg

On regional level, following organisations representing the public sector are important as partner and multiplier for the CaSCo project:

- Landkreistag Baden-Württemberg (HVH Partner)
- Landkreistag Bavaria

3.4.3) France

a) Organisations and b) Single actors

In the Auvergne Rhone Alpes regione no organisations and single actors could be identified in this sector. More data are not available.

3.4.4) Germany

a) Organisations

On national level, following organisations representing the public sector are important as partner and multiplier for the CaSCo project:

- Deutscher Landkreistag (HVH partner)
- Deutscher Städte- und Gemeindebund (contacts)
- Climate Alliance (project partner)

On regional level, following organisations representing the public sector are important as partner and multiplier for the CaSCo project:

- Baden-Baden
- Villingen-Schwenningen
- Freiburg
- Tuttlingen
- Freudenstadt
- Rottenburg
- Reutlingen
- Mengen
- Lahr
- Oberndorf
- Engen
- Donaueschingen
- Emmendingen
- Kehl
- Lörrach
- Offenburg
- Rottweil
- Ravensburg
- Tübingen
- Augsburg
- München
- Gemünden
- Ingolstadt
- Donauwörth

b) Single actors

On regional level, following cities are important as multiplier or potential stakeholder for the CaSCo project and will be addressed directly:

- Baden-Baden
- Villingen-Schwenningen
- Freiburg
- Tuttlingen
- Freudenstadt
- Rottenburg
- Reutlingen
- Mengen
- Lahr
- Oberndorf
- Engen
- Donaueschingen
- Emmendingen
- Kehl
- Lörrach
- Offenburg
- Rottweil
- Ravensburg
- Tübingen
- Augsburg
- München
- Gemünden
- Ingolstadt
- Donauwörth

3.4.5) Italy

a) Organisations

On regional level (Unione montana dei communi della Valsesia):

- UNCEM

UNCEM, the association of mountain local authorities, was born in order to enhance and develop the territory and institutions; promoting coordination of activities of mountain local authorities. This organisation is an important potential multiplier to the project objectives and instruments.

b) Single actors

On regional level, following organisations representing the public sector are important as partner and multiplier for the CaSCo project:

- Unione Monti del Valsesio
- Unione Monti di Valsugana
- Unione Monti della Valsusa
- Unione Monti del Valsugana
- Unione Monti di Valsugana
- Unione Monti della Valsusa
- Unione Monti del Valsugana
- Unione Monti di Valsugana
- Unione Monti della Valsusa
- Unione Monti del Valsugana
• Metropolitan City of Torino

The Metropolitan City of Torino (identified also as the Turin territorial department) is engaged in the territorial development, with an office dedicated to territorial marketing and promotion. In the former years, in the frame of the Interreg Alcotra project “Bois Lab”, it set up a protocol for the certification of the local origin of the timber used by the organizations located at the local level (LPT, Legno Provincia Torino).

Environmental sector of the Metropolitan City is also active in the promotion of Green Public Procurement, with training activities of local actors for the inclusion of good practices and innovative criteria in their procurement processes and procedures (APE network).

3.4.6) Slovenia

a) Organisations and b) Single actors

In Slovenia no organisations and single actors could be identified in this sector. More data are not available.
Chapter 4: Forests and Forestry

The forests in the Alpine Space are sustainable managed since decades.
4.1) Forests

4.1.1) Sustainable managed

»Old sustainable managed forests« in Europe and sustainable management by law in Europe. After the old forest definition „sustainability“ means that there is only as much timber used as it is growing per year. In general this is valid for new plantations in tropics and for „old sustainable managed forests“ in Europe. With the implementation of the European „Due Diligence“ regulation in 2013, the EU assumes that within the European Union there is no poaching in forests because the most countries in the union have laws for sustainable forest management, like Austria, Germany, France, Italy and Slovenia. What means sustainable management for forests in Europe already was defined by the „Helsinki Criteria“.

Timber from sustainable managed forests, Due Diligence and forest labels. Timber under the FLEGT regulation means timber that has been harvested in accordance with national and international laws. In the Alpine Space countries can be assumed, that this is at the same time timber from sustainable managed forests. In other countries this might not be the case. From such sources only timber with forest labels provide incidence, that the timber has been harvested sustainable. Worldwide there are many different forest labels existing. The most known and reliable are the worldwide operating labels FSC and PEFC.

The role of forest labels in the European Union. In some European countries huge parts of the forest area is certified. While in Germany, Austria, Finland, Norway, and Czech Republic the certification status of the country forests reaches 70 to 100%, other countries in the European Union have almost no certified areas. For example until now only 1-2% of the forests in Russia are certified, but for example about 30% of the sawnwood in the European market comes from Russia, often this is poached wood (WWF, 2009, 2012).

The role of forest labels worldwide. In the USA 30%, in Asia 3%, in Latin America 2% and Africa 1% of the forests are certified according to FSC or PEFC. The import of timber from these areas to Europe is enormous, but the amount with admitted forest labels is very small. But especially in these regions with the last tropical forests poaching is bigger than ever before. The certification of tropical forests alone can not stop the destruction of these forests and betrayal in this field is enormous (Green Carbon - black trade, report UNEP and Interpol, 2012).

Low carbon timber with certificate of origin in the whole chain of custody. Tropical timber imports without admitted forest labels (FSC, PEFC) are a no-go. But it should be recognised that the European Union and especially the Alpine Space has large amounts of forests (Tab. 4.1) and of very beautiful and divers timber species . Many customers do not know the variety and beauty in the domestic sustainable managed forests of their countries. Often the same tree species which grows in the Alpine space, in high volumes are imported from outside, often from poaching. Therefore it is not sufficient just to call for the usage of „domestic timber species“, but it is necessary to ask for a proof of regional origin.

<table>
<thead>
<tr>
<th>country</th>
<th>forest area [1000 ha]</th>
<th>country forest area [%]</th>
<th>change [1000 ha/ year 2000-2010]</th>
<th>cert. forest [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>1.005.001</td>
<td>45%</td>
<td>60</td>
<td>26</td>
</tr>
<tr>
<td>France</td>
<td>15.954</td>
<td>29%</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Germany</td>
<td>11.076</td>
<td>32%</td>
<td>78</td>
<td>7</td>
</tr>
<tr>
<td>Italy</td>
<td>9.149</td>
<td>31%</td>
<td>10</td>
<td>87</td>
</tr>
<tr>
<td>Austria</td>
<td>3.887</td>
<td>47%</td>
<td>10</td>
<td>87</td>
</tr>
<tr>
<td>Slovenia</td>
<td>1.182</td>
<td>58%</td>
<td>10</td>
<td>no data av.</td>
</tr>
<tr>
<td>Russ. Fed.</td>
<td>809.090</td>
<td>49%</td>
<td>-18</td>
<td>&gt; 1</td>
</tr>
<tr>
<td>Sweden</td>
<td>28.203</td>
<td>69%</td>
<td>81</td>
<td>61</td>
</tr>
</tbody>
</table>

Tab. 4.1): Alpine Space countries compared to big import countries. Comparing forest areas, change in forest cover and certified forest area. Data last FAO worlds forest report.
4.1.2) Area and structure

Forest areas and functions

The biggest forest area has France (Fig. 4.1). In France and Italy the forest area increased within the last twenty years. The Slovenia forests are covering 62% of the country area, in Austria 47%, in Germany 32%, in Italy 31% and in France 29%. In the Alpine Space countries, the forest cover increased slightly in the past 20 years. Private owners with greater areas are market oriented and provide timber for the market. Small private owners (e.g. < 5 ha) on the other side are not market oriented. The supply of wood from these forests is uncertain. They often use the timber for own purposes and harvest not on market demand. If they are not too small, many private owners are organized in forest support organisations, which then enhance the sales of timber though advice and bundling for amounts.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>3.88</td>
<td>k.a.</td>
<td>k.a.</td>
<td>k.a.</td>
<td>87</td>
</tr>
<tr>
<td>France</td>
<td>15.95</td>
<td>1.63</td>
<td>14.29</td>
<td>0.03</td>
<td>26</td>
</tr>
<tr>
<td>Germany</td>
<td>11.08</td>
<td>5.28</td>
<td>5.79</td>
<td>0</td>
<td>70</td>
</tr>
<tr>
<td>Italy</td>
<td>9.15</td>
<td>0.62</td>
<td>8.44</td>
<td>0.09</td>
<td>7</td>
</tr>
<tr>
<td>Slovenia</td>
<td>1.25</td>
<td>0.03</td>
<td>1.11</td>
<td>0.11</td>
<td>no data av.</td>
</tr>
</tbody>
</table>

Tab. 4.2) Forest status & function. Data FAO 2010.

Growth rate, growing and carbon stock

The biggest growing stock have Germany and France, because they also have the biggest forest areas. The lowest growing stock per hectare have France and Italy. This is probably due to the extreme highly use rate of roundwood for wood fuel (see later). The highest carbon stock in total has France and Germany, but Germany and Slovenia have the highest carbon stock per hectare (Tab. 4.3). Average growth related to CaSCo regions.

<table>
<thead>
<tr>
<th>Forest</th>
<th>Growing Stock [Mio. m³]</th>
<th>Growing Stock [m³/ha]</th>
<th>Carbon Stock [Mio. t]</th>
<th>Carbon Stock [t/ha]</th>
<th>Average Growth [m³/ha*a]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>1.135</td>
<td>337</td>
<td>393</td>
<td>116</td>
<td>11,6</td>
</tr>
<tr>
<td>France</td>
<td>2.584</td>
<td>162</td>
<td>1.213</td>
<td>76</td>
<td>3,4</td>
</tr>
<tr>
<td>Germany</td>
<td>3.492</td>
<td>336</td>
<td>1.407</td>
<td>127</td>
<td>11,2</td>
</tr>
<tr>
<td>Italy</td>
<td>1.384</td>
<td>151</td>
<td>558</td>
<td>61</td>
<td>&gt; 5</td>
</tr>
<tr>
<td>Slovenia</td>
<td>416</td>
<td>332</td>
<td>178</td>
<td>142</td>
<td>no data av.</td>
</tr>
</tbody>
</table>

Tab. 4.3) Growing stock, carbon stock and growth rate. Calculated with data from FAO 2010, German forest inventory, ProHolz.at and data from partners.

65 trees species in the Alpine space

In the forests of the Alpine Space in Austria, France, Italy, Slovenia and Germany are potentially growing 65 tree species. In some regions are more conifer forests present and in other more deciduous forests. The highest proportion of deciduous forests are found in Slovenia, the lowest in Austria. In the next table (Tab. 4.4) the proportions are displayed for the different CaSCo regions. The data show enormous variations between the different regions.

<table>
<thead>
<tr>
<th>Forest area</th>
<th>CaSCo regions</th>
<th>Deciduous [%]</th>
<th>Trend</th>
<th>Conifer [%]</th>
<th>Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>28</td>
<td>+</td>
<td>72</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>60</td>
<td>?</td>
<td>40</td>
<td>?</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>41</td>
<td>+</td>
<td>59</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>50</td>
<td>no data</td>
<td>50</td>
<td>no data</td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td>54</td>
<td>+</td>
<td>46</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Tab. 4.4) Ratio of deciduous and conifer forest area in the CaSCo regions. Data from German forest inventory, ProHolz.at, data of partners.
The tree species composition in the participating CaSCo countries shows the next table (Tab. 4.5). In general the proportion of conifer forest area is declining because of climate change and adaptation of the tree species composition. This partly is supported actively by forest management. This necessary shift from conifer to deciduous tree species composition needs to be met and accompanied by changing markets and processing chains. Deciduous wood usually went in other products and applications. There is a big challenge in developing new markets and products, but it provides new chances and opportunities as well. Especially in connection with the aspects of low carbon timber from regional processing chains deciduous tree species offer interesting potentials. In the next table (Tab. 4.5) tree species with higher stocks, covering more than 2% of the forest area, are indicated in green. They may be interesting tree species for a special information campaign or product development. In Italy for instance especially larch, chestnut, or robinia offering interesting perspectives. Robinia and chestnut because of durability and suitability for urban furniture and larch for construction and facades. In Germany Fir and Pine could be interesting to be developed as an alternative construction material to spruce, which is close to the limit of sustainable harvesting. In Slovenia as well Fir and Pine are interesting for the same purpose and additionally Beech because of the massive occurrence. For Austria the proportion of single tree species is not known.

Tab. 4.5) Tree species in the CaSCo regions. Data in absolute area [ha] and percent of forest area [%]

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>English</th>
<th>Austria</th>
<th>France (AURA)</th>
<th>Germany</th>
<th>Piedmont</th>
<th>Slovenia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abies alba</td>
<td>fir</td>
<td>X</td>
<td>n.d.</td>
<td>226.000</td>
<td>12%</td>
<td>159.610</td>
</tr>
<tr>
<td>Acer spec.</td>
<td>Acer</td>
<td>X</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>124.156</td>
</tr>
<tr>
<td>Aesculus hippoc.</td>
<td>horse chestnut</td>
<td>?</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>64.308</td>
</tr>
<tr>
<td>Alnus spec.</td>
<td>alder</td>
<td>X</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>84.278</td>
</tr>
<tr>
<td>Betula betulus</td>
<td>birch</td>
<td>X</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>39.900</td>
</tr>
<tr>
<td>Castanea sativa</td>
<td>sweet chestnut</td>
<td>-</td>
<td>n.d.</td>
<td>105.000</td>
<td>5-6%</td>
<td>3.701</td>
</tr>
<tr>
<td>Fagus sylvatica</td>
<td>beech</td>
<td>X</td>
<td>n.d.</td>
<td>295.000</td>
<td>16%</td>
<td>622.568</td>
</tr>
<tr>
<td>Fraxinus excels.</td>
<td>ash</td>
<td>X</td>
<td>n.d.</td>
<td>128.000</td>
<td>6-7%</td>
<td>123.406</td>
</tr>
<tr>
<td>Juglans nigra</td>
<td>black walnut</td>
<td>-</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Juglans regia</td>
<td>walnut</td>
<td>-</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Larix decidua</td>
<td>larch</td>
<td>X</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>63.491</td>
</tr>
<tr>
<td>Malus sylvestris</td>
<td>wild apple</td>
<td>X</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>643</td>
</tr>
<tr>
<td>Picea spec.</td>
<td>spruce</td>
<td>X</td>
<td>n.d.</td>
<td>238.000</td>
<td>13%</td>
<td>1.479.166</td>
</tr>
<tr>
<td>Pinus sylvestris</td>
<td>pine</td>
<td>X</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>493.473</td>
</tr>
<tr>
<td>Pinus sylvestris</td>
<td>scotch pine</td>
<td>-</td>
<td>n.d.</td>
<td>234.000</td>
<td>13%</td>
<td>-</td>
</tr>
<tr>
<td>Platanus spec.</td>
<td>plane tree</td>
<td>-</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Populus alba</td>
<td>white poplar</td>
<td>X</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>1.545</td>
</tr>
<tr>
<td>Populus tremula</td>
<td>asp</td>
<td>X</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>26.081</td>
</tr>
<tr>
<td>Prunus padus</td>
<td>bird cherry</td>
<td>-</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>16.973</td>
</tr>
<tr>
<td>Prunus spec.</td>
<td>cherry</td>
<td>-</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Psedotsuga menziesii</td>
<td>douglas fir</td>
<td>-</td>
<td>n.d.</td>
<td>111.000</td>
<td>6%</td>
<td>63.124</td>
</tr>
<tr>
<td>Pyrus communis</td>
<td>wild pear</td>
<td>X</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>1.363</td>
</tr>
<tr>
<td>Quercus robur</td>
<td>Pedunculate oak</td>
<td>X</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>107.733</td>
</tr>
<tr>
<td>Quercus spec.</td>
<td>oak</td>
<td>X</td>
<td>n.d.</td>
<td>553.000</td>
<td>30%</td>
<td>145.733</td>
</tr>
<tr>
<td>Robinia pseudacacia</td>
<td>locust / robinia</td>
<td>X</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>4.409</td>
</tr>
<tr>
<td>Salix spec.</td>
<td>willow</td>
<td>X</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>21.283</td>
</tr>
<tr>
<td>Sorbus aria</td>
<td>hawthorn</td>
<td>-</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>2.688</td>
</tr>
<tr>
<td>Sorbus aucuparia</td>
<td>rowan</td>
<td>-</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>26.791</td>
</tr>
<tr>
<td>Sorbus domestica</td>
<td>sorb tree</td>
<td>-</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>14</td>
</tr>
<tr>
<td>Sorbus terminalis</td>
<td>chequer tree</td>
<td>X</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>1.125</td>
</tr>
<tr>
<td>Thuja plicata</td>
<td>eastern thuja</td>
<td>X</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tilia spec.</td>
<td>lime tree</td>
<td>X</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>25.905</td>
</tr>
<tr>
<td>Ulmus spec.</td>
<td>elm</td>
<td>X</td>
<td>n.d.</td>
<td>-</td>
<td>-</td>
<td>5.163</td>
</tr>
</tbody>
</table>

Sum 36  -  36  20  36
Chapter 5: Timber products & material flows

From traditional to innovative timber products, no timber product lacks within the Alpine space.
5.1) Roundwood

5.1.1) Introduction

Roundwood in Europe

In Europe 722 Mio. m³ roundwood is produced, with 474 Mio. m³ conifer (66%) and 248 Mio. m³ deciduous (37%) wood. About 573 Mio. m³ of this are industrial roundwood, with 422 Mio. m³ conifer (74%) and 151 Mio. m³ deciduous (26%) wood. Roundwood consumption is 704 Mio. m³ and from that 556 Mio. m³ industrial roundwood with 408 Mio. m³ conifer and 149 Mio. m³ deciduous. Theoretically Europe could cover its need of roundwood by its own production, it has 18.8 Mio. m³ surplus production. But there are also 61 Mio. m³ imports of roundwood in the EU and 80 Mio. m³ exports from the EU to other world regions like Asia (e.g. China). Redundant transport quantities with overlapping material flows and enormous transport rates of roundwood from and to Europe are 122.2 Mio. m³.

FLEGT and Due Diligence

The imports to Europe underlay the European FLEGT and Due Diligence regulation. Until now international strategy for protection of primary forests are constrained to international conventions like FLEGT or the European Due Diligence to control illegal timber trade. International conventions are regulating illegal trades but the market has the most important influence on primary forest protection and sustainable use of the natural resources. The global timber market has elementary influence on the global forests, there kind of use, there protection or there destruction. Illegal poaching is a worldwide and seriously problem. It can account for >80% of total harvesting in some countries (WWF, 2009). Therefore, as the first region in the world, the European Union in 2003 has initiated the »FLEGT Action Plan«, to dam the invasion of illegal timber trading into the European Union. Since 2013 the FLEGT regulation is completed by the European „Due Diligence“ (DD) regulation. The „DD“ is one of the three columns of the international FLEGT process which aims to prevent or dam illegal poach and trade timber from the European market. This is based on three columns: (1) „VPA“ voluntary partner agreements between source countries and the EU, (2) supporting sustainable public procurement of timber and (3) voluntary agreements of industry and market participants.

Monitorings showed that to focus only on political regulations can not dam illegal timber trades (Green Carbon - Black Trade, 2012 report UNEP and Interpol). It should be considered that FLEGT have only a focus on „illegal“ poached and traded timber. Illegal means „illegal“ due to the laws of the export country. But if these countries allow deforestation by law this timber is not under the „DD“ and can enter the EU as legal wood. An other problem is that timber which has entered the European Union at any point of the European border can transit different countries until it comes to its destination and underlies no DD regulation within the EU. This does also not mean, that timer entering the EU „legal“ is sustainable or climate friendly. Timber without certificates of origin and chain of custody certificates can not really be controlled. Therefore in the early future the EU will set a focus an regulations of chain of custody. CaSCo countries signed all relevant regulations for environment, climate and biodiversity.

<table>
<thead>
<tr>
<th>International conventions signed</th>
<th>CBD</th>
<th>UNFCCC</th>
<th>Kyoto Protocol</th>
<th>UNCCD</th>
<th>ITTA</th>
<th>CITES</th>
<th>Ramsar</th>
<th>World Heritage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>8</td>
</tr>
<tr>
<td>France</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>8</td>
</tr>
<tr>
<td>Germany</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>8</td>
</tr>
<tr>
<td>Italy</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>8</td>
</tr>
<tr>
<td>Slovenia</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>8</td>
</tr>
</tbody>
</table>

Tab. 5.1) Data Holz von Hier.
5.1.2) Country overview

Roundwood in total

France and Germany have the highest logging rates (Fig. 5.1). France and Italy are producing more deciduous than conifer wood. Germany, Austria and Slovenia produce more conifer wood. France and Slovenia could supply their roundwood needs by own production, but Austria, Germany and Italy consume more than they produce (Fig 5.2). But all countries also have considerable imports and exports of roundwood. Austria, Germany and Italy have higher imports than exports and France and Slovenia higher exports than imports. In Austria and Italy roundwood imports are half of the country production. That’s the same for industrial roundwood (Fig. 5.3).

France and Italy harvest large percentages of deciduous wood, but most of it for firewood (Tab. 5.2). In this segment all countries harvesting more conifer than deciduous wood, which means that all countries use their deciduous forest parts mostly for wood fuel and not for long-living-carbon-storage products. France and Slovenia are autark with their roundwood production (Tab. 5.2), Austria, Germany and Italy have higher needs than they produce. All project countries have considerable high imports and exports of roundwood of the same timber species (!). This cause high overlapping transports, for conifer wood especially in Germany and Austria and for deciduous wood in Austria and Italy.

5.1.3) Country balances

Roundwood from Austria

Nearly half of the roundwood production in Austria is for energy use (Fig. 5.4). The consumption of industrial roundwood for sawnwood, panels and veneer is much higher than the production. This lack is filled up with imports. A small amount of industrial roundwood is exported. For example the project region Joglland (Steiermark) produces 428,000 m³ roundwood, but mostly for external use (323,000 m³).
Roundwood from France
France produces nearly same amounts of roundwood for wood fuel and industrial use. It consumes lesser industrial roundwood than it use. Therefore it exports more industrial roundwood than it use (Fig. 5.5) and imports of it are lower than exports.

Fig. 5.5) Roundwood balance in France. Data Eurostat, 2016.

Roundwood from Germany
Most of annual German roundwood production (56 Mio. m³) is industrial roundwood (Fig. 5.6). About 76% of the industrial roundwood is conifer wood (spruce, fir, douglas fir, pine, larch). Consumption of industrial roundwood is higher than production and therefore imports are higher than exports of industrial roundwood. About 44% was harvested in private forests, 34% in country forests. German companies annually buy 38 Mio. m³ roundwood.

Fig. 5.6) Roundwood balance in Germany. Data Eurostat, 2016.

Roundwood from Italy
Italy produces nearly 3-times more roundwood for wood fuel than for industrial use (Fig. 5.7). It consumes 3-times more industrial roundwood than it produce and also its need for wood fuel is higher than its production. Therefore imports of industrial roundwood and wood fuel are high and Italy has nearly no exports of roundwood.

Fig. 5.7) Roundwood balance in Italy. Data Eurostat, 2016.

Roundwood from Slovenia
Slovenia produces twice as much industrial roundwood as it produce and there are also imports (Fig. 5.8). Therefore exports of roundwood are very high, higher than in all other CaSCo countries. Consumption and production of wood fuel are nearly in the same amount, but there are also considerable imports and exports of wood fuel.

Fig. 5.8) Roundwood balance in Slovenia. Data Eurostat, 2016.
5.2) Wood Fuel

5.2.1) Introduction

Types of energy wood

Energy „wood“ types are (1) roundwood from the forest, (2) bark, (3) materials from landscape management, (4) residues from sawmills and (5) timber industry, (6) wood waste and (7) in bigger plants also „black-lye“, a waste product from the pulp industry.

Residues from the sawmills are sold to the plate-industrie and producers of energy products like pellets. Big sawmills („profilizersparner“) are producing more residues than SME sawmills („Band- Gattersägen“), they are less resource efficient. An average output is 64% sawnwood and 36% (27% to 44%) residues. For example in Germany the amount of wood residues form sawmills has increased by 30%, the amount of black-lye in the pulp industry by 40% and the use of wood waste in biomass plants by 80% since 2000. The use of sawmill products for energy wood (chips, residues, sawdust for pellets) increased 10-times in this time scale (Fig. 5.9, 5.10).

Use and consumption of energy wood

In the last centuries (mainly the last 30 years) the usw of timber in Europe has increased generally, but especially and nearly exponentially increased the energy use of wood. That increase took place not only in households but also smaller (< 1 MW) and bigger (> 1 MW) biomass heating systems. For example, in Germany the use of fire wood in private households increased more them 3-fould since 2000 and the use of fore wood directly from the forest has more than doubled. The use of wood-briquettes increased 4-fould and that of wood-Pellets 27-fould in the same time scale. Even the use of materials from landscape management doubled.

This use of energy wood is coupled to the price of the other energy carriers like oil and gas. But within the last decades the renewable energies captured and strengthened there role within Europe.
5.2.2) Country overview

Wood Fuel from forest roundwood

France has the highest fire wood production and use. This is mainly deciduous wood. France and Italy use obvious more roundwood for fire wood than within the valuable industrial usage. To use roundwood for fire wood instead of long-living-products decrease the added value of the country and also the positive climate effect of timber use. Good climate protection can especially be achieved with long-living-timber-products, marginally with fire wood. The immense raised use of fire wood in Italy and France do not response on increasing electricity and gas prices, which are climbed up much more in other European countries, e.g. Germany (Fig. 5.11, 5.12, 5.13, 5.14).

5.2.3) Country specifics

Wood fuel (forest) from Austria

Austria consumes 14% more firewood than it produce and about 24% of the logging is used for firewood. The Austrian Energy Agency (2014) showed, that a large amounts of roundwood and residues goes to the energy sector, much more than what is used for long-living-products (Fig. 5.15).
Wood Fuel (forest) from France

France uses nearly same amounts of fire wood that are stroke. But about 52% of the total roundwood stroke is used for firewood.

Biomass heating plants using timber (pict. HvM)

Wood Fuel (forest) from Germany

Production and Consumption. Germany produce and use large amounts of energy wood. The occurrence of energy wood is about > 30 Mio. t per year as energy roundwood from forests, bark, landscape foster material, residues from sawmills and timber industry, black-lye, wood waste (see box). The production of chips and pellets are about 8 Mio. t. The use of energy wood is about 15 Mio. t in biomass plants and about 34 Mio. tons in domestic homes.

Example Germany

The occurrence of energy wood:
- energy roundwood from forest: 8,0 Mio. m³ = 4,2 Mio. t
- bark: 4,7 Mio. m³ = 2,6 Mio. t
- Landschaftspflegematerial: 4,5 Mio. m³ = 2,3 Mio. t
- residues from sawmills: 15 Mio. m³ = 10,6 Mio. t
- residues from timber industry: 5,8 Mio. m³ = 3,1 Mio. t
- black-lye (“Schwarzlauge”): 3,6 Mio. m³ = ?
- wood waste (“Altholz”): 14 Mio. m³ = 6,5 Mio. t.

The production of chips and pellets:
- pellet production: 1,95 Mio. t
- chips conifer wood from sawmills: 5,6 Mio. t (calcul.)
- chips deciduous wood from sawmills: 0,3 Mio. t (calcul.)

The use of energy wood in Germany:
- biomass plants > 1 MW: 22,6 Mio. m³ = 11,2 Mio. t
- biomass plants < 1 MW: 7,2 Mio. m³ = 3,6 Mio. t
- domestic fuel in total: 33,9 Mio. m³ = 16,9 Mio. t
- domestic fuel only pellets; ca. 2,0 Mio. t
- domestic fuel only fire wood aband others: 14,9 Mio. t
- other use: 0,1 Mio. m³ = 0,05 Mio. t
- producers of energy products: 4,6 Mio. m³

Data: Mantau 2012, tons calculated with factors from Manthau 2012

Alpine Space regions Bavaria and Baden-Württemberg. After the cluster study Bavaria (2015) additionally nearly 700,000 tons fire wood were exported from Bavaria (mostly to Austria, 70% to 90%) and 500,000 tons of fire wood were imported to Bavaria. In Bavaria nearly 60% of the felled roundwood (direct and indirect via residues from the industry) is used as energy wood (cluster study Bavaria 2015). Probably that is the same for Baden-Württemberg. The majority of the biomass plants in Bavaria and Baden-Württemberg using wood chips, followed by biomass plants that use pellets. In Bavaria 2015 in total 5,3 Mio. t energy wood was used, 3,4 Mio. t by households, 1,4 Mio. t by Biomass(heat)power plants und 0,5 Mio. t by industry plants (values in atro). In Baden-Württemberg annually 1,3 Mio. t energy wood is used (cluster study Bavaria 2015, cluster study Baden-Württemberg, 2010).

Wood Fuel (forest) from Italy

According to general statistics (e.g. FAO) Italy consumes nearly 15% more fire wood than it is produced in Italy, despite the fact that Italy uses more than 70% of the total roundwood logging for fire wood. This would prompt an enormous loss of added value.

Production. Statistical data about timber productions and flows are a critical problem in Italy. Data detection is far from complete and often questionable, and the different sources are inconsistent, so that the estimates below are approximate. This is particularly true for Italian wood fuel sector: it is characterized by a complex informal economy based on low scale harvesting, operated by plenty of small private actors who are not included in official statistics. In EurObserv’ER’s report named “Barometer”, Italian production of primary energy from solid biomass was 6,71 Mtoe in 2015, equivalent to about 15 mio t of fire wood, and 7,45 Mtoe in 2013 (16,6 mio t firewood). As we cannot use a unique data source for a global glance to the issue, we had to refer to 2013 to make data comparable. According to national official data (ISTAT, 2013), domestic production of wood fuel from forests amounts to about 5,3 mio m³ (2,7 mio t). This volume corresponds to nearly 70% of the total national harvest. The percentage has been growing since the end of the ’70s, due
to the continuous de-specialization of Italian timber logging, increasingly directed to lower added value productions. Yet, other data sources consider this estimate much understated, assuming that the real value would be 13,3 mio m³ (6,6 mio t). Recycled waste wood amount is 1,4 mio t (Rilegno data) but no data about the percentage used as fuel are available; we have no information about wood coming from out-of-forest logging, too.

**Import.** According to COMTRADE, the amount of potential energy wood imported to Italy in 2013 was 3,8 mio t (0,8 mio t of forest roundwood, 1,75 pellet, 0,63 woodchips) but an uncertain part of it is used for industrial productions (panels, pulp).

**Consumption.** Official data assume that 15-20% of Italian households consume biomass as major energy source for heating, with wood biomass being the dominant source. In 2013 (ISTAT) the Italian domestic annual consumption of firewood was estimated about 17,7 mio t of firewood (3,2 t/household) and 1,5 mio t of pellet (1,4 t/household), but the use of pellet is increasing. Unexpectedly, the 2013 National Energy Balance (BEN) reports a total consumption of firewood of 26,7 mio t (21,2 from domestic production!). Clearly, consumption data widely exceed production data, and the data sources don’t meet at all. We presume the most significant data for our purposes are those reported below:

1. Italian production of primary energy from solid biomass (2015): 6,71 mio t (15 mio t of firewood).
2. Italian estimated firewood production: >7 mio t (12-14 mio m³).
3. Italian firewood consumption (2013): 17,7 mio t.

Finally, it’s crucial to note that 55% of Italian household consumers who use firewood as a heating source satisfy their need by self production, fully in 38%, partly in 17%.

Another significant percentage concerns firewood logged, processed, sold and consumed in a range of a few kilometers. Consequently, most of Italian firewood supply chains are very short and the carbon emissions are remarkably low. An important action field for emissions decreasing would be to reduce the import and to increase local production of firewood, woodchips and pellets, and to redirect consumers’ trend from pellet heating plants to small woodchips ones.

In fact, as most of pellets consumed in Italy are imported, woodchips processing chain is simpler and more suitable for small enterprises and micro-businesses, which are the bulk of forestry sector in Italian mountain territories. Moreover, very short supply chains make it possible to improve the economic results for small logging companies and give them a better opportunity to evolve to more structured forms.

**Main sources:**


**Wood Fuel (forest) from Slovenia**

Slovenia produces 16% more fire wood from the forests than hat is consume in Slovenia itself, despite the fact that „only” 31% of the roundwood logging is used as fire wood.

**Only low-tansport wood fuel products are climate friendly (pict. HvH)**
5.3) Sawnwood

5.3.1) Introduction

The aim to shorten material flows in timber products should lead to the assumption that this is only necessary for timber. All other building materials have comparable or much more wider transport rates within the chain of custody. Helpful for this is to have a look at the basic raw materials of other building products, with often much larger transports. Most of them are even not available in Europe or the project countries.

Comparison of basic raw materials

The main basic raw materials for building products are: primary aluminium, bentonite, kaolin, feldspar, gypsum, quicklime, salt, soda ash and roundwood. These raw materials have much lesser occurrence in the project regions than roundwood (Fig. 5.16).

With comparison of the basic materials used in the manufacturing of building products it has to be realised, what is meant, when buildings products were compared in ecological aspects.

Are the basic raw materials meant or the intermediate products? That can imply very different material flows, with different manufacturing steps within different countries worldwide. For example bauxite for the alumina production occurs only in 26 countries worldwide (not in the project countries) but forests (in 217 countries) and especially planted forests occur in 166 countries worldwide (data HvH database SAVE with in this case data from USGS).

Are meant the intermediate or refined products and on which step? Ecobalances should not (but do) compare balances where the basic materials in the balance are from very different parts of the chain of custody. If a ecobalance starts with the intermediate product „PE-plastik-granulate“ (and not oil), it can not be compared with an ecobalance, that starts with the raw material „roundwood“: But such comparisons often occur in the ecobalance field. But users like planers, who in the practise often only overtake the ecobalance values like „kg CO2-Äqv“, should recognize that they compare „apples with pears“.

Fig. 5.16) Occurrence of different raw materials in the project countries. Data from the HvH SAVE database, diff. sources.

Comparable intermediate products are: hydraulic cement, raw steel, alumina compared to sawnwood and wood based panels (Fig. 5.17). It can happened that the raw materials are widely spread out, but that the intermediate products are occurring only in a few countries worldwide and therefore that there transport rates have to be higher.

Fig. 5.17) Primary products for construction. Data Eurostat.
5.3.2) Country overview

Conifer sawnwood

Austria and Germany produce more sawnwood than they use, France and Italy use more sawnwood than they produce, but all of them have considerable imports and exports (Fig. 5.18). Austria has considerable exports of sawnwood, bigger than their own production (!), that means a part of there production and especially there imports are exported again. Exports from Austria to other countries without certificates of the chain of custody, can not automatically be seen as „sawnwood produced in Austria“. In Slovenia production and consumption have nothing to do with imports and exports, as it seems.

Deciduous sawnwood overview

France and Germany produce more deciduous „hardwood“ than they use. In the opposite Italy, Austria and Slovenia consume more than they produce, in the case of Italy much more (Fig. 5.19). France and Germany could be autark from deciduous hard wood, however they have high imports and exports. Austria and Slovenia have production, consumption, imports, exports of deciduous wood in nearly the same amount, although they have high supply of interesting and different hardwood in the forests.

Overlapping material flows

Only Austria, Germany and Slovenia could supply its needs for conifer sawnwood by their own production (Tab. 5.6 „autarky“ green data), but not France and Italy. In some countries like Austria and Germany the border for sustainable harvesting of conifer wood, especially fir, could be or seems to be reached in some, but not in all, regions and to enhance production capacities could reach this „autarky border“ of equal production and consumption. In other countries this can not be concluded from these data.

All countries have considerable overlapping material flows of conifer sawnwood. Weather this is various in different „sawnwood products“ (fresh, dried, planed, glued products), can not be seen with these data. The most overlapping are arising in Germany and Italy.

<table>
<thead>
<tr>
<th>sawnwood [Mio. m3]</th>
<th>Autarky</th>
<th>overlapping amounts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>conifer</td>
<td>deciduous</td>
</tr>
<tr>
<td>Austria</td>
<td>-3.22</td>
<td>+0.03</td>
</tr>
<tr>
<td>France</td>
<td>+1.48</td>
<td>-0.12</td>
</tr>
<tr>
<td>Germany</td>
<td>-2.60</td>
<td>-0.27</td>
</tr>
<tr>
<td>Italy</td>
<td>+3.77</td>
<td>+0.57</td>
</tr>
<tr>
<td>Slovenia</td>
<td>-0.13</td>
<td>+0.01</td>
</tr>
</tbody>
</table>

Tab. 5.6) Autarky and overlapping transported amounts of sawnwood in the CaScCo countries. Calculated from consumption, production, import, export with data from Eurostat.
5.3.3) Country level

Sawnwood Austria

Conifer sawnwood

About 98% of the consumed and produced sawnwood in Austria is conifer wood (82 Mio. m³ conifer and 0.14 Mio. m³ deciduous). Austria could supply its needs for conifer sawnwood by own production, but there are 40% overproduction (Fig. 5.20). Export has the same range as consumption, because there are big global players located in Austria. At the same time Austria has strong imports of conifer sawnwood, about 33% of the own consumption could come from imports of conifer sawnwood. This part could be influenced by low carbon timber.

But the proportion of long distance wood in sawnwood could be obvious higher, because 32% of the probably used industrial roundwood (16.29 Mio. m³ calculated) are from net imports (5.22 Mio. m³ calculated). Normally sawnwood producers have conifer sawnwood outputs of 60% (bigger ones lesser) of the industrial roundwood material they bought. This would lead to 11.51 Mio. m³ industrial roundwood for sawlog production that is needed to produce 8.22 Mio. m³ sawnwood.

That means that at minimum 25% of the conifer sawlogs for production of sawnwood originates from import. The other part of the industrial roundwood on the Austrian market is used for production of pulp and panels. Also there is an important part form imports (see later).

In the current production of 13.09 Mio. m³ conifer roundwood and the estimated use of at minimum 16.29 Mio. m³ industrial roundwood, Austria is a net importer and can not supply its needs from industrial roundwood. This can not easily be influenced by implementing low carbon timber processing chains.

Austria: conifer wood

<table>
<thead>
<tr>
<th>conifer roundwood</th>
<th>8.22 Mio. m³</th>
<th>conifer sawnwood production</th>
<th>8.22 Mio. m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>conifer roundwood in total production</td>
<td>13.09 Mio. m³</td>
<td>conifer sawnwood</td>
<td>5.84 Mio. m³</td>
</tr>
<tr>
<td>conifer roundwood imported</td>
<td>5.84 Mio. m³</td>
<td>conifer roundwood for sawlogs</td>
<td>5.84 Mio. m³</td>
</tr>
<tr>
<td>conifer roundwood</td>
<td>1.32 Mio. m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>conifer sawnwood</td>
<td>0.14 Mio. m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>conifer sawnwood export</td>
<td>0.10 Mio. m³</td>
<td></td>
<td></td>
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</tbody>
</table>

Fig. 5.20) Conifer sawnwood balance Austria. Data calculated from FAO 2014.

Deciduous sawnwood

Austria consumes 0.17 Mio. m³ deciduous sawnwood (Fig. 5.21), about 17% more than it produces, but in general deciduous sawnwood does not play an important role on the Austrian market, although Austria has important amounts of deciduous tree species in its forests, that are mainly used for wood fuel. Imports of deciduous sawnwood (0.17 Mio. m³) are higher than the production in Austria and also exports (0.14 Mio. m³) are high. This is a very good starting point for low carbon timber because in a worst case 100% of the timber in a certain amount of consumed deciduous sawnwood, for example in furniture, could be from imports.

The data indicate, that the net import (1.32 Mio. m³) of deciduous industrial roundwood is much higher than the Austrian production (0.96 Mio. m³). The home production of deciduous saw logs would under normal rates of residues in saw wood production (~ 30 - 50%) be sufficient to ensure the current production of deciduous saw wood. Additionally there is a high amount of 1.32 Mio. m³ import of deciduous roundwood, which is split into sawlogs and pulp and panel in an unknown ratio.

Sawnwood France

Conifer sawnwood

About 82% of the produced and 85% of the consumed sawnwood in France is conifer wood. The production of conifer sawnwood is not a question of raw material (saw logs) availability, as the export is higher than the import. France consumes 20% more conifer sawnwood (783 Mio. m³) than it produces (6.35 Mio. m³; Fig. 5.22). The balance of 1.48 Mio. m³ sawnwood, which now is part of the import of 2.21 Mio. m³, however could probably produced domestic, as according to expert insight, in all Alpine Space countries SME saw mills are under pressure and are far from production capacity limit.
Sawnwood Germany

Conifer sawnwood

Nearly 95% of the produced and 96% of the consumed sawnwood is conifer wood. Germany produces 13% more sawnwood than it consumes (Fig. 5.24). Nevertheless there are high foreign trade rates with a net export. According to usual residues rates of 30 - 50%, the domestic production of saw logs (24.92 Mio. m³) would not cover the domestic production of sawnwood (20.76 M⁴). The rates of import and export of industrial roundwood prompt, that an amount of 5.97 Mio. m³ from net import is available, unknown, how this amount is allocated to saw logs and other industrial roundwood. This could almost be substituted by domestic production, if no industrial conifer roundwood would.

Fig. 5.24) Conifer sawnwood balance Germany. Data: ZMP, 2007; FAO, 2014; Destatis, 2016.

Even chamber dried sawnwood has lost enormous market shares in the building sector. The in-house-production of the German sawmills for classic sawnwood is 25% lower than 10 years ago. These amounts are purchased additionally, mostly from outside the country.

German sawmills sells 19.8 Mio. m³ sawnwood (conifer and deciduous), 67% from that is classic chamber dried sawnwood and 33% products like KVH, BSH. About 95% is conifer wood.

The intensity of foreign trade increased within the past years, as a comparison of data from 2007 (central marketing reporting organisation), the FAO data from 2014 with newest statistical data (German statistical agency) from 2016, as indicated in Fig. 5.24). The import of conifer sawnwood has more than doubled from 3.63 Mio. m³ in 2007 up to 7.98 Mio. m³ in 2016. At the same time export has doubled as well with an increase from 5.74 Mio. m³ in 2007 up to 11.9 Mio. m³ in 2016. With regard to climate issues it is important, which countries are importers and exporters. The five most important import countries are Sweden, Austria, Finland, Czech Republic and Russian Federation, added by a big part of the im-

Deciduous sawnwood

The production of deciduous sawnlogs as raw material for sawnwood is not a question of raw material (saw logs) availability, as the export is 6 to 7 fold higher than the import (Fig. 5.23) and additionally already the production of deciduous sawnwood is 1/3 of the amount of saw logs. If the statistical data are to be interpreted in a strict way (100% saw logs went into 100% production of sawn wood) this would correspond with a rate of 70% of residues from sawnwood production, which is rather ineffective. The consumption of deciduous sawnwood is 8% lesser than the domestic production. Although production would cover consumption, a considerable amount of foreign trade occurs.

Fig. 5.23) Deciduous sawnwood balance France. Data calculated from FAO 2014.

France: deciduous wood

Fig. 5.22) Conifer sawnwood balance France. Data calculated from FAO 2014.

France: conifer wood

Germany: conifer wood : values in [Mio. m3]

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<tbody>
<tr>
<td></td>
<td>conifer roundwood in total production 20,18 Mio. m³</td>
<td>consumption of deciduous sawnwood 1,18 Mio. m³</td>
<td>consumption of deciduous sawnwood 0,30 Mio. m³</td>
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<td></td>
<td>conifer roundwood export 2,27 Mio. m³</td>
<td>conifer sawnwood consumption 7,83 Mio. m³</td>
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<td>conifer sawnwood consumption 7,83 Mio. m³</td>
<td>conifer sawnwood consumption 0,73 Mio. m³</td>
</tr>
<tr>
<td></td>
<td>conifer industrial roundwood production 6,35 Mio. m³</td>
<td>conifer sawnwood consumption 7,83 Mio. m³</td>
<td>conifer sawnwood consumption 0,73 Mio. m³</td>
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<tr>
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<td>conifer industrial roundwood export 1,54 (2014)</td>
<td>conifer sawnwood consumption 7,83 Mio. m³</td>
<td>conifer sawnwood consumption 0,73 Mio. m³</td>
</tr>
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</table>

Fig. 5.24) Conifer sawnwood balance Germany. Data: ZMP, 2007; FAO, 2014; Destatis, 2016.
ports comes from fare countries. The fife most important countries for sawnwood exports are closer with destination Austria, France, Netherlands, Italy and Belgium.

**Baden-Württemberg (BW) and Bavaria (BY)**

Baden-Württemberg (BW) and Bavaria (BY) are Alpine Space regions still with a lot of sawmills and with a divers structure of SMEs. Annually they purchase 14 Mio. m³ roundwood. BW and BY together produce 7.56 Mio. m³ conifer and 0.25 Mio. m³ deciduous sawnwood annually. The Bavarian clusterstudy (2015) estimates that 0.4 Mio. tons of sawnwood are importet and 0.8 Mio. tons are exported from Bavaria. Imports to Bavaria according to the study originating mainly from Austria (26%), Czech Republic (21%) and Russia (10%). More detailed conclusion can not be drawn from the existing cluster studies of BW and BY.

**Planned sawnwood**

Imports are mainly planned conifer sawnwood with increasing amounts, which is more and more used for the internal KVH and BSH production (interviews Holz von Hier with the German VSH). The foreign trade reaches considerable amounts (Tab. 5.7) with a net export in total. The numbers let assume, that foreign trade ranges in the same or even bigger quantity than internal production. The biggest fife export partners are Austria, Netherlands, France, Belgium and Italy whereas the biggest countries of origin of import are Sweden, Russia, Austria, Belarus and Finland.

<table>
<thead>
<tr>
<th>planned sawnwood(*)</th>
<th>reg. sawnwood</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>2016</td>
</tr>
<tr>
<td>Import [Mio. m³]</td>
<td>0.48</td>
</tr>
<tr>
<td>Export [Mio. m³]</td>
<td>2.42</td>
</tr>
</tbody>
</table>

*Tab. 5.7) Planed sawnwood and normal sawnwood import and export. Data ZMP 2007, Destatis, 2016. (*) Planed sawnwood includes smaller amounts of KVH and BSH.

**KVH, BSH**

Nearly 33% of the products from German sawmills are KVH and BSH. In Germany 6.3 Mio. m³ sawnwood is further processed to KVH, BSH, with an output of 69% (Fig. 5.25). This leads to 4.4 Mio. m³ or 1.9 Mio. t KVH/BSH. Nearly 0.09 Mio. t are imported, 0.1 Mio. t are exported, which leads to a calculated consumption of 1.89 Mio. t KVH/BSH. The five most important export countries are Switzerland, France, Austria, Spain and Belgium, where-as the most important import countries are Austria, Poland, Italy, Latvia, Indonesia, Russia and Romania. German sawmills, especially the KVH/BSH producers, additionally purchase 25% of the sawnwood used for KVH production, from external sources.

KVH became a very common used mass product for timber buildings in Germany. Without a certificate of origin customers cannot be sure, that the product they bought even contains wood, which has been grown in German or Alpine Space forests.

**Deciduous sawnwood**

The consumption of deciduous sawnwood is 25% lesser than the production (Fig. 5.26). However the same amount as consumption is exported. At the same time a high amount of sawn wood is imported.

**Fig. 5.26) Deciduous sawnwood balance Germany. Data FAO, 2014; Destatis, 2016.**

In the past years domestic production as well as consumption of deciduous saw wood decreased. The same occurred with import and export amounts. This decrease obviously is not due to scarcity of raw material, as industrial deciduous roundwood is by far high enough to provide sufficient raw material. This decline of deciduous sawnwood production is contrary to the German forest policy of raising the amount of deciduous wood in managed forests.

For example today in Germany 0.69 Mio. m³ deciduous sawnwood are produced and lesser is consumed, probably because great parts of the furniture industry broke down. Imports and exports decreased also, but still there are a net export. Main exports are from beech and oak. About 20% of the entire domestic production of deciduous sawn wood
is exported as beech sawnwood to China (Destatis). Oak sawnwood mainly goes to Poland, Vietnam, Netherlands, China and Indonesia. On the other side imports of furniture from Poland and Asia (China, Indonesia) increased considerably. Therefore it is not enough, to tender domestic wood species, as all of them also undergo foreign trade. Only in combination with a certificate of origin for low carbon timber a raised demand of products from deciduous wood supports the forest policy strategies for climate adaptation and biodiversity.

A lot of products from tropical timber were imported in the last years, especially furniture and timber floors. In Germany up to 70 tropical timber species are commonly used (holz-von-hier.de). About 33 of them are endangered but probably often originate from poaching. Only 11 are not endangered and available with forest labels but also are traded without.

**Sawnwood Italy**

**Conifer sawnwood**

Nearly 64% of the produced, but 81% of the consumed sawnwood is conifer wood. Italy consumes 5 fold more sawnwood than it produces (Fig. 5.27). Import of saw logs reaches almost domestic production. Export of conifer saw logs and conifer roundwood occurs, but is comparable low. The usual rates of residue (~ 40%) supposed, 1,52 Mio. m³ saw logs would be required. This would require 1 Mio. m³ from import in addition to 0,52 Mio. m³ of domestic production. That prompts, that sawn wood produced in Italy may contain a high proportion of long distance wood (in average 2/3).

**Sawnwood Slovenia**

**Conifer sawnwood**

In Slovenia 87% of the produced and 83% of the consumed sawnwood is conifer wood. Slovenia produces 17% more sawnwood that it consumes (Fig. 5.29). Additionally there are huge amount of foreign trade material flows, which are even higher than production or consumption. Underlying the statistical data, the production of conifer sawnwood is connected with a residues rate of 66%, which usually occurs only in the case deciduous wood. It is noticeable, that already 93% of the whole conifer roundwood is used as industrial roundwood and 66% as saw log.

It is also noticeable, that the statistical data of production set against with the foreign trade result in 1,34 Mio. m³ (2014) resp. 1,39 Mio. m³ (2015) of deciduous roundwood available for domestic use. At the same time the statistics states a production of conifer saw logs of 1,82 Mio. m³ (2014) resp. 2,21 Mio. m³ (2015). That would mean a lack of 1,24 Mio. m³ (2014) resp. 1,47 Mio. m³ (2015). The cause of this statistical deficit is not apparent.

A comparison of the FAO data from 2014 with Slovenia statistical data from 2015 show an considerable increase in conifer roundwood production and an increase of export (and import) of conifer industrial roundwood.

**Deciduous sawnwood**

The consumption of deciduous sawnwood is doubles the production in Italy (Fig. 5.28). A high amount of sawn wood is imported, export occurs at 1/3 of production. The same rates of residues in production assumed, like in Germany or France, Italy would require 1,63 Mio. m³ saw logs for the sawn wood production. That indicate an part of imported wood of 1,14 Mio. m³. Although Italy consumes much more sawnwood than it produces, the part of fire wood that is used form the forests is extremely high.

---

**Italia: Conifer sawnwood**

<table>
<thead>
<tr>
<th>Product</th>
<th>Import 2014</th>
<th>Production 2014</th>
<th>Export 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conifer roundwood</td>
<td>1,36 Mio. m³</td>
<td>2,65 Mio. m³</td>
<td>1,56 Mio. m³</td>
</tr>
<tr>
<td>Conifer industrial roundwood</td>
<td>1,32 Mio. m³</td>
<td>2,47 Mio. m³</td>
<td></td>
</tr>
<tr>
<td>Conifer sawnwood</td>
<td>3,91 Mio. m³</td>
<td>4,64 Mio. m³</td>
<td>1,09 Mio. m³</td>
</tr>
</tbody>
</table>

**Italia: Deciduous sawnwood**

<table>
<thead>
<tr>
<th>Product</th>
<th>Import 2014</th>
<th>Production 2014</th>
<th>Export 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deciduous roundwood</td>
<td>0,94 Mio. m³</td>
<td>1,14 Mio. m³</td>
<td>1,52 Mio. m³</td>
</tr>
<tr>
<td>Deciduous industrial roundwood</td>
<td>0,30 Mio. m³</td>
<td>0,49 Mio. m³</td>
<td></td>
</tr>
<tr>
<td>Deciduous sawnwood</td>
<td>0,73 Mio. m³</td>
<td>0,94 Mio. m³</td>
<td>1,53 Mio. m³</td>
</tr>
</tbody>
</table>

**Fig. 5.27** Conifer sawnwood balance Italy. Data calculated from FAO 2014.

**Fig. 5.28** Deciduous sawnwood balance Italy. Data calculated from FAO 2014.
5.3.4) Potentials, action fields

**Potentials for closing regional processing chains**

- Quantitatively the export of 0.62 Mio. m³ industrial conifer sawlog roundwood could be avoided. As this would compensate the same amount of imported roundwood, the avoidable transported amount doubles to 1.24 Mio. m³.

- The same balance refers to conifer sawnwood with a net export. Imports of 1.62 Mio. m³ could be avoided and in total amounts of 3.24 Mio. m³.

- Related to deciduous saw logs the export of 0.1 Mio. m³ could be compensated from reduction of import, so that in total (bidirectional!) 0.2 Mio. m³ could be used in regional processing chains.

- Related to deciduous sawnwood the export of 0.14 Mio. m³ could be compensated from reduction imports by same amounts, resulting in 0.28 Mio. m³ potentially used in regional cycles. Especially because the foreign trade ranges in the same dimension like the entire internal production.

**Potentials for Austria**

- Quantitatively the import of amounts of 1.18 Mio. m³ industrial conifer sawlog roundwood could be avoided. As this would compensate the same amount of exported roundwood, the avoidable transported amount doubles to 2.36 Mio. m³. The same balance refers to conifer sawnwood with a net export. Imports of Mio. 0.73 m³ could be avoided, resp. in total amount of 1.46 Mio. m³.

- Related to deciduous saw logs the import of 0.32 Mio. m³ could be compensated from reduction of export, so that in total (bidirectional!) 0.64 Mio. m³ could be used in regional processing chains.

- Related to deciduous sawnwood the import of 0.29 Mio. m³ could be compensated by reduction of the export by the same amount. That results in 0.58 Mio. m³ potentially used in regional cycles.

**Potentials for France**

- Quantitatively the export of amounts 2.04 Mio. m³ industrial conifer sawlog roundwood could be avoided. As this would compensate the same amount of imported roundwood, the avoidable transported amount doubles to 4.08 Mio. m³.

- The same balance refers to conifer sawnwood with a net export. So in principle imports of 4.23 Mio. m³ could be avoided, resp. in total the amount of 8.46 Mio. m³.

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**Deciduous sawnwood**

Consumption of deciduous sawnwood is 10% higher than production, although Slovenia is rich of deciduous forests (Fig. 5.30). A remarkable aspect is, that Slovenia’s imports and exports are in the same range than its production. Without more information this is to be interpreted, that Slovenia is a „passing-through-country“ for sawnwood, which is not supporting the objective of closed regional cycles.

Regarding the balance of production of deciduous roundwood and foreign trade show the same pattern of „lacking“ amounts like with coniferous roundwood.

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**Slovenia: deciduous wood : values in [Mio. m3]**

Fig. 5.30 Deciduous sawnwood balance Slovenia. Data for 2014 with FAO, data for 2015 with Statistical office of the Republic of Slovenia, provided by BSC Slovenia.
• Related to deciduous saw logs the import of 0.49 Mio. m³ could be compensated from reduction of export, so that in total (bidirectional!) 0.98 Mio. m³ could be used in regional processing chains.

• Related to deciduous sawnwood the import of 0.42 Mio. m³ could be compensated by reduction of the export by the same amount. That results in 0.84 Mio. m³ potentially used in regional cycles.

Potentials for Italy

• The potential for avoiding long distance wood by establishing low carbon timber processing chains is comparably low because of the high net import rates. Nevertheless, quantitatively the export of an amount of 0.14 Mio. m³ industrial conifer saw-log roundwood could be avoided. As this would compensate the same amount of imported roundwood, the avoidable transported amount doubles to 0.28 Mio. m³. The same balance (0.28 Mio. m³) refers to conifer sawnwood. Nevertheless it is especially important to take care of proven low carbon timber processing chains.

• In the Alpine Space raw material availability may be better than in Italian average, as for instance larch covers big forest areas (data from Envipark).

• Related to deciduous sawnwood the export of 0.17 Mio. m³ could be compensated by reduction of the export by the same amount. That results in 0.34 Mio. m³ potentially used in regional cycles.

Potentials for Slovenia

• Regarding conifer sawnwood imports of 0.82 Mio. m³ could be avoided, compensating same amounts of export, resulting in a total amount of 1.64 Mio. m³.

• Related to deciduous sawnwood the same ratio occurs, but at a lower level. The numbers are 0.08 Mio. m³ export, which could be avoided, compensating the same amount of import. That results in 0.16 Mio. m³ potentially used in regional cycles.

Other action fields

Other action fields for Austria

• Switching more roundwood from wood fuel to industrial roundwood

• Increasing the production of conifer roundwood in total, if growth rates and sustainable management would allow this.

• In general the demand for long living and sustainable products of deciduous wood could be raised, triggering a better valorization of deciduous roundwood.

Other action fields for France

• Switching more roundwood from wood fuel to industrial roundwood provides high potentials for rationalisation. Only 25% of deciduous roundwood is used as industrial roundwood and 14% as saw logs.

• Raising the demand for long living and sustainable products of deciduous wood with low carbon timber certificate could direct additional (1.81 Mio. m³) material flows of deciduous saw logs from export to domestic production and around 0.11 Mio. m³ from sawnwood exports to domestic use.

• Consumption conifer sawn wood in France is 1.48 Mio m³ higher than own production. But this gap could be closed through switching conifer saw logs from export into the domestic production.

• Raising the demand for pure solid construction timber instead of glue laminated wood would offer potentials for SME saw mills as prerequisite for low carbon timber.

Other action fields for Germany

• Switching more roundwood from wood fuel to industrial roundwood provides a high potential for regionalization, as only 58% of deciduous roundwood is used as industrial roundwood respectively 23% as saw logs.

• Raising the demand for long living and sustainable products of deciduous wood with low carbon timber certificate could direct additional (0.75 Mio. m³) material flows of deciduous saw logs from export to domestic production and 0.27 Mio. m³ from export of sawnwood to domestic use.

• Consumption of low carbon timber conifer sawnwood with certificate could be increased by additional 2.6 Mio. m³ without having a supply gap.

• Raising the demand for pure solid construction timber instead of glue laminated wood would offer potentials for SME saw mills as prerequisite for low carbon timber.
Other action fields for Italy

- It should be investigated, whether portions of roundwood, currently used as wood fuel, could be shifted to be used as industrial roundwood, as only 17% of deciduous roundwood is used as industrial roundwood respective 9% as saw logs. If this could be achieved, net imports of 1,53 Mio. m³ saw logs and 0,56 Mio. m³ of sawn wood (corresponding 1,87 Mio. m³ of saw logs) could be avoided. Even then, there would be 1,31 Mio. m³ roundwood for wood fuel remaining.

Other action fields for Slovenia

- Raising the demand for long living and sustainable products of deciduous wood with low carbon timber certificate could open considerable potentials of regional closed cycles at the same time supporting the current situation of a majority of deciduous parts of the forest area.
5.4) Veneer

5.4.1) Introduction

Veneers are sheets from wood, which are usually have a thickness between 0,3 and 6 mm. They are produced either through paring, sawing or cutting of a log. Veneer offers a broad variety of applications in big as well as small surfaces, from walls to smart phone shells (from: „Positions of the initiative ‘Veneer + Nature e.V.,“ 2014). Some European countries, like Germany changed continuously from a producing country to a trade hub of veneer. For example today only 7 German companies are still producing veneer themselves. The most important customers for the veneer producers are furniture industry, producers of components like doors, battens, panels as well as exclusive constructors of automobiles, airplanes and yachts.

Main causes for the decrease of production are so called substitutes. These substitutes are synthetic foils, which - imitating wood impression - can be applied on various end products cheaper than veneer.

To save and enhance the biological diversity forestry and timber industry need to advocate jointly for ecological stable forests with a high variety of tree species. Only this way forests may produce high quality timber. Through increasing the stock in the forests in the long term more high value timber can be produced, from which long living and high quality products may be fabricated.

But there may arise competing interests, as a lot of forest strategies target to reduce the current stock in order to rise the carbon capture through growing forests. Also timber with great diameters is not very popular among the timber industry (except veneer) and therefore as well among forest owners, as the price related to volume decreases.
5.4.2) Country overview

Europe produces 2,02 Mio. m³ veneer and it consumes 1,99 Mio. m³ and could supply its own needs, but it also imports (1,20 Mio. m³) and exports (1,23 Mio. m³) large amounts. CaSCo countries together produce 0,39 Mio m³ veneer, 19% of European production) and consume 0,58 Mio. m³ veneer, 29% of European consumption (Fig. 5.31). They import 0,38 Mio. m³ veneer and export 0,19 Mio. m³ veneer. In all CaSCo countries production is lower than consumption, except Slovenia, where the production is higher than the consumption (Tab. 5.8).

![Veneer production, consumption, import, export](image)

**Fig. 5.31) Veneer - production, consumption, import, export - of the project countries (FAO, 2014).**

<table>
<thead>
<tr>
<th>amounts [m³]</th>
<th>Production</th>
<th>Consump.</th>
<th>Import</th>
<th>export</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>2,017.000</td>
<td>1,984.000</td>
<td>1,195.000</td>
<td>1,228.000</td>
</tr>
<tr>
<td>Austria</td>
<td>8.000</td>
<td>35.000</td>
<td>44.000</td>
<td>17.000</td>
</tr>
<tr>
<td>France</td>
<td>59.000</td>
<td>87.000</td>
<td>97.000</td>
<td>69.000</td>
</tr>
<tr>
<td>Germany</td>
<td>98.000</td>
<td>123.000</td>
<td>79.000</td>
<td>54.000</td>
</tr>
<tr>
<td>Italy</td>
<td>203.000</td>
<td>321.000</td>
<td>148.000</td>
<td>30.000</td>
</tr>
<tr>
<td>Slovenia</td>
<td>25.000</td>
<td>15.000</td>
<td>10.000</td>
<td>20.000</td>
</tr>
</tbody>
</table>

**Tab. 5.8) Veneer balance. Data FAO, 2104.**

5.4.3) Country balances

Veneer from Austria

In Austria veneer consumption is 4 to 5 times higher than the production. Exports twofold higher than production and therefore imports are higher than consumption (Tab. 5.8).

Veneer from France

France has higher veneer imports than the country produce and consumes it and a certain amount of veneer may pass through the country. This is despite the fact that France probably still have good deciduous trees that could be used for veneer. For example for many veneer producers in Germany France was and is an important market for veneer trees.

Veneer from Germany

In Germany the veneer production and exports decreased within the last ten years and imports increased (Fig. 5.32). Nowadays imports (0,094 Mio. m³) are higher than the internal production (0,069 Mio. m³). Already in 2010, only 30% of consumption were are from internal production (Knauf, 2010) and 57% veneer was processed. Half of this processed veneer could be „smoke-veneer“ from a important producer, with half of German production (Bavaria, Holz von Hier pilot). The main export countries are Italy, Czech Republic, Hungary, Bulgaria, Norway, USA, France, Poland, Rumania, United Kingdom, for 70% of the exports. The main import countries are Romania, Czech Republic, USA, Austria, Poland, Ukraine, Cote d’Ivoire, Sweden, France, Indonesia for 80% of the imports.

![Veneer balance](image)

**Fig. 5.32) Veneer balance. Data: ZMP, 2007; FAO, 2014; Destatis, 2016.**

Veneer from Italy

Italy is the number one consumer for veneer in Alpine space. Veneer production in Italy is twice as big than in Germany and its consumption of veneer three times bigger. Italy consumes 0,12 Mio. m³ more than it produce (Tab. 5.8). Therefore a large amount of veneer is imported. Mainly these are tropical veneers. In Italy there are still bigger veneer- and plywood producers, but also here more veneer- plywood is used than produced and the imports of this product are high, often from overseas.

Veneer from Slovenia

In Slovenia veneer production and consumption would quantitatively play a considerable role in the alpine space, as - according to the comparing data of FAO from 2014 - more veneer is produced than for instance in Austria (Tab. 5.8). This could reflect the high proportion of deciduous forest areas in Slovenia. However the statistical office of Slovenia show differing figures. According to this office only 4.000 m³ of veneer has been produced (2016).
5.4.4) Potentials, action fields

Veneer seems to be quantitatively of minor importance for the project issue. But forests, which are assigned to veneer log production are special forests with a high biodiversity potential and carbon stock. On the other hand, interior and furniture with veneer are especially for the public sector of importance and have a signal effect, as seldom furniture made of solid wood are purchased. Furniture with veneer in the public sector may substitute furniture with plastic. In any case veneer is the preferential solution for old and strong logs, rather than collection batches or use as fuel wood.

Potentials for low carbon timber depend from several aspects to be considered: (a) the amount of foreign trade and long distance purchase, (b) the structure and density of producers, (c) raw material availability and (d) general demand or promoting of related products.

Potentials for closing regional processing chains

Potential for closing regional processing chains:

- In all CaSCo countries there is a remarkable amount of foreign trade of veneer, ranging from around half of the values of production or consumption up to the same values. This offers considerable quantitative potentials for shortening of supply chains.

- Special potentials are assumed in Italy because of the high production of veneer, in Slovenia because of a high number of producers (43 producers of veneer sheets and/or panels) as well as the high proportions of deciduous wood and in Germany because of veneer producers with special applications like smoked veneer.

Other action fields

Other action fields are:

- Therefore great potentials lie in product exhibitions, and specific information from carpenters and crafters what can be processed.

- Veneer builds a potential for innovative applications, e.g. design furniture, lamps, wooden wallpapers, light constructions (mobile inner walls, ship interior, interior finishing and others.)

Questions to be clarified

- Does it occur, that potential veneer logs are sold under value e.g. in collection batches to other purposes?

- Up to now we have only information about veneer producers in Germany and Italy. As far as we know, France had a great importance in producing veneer logs. Is that still the case? Are there as well veneer producers in France?

- Is there an idea regarding the deviation of veneer production in Slovenia between FAO and stst. office?
5.5) Wooden Insulation

5.5.1) Introduction insulation

Insulation market shares

Insulation markets is dominated by mineral based and plastic insulations (Tab 5.9).

<table>
<thead>
<tr>
<th>market</th>
<th>[Ths. m³]</th>
<th>share [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rockwool</td>
<td>13.320</td>
<td>54.6 %</td>
</tr>
<tr>
<td>Styro foam</td>
<td>7.439</td>
<td>30.5 %</td>
</tr>
<tr>
<td>Polyurethane foam</td>
<td>1.198</td>
<td>4.9 %</td>
</tr>
<tr>
<td>Polystyrol foam extruded (XPS)</td>
<td>1.426</td>
<td>5.8 %</td>
</tr>
<tr>
<td>composite heat insulation systems *</td>
<td>95</td>
<td>0.4 %</td>
</tr>
<tr>
<td>Renew. raw material, from which cellulose (32%), soft wood fibre boards (28%), light construc. panels (20%), hemp (9%), wool (4%), others (7%)</td>
<td>976</td>
<td>4 %</td>
</tr>
</tbody>
</table>

Tab. 5.9) Market share of insulations, Germany. Source: (GDI) Baumarktstatistik 2005, NaWaRo from Fachagentur Nachwachsende Rohstoffe e.V. (FNR, 2008).

Insulation at the cost of climate?

Insulation nowadays is a ‘magic’ phrase for climate protection. Mostly the applied insulation materials do not have internalized external climate and environmental costs, e.g. in form of ecological backpacks, reusability a.o.. Yet especially in case of insulation this should be taken into account. Her one have to consider wall and insulation in combination as a unit. Energy saving in the usage phase depends mainly on the user behaviour rather than on the technical performance of the product. The best passive house standard is obsolete, if the dweller because of a sad indoor climate need or want to open windows repeatedly? Thus the feel good temperature and perception as well as climate is crucial. The feel good temperature on the other side, is influenced by the material used for inner walls and flooring. Every construction or insulation material shows different energetic behaviour. In common calculations only the insulation factor (Uw) is considered. But this does not recognize crucial differences in phase delay.

Example 1) wood fibre insulation

Usage phase

Insulation with soft fibre boards save a lot of money in the usage phase because of material characteristics. Wooden fibre boards do not cause a thermal disconnection of the façade. Therefore no condensation water is produced with subsequent development of ice or mould in the system wall - insulation - facade. That guarantees an optimal sustainability. Wood fibre insulation is long lasting at comparably low vulnerability. Wood fibres store the warmth and prevent a cool down of the wall during the night. So the next day only the room needs to be heated up and not the wall. Wood fibres at the same time buffer heat from sunlight. Summer indoor temperatures are some degrees below them of other insulation materials. That saves energy from coolers and heating up especially under roof is reduced. Because of their greater mass compared to other insulation materials, wood fibre boards better absorb acoustic noise and serve for a good acoustic insulation in buildings. That may - if well planned - save costs for adjacent measures for acoustic insulation.

Wood fibre boards features through a high diffusion-openness, that means they can take up and release high amounts of humidity. This contributes to a well indoor climate and prevents the emergence of mould. Whereas in buildings with other insulation moulding needs to be prevented by increase in heating or climatization, wood fibre boards reach this naturally based on material features. That saves real costs, supported by a better indoor climate and appropriate user behaviour.

End of life phase

Even after the usage phase wood fibre boards save costs in disposal, as the represent a secondary raw material, which even may be paid for. Wooden constructing materials, façades as well as insulation boards partly even can be reused in similar applications, the may be recycled or finally at least used as...
fuel, replacing fossil fuels. 'Waste wood' is since a longer time not a real waste anymore and it is traded international, partly over long distances, which indicates that it is economically attractive. Waste wood is not 'disposed' but requested as raw material.

**Example 2) synthetic insulation**

**Usage phase**

Insulation materials based on crude oil like EPS (Polystyrol), XPS and PUR are the cheapest insulation materials regarding the investment or purchasing costs. But usually additional hidden costs in the usage phase as well as costs after end of life remain unregarded, as subsequently described. This should be considered through a life cycle cost planning.

Polystyrol insulation involves the danger of thermic disconnection between facade and wall. During summer condensation water can occur. The condensation water only can be removed by diffusion. However the plastic inhibits exactly this, so that the wall beneath EPS insulation become increasingly humid. This lowers the insulation factor on the one hand, and on the other it leads to moulding. The combination of wall an insulation losses increasingly its effectiveness, so that the inhabitants need to increasingly heat against a worsen indoor climate. Polystyrol does not store warmth but only isolates. And it does this as well against the radiation energy of the sun. EPS insulation is unable to use in winter solar energy of southern walls and to save fuel costs by this.

The durability of EPS insulation is stated in the web mostly between 40 and 50 years. However this probably overestimates the facts. On the one hand, there are no experiences over this time span. On the other hand, the compound EPS - plaster is very vulnerable, so that consistently a repair of the plaster is necessary. A recurring phenomenon of EPS insulation facades is glacification in winter. This is to be taken seriously, as mechanical damage on the facade may lead to humidity entering the insulation.

**End of life phase**

Plastic insulation materials causes high national economic costs. Up to now not a single reasonable recycling system for poly styrol is developed. So the main path after end of life is the disposal in thermally waste plants (MVA). The problems for health and environment and the high treatment costs are put on the shoulders of the general public.

According to a study of Greenpeace (1999) the combustion of 1 ton plastics in such MVA causes additional disposal costs of 800 € compared to other combusted materials, because of the chlorus and dioxin emissions. These additional costs, which arise for the operator of the MVA (mostly in the hand of public authorities) parallels a plus of 3–4 €/m² of insulation material. Most of the MVA for this reason do not like to accept poly styrol, but they are forced to do so. If the usage of poly styrol insulation increases further on, this will rise severe problems, for which a solution not yet is found and will burden following generations.

During combustion of poly styrol high concentrations of dioxins arise. Does this occur not outside of Germany with its high environmental standards, these substances find its way into environment. Furthermore the content of carbon in poly styrol is too high for depositions so that it requires a 'pretreatment' in MVA before deposing, causing double environmental problems.

There are additional indirect threats to health and environment though deposing EPS. EPS contains nowadays Hexabromcyclododekan (HBCD) as flame inhibitor. HBCD meanwhile is counted as high toxic and cancerogenic and extremely toxic to aquatic organisms (REACH regulation candidate list). It shall be prohibited in concentrations above 1 ppm. The chemical industry actually searches for alternatives to replace HBCD in medium-term.

Pentan, which is a foaming component in poly styrol is counted as well as cancerogenic. It becomes relevant in case of deposition (which is not allowed in Germany) when these substances through washout enter ground water and so as well drinking water.

The high caloric material causes environmental problems in the MVA as well as if it is deposited. These problems are together with the disposal exported into countries with lower environmental standards than Europe. A recycling of EPS is because of contamination and mixing nowadays no practice. In theory recycled EPS can only to a very low degree be reused in poly styrol granules or high quality injection moulding. Unfortunately parts of these recycled contaminated plastic foams are processed to other products, so that significant traces of the flame inhibitors are found also in very sensible applications like packaging of food.

**5.5.2) Country overview**

There is no country comparison possible because of lacking general statistical data. But the trends shown for Germany may be true for all other Alpine Space countries.
5.5.3) Country balances

Wooden insulation: data for Germany

Wooden insulation materials until now have with 4 - 7% a comparably low market share especially compared to plastic (EPS, XPS) and mineral insulations (mineral-, glass- and rockwool).

Wooden Insulations. In Germany every year > 56 Mio. m² outer walls of new buildings have to be insulated, in Baden-Württemberg > 7,6 Mio. m² and in Bavaria > 12 Mio. m² (Fig. 5.33). Nowadays mostly this are composite heat insulation systems, plastic or mineral wool insulations. The calculated demand on wooden insulations based on the market share could range at 0,3 – 0,6 Mio. m³ (with an average thickness of 15 cm), which corresponds to ~ 0,1 Mio. t of timber (with an average density of 200 kg/m³). There are no further data available from the current cluster studies in Bavaria and Baden-Württemberg.

![Fig. 5.33] Area of the outer walls of new residential buildings in German federal states, with the Alpine Space regions Baden-Württemberg and Bavaria. Calculated with data from Destatis.

5.5.4) Potentials, action fields

Other action fields

Other action fields are:

- Through the one-eyed focus on the usage phase of buildings and the unilateral view on the insulation factor (Uw value) the meaning of pre processing chains and end of life phase had been neglected. This led e.g. in Germany to funding programs, which triggered massively synthetic insulation materials like EPS, XPS, PUR a.s.o., because they are referred to the Uw value, mostly cheaper than insulation from renewable materials, disregarding the real costs during usage phase and end of life. These insulation materials are additionally hazardous to health from several reasons (see introduction).

- Therefore targeted information transfer and promoting the benefits of renewable and wood in insulation materials regarded to health, environment, life cycle costs and well living in buildings could increase the application of wooden insulation. Even the usability of wood fibre insulation boards in the various forms of insulation like a) external wall insulation, roof insulation, floor insulation and others) is not fully known and underestimated.

Potentials for closing regional processing chains

Potentials for closing regional processing chains are:

- Fibre insulation boards are produced from residues and wood chips, which indicates, that insulation with wood materials is not a question of raw material availability. However high amounts of foreign trade in chips and residues indicates a high potential of regional closed supply chains in production of fibre boards.
5.6) Wooden Facades

5.6.1) Introduction

Facades are the face of buildings. For that reason they should show a climate friendly face. Facades often are made from plaster or panels of cement and other materials. Increasingly combined insulation systems are applied. But they do not only exhibit an adverse eco balance, moreover they are very bad in reusability, as they hardly dividable into their components and thus need to be thermally disposed. Traditional facades from wood had been faded into obscurity, but they currently experience a revival, fortunately, as they show a optimise eco balance and a very good cost value relation.

More and more composite heat insulation systems enter the market and are increasingly applied. These systems seems to be advantageous because of being easily build and „care free“. This however is a myth. In the usage phase such facades exhibit their hidden drawbacks, as they are very cost intensive in repair, if something gets broken, which can easily occur.

Common materials

Common materials are wood, dutch clinker, stone, aluminium or steel plates, fibre cement, fibreglass or others. Wood mostly have the lowest energy input of all materials and mostly the lowest price, as the following table shows (Tab. 5.10).

<table>
<thead>
<tr>
<th>Material (examples)</th>
<th>„Grey energy“ Spec. costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood</td>
<td>18 kWh/m² 50 – 80 €/m²</td>
</tr>
<tr>
<td>Fibre cement</td>
<td>39 kWh/m² 70 – 90 €/m²</td>
</tr>
<tr>
<td>Aluminium</td>
<td>92 kWh/m² 100 - 130 €/m²</td>
</tr>
<tr>
<td>Nature stone clinker</td>
<td>34 kWh/m² 200 – 600 €/m²</td>
</tr>
</tbody>
</table>

Tab. 5.10) Facade materials with their grey energy and special costs Date from Gabriel, 2012: wood facades

Facades and solar power

Buildings are responsible for round about 40-50% of the global energy consumption. Besides the field of insulation a growing focus lies on the development of buildings, which aside from energy saving construction are able to use renewable energy to supply the own energy demand or even more. So photo voltaic integrated into facades increases. Up to now, such modules however are produced mainly by big players in construction business. Therefore innovative solutions are mainly found in combination with steel, aluminium or plastics without the usage of wood.

To achieve beyond a positive net energy balance as well a low footprint of grey energy, the processing chains and materials should be taken into account, from where wood would arise as a winner material with regard to eco balance and reusability.
5.6.2) Country overview

There is no country comparison possible for the regarding the usage of wood in facades, as there are no general statistical data existing. For Germany based on specifically statistical data of buildings own calculations has been made. These trends may eventually be true as well for the Alpine Space.

Timber for facades: there is enough raw material in the Alpine space

There are several timber species, used and usable for facades, growing in the Alpine Space countries, like larch, spruce, fir, douglas fir as well as thermic treated wood from beech and other deciduous species. Very popular however is larch, which often originates from Siberia. Although enough amounts of larch is growing in the Alpine Space countries (see also chapter 'forests').

5.6.3) Country balances

Wooden facades: data for Germany

Based on the statistics to building licenses and the reported cubature of the buildings a surface area of 106 Mio. m² for all facades of new buildings can be estimated. Generously assuming a percentage of 10 - 20% facades made from timber, this would correspond to 11 - 21 Mio. m² or 0,22 - 0,42 Mio. m³ (2 cm thickness) wood would be needed for this purpose.

For the Alpine Space part of Germany - Baden-Württemberg (BW) and Bavaria (BY) - similar calculations lead to an estimated surface area of facades of 13,74 Mio. m² in BW and 22,56 Mio. m² in BY. Assumed the same amount of wood usage in facades would result in 1,4 - 2,8 Mio. m² in BW and 2,2 - 4,5 Mio. m² in BY for wood facades. This corresponds to 28,000 - 56,000 m³ of timber in BW and 44,000 - 90,000 m³ in BY, which would be needed annually.

5.6.4) Potentials, action fields

Potentials for closing regional processing chains

Quantitative potentials for low carbon timber from regional closed processing chains mainly correspond with the potentials of related sawnwood, mainly planed sawnwood.

- For Germany, Slovenia and France the statistical data show considerable quantitative potentials. A raised demand for low carbon timber in facades could switch material flows from export and import to domestic production and application.

- For Italy the immediate quantitative potential for regionalising supply chains in sawn wood is comparably low. But it could be examined, whether the comparably high proportions larch stocks in the forests could be mobilized.

Other action fields

- An important potential to support the application of wood in facades lies in information transfer regarding the technical features, benefits and low-maintenance of wooden facades to purchasers and decision makers. As nowadays composite heat insulation system have an increasing market share because of lack of information and because they are considered to be ‘modern’ and easy to build. Nevertheless they inhabit some severe technical and financial disadvantages to the principal.

- Presenting and promoting the beauty of wooden facades could additionally trigger this process. This is aimed within the project output “eco planner tool” and can be as well part of the information in the frame of the smart places network.
5.7) Timber for outdoor application

5.7.1) Introduction

Regional Timber for the outdoor

There are strong trends to garden landscaping, generous balconies and roof terraces, also within the cities. For example the German timber trade already makes 10% of its sales with terraces with increasing rates (interviews Holz von Hier). Some timber species from the Alpine Space (Tab. 5.11), can easily compete with the classical outdoor timber form tropical species like Bangkirai, Bubinga, Bongossi or Merbau (resistance class 2) which mainly are from poached wood (see IUCN red list).

<table>
<thead>
<tr>
<th>Rcl.1</th>
<th>Rcl. 2</th>
<th>Rcl. 3</th>
<th>Rcl. 4/5</th>
</tr>
</thead>
<tbody>
<tr>
<td>robinia</td>
<td>oak</td>
<td>larch</td>
<td>not usable for the outdoor</td>
</tr>
<tr>
<td>thermowood</td>
<td>sweet chestnut</td>
<td>douglas fir</td>
<td></td>
</tr>
</tbody>
</table>

Tab. 5.11) Resistance class (after DIN 68364 (11-1979). „1“ means highest resistance class and „5“ low durability.

Thermowood

Product ranges for thermowood are wide, for example outdoor products, facades, garden furniture, terraces, benches, timber tiles, pergolas, windbreak and soundproofing elements, window shutter, play equipment, garden wood, poles, fences, path layers, wet areas like baths, wellness areas, sauna, wainscots, wall coats and others. For customers and communities thermowood is very interesting as an alternative for tropical timber for outdoor usage and wet house areas as it has very high durability and good technical properties. But for users without labels and or knowledge it is sometimes not an easy decision, because especially imports into the European Union are qualitatively not comparable with the good technical standards of the products produced in Europe. Thermowood from Germany and Austria for example has quality assurances and the experience of the producers ensure good colours and product quality. Thermowood could also have high importance in design because it has a colour like „caramel.“ Thermowood is processed with > 160°C, pressure and under oxygen expulsion. The features of thermo timber are: climate and biodiversity friendly, highest durability, noble colours, dimensionally stable, insulation, secure, innovative and made from wood species growing in Europe and also in the Alpine Space like beech.

Good features of Thermowood

Climate friendly. Tropical timber can be substituted by thermowood and referred to climate protection and biodiversity it should be greeted hat the thermowood market within the Alpine space region is growing. The innovative technical processing of thermowood offers very gut use alternatives for regional deciduous wood. But also for thermowood it is necessary to have a look ore a label for the origin and the chain of custody.

Highest durability. Through the thermo processing the timber becomes extremely robust and durable. For example thermowood from German and Austrian producers have durability classes of 1 or 2 due to official testing institutes.

Nobel colours. Due to the processing the timber becomes different colours from honey-yellow to black. With high quality thermowood all colours are consistent in profile.

Dimensionally stable (no welling, shrinking or ripping). Especially short fibre tropical timber like Bankirai from Indonesia and Malaysia (which is often poached wood), are often recommended in calls for bits. Thermowood also has short fibres and has the same or even more dimension stability as tropical wood, but has much better ecological footprints. To dress thermowood requires special knowledge, that German and Austrian producers have perfectioned.

Good insulation, security and innovation. Thermowood has better insulation properties than normal timber.
5.7.2) Country overview

Because of lacking data there can not be made a real country comparison, but is obvious that this issue is and could be very obvious in each country of the Alpine space.

5.7.3) Country balances (examples)

Example Germany

Unfortunately a big amount of the terraces are from tropical timber (market: 53%, Tab. 5.12), very often from „uncertain“ sources, often poached wood (interviews HvH). Wood species like Douglas fir and larch increase within the outdoor sector (market: 23%). But often they originate from outside of Europe, mainly Russia and could be poached wood. Because of long distances this is no low carbon friendly product. And additionally in the Alpine Space region there are a great amount of Douglas fir and larch in the managed forests available. Impregnated timber (15%) has decreasing market rates. Wood plastic compounds (WPC) are made form timber and plastic and its climate friendly properties are defined by climate backpacks of the chain of custody.

<table>
<thead>
<tr>
<th>Terrace layers</th>
<th>Market percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tropical timber („brown decks“)</td>
<td>53 %</td>
</tr>
<tr>
<td>Douglas fir, Larch („yellow decks“)</td>
<td>23 %</td>
</tr>
<tr>
<td>Pine, Fir, Spruce („green decks“)</td>
<td>15 %</td>
</tr>
<tr>
<td>WPC wood plastik compound</td>
<td>6 %</td>
</tr>
<tr>
<td>Thermo wood - imported</td>
<td>2 %</td>
</tr>
<tr>
<td>Thermo wood - German production</td>
<td>1 %</td>
</tr>
</tbody>
</table>

Tab. x. 5.12. (*) „Green decks“ are often impregnated.

In Germany annually 1,66 Mio. m³ (0,83 Mio. t) timber is used for the outdoor (Manthau, 2012). Here domestic wood species like larch, fir, pine are used but today in this sector mostly tropical timber is dominating. An alternative would be thermowood because of its durability. The production of thermowood in Germany and Austria is only 0,08 Mio. m³. But there also a lot of imports of thermowood in the Alpine space. Thermowood until now has small market segments (2% imports and 1% Germ. production) but is predicted to get high growth rates. Today the production capacity for thermowood in Europe is >200.000 m³, > 80.000 m³ here from in Germany and Austria, 80.000 m³ in Scandinavia, 30.000 m³ in Netherlands and 8.000 m³ in the Baltic states.

For Germany the promoting of Thermowood for outdoor purposes offers a high potential for low carbon timber supply chains, as enough beech as a classical raw material is available. At the same time it supports the objective of shifting the managed forests towards a higher proportion of deciduous wood.

Example Italy

Also for Italy promoting of Thermowood for outdoor purposes would offer a high potential for low carbon timber supply chains, as beech is the second most tree species in piedmont region and covers large forest areas in Italy (>14 %, 123.484 ha, see chapter forests). Eventually installation of production capacities is required, but which is a manageable task. Also larch is an interesting alternative for outdoor furniture and facades, depending on the quality of the roundwood (Larch forest area in Italy is 7,4%, 64.913 ha). Very good durability properties also has robinia and considerable forest areas are covered with this tree species (5% = 39.300 ha). Especially robinia is often searched from specialised outdoor furniture producers.

Example Slovenia

Also for Slovenia promoting of Thermowood from beech, for outdoor purposes would offer a high potential for low carbon timber supply chains. Beech has the highest forest cover of all tree species in Slovenia (32,3%, see chapter forests) and is until now mainly used for firewood and short living timber products. Eventually installation of production capacities is required, but which is a manageable task.
5.7.4) Potentials, action fields

Potentials for closing regional processing chains

- Potentials are buried in a general raise of application of several domestic deciduous timber species for outdoor purposes, as tropical timber dominates this market among the wood sector. Substituting tropical timber saves great amounts of carbon emissions due to avoided transportation on the one hand but additionally because of common poaching of key target timber species and carbon set off from soils on the other.

- This potential is underlined, as in all of the participating CaSCo countries sufficient amounts of potentially suited tree species occur, which could be even better valorized for this specific applications.

Other action fields

- One obstacle against a higher usage of domestic tree species for outdoor purposes are prejudices and a lack of information. Many consumers and even planners are not aware of the features of e.g. thermowood or even of this sortiment at all. Targeted information transfer and visualisation of application examples might foster the usage and thus the domestic production.
5.8) Panels

5.8.1) Introduction

Panel types

The divers panel types are suitable for different application fields in the interior (Tab. 5.13).

<table>
<thead>
<tr>
<th>WBP</th>
<th>Used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plywood</td>
<td>cabinetry, interior fittings (constructive)</td>
</tr>
<tr>
<td>Particle board (incl. OSB)</td>
<td>house bildung, (loft) conversion, interior constructions (const.)</td>
</tr>
<tr>
<td>HDF hardboard</td>
<td>cabinetry, interior fittings (constructive)</td>
</tr>
<tr>
<td>MDF</td>
<td>interior fittings (not constructive)</td>
</tr>
<tr>
<td>Insulation board</td>
<td>insulation (in, out, roof, walls)</td>
</tr>
</tbody>
</table>

Tab. 5.13) Wood based panels types and there main usage.

Wooden insulating panels (MDF, HDF, DHF, etc) consists of: wooden fibres (82 - 86%), water (5 - 7%), PMDI or UF glue (4 - 11%), paraffin emulsion (< 1%) and additives or decor papers. OSB panels consists conifer wood (spruce, pine), MUF or PMDI glue. Basic raw material is forest roundwood and chips from the timber industry. Timber from sustainable managed forests is continuously available, because there is no more timber harvested than raises up again. Timber from tropical and boreal primary forests should not be used for ecological and climate protecting reasons.

Competitive products for wood based panels are „Eternit“ panels or fiber-cement-panels for the outer walls of buildings and plasterboard for interior constructions.

Panel production worldwide

Worldwide 264 to 269 Mio. m³ wood based panels were produced annually. The three world regions with the biggest production are Asia, Europe and North America (data FAO). Only 15 countries are producing 80% of the wood based panels and also consume 75%. An „over“production with high exports but nearly no imports have Asia and Latin America.

The three most important producers are China with 7,6 Mio. m³, Poland with 6,2 Mio. m³ and Malaysia with 5,4 Mio. m³. A greater need with high imports has North America, especially USA with 6,7 Mio. m³.

The European production is 77,71 Mio. m³ and its consumption 75,12 Mio. m³ (Tab. 5.14). Only 15 countries in Europe produce 86% and consume 72% of wood based panels. The biggest producers in Europe are Germany (No. 1), Russia, Poland, France and Italy. The five biggest consumers in Europe are Germany (No.1), Russia, Italy, England and France.

In Europe these 15 countries have 33 Mio. m³ quantitative avoidable material flows, 1/3 of it accounts for Germany. The biggest „over“ production from wood based panels have Poland (6,2 Mio. m³), Germany (3,5 Mio. m³) and Austria (2,9 Mio. m³). The biggest net demand have England (2,9 Mio. m³) and Italy (1,6 Mio. m³).

<table>
<thead>
<tr>
<th>WBP in [Mio. m³]</th>
<th>WBP</th>
<th>Ply-</th>
<th>Particle board</th>
<th>veneer sheets</th>
<th>HDF</th>
<th>MDF</th>
<th>Insulation board</th>
</tr>
</thead>
<tbody>
<tr>
<td>production</td>
<td>Europe</td>
<td>77,71</td>
<td>8,28</td>
<td>47,00</td>
<td>2,02</td>
<td>4,36</td>
<td>12,88</td>
</tr>
<tr>
<td>consumption</td>
<td>Alp. sp.</td>
<td>24,65</td>
<td>0,96</td>
<td>15,48</td>
<td>0,41</td>
<td>2,48</td>
<td>3,79</td>
</tr>
<tr>
<td>Europe</td>
<td>75,12</td>
<td>9,15</td>
<td>44,93</td>
<td>1,99</td>
<td>4,10</td>
<td>12,03</td>
<td>2,93</td>
</tr>
<tr>
<td>Alp. sp.</td>
<td>23,29</td>
<td>2,29</td>
<td>14,51</td>
<td>0,59</td>
<td>1,4</td>
<td>2,7</td>
<td>1,84</td>
</tr>
</tbody>
</table>

Tab. 5.14) Wood based panels - production, consumption - of the project countries (data from FAO, 2014).

Picture above: Panels are mainly made from chips from forests and sawmill residues (pic: HvH).
5.8.2) Country overview

Wood based panels in total

Within the 5 Alpine Space countries of the project about 24,65 Mio. m³ wood based panels were produced in total and 23,29 Mio. m³ consumed. That represents 32% of the whole European production. Austria, France, Germany and Slovenia produce more wood based panels than they consume, only Italy consumes more than it produces (Fig. 5.34).

Particle boards

Most of the panels that are produced and consumed in the Alpine Space are particle boards, which are used for constructions and furniture. Germany, Italy and Slovenia consume more particle board than they produce, Austria and France show an ‘over production’. There are high imports in Italy and Germany and high exports in Austria and France (Fig. 5.35).

Plywood

Plywood is mainly used for furniture manufacturing. In the Alpine Space, France, Germany, Italy and Slovenia consume more plywood than they produce, Austria produce more (Fig. 5.36). But consumption is the highest in Germany and therefore the imports are considerable. Germany has only very few producers of plywood left. Italy and France have some more producers. The most plywood product imports to Europe comes from Asia, mainly China. Especially the product „veneer-plywood” which is used in furniture manufacturing has transports around the world within its chain of custody. Often there is used tropical timber in these products, sometimes with worldwide endangered species like „Framire” (see IUCN, database) in the middle layers.

HDF - Hardboards

Hardboards like HDF (High Density Fibre board) are mainly made from industrial roundwood and wood chips. The fibres are glued under high pressure to high dense boards. These boards are used as base materials for interior and furniture products where high loads and strength with small material thickness is needed (e.g. for laminate floors and laminated furniture). Germany has by far the highest production of hardboards which are mainly exported (Fig. 5.37).

MDF - Medium dense boards

MDF boards are also made from industrial roundwood and chips under pressure and with glue. They are used for interior construction, loft conversion. Laminated boards, mainly melamine coated are
used for furniture manufacturing, cabinets, table and cover boards. In the last decades the worldwide production of MDF increased continuously, may be because they can be used in multiple ways and can be covered with many paint and varnish. The three biggest MDF producers worldwide are China, Turkey and Brazil. The product market is international. In Austria, Slovenia and especially Germany the production exceeds the consumption of this board type and high exports occur. In France and Italy consumption is overstepping production. But in each of the Alpine space countries there are large amounts of imports and as well exports of MDF (Fig. 5.38).

### 5.8.3) Country balances

#### Wood based panels from Austria

Austria could supply its own needs for wood based panels. It produces 60% more wood based panels than that are needed in the country itself (Fig. 5.40). The export of wood based panels exceeds the inner consumption two fold. But large amounts are also imported. Especially production of particle board is higher and therefore large amounts are exported. In average conditions 66% of the wood based panels, for buildings, own products in Austria, could come from larger distances. Great panel factories are located in Austria. Only producers of insulating boards are rare.

![Fig. 5.40] Wood based panels production, consumption, import, export in Austria (FAO, 2014).

#### Insulation boards

Insulation boards from wood fibres are produced and consumed in relatively high amounts in Germany. But in all other Alpine Space countries imports and exports are slightly higher than production, especially in Austria and France (Fig. 5.39). In Slovenia no wooden insulating boards are produced. In general wooden insulating have only 4-7% of the market shares in Germany and this may be the same (or lower) in the other Alpine Space countries. Today the most important insulation materials on the European market are mineral wool and EPS plastic insulations.

![Fig. 5.39] Insulating - production, consumption, import, export - of the project countries (FAO, 2014).

#### Wood based panels from France

France produces more wood based panels than it consumes. On closer examination this mainly is due to the production of particle boards, including OSB (Fig. 5.41). For plywood, HDF and MDF consumption is higher than the production, therefore considerable amounts of imports (and exports) exists.

![Fig. 5.41] Wood based panels production, consumption, import, export in France (FAO, 2014).
Wood based panels from Germany

Germany has the highest production, consumption, imports and exports of all Alpine space countries. Germany produces more panels than it consumes (Fig. 5.42). This surplus are mainly HDF and MDF panels. In contrast for particle boards and plywood there is a net import. Especially with veneer-plywood in Germany there is only one main producer left and these panels are in increasing amounts imported, often from Asia (China) where poached wood for products without labels for sustainability cannot be excluded (see report Green Carbon - black trade, UNEP and Interpol, 2014). But these panels also were exported.

Particle boards. In Germany 8 Mio. m³ particle boards were produced and 8,9 Mio. m³ sold (Fig. 5.43). The producers buyed in addition 10% of there production. Calculated internal consumption has also increased. About 40% of the imports come from the Alpine space and 24% exports goes to it. About 9,7 Mio. m³ roundwood were used for production of wooden panels in total (Destatis, 2015) and 4,0 Mio. m³ from that for particle boards, including OSB (Fig. 5.44). In Bavaria and Baden-Württemberg are located some considerable producers for particle board and OSB. More informations are not available, even not by cluster studies.

Plywood. German industry sells 0,5 Mio. m³ plywood (Fig. 5.45). Although production of plywood has increased within the last ten years, this is much lesser than the German consumption. Hugh amounts of plywood are imported, much more than exported. Material flows of veneer-decks for veneer-plywood are worldwide, even if the product is, in the last step, fabricated in Europe, with great producers in Germany and Italy. About 13% of the imports comes from the Alpine space to Germany (esp. Italy), but the exports to the Alpine space are with 25% relatively high.

MDF, HDF boards. The German industry produces 4,1 Mio. m³ MDF, HDF boards and sells 4,2 Mio. m³. Internal production is more than twice as big as the consumption, but there are a lot of imports also. Exports are 75% of the German production, but only 18% of this export goes to Alpine space countries and 25% of the imports comes from it (Fig. 5.46).
Wood based panels from Italy

Italy consumes more wood based panels than it produces and its imports are high (Fig. 5.47). Big producers are directly neighbouring in the Alpine space especially Germany, Austria, France and Switzerland. But there are also exports of panels from Italy to other countries. HDF boards are nearly not used in Italy, but the use of MDF boards is higher than in France, Austria, Germany and Slovenia. Also the use of particle board (incl. OSB) is relatively high in Italy, higher than in France for example. Also production and consumption of plywood is relatively high, compared with the other Alpine Space countries, because in Italy there are big producers.

Solid-wood-panels. Solid-wood-panels for furniture-frontages, table- and kitchen work tops or interiors are a good alternative for particle boards and plywood because one of their big advantage is, that they can be polished very good and therefore they are very easy renewable. In Germany there are only a few producers of this attractive products left, although their consumption in the last years strongly increased. There are no official data available for this product group, but one of the brand leaders (Baden-Württemberg, pilot, Holz von Hier) indicates, that imports of that panels to Europe and Germany are very high and that the most important import partner for deciduous solid-wood-panels is Poland. Consumers can assume that most or nearly all of the solid-wood-panels in hardware stores are from imports. So a certificate of origin like Holz von Hier is very important for that panels.

Solid-wood-panels could play an important role for the demand of deciduous wood from German and Alpine forests and should have a wide renaissance, but with low-carbon-timber-panels. For that aim the whole chain of custody and information transfer to customers, planners and communities is needed.

Solid wood based panels is a important product group within the project, with a peer producers in Germany.

Wood based panels from Slovenia

Slovenia produces, consumes, imports and exports panels in similar magnitudes. The production of plywood is higher than the consumption. Consumption of panels for construction purposes like particle board (incl. OSB) is higher than production. Production of insulating boards like MDF is much higher than the consumption in Slovenia, these products are largely produced for exports (Fig. 5.48).
5.8.4) Potentials, action fields

Potentials for closing regional processing chains

- There are quantitative potentials for regionalising processing chains and saving carbon emissions, as in some countries resp. product categories of boards overlapping material flows occur. They range in total for all types of boards at 7.1 Mio. m³ per year. Potentials for internal domestic reduction of transport distances is rather low, as only a few producers of such boards exists.

Other action fields

- Another option to reduce materials flows and carbon emissions, is to substitute particle board materials trough boards of solid wood, which may be produces from various regional companies. For this purpose however a lot of persuading is to do among community actors, decision makers, consumers and planners.
5.9) Windows & Doors

5.9.1) Introduction

Wooden windows characterize buildings

Windows underline the character of building, especially if they are made from wood. Modern wooden windows are beautiful and have several advantages:

- Excellent insulation features (Uw <0,8), (2) stability even with slender profile sizes.
- Long durability up to 50 years (for windows in general 30 years are declared).
- With modern technique and procedures effort for care reduced to almost zero.
- Better security in case of fire.
- No beatable environmental footprint in case of using low carbon timber.

Wooden windows are aesthetic, stable and fulfil high performance demands, as even very slender wooden frames inhabit high sturdiness. Windows from plastic need a lot of supporting features like steel enforcement for stability and poly urethane foam for insulation to reach comparable performances, what down grades them to hazardous waste. Additionally the profile sizes need to be bigger at same stability.

In contrary to common opinion the care effort for modern wooden windows is low and small aluminium shells allow an optimised durability even under worst climatic influences. In case of fires wooden windows offer a better security as windows from PVC are very dangerous because of toxic emissions.

The market for windows is a market of refurbishment. In Germany before 1978 windows had been mounted with an Uw value of 2,6 to 4,6 W/m²K from 1978 to 1995 insulation windows had been mounted with an average Uw value of 2,4 W/m²K, it is estimated, that 52 Mio. window units in Germany have this standard. Until 2008 windows had been used with an Uw value of 1,7 W/m²k. The German Energy Saving Ordinance (ENEV) today requires an Uw value of lower than 1,3 W/m²k. But modern wooden windows with an Uw value 0,8 W/m²k today in Germany are state of the art. Therefore replacing old windows through modern wooden windows inhabit a high climate protection potential. If all (77 Mio. pieces) single glass and box windows would be replaced by modern wooden windows, a sum of 2.7 Mio. tons of CO₂ could be saved per year. But in balancing the environmental footprint, the frame material has a crucial influence (Bruckner & Strohmeier, 2010).

The frame material counts

High performance in insulation today is state of the art in modern domestic window production. Insulation is a core performance of windows. The better the „Uw“ value, the lower energy loss and fuel consumption and thus carbon emissions. But the better the insulation of a window and so the amount of „red“ energy in the usage phase of the life cycle, the more important is the proportion of „grey“ energy of production phase at the entire environmental footprint. In this life cycle phase the frame material has a crucial influence. The lower the insulation factor Uw value is, the more important is the frame material for the final carbon balance. The carbon balance is influenced by (1) carbon emissions during the usage phase, (2) the carbon footprint of all processing stages and (3) the possibilities for reuse or recycling. A wooden frame with low carbon timber (e.g. with Holz von Hier certificate) with an Uw value of 0,8 has a considerable better carbon footprint (28 kg CO₂/window unit) as a wooden window made of Meranti (82 kg CO₂/window unit) or a window made of PVC with the same Uw value (385 kg CO₂/window unit) (Bruckner & Strohmeier, HZBL 2010). After the usage phase windows need to be disposed, producing additional 165 up to 260 kg CO₂/window unit for the frame material. This value depends as well on the life span of the window. In case of wooden frames recycling possibilities are present almost across the whole country. PVC frames in contrary up to now need to be disposed as recycling capacities for PVC are scarce within the EU.
5.9.2) Country overview

Until now a country comparison is not possible because there are not enough data to compare. But in the whole Alpine Space window and door production have a long tradition. Insulating, and windows are seen to have an enormous potential for Carbon saving, but until now there is only the usage phase taken into account.

5.9.3) Country balances (examples)

Wooden windows from Germany

Wooden windows have 24% of the German market. In Germany annually 13,6 Mio. windows were exploded (www.baulinks.de), 61,3% of it for restoration and rebuilding and 38,7% for new buildings.

Germany consumption for wooden windows, especially timber-metal-windows could be matched by own production. Annually 2,1 Mio. timber- and 1,2 Mio. timber-metal-windows are exploded and 2 Mio. timber- and 1,1 Mio. timber-metal-windows are produced (Fig. 5.49). The German window industry could enhance this part of wooden windows easily. The produces frames are 15,3% timber (2,1 Mio.), 8,9% timber-metal (1,2 Mio.), 176% metal, 58,3% PVC. German companies produce nearly 12,3 Mio. FE (VFF, 2015), nearly 6,8 Mio. PVC frames, 2,4 Mio. metal, 2,0 Mio. timber (16%) and 1,1 Mio. timber-metal (9%). But there are large imports (1,1 Mio. windows) and exports (0,6 Mio. windows). Wooden windows form conifer and tropical wood (e.g. Meranti) were mostly imported from Denmark and Poland (see German report) and exported to Denmark, Switzerland, Austria (Examples: Denmark imports 22.291 t and exports 22.664 t, Poland imports 22.913 t and exports 89 t). The mean partner for the external trade for wooden windows are Austria and France and an important importer is Slovenia. More data for production and consumption within BW and BY are not available from Destatis and also not from regional cluster studies.

Wooden doors from Germany

Annually <1,4 Mio. outsite-poops are sold, thereof 32,2% aluminium, 32,8% plastics, 25,6% timber (0,35 Mio.) and 9,4% other frames. German manufacturers annually produce 1,4 Mio., thereof 0,47 Mio. metal, 0,42 Mio. PVC, 0,37 Mio. timber (27%) and 0,14 Mio. other materials. If there are only two wooden outside-doors would be implemented into new buildings this would 60.000 door (assumed 20% of the 148.000 new building in Germany), additionally renaturation and redevelopments. This suggest enormous exports, because there are also enormous imports of outsite-doors. Exports of frames for doors are 2,03 Mio. and imports 1,31 Mio. pieces annually. A more exact calculation is not possible because of lacking data from Destatis.

There are no official data available for production and consumption of doors and door-frames, but exports of 2,03 Mio. pieces and imports of 1,31 Mio. pieces are considerable high. Exports of mostly deciduous wood doors with great amounts are going to Switzerland, France, Austria, Slovenia and others. Imports are dominated by Poland (41%), but also comes from France, Slovenia, Italy and with broader transports from Romania, Sweden, Finland, Turkey, China, USA. Doors and frames with tropical timber mostly comes from the Netherlands (material imports to the Netherlands) and directly from Asia (e.g. Indonesia), from where timber without reliable eco-labels can be seen as poached wood (Green carbon - black trade, UNEP and Interpol, 2012). About 15% of the frames are imports from and only 1,6% are exports in the Alpine space. For door frames the Alpine space has no importance for German external trade until now (Fig. 5.50).
**5.9.4) Potentials, action fields**

**Potentials for closing regional processing chains**

Potentials for closing regional processing chains are:

- **The frame material counts!** The better the insulation of a window is, the more importance for the entire life cycle balance is assigned to the frame material. This is because the share of grey energy increases in the total balance at the same time the carbon emissions during usage phase are reduced. So a modern window with an Uw value of 0.8 W/m²K admits a carbon emission through fuel combustion of 330 kg CO₂/unit in the life span of 30 years. But if the grey energy is taken into account, the frame material and its origin becomes importance. A window unit of wood with a certificate of Holz von Hier has a total of 28 kg CO₂/unit for the whole production process from cradle to gate. A window made from the tropical timber Meranti (30 - 50% of wooden windows in Germany) accumulates up to 80 kg CO₂/unit, whereas a window of PVC reaches 385 kg CO₂/unit. Therefore the question of material and origin matters regarding the climate protection effect.

- **Short distances up to final destination!** Not only the production process (A3) counts, but also the transportation from the production site to the application site. This can include several trading posts and lead to products with foreign origin. This life cycle stage (A4) can play a notable role in environmental considerations. A window imported from Poland for instance causes additional emissions of 5 kg CO₂/unit in comparison to a window with Holz von Hier certificate. Related to Germany with its 23,000 t of imported windows from Poland this adds up 2,300 tons of CO₂ per year (Destatis).

- **Wooden interior doors.** Doors today are very complex products, composed of several different layers and components. Many of them consists of Plywood as central parts. But especially in case of doors and furniture the plywood contains middle layers which are made from tropical timber species. These are often internationally endangered species like Framire. But even if the outer layer are made from 'domestic' tree species, these may originate as well from import. Additionally the processing chain undergoes a lot of different stations, located all over the world. The veneer for instance comes from Africa, the plywood is produced in Italy, the door composed in Poland and via trade is sold in Germany. But especially for inner doors simple and beautiful doors from massive wood of locally produced timber species are an alternative, which does not only makes ecologically sense but is as well attractive and durable. Doors from massive wood could especially be interesting for public buildings with a representative function.

- **Low carbon timber instead of tropical timber for doors and windows.** Meranti, Fuma, Ramin and other tropical timber species are commonly used in Europe for production of windows and doors, although they are internationally endangered according to the international red list of IUCN. At the same time they could be easily replaced by domestic timber species like Fir, pine, oak, douglas fir as well as spruce. They are successful used by modern and ecologically thinking window producers in Germany.
Other action fields

Other action fields are:

- **Lack of information transfer.** Especially in the sector of windows and doors a profound information of the customer as well as of planners and retailers is very important, because a lot of prejudices are to be found, which are not corresponding to reality. Some examples are subsequently described. Regarding this an appropriate information transfer will be conducted within the project.

Prejudice 1: ‘Wooden windows are more expensive’.

Fact is: who only purchases ‘cheap’ often pay twice. The higher the quality of the window, the longer its life span. That saves not only resources but also money. Price differences between windows from wood or PVC often are due to differences in Quality. A window with 20 instead of 50 years longevity is more expensive, even if it can be purchased for half the price. High quality and stable windows of PVC are mostly not cheaper than wooden windows. Moreover not only the product price has to be considered but also the installation. To have this done by a qualified company is crucial, as badly installed windows may loose efficiency and durability.

Prejudice 2: ‘wooden windows need a lot of care’.

Fact is: Windows of PVC do require a constant care as well. To maintain the optical image as well as material durability of synthetic widows, they need to be treated form time to time as well. On the other side, modern wooden windows requires a lot lesser care than in former times, due to technological development or material composition. In combination with a slim aluminium shell they are nearly ‘care free’.

Prejudice 3: ‘Wood products may cause health problems’.

Fact is: modern wooden windows are optimized in health and security. Repeatedly wood products are under suspicion to emit hazardous substances as PCB and PCP, due to surface treatment. Such substances are at right in focus, as they causes cancer and are toxic for aquatic organisms. Nevertheless for instance German window producers do not make use of such substances, in German production PCP moreover is strictly prohibited since years. Within the EU up to a limit of 0,1% (mass related) the application is allowed. In countries outside of the EU, PCP for instance is still in use. So imported products may cause indeed health risks, which are excluded with products from domestic production. Consistently cases gets known, where imported PCP containing products causes stresses to health and environment (Heudorf 2000). Globally the PCP burden decreases, however the Asiatic region deviates from that (Zheng 2011). The same situation refers to substances like Diarsenpentaoxid and Natriumdichromat, -dihydrat, anhydrid, which are prohibited in Europe (Reach regulation), in imported products in contrary not. PVC in window frames finally is a material, which itself is already cancerogenic besides any additive. Greenpeace for instance describes PVC, Poly carbonate and styropor as the three most toxic synthetics and advises against the usage of them for health protection.
5.10) Wooden Floors

5.10.1) Introduction

Wooden floors are parquet, prefinished wood parquet or floor boards. Commonly also Laminate counts as wood floor although it contains only few proportions of wood inform of fibre board. Massive floor boards are a simple but beautiful wood floor. The boards are either laid with glue or 'swimming', which is better for health and reusability. Surface treatment may happen with natural oil or through sealing. Specialities are cross-cut wooden floors and industry parquet. Both are extremely hard-wearing, but have the disadvantage to be layed in a glue bedding. Prefinished wood parquet exists in various qualities, normally it has a fibre board as carrier with a wooden deck layer of varying thickness. It is considerably lesser durable than massive parquet. The durability of wooden floors are stated in the architects information platform BNB of the Federal Ministry of Buildings with > 50 years. In reality floors of massive wood like floor boards or Parquet have almost unlimited durability due to the possibility of grinding and repolishing the surface. Massive wooden floors are 'more generation floors'. The do not get out of fashion, are timeless beautiful and easy to care (Tab. 5.15).

In public buildings wooden floors are quite uncommon, but they would be a very interesting option because of the representativeness and the good cost benefit relation, if the whole life cycle is taken into account. Especially in public buildings, which have representing functions floors should look good over a long time. Here in any case quality is the crucial aspect. Massive wooden floors may score especially in this cases. But the benefits of wooden floors are often not yet in the focus of purchasers.

Additionally to the above mentioned advantages wooden floors provide a optimised feel good temperature, so that fuel costs can be reduced. Another advantage is, that wooden floors are not electrostatic, which is positive for IT-working places. Flooring of synthetic textiles need to be specifically treated with chemical or nanotechnology impregnations to reach that, what makes them very cost intensive.

<table>
<thead>
<tr>
<th>Verlegeart</th>
<th>Stein, Keramik</th>
<th>Glas, Guss</th>
<th>Textilboden</th>
<th>PVC, Elasto.</th>
<th>Dielen, Parkett</th>
<th>Fertigparkett</th>
<th>Lamnlat</th>
<th>Linoleum</th>
</tr>
</thead>
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<tr>
<td>Oberflächen. Kategorien</td>
<td>B</td>
<td>B</td>
<td>C</td>
<td>C/B</td>
<td>A/B</td>
<td>B</td>
<td>B/C</td>
<td>B/C</td>
</tr>
<tr>
<td>Strapazierfähigkeit</td>
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<td>+</td>
<td>+</td>
<td>+</td>
<td>+++</td>
<td>++</td>
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<td>++</td>
</tr>
<tr>
<td>Pflegeleicht</td>
<td>+++</td>
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<td>+++</td>
<td>++</td>
<td>++</td>
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<td>++</td>
</tr>
<tr>
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<td>≥ 50</td>
<td>8 - 10</td>
<td>≥ 50</td>
<td>&lt; 50</td>
<td>&gt; 20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Dip index</td>
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<td>5</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

Tab. 5.15) Comparison of floorings. Way of layering: (1) Clicking, screwed (2) glued. Surface categories: (A) natural oil, waxed (B) sealed (C) impregnated. Resilience: +++ (very good) to + (bad). Care effort +++ (very good) to + (bad). Durability [years] according to BNB. Dip = reusability index: (1) single substance or almost only one material, (2) composed product of separable components, (3), composed product of hardly separable components (4) compound system, (5) product of compunds systems not reusable or recyclable.

Parquette from „copper“ oak (pict. HvH net)
5.10.2) Country overview

A comparison of all countries is not possible, because until now there are not enough data available and especially in the segment of floors not easy to gather from official statistics. There are biobased floors and others floor coverings that are in competition with wooden floors (Tab. 5.16).

<table>
<thead>
<tr>
<th>bio-based</th>
<th>others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parquette, pre finished parquette, wooden floor boards, cork, linoleum, sisal-, cocos fibre, wool textile a.o.</td>
<td>Stone, PVC-, vinyl, laminate, chemical textile a.o.</td>
</tr>
</tbody>
</table>

Tab. 5.16: Floor coverings in the categories „biobased“ and „others“.

The market share in the Alpine space is not known, but it could be that same proportions like in the German market where 50% are synthetic textile floors, followed by laminate, ceramics and PVC. Wooden floors have only a small market share of 4% until now, despite there very good features and a good price-performance-ratio. Linoleum, cork, elastomers ad others have a market share of 6-7%.

Even the market of „wooden floors“ is spliced into very different product groups, the big group of pre finished parquet (>60%), massive wooden parquet (25%) and floor boards (16%). Dies main groups are splitted into different other product groups (Fig. 5.51).

Solid parquets and floor boards are a classical sortiment for many SME sawmills. In the product sortiment of massive wooden floors it is necessary to inform the consumers about these products and there advantages. In the Alpine space there are many sawmills that could produce floor boards and also a number of producers for solid parquet.

5.10.3) Country balances (examples)

Wooden floors from Germany

Wooden floors are floor boards, massive parquet and pro finished parquet. The latter has the biggest market share in Germany, but often comes from imports with low qualities. Trends within the parquet market were and are: closing of production and retailing locations, translocation of the production to cheaper countries and especially strongly increasing imports.

In Germany about 500 Mio. m² floors each year were consumed. Thereof 240 Mio. m² synthetic textile floors, 80 Mio. m² laminate, 72 Mio. m² ceramics and 48 Mio. m² PVC, other floors like Linoleum, Cork, Elastomer and others together have a market share of 27-29 Mio. m².

Wooden floor production is not exactly known especially the amount of massive parquet and wooden floor boards. There are no official statistical data available but market mavens estimate that in total 16 - 20 Mio. m² wooden floors are produced in Germany. The German parquet production decreased from 13 Mio m² in 2007 to 10 Mio. m² in 2014 (parkett-bericht.de). About 90% of the production are multy-layer-parquets. The German parquet consumption was 21 Mio. m² in 2014 with increasing tendency and 75% prefinished parquet (parkett-bericht.de). Half of the consumption of parquet in 2014 came from imports (14,5 Mio. m²), mostly parquet with tropical timber. There were and are parquet exports also (6,9 Mio. m² in 2014). Imports and exports mainly concern prefinished parquet (Fig. 5.52).

![Fig. 5.52] Parquettet balance form 2014 (parkett-bericht.de)
5.10.4) Potential, action fields

Potentials for closing regional processing chains

Potentials for closing regional processing chains are:

• In the case of wooden floors there is a high potential for carbon savings, because most of the saw mills could produce planed flooring boards. Requesting solid planed wood or parquet however needs to be combined with a low carbon timber certificate, as foreign trade in this sector is the highest among all timber sortiments. Solely with parquet at least 6.8 Mio. m² from export could be saved, respectively the double amount of 13.6 Mio. m² as switching export to regional markets would compensate corresponding amounts, which yet originates from import.

• Because especially at prefinished wood parquet, which holds the greatest share in imports, the surface layer often consists of tropical timber, it is important, that customers ask for a low carbon timber certificate. It requires as well, that customers are sensitized for the beauty and broad variety of domestic timber species and their applicability for flooring. Several domestic timber species up value every room, like hornbeam, apple, elm, acacia, douglas fir, smoked oak and others.

• Promoting flooring boards besides parquet as such to give this product a renaissance would support and foster regional value chains, as many regional producer would have the technology to produce this sortiment. As well the benefit for the forest lays at hand. (1) as well tree species, which are rarely used up to now, could find an interesting market what would support management strategies towards enhancing biodiversity.

• (2) Sortiments of lower roundwood quality class can be used in parquet fabrication, as lesser dimensions are usable. Important is, not just to promote domestic timber species, as especially in this sector all of these species are subject of long distance transports (Cherry and Oak from USA, Maple from Canada, Birch from Scandinavia, Larch from Siberia and others as examples).

• Moreover flooring are only one application of wood in public rooms. Wall panelling is another upcoming example. Mostly these are veneer boards, which contain a high amount of wood from far away, partly from tropical timber. Instead of this, domestic veneer could substitute this.

Other action fields

Other action fields are:

• Wooden floors are in competition with other floors and a main part of actions in this field is to show communities and planners what wooden floors from low carbon timber are able to do, compared with other floor coverings. According to wooden floors still a set of prejudices or information lacks exists, which hampers the market access. Some of them are shortly mentioned in the following paragraphs, more detailed this will be part of the information transfer within the project to communities and planners.

Short supply chains are more easily implement-ed in wooden flooring than in other product categories of flooring materials

Wood as raw material is widespread in the Alpine Space and sufficiently available with regard to quantity and diversity. Admittedly a low carbon timber certificate is necessary to ensure the domestic origin of the wood from the Alpine Space, but in principle, the supply chains are potentially closer than in other flooring products like PVC, laminate or others, which are based on crude oil. Such products therefore contain already global material flows already in the preproducts and halfware like PVC granulate, as well the final products are subject of global trade.

Energy and water footprint in comparison

Efficiency of production regarding energy, water and resource use is crucial for all products. Wooden floorings perform mostly better than of other materials. Production of a solid flooring board for instance consumes 58 – 90 MJ/m² energy and 9 kg/m² water compared to a textile floor made from PE or PES with a consumption of 112 – 282 MJ/m² energy and 90 – 290 kg/m² water.

Material influences fuel consumption

Flooring materials themselves do not consume any kind of energy during the usage phase. However they influence the feel good temperature and thus the
demand for resp. consumption of heating energy as they shape the indoor climate. Solid wooden floors for instance feel warmer at the same temperature, than synthetic materials like PVC or laminate do. With laminate for instance people tend to increase the room temperature for some degrees. As lowering the room temperature saves up to 7% fuel per degree (e.g. https://www.comoil.de) wooden floors may save a lot of money. Moreover wooden floors are diffusion-open and regulate air humidity (if they are treated with oil or wax).

**Material influences health**

Solid wooden floors are optimally health tolerable. In Germany fabricated wooden floors all safety limits for formaldehydes, cancerogenic substances, VOC and others are complied with. Moreover the risk of containing substances according to the REACH list is lowest in wooden products compared to nearly all other materials. The crucial factor with floors is rather the fixing and surface treatment: A floated laying of course bear lesser harm as using glue. The surface optimally is treated with natural oil or wax. But even varnish in the Alpine Space countries is available as environmental and health friendly. Laminate however - which is virtually not a real wood product - is to be assessed at their carrying board and the used glue mainly. Glue with PAK for instance is prohibited in Germany and other European countries, in other import countries however not, what has to be considered in purchasing.

Regarding synthetic flooring materials like textile or PVC flooring the information database wecobis.de of the German Federal Ministry of Construction some interesting information are to be read: “… in floorings like elastomers, polyolefines, PVC or chemical textile fibres, there a large differences with regard to health protection” and that one should make certain though proves or certificates while purchasing, that no hazardous substances will be emitted”.

It may be remarked at this place, that in case of domestic production also these flooring materials are in congruence with safety limits. Related to synthetics however only 5 substances are listed currently under REACH, but 41 substances are named on the so called candidate list, which contains substances under suspicion to be cancerogenic or being hazardous to fertility and health. Generally just the most popular floorings in Germany, textile and PVC floorings, contain high concentrations of additives, like antistatic, anti soling for protection against dirt, flame inhibitors and others. PVC especially inhabits health risks already through the material itself, as it is described as potentially cancerogenic.

Synthetic floorings contain besides several filling substances (54%) high concentrations of softener (10,5%) and several stabilisers, pigments, flame retarding and other more. Softeners in PVC are precarious as they can be absorbed by spit, the skin or respiratory passages. Softeners like phthalates are damaging kidney and liver, may inhibit physical development in children and are under suspicion to be cancerogenic. Some phthalates like DEHP are estimated as harmful to fertility and unborn.

In many synthetics up to now the flame retardant Hexabromcyclododekan (HBCD) is used. HBCD is estimated as highly cancerogenic and is according to the REACH regulation at a concentration of more than 1 mg/kg within the product prohibited. Brome containing flame retardants like HBCD from uninjured synthetics probably get into environment only in tracks. But they are hardly depleted in nature even in miniscule concentrations and they accumulates in mother’s milk and blood. Therefore it is stated as extremely dangerous to water organisms with a high accumulation potential. The German Federal Agency recommends to avoid in general products potentially containing HBCD.

**Fire security**

In fire cases people mostly die because of intoxication rather than through burning. Solid wood floorings show many advantages in fire cases. On the one hand they do not emit toxic gases under fire like synthetic substances do. Furthermore solid wood floors with a deck layer of at least 5 mm thickness are stated as ‘fire secure’ according to the rule EN 14342. Only floors with a deck layer below 5 mm, like prefinished parquet or especially laminate are stated as not fire secure.

In contrary to wooden floors, synthetic floorings are melting in fire cases sips while burning down, and fire can be very hard erased. Additionally synthetic floorings increase the fire load considerably. This is even the case, if they are treated with flame retardants. In fire cases immediately a thick dark smoke develops, which exacerbates the sight and orientation. This is very important especially in public buildings with inhabitants with weak orientation themselves like Kinder gardens, schools, hospitals or retirement homes. While burning besides the toxic CO as well NOx, chlorocarbons, high toxic dioxins, furnace, aromates and other substances are developed. EPD virtually never give information about these threats.
Solid floor boards from (l. to r.) larch, hornbeam, copper oak (Holz von Hier). This floor has been passed by over 1 million people within 7 months and under all weather conditions. This floor only needed one cleaning a week to look almost as new (pict. HvH).

Durability

The durability of wooden floors are stated in the architects information platform BNB of the Federal Ministry of Buildings with > 50 years. In reality floors of massive wood like floor boards or Parquet have almost unlimited durability due to the possibility of grinding and repolishing the surface. Massive wooden floors are ‘more generation floors’. They do not get out of fashion, are timeless beautiful and easy to care. Solid wooden floors are hard-wearing and long living floors which are easy to care. If they are heavily polluted or damaged, they can be easily repaired. Solid wooden floors mostly can even be reused after dismantling.

The durability of synthetic PVC floorings are stated by the above mentioned database with 20 years. Laminate and synthetic textiles are estimated with 8-10 years durability. The care and cleaning of synthetic floorings is difficult in case of heavy pollutions. Mostly professional cleaning machines are required under application of acrid cleaning agents.

End of life reusability

After end of life products from solid wood are - if not simply reused - at least a valuable secondary raw material. They can after recycling be used materially in other products like particle boards or at least the save climate through substituting fossil fuels in power or heating plants.

Synthetic floorings however nowadays are only subject of disposal and combustion in specific garbage incineration plants. The chlorocarbon and dioxins raising in the burning process, are as far as possible retained. But this service is fairly expensive. For that reason remarkable material flows though waste export into other countries can be observed. In Germany a deposition of such waste is not possible any more according to the Technical rule for settlement waste (TA Siedlungsabfall). However it may sometimes still occur in connection with construction waste. Especially from soft PVC a severe contamination of groundwater with softeners may occur.

In theory thermoplastics like PVC can be remelted if they are of single origin and used for fabrication of other products but only in a down cycling for minor products. Especially a recycling of mixed wastes still is a big problem and probably will remain, as this requires a high working power and additionally a high input of water and energy, which turns out negative with regard to the cast calculation as well as the environmental balance.

Oak floor panels at an official building. There was ordered and used oak of b/c quality from local sawmills with local wood (Holz von Hier). This wooden floor fulfills all burning regulations and was by far the cheapest that was provided on the call for bits (pict. HvH net.)

Comparing prices

Regarding the costs it has to be distinguished between the purchasing price for the flooring itself and the costs per laying including all supporting materials. Regarding the purchasing price rather quality defines the price level rather than material. Solid wooden floors often would even be cheaper than textiles or specific PVC floors of high quality.

Important in comparing prices is as well to take the durability into consideration. Especially dismantling and substitution of floorings is expensive, annoying and disturbs the public visitor traffic. Durability and capacity for repair as well as easy care is quickly a matter of high or low life cycle costs.

Typical purchasing prices for floorings in Germany (without warranty): Solid wooden flooring boards: 30-60 €/m²; Parquette: 35-70 €/m²; prefinished parquette, higher quality: 35-65 €/m²; prefinished parquette, lower quality 20-40 €/m², industry parquette: 20-50 €/m², laminate: <5 – 25 €/m², Linoleum: 20-60 (?) €/m², ceramic floors <15 - >80 €/m², PE-PES textiles and PVC: <15 - >80 €/m².
5.11) Buildings

5.11.1) Introduction

Timber buildings are part of the European „Bioeconomy“ strategy

The European „Bioeconomy“ strategy put wood products into a main focus, with the argumentation that timber fixes CO₂ during growth thus representing a carbon storage. But this is only true if (1) the timber originates from forests that are sustainable managed and also depends, referred to a product, clearly on (2) the realistic (!) transports within the CoC. Point 2 is until now mainly not regarded but focussed within the project. For example roundwood from Russia or Poland in a wood building, as main import countries for timber building materials to the Alpine Space, has very different environmental footprints than timber with low transport rates (more information see chapter 6). This affects climate but also biodiversity, water and resources. However this does not only refer to timber but also to other construction materials. In the European context it is important that solutions for low carbon timber, are transnational solutions avoiding the appearance of nationalism or protectionism.

A comparison and evaluation of different studies and environmental footprints for building products showed, that only transports of raw materials varying strongly. The carbon emissions does nearly not vary for forest production and production of sawn wood, but vary strongly for the transports of raw materials to the production (more information see chapter 6).

Sustainable buildings are part of the „Green Infrastructure“ strategy

The European „Green Infrastructure“ strategy has to do with (1) green belts and linkage of nature protecting areas, (2) increasing the carbon storage of the forest landscape, (3) linkage between cities and the surrounding country, (4) greening within the city planning, (5) timber buildings and (6) „green buildings“signet with the worldwide available green building labels (LEEDS, BREAM, Green Star, BNB etc.). All these issues are positively affected if it could be achieved, that the low carbon timber strategies and instruments developed and tested within the CaSCo project, could be implemented and adopted into EU strategies and regulations.

Timber buildings are part of the European EPBD

Buildings are part of the Energy Performance of Buildings Directive (EPBD), but not yet in a really green context, referred to the building materials. The global building market is predicted to increase up to 15,5 trillion US-Dollar (Global-Construction-2030-report of Global Construction Perspectives and Oxford Economics). This indicates that buildings may become an important driving force to reach the worldwide climate aims for more climate protection - or not.

Policies for the energy efficiency of buildings and the Green Building program for not-residential-buildings were adopted some times ago from the EU. Sustainable buildings are part of the EPBD strategy but until now the EPBD is only adjusted to red energy not to the grey energy of the chain of custody of construction materials.

But especially the grey energy of building materials has the key influence on the environmental footprint because building materials are inert within the usage phase. They do not consume energy or water during this phase, unlike to heating, lamps or cooling technique of a building. Also the end of life use of the building materials is not really taken into account. Within the EU 475 kg of municipal waste per capita (baulinks.de) shows that building materials are crucial and one key factor for resource efficiency.
5.11.2) Country overview

Building licenses in the Alpine Space

Until now there could not be made a country comparison because of lacking data. But the data from Eurostat showed, that building licenses increased in Germany, Austria and France, especially since 2014 for residential-buildings. In Slovenia there was a strong increase in not-residential buildings since 2014. In Italy residential-buildings and non-residential-buildings decreased since 2010 (Fig. 5.53, 5.54).

Wood constructions in the Alpine Space

Timber constructions have a long tradition within the Alpine Space. Types of wood constructions used in the Alpine space are:

(1) Wood frame constructions are made of conifer sawnwood like lumber or KVH that are fixed and faced on both sides with lumber or particle boards like OSB. Added are normally insulating products and facades from timber and components like windows and outer-doors. This construction type today is common.

(2) Block constructions are made of solid logs. Panels are not necessary. Timber fibre insulating products can be used or not, but are fixed at the inner side.

Additional facade materials are normally not needed. New buildings today seldom are block constructions but they are very common in traditional old buildings especially in the Alpine Space. This type is used for private and seldom in official buildings, but it could be used in smaller ones.

(3) Solid wall constructions. Solid timber walls cover various different types, some of them with glue, some with nails and some with wooden pegs. They have the same advantages like stone or brick buildings but also the eco- and living advantages from timber. The walls can be prefabricated so that the time at the building lots can be easily shortened. Solid timber walls are more fire proof than normal timber frame constructions, they are earthquake proof and allow money saving quick building times. With solid timber walls private homes, public buildings and even tower blocks can be build. For example companies from the Holz von Hier network build a 5-floor-timber-building from solid timber walls, with Holz von Hier certificate).

Market share of wooden buildings

Market shares of wooden buildings in the Alpin Space are:

- Germany 16 - 18%.
- Austria 39%.
- France 10%.
- Italy: no data available.
- Slovenia: no data available.

At present these shares are strongly increasing especially in France and Italy (pers. com. of architects) but are still low compared with other European countries, e.g. Sweden with 55% (data for 2015 from Destatis and cluster study Bavaria).

The Alpine Space regions Bavaria (BY) and Baden-Württemberg (BW) are timber building leaders in Germany. In BW about 19.135 and in BY 33.171 new buildings were settled 2015 (Destatis). The part of prefabricated houses have reached 27% in BW and 21% in BY (residential: 26% in BW und 18% in Bavaria, non-residential 30% in BW and BY).
5.11.3) Country balance (example)

The first „Holz von Hier” 5-floor timber building (pict. HvH net.)

Until now only for Germany data are available. There can be seen the following trends.

Construction activities in Germany

Two-thirds new buildings

In Germany about 222,280 buildings were licensed in 2015, with only 55% for new buildings. The Alpine Space regions Bavaria (BY) and Baden-Württemberg (BW) together realised 40% of all new buildings in Germany (Tab. 5.17). Renovation and redevelopment activities are strongly increasing and in BY and BW this are 30 - 34% of all building activities. This sector is interesting for SME.

![Building market in Germany](image)

Costs for building activities

Building activities in Germany consumed 85 billion €, a great part from that in Bavaria and Baden-Württemberg and mostly (80-90%) for new buildings (Tab. 5.18). In German an average of 0.37 Mio. € per new residential-building are paid and in the Alpine Space regions Baden-Württemberg and Bavaria even 10 - 13% more (Tab. 5.19). For renovation and redevelopment activities the private sector spent 0.10 - 0.12 Mio. € and public building contractors 0.32 - 0.39 Mio. € per activity. Highest building costs per m² have renovation and redevelopment activities of non-residential-buildings (Tab. 5.20). Blocks of flats and official buildings are build by bigger building contractors.

![Average costs per building](image)

![Average costs per m²](image)

Construction in Germany is dominated by the private sector.

About 78% of the new residential buildings and 90% of renovation activities are addressed to private clients and bigger private builders (20%). Public builders are in the minority. Non-residential-buildings are dominated by enterprises and agriculture. New non-residential-buildings in the Alpine Space regions Baden-Württemberg and Bavaria are mainly (60%) operational buildings like factory halls, workshops, storage, showrooms, commercial buildings and 28% are farm buildings. New public administration buildings represent only 5-9% (renovation of public buildings 10-13%). Even for renovation and rebuilding public buildings does not play a significant role.

![Blocks of flats and official building](image)
Wooden material costs share only 4-6% of the building costs.

Building costs have strongly increased (HPI price index 2016, +4,7%). Material costs however remained quite stable, and timber costs for wooden buildings in Germany have a share of only 4-5% of the costs for the entire building (calculated with 60 m³ timber per resident-building, 40 m³ per non-resident-building and current prices for KVH/BSH of 300 €/m³).

Additionally the prices for sawnwood decreased continuously in the last years, because of increasing imports of cheaper sawnwood form large distances and of unknown origin. But this does not lead to cheaper prices for the customers.

To enhance the carbon footprint of wooden construction materials and the entire building, communities, planners and customers should be informed about that fact, because many customers are very interested on sustainable products.

Enough low carbon timber is available

Studies showed, that timber use for construction materials like exterior walls, roofs, windows, doors and panels could reach 8,6 Mio. m³ respectively 3,3 Mio. tons of timber (data from Manthau 2012 for m³ and for tons own calculations 0,5 t/m³).

![Timber consumption in Germany for constructive uses ("Rohbau") in Mio tons of timber](image)

Fig. 5.55) Timber for constructive in Germany (Manthau 2012).

Timber use just for constructions like exterior walls (20%) and roofs (46%, Fig. 5.55) in Germany was 5 Mio. m³, respectively 2,5 Mio. tons of timber. With 3,7 Mio. m³ for new buildings and 1,2 Mio. m³ in the renovation/rebuilding market. The calculated timber in these product segments for new buildings in Bavaria are 0,8 - 1 Mio. m³ and in Baden-Württemberg 0,5 - 0,7 Mio. m³. Additional there is use of timber for renovation and rebuilding activities (see more data www.holz-von-hier.de; calculated with data from Destatis 2015/2016 and cluster study Bavaria 2015 and an average density of 0,5 t/m³; data exclude insulating and timber for the outside use.

This leads to the conclusion, that Germany and probably also Austria, France, Italy, and Slovenia could supply there own needs for timber in the building sector, because they produce enough sawnwood. For example the German sawmills produce 15 Mio. m³ conifer sawnwood (with 6 - 7 Mio. m³ KVH, BSH) and they sell 19 Mio. m³. Much more sawnwood is produced than that is used in the constructive timber sector in Germany (Fig. 5.56).

Additionally enormous overlapping material flows of sawnwood and construction wood are existing. The German market is ‘flooded’ with 6,8 Mio. m³ sawnwood from imports. Without certificates for low carbon timber with low transports within the chain of custody a customer can not be sure that the timber in his building is climate friendly low carbon timber, growing in regional or European forests. This situation has strongly sharpened within the last ten years.

![Part of sawnwood that is needed for buildings, compared to production, import, export. Data Destatis, 2015.](image)

Fig. 5.56) Part of sawnwood that is needed for buildings, compared to production, import, export. Data Destatis, 2015.

5.11.4) Potentials, action fields

![First „Holz von Hier“ building with BSH from Alpine space (pict. HvH net.)](image)
Potentials for closing regional processing chains

• There are large carbon saving potentials, as they are connected with potentials for sawn wood in general (see there).

• Many customers are very interested in sustainable products and planners especially plan wooden houses while believing that wooden buildings especially in the Alpine space are always climate friendly, because there are forests, sawmills and carpenters everywhere. Not many principals know that the timber for their building, used by the carpenter, may originate from a forest far away. Therefore and especially for timber buildings it is very important to have certificates of origin and low transport rates within the total chain of custody (e.g. Holz von Hier). This lowers the carbon footprint of wooden buildings and makes them real “Green buildings”.

Other action fields

• The meaning of low carbon building materials (not only timber) for a real greening of buildings is highly underestimated. A viable information transfer to communities and customers is needed regarding the fact that a timber building with wood from long distances cannot be stated as ‘climate friendly’.

• Requiring forest certificates like FSC and PEFC is essential to get timber products that come from sustainable managed forests. For many communities and customers this is important. But they should also be informed that these labels do not indicate climate friendly low carbon timber products, because these products could have travelled thousands of transport kilometres.

• Because the climate aspect is also important for many customers and communities, they could ask for low carbon labels like „Holz von Hier“ Especially for communities that have a communal „climate protection plan“ this could be important or become a part of this plan.
5.12) Interior and Furniture

5.12.1) Introduction

Wooden furniture are trendy but mainly they are from imports

To office furniture belong product categories like chairs, arm chairs, sofas and living room suites, tables as well as racks and others.

Especially office furniture are composed from material mixes like steel, PVC, wood, textiles, foams etc. To give a comprehensive evaluation of the environmental footprint is not easy and not for all materials possible in the same manner. For this reason also environmental label often consider only parts of the components.

Wooden furniture nowadays live a come back and else in office furniture the increasing importance of wood as material is highlighted by experts (material trends 2016 in: Man & office on the way, edition 1, 2016). If wooden furniture are used, however these are mostly furniture made of particle board, often from imports.

The German furniture industry regrets, that traders more and more are focussing on imports instead of empowering qualitative, ecological and social compatible products (moebelindustrie.de). They furthermore verify that consumption of the Germans today is as high as seldom in the past decade and that they should reached by the traders with intelligent marketing concepts enhancing the willingness to buy long-living, qualitative and sustainable regional produced furniture. In a position paper on website the furniture industry determines, that trade is on the best way to marginalize the German furniture producers especially the SME. „Customers have the right to know from where products originate and which level of fabrication and quality they have: The origin of products they proclaim is very important for quality, environment and consumer protection standards.

Important environmental properties of interior products and furniture

In all products the environmental impact of all life cycle stages are important: (1) production including the preprocessing steps from raw material extraction, (2) the usage phase and (3) the end of life stage. Regarding the preprocessing steps the raw material extraction (LCp Phase A1), Transports along the supply chain (LCp A2) as well as up to final application site (LCp A4) and production (LCp A3) relevant. Wood has several advantages in this respect.

The environmental impact depends essentially on the consumption of energy and water. The footprint of products, which do not consume energy or resources during the usage phase, like furniture therefore is mainly shaped by production and preprocessing chains. In general also aspects like durability and stability as well as health aspects are of importance in the usage phase.

Even the environmental footprint of the end of life treatment of a product is influenced by the material. Therefore reusability and life cycle optimization starts with procurement. Wood shows as well a good performance with regard to end of life stages.
5.12.2) Country overview

Up to now there is no clear country comparison possible, as the appropriate statistical data are missing.

In the principle however all Alpine Space countries are home of a broad variety of tree species in their forests, which could be perfectly used for furniture production. There is an tendency of decreasing domestic production of deciduous sawn wood and veneer for instance in Germany, while imports of furniture are raising, which is probably the same trend in all Alpine Space countries. This can only be prevented or changed, if customers, planners and decision makers in communities are sensitized for the beauty and uniqueness of domestic timber species. A lot of customers only are aware of a few main tree species and they are fascinated by the variety and beauty of domestic tree species in exhibitions of Holz von Hier, where wood of 45 different trees species are presented.

Even producers sometimes are not familiar with the technical characteristics of lesser used domestic timber species. That leads to the effect, that even timer of potential high quality like fir or hainbuche are mostly find their destination as energy supply or paper production. Positive examples are practised for instance in the Joglland, where fir is used as wood for acoustic sensible interior finishing.

5.12.3) Country balance (example)

In Germany nearly 1,4 Mio. t timber are consumed only for the interior sector. The main part of it is used for refurbishing and flooring (Fig. 5.57).

There is a hard global competition on the market for Interior and furniture. For example 58% of the furniture sold in Germany originates from imports (moebelindustrie.de, 2017). In the sector of sustainable procurement this percentage is even much higher. About 70 - 80 % of the office furniture purchased have their origin in imports (pers. comunic. through producers of the HvH network). But at the same time also exports of furniture are high.

Meanwhile these imports not only refer to products of the low price segment. The main competitors are from Poland and Asia, especially China and Taiwan (www.moebelindustrie.de). Highly probable this is the same fact in the other Alpine space countries.

Even the materials for furniture production as massive wood panels for furniture frontages and tables today often (70 - 80%) are imports from Poland or oversee.
The three main export markets for furniture from Germany are the neighbour countries. So still in 2014 France, Switzerland and Austria shared 35% of the entire export market. On the other side, Poland, China and the Czech republic provided 50% of the imports to Germany with increasing trend.

However there has to be distinguished between different furniture categories. Kitchen furniture still are a German export hit. Export still override imports in this segment. Main destinations are France, the Netherlands, Belgium, Switzerland and Austria.

Upholstered furniture however underlie an extreme pressure form imports, which is 2 to 3 fold higher than export. This is disregarding the fact, that still some important producers are located in Germany. Major suppliers are China and Poland, they share together 65% of the import market. Especially in this segment purchasers should consider the origin, also with regard to the REACH regulation, as imported products may contain substances which are prohibited under the European REACH regulation for domestic or European producers.

5.12.4) Potentials, action fields

Potentials for closing regional processing chains and other action fields

Potentials for closing regional processing chains are:

- Low carbon timber could be used in the following segments: cabinets, tables, working table plates, seating furniture, living room furniture, office furniture and children furniture (Kinder garden). Interior finishing integrates all measures that are not belonging to structural work and housing technology. For timber products relevant are floors, walls, ceilings, stairs, inside doors and others.

- More low carbon solid timber materials and products, like planed sawnwood, massive wood panels, veneer and other should be used for interior and furniture manufacturing. This would contribute to strengthen the diversity of regional deciduous wood. Because in managed forests like in the Alpine Space, only tree species are replanted and supported which have high market potential. Additionally sales of deciduous sawnwood from could be supported which leads to considerable carbon savings from external trade.

Other action fields

Other action fields are:

- One main action field lays in communicating the advantages of low carbon solid wood products as interior finishing and furnitures to communities, planers and customers. These advantages are shortly charcterised below, but will be elaborated in detail within the information materials provided for planers and decision makes in communities for instance in the eco planners tools.

- Especially in public bodies purchasers should think twice, whether the furniture for the cafeteria need to by made from synthetics or whether massive wood could be a reasonable alternative. Preferably in representing spaces low carbon timber products from massive wood would have their appropriate place. There are a range of beautiful wooden panels for fabrication of tables and other furniture, which not only would up value every office, but would at the same time be a statement for the own region.

- However, even if a public body emphasises regional added value, without a certificate of origin one can not be sure to determine, from which source the wood in the products originates. It could be quickly pay off, to ask for offers for high quality office furniture from local carpenters, probably a lot of purchasers would be surprise about the cost quality ratio.

- However even a lot of crafters, who purchase their raw material from retailers, are of the opinion, that many wood products would not be achievable at local or regional level. So information transfer is of importance even within the chain of custody.

Some PRO’s for low carbon timber

Round wood from the Alpine Space is an environmental raw material

The trade with illegal wood nowadays reaches a level of organised criminality, comparable with the range of criminal trade with drugs and humans (UNEP and Interpol, 2012).

In the case of imported timber it is a must be to ensure the origin in sustainable managed forests (e.g. through a certificate of FSC or PEFC), however it is
not sufficient enough to avoid a further continuing destruction of primary forests in the world, if it is not joined by a systematical and international combatting of organised criminality.

Even wood from plantations is not always a guarantee for environmental friendliness, as many plantations are located at sites, where the former primary forests has been clear cut. As well as so called ‘single stem usage’, which counts for a specific caring usage and management of forests, causes a considerable loss of biodiversity (e.g. Asner et al., 2000, Science).

The recently launched FLEGT regulation shall ensure a sustainable origin of the timber of increasing imports into the EU. However single audits of import charges through the Federal office of agriculture and food (BLE) in Germany gave incidences, that in spite of official federal documents of the origin countries a fraught may occur. One problem is, that as soon, as an entry of timber into a European member state, this is not longer subject of the regulation within inner European trade. And the regulation is not in any country implemented in the same level and efficiency. In case of a proven origin of the roundwood from Alpine Space, this problem does not occur, as legality and also sustainable management of forests is ruled already by law.

**Optimised climate protection through a low carbon footprint based on short distance processing along the entire supply chain.**

The usage of wood as a potential carbon storage itself is not sufficient to ensure a real contribution to climate protection facing the global material flows occurring nowadays. Only products with timber from sustainable managed forests and low transport loaded supply chains up to the final destination of the product are almost ‘CO2 neutral’. All tree species, growing in Alpine Space forests, have a wide geographical distribution. Without a proof of origin along the processing chain, it can not be premised that the usage of ‘domestic species’ ensures their local or regional offspring.

**Domestic timber replacing tropical wood contributes to saving biodiversity**

Whereas in Europe the forest area continuously increased since 1990, in Africa, Latin America and Asia in total 270 Mio. acres of primary forest have been lost (FAO 2014). Roughly 93 % of the globally endangered species live in primary tropical forests, which are increasingly threatened by overfelling and land use change. Illegal logging in primary forests reduces the global market price for sawnwood for about 9-16% (WWF, 2009). That means, that cheap timber products trigger are paid with severe impact on environment, if they are not certified.

In Germany especially in the furniture industry and flooring at present 70 tropical timber are regularly applied. From these species 33 belong to internationally endangered species whereas 28, although not endangered, probably originate from poaching. Only 11 are not endangered and available with sustainability certificate.

On the other side, in the Alpine Space around 60 - 65 tree species are domestic. Neither customers nor planners now most of this variety however.

The beauty and variety of the domestic tree species and their wood would be an important objective though. In European managed forests such a broad variety is only fostered, if the wood finds viable markets. As tree species diversity is one core precondition for biodiversity in general, raising demand for this tree species variety in products with wood from local resources fosters biodiversity in Alpine Space as well.

**Implicit protection of biodiversity through low distance wood**

A completely unregarded impact of transportation is the influence on biodiversity. Through transportation globally almost as much animal and plant species are threatened than through poaching. This is due as well to ship freight, as especially the trading routes from Asia, North Africa and Oceania play a vital role causing threats for a great number of species.

**Risk of Biodiversity Loss**

The risk of biodiversity loss can be defined as a innovative factor (RBL) calculated based on data from the red list of IUCN (s. www.holz-von-hier.de/produktumweltampel).

Some comparisons in RBL:
- Poaching in primary forests of Malaysia: 502 species,
- Mining in China: 113 species
- Transports in Germany: 16 species
- Transports of goods form China to Germany: 872 spec.
- Transports of goods from Malaysia to Germany: 938 spec.

see more info: www.holz-von-hier.de.
Efficiency in production regarding energy, water and resources are comparably high.

The consumption of energy, water and resources in fabrication of products is always a crucial factor. Wooden products show often generally a high performance with this regards having for instance high proportions of renewable energy use in production processes: EPS 0,1 – 0,5%, planed wood 65%, particle board 13%.

The water footprint of industrial production (expressed for instance as Water consumption by industry per gross domestic product - WCI/GDPi) in the Alpine Space countries as an example is comparably better than a lot of important other countries, from where several goods are imported: Germany (5,56 kg/US-$), China 23,69 kg/US-$, USA 31,42 kg/US-$). A similarity is found regarding resource efficiency of industrial production (Domestic material consumption per gross domestic product - DMC/GDP): Germany 0,57 kg/US-$, USA 0,67 kg/US-$, China 7,40 kg/US-$.

Every country has a specific electricity mix and a correlating global warming potential, to which usually life cycle assessment of products refer. This influences the environmental footprint of goods as well. In Germany for instance the electricity related GWP ranges at 156.219 kg CO2eq./TJel., in China at 219.479 kg CO2eq./TJel. and in Poland at 266.819 kg CO2eq./TJel.), so furniture, imported from China or Poland to Germany are already though its origin connected with a higher environmental load than domestic ones.

Well crafted products from massive wood are an not only ecological favourable but also economically senseful alternative to cheap particle board furniture from import.

„Cheap purchased is bought twice“, to that conclusion comes a study of the German federal environmental office in 2010. Longevity, capability of repair, modularity, timeless design and other features are important factors for climate and environmental impact of products. The higher the longevity of a product, the better the keener it becomes in relation to invest. That’s nothing really new to lots of the purchasers and many scores longevity as second most important criterion (Günther et al. 2004), at least in theory.

However in practice the focus lies primarily on the purchasing price. Buying furniture, often particle board based furniture are chosen or even already named in call for bids. This is, because, purchasers often suppose, that these are the cheapest option. This may be true compared with furniture from massive wood - but only, if the usage phase is not taken into account. Furniture of particle boards are more vulnerable and gets quicker unattractive. Even because of that they are more often substituted by new ones. A table from massive wood is like new after grind off and polishing. This is impossible in particle board furniture. A modular furniture of massive wood, where its components may be put apart and substituted for instance by the facility manager, is economically attractive and ecologically favourable.

Quality & Price

In case of furniture it is misleading just to compare purchasing prices. One should always take quality, durability and health aspects into account and set them in relation to the pure investment. Comparing a table of massive wood from regional offspring with a table from melamine coated particle board from China must not be reduced on the purchasing price. Sustainability is not to have in sales. Additionally the costs in usage phase and end of life of cheap products often are higher than of high quality products.

The German Federal Ministry for Construction maintain a list of life span of construction products (Oekobaudat.de). In this list, the life span of furniture are stated between 10 years for working places and conference rooms and 40 years for racks of all kind. The numbers prompt that the longevity depends strongly on the way of usage. This again depends on taste, intensity of usage and representation function. For this reason it is not appropriate to just transfer the numbers to „wood furniture“ in total. The longevity depends very much of its quality and design. Nobody will repair or maintain a furniture after
the melamine coating has peeled off, a table of massive wood however may just be easily kept attractive. This has been practiced for instance by the German Bank GLS. The tables had been foreseen with a new frame technically adapted, as the tabletop has just been grinded and polished again. That was not only cheaper than buying new furniture but as well highly sustainable.

**Domestic wood products are social fair**

Especially in timber products the origin influences strongly social and health issues (REACH). This should be considered facing global markets. The European REACH regulation is unique in the world in consumers health care and social fairness in the Alpine Space countries has to be stated as above global standards like ILO and others. In many importing countries both social and health issues are far from that level. Particle boards for instance from German production do not contain wood waste, as it is the case in many other countries of origin. Furthermore in Europe producers of boards and furniture underlie the REACH regulation, which prohibits the application of several substances potentially hazardous to health. This is not the case for imported products.

In many environmental product declarations (EPD) information on potentially hazardous substances are rather scarce. Sometimes there are information about formaldehyde, but this is far not the only substance of risk. A lot of substances which are already part of REACH regulation or at the candidate list, are not regarded. Therefore it is worthwhile to ask for environmental labels like NaturePlus, the ‘Blaue Engel’, the Austrian ‘Umweltzeichen’ or others, which are stricter in assessment. But imported products from eastern Europe or the Asiatic region usually are not proved or certified. Alternatively it is helpful to assure, that the product contains material from domestic offspring, e.g. through a certificate of origin of Holz von Hier or others.

But regarding health it is not only relevant, if and which potentially hazardous substances a product emits during the regular usage phase. It may be crucial as well, what happens in case of fire. Furniture or floors of massive wood only develop smoke, while synthetic products with glue and coating components emit in case of fire very toxic substances. This is of concern, as most of the fatal victims died not because of burning but of intoxication through smoke gases.

**Reusability**

The potential reusability or recycleability is also a question of material from the right beginning. The reusability of furniture depends on the material combination and modularity. Mostly furniture of massive wood show also a very good performance in this regard. With appropriate product related design they enables the highest opportunity for a real reuse. But even if not, after end of life they still would deliver a valuable secondary raw material for production or as substitute for fossil fuelling. The more components a furniture has or the higher the syntethic proportion the worse is environmental balance and the more expensive probably the disposal.
5.13) Pulp and Paper

5.13.1) Introduction

The pulp and paper market is global and promotes material flows of all timber products. In the recycling paper market the material flows in some product categories are even much more international than in the „fresh fibre“ paper market.

Worldwide 400 Mio. tons of paper, carton, paperboard annually were produced, mainly in China (105 Mio. t), USA (74 Mio. t), Japan (26 Mio. t) and Germany (22 Mio. t). Many producers are international (VDP 2013, 2015). The ten biggest paper producers in the world are: (1) International Paper, (2) Stora Enso, (3) UPM, (4) SCA, (5) Smurfit Kappa Group, (6) Nippon Paper, (7) Nine Dragons Paper Holding, (8) Sappi, (9) Oji Paper and (10) Smurfit-Stone. Main producing regions are Europe, North America and Asia.

The raw material for paper is pulp and for pulp it is industrial roundwood. Asia is worldwide the biggest net-importer of industrial roundwood, including tropical timber, and also for pulp (FAO Daten). USA and China are the biggest pulp users worldwide. Germany is the 7. biggest producer of industrial roundwood and the 15. biggest pulp producer worldwide and the number 4 in Europe. With 20 Mio. t annually, Germany is one of the biggest consumer of paper worldwide and in ranges in Europe at number one. Today 60% of the German paper industry is owned by global players, but there are some interesting smaller producers with special products, being international brand leaders.

„Paper is not paper“. In the most official statistics the term „paper“ summarizes a broad range of sortiments and products. Therefore in all life cycle calculation programs and studies often non comparable products are compared.

- „Power-liner“ (Kraftliner) are the basics of outer packagings (e.g. pizza boxes, online-order-products) and are made of high percentages of used paper. Until now eco-labels like Blauer Engel do not play a great role in this segment. But recycling paper cannot be automatically seen as „the good“ paper because the material flows may be globally as well and they often contain harmful substances. These aspects are especially in imported products incalculable.

- (Mass-)office-paper and paper for newspapers consists of fresh-fibers and recycling-fibers. A great amount of labels is applied in this segment providing them a considerable advertising space for free. But the risk of green washing is high.

- Valuable quality papers for brochures normally uses only fresh fibres not recycled fibres, because only fresh fibres ensures high print quality. But ecological performance of the paper is very important for most of the customers using it.

Paper producers are big energy users and therefore emit a lot of CO₂ compared to other product categories. Therefore the paper industry in Europe is obliged to the CDM market and has to buy CO₂ certificates. But what is called big is also a question of comparison. The production of 1 tons of paper (paper rolls) causing nearly 1 tone of CO₂ (per. com. Sappi). But the production of 1 ton palm oil produces 30 t CO₂ (WBGU, 2009, WGBU is the scientific counselor of the German government for global environmental aspects). If used paper would get more and more to cascade use this would spare much more CO₂ than the „Bio“-fuel palm oil.

In all life cycle studies regarding paper the factor „transports“ is nearly neglected. But even if the production has the highest importance for the single paper producer, the CO₂ balance for a book bought by a customer could be completely different if its produced either from paper with low transport rates within the CoC or with paper from Asia.

Picture above: ball pens with low carbon regional timber species (pict. HvH)
5.13.2) Country overview

Pulp and paper from project countries

This short overview on pulp and paper within the Alpine space countries shows that Germany, Austria and France have high importance in the pulp market (Fig. 5.58). But this is not surprising, because big producers are located in Germany. Also not very surprising is that Germany has the highest production for paper and paperboard, due to its big producers. In contrast Italy has a low production but large consumption supplied by large amounts of import.

Considerable are the high production and consumption of recovered paper in Germany (Fig. 5.59) compared to the other countries. This in Germany has a long marketing story and is politically wanted. Astonishing is the low production and consumption in Austria, being much lower than in France and Italy.

Germany has the highest production and consumption of paper & paper boards (Fig. 5.60) and printing and writing paper of the project countries (Fig. 5.61). For the climate also important are the high import and export rates, which shows that paper is not paper. To get a insight into CO₂ saving potentials this would need a deeper evaluation by expert interviews. But the exchange between the Alpin Space countries in this segments could be high.
5.13.3) Country balances

Pulp and paper from Austria

Austria consumes a little bit more pulp than it produces (Fig. 5.62). The use of recovered paper exceeds the national production (46%). The production of paper and paperboard and also printing and writing paper is higher than the consumption, therefor the exports are big. Additionally large amounts of pulp, recovered paper, paper and paperboard, printing and writing paper are imported.

Pulp and paper from France

France consumes more pulp, paper, paperboard, printing and writing paper than it produce (Fig. 5.63). It consumes less recovered paper than it produce. France exports large amounts of paper, paperboard, printing and writing paper and also of recovered paper. The high amount of recovered paper that is produced in France could be used there, if the consumption of this product could be raised. Due to the fact of high consumption, larger amount of especially pulp but also paper, paperboard, printing and writing paper are imported.

Pulp and paper from Germany

Germany is one of the five biggest paper producers in the world. German demand for pulp can not be covered by own production, therefore the imports are higher than the German pulp production (Fig. 5.64). Recovered paper shows similar balance. „Paper an paperboard” calculatory could be supplied by production, however there are also high amounts of imports and exports. The balance of „printing and writing” paper with its nearly equal production and consumption and nearly the same export and import rates show, that this sector is very divers in products and qualities. Paper production in Germany is divided into very different groups of „paper.” Mostly packaging paper is produced (50%), followed by graphic papers (37%), hygiene papers (7%) and special technical papers (6%), together 19 Mio. tons (VDP 2016). In Bavaria and Baden-Württemberg big producers are located, e.g. UPM, Palm, Sappi. FAO data show, that there are high import and export rates for wood pulp, recovered paper, paper and paperboard and printing and writing paper (Fig. 5.65).
Pulp and paper from Italy

Italy consumes much more pulp than it produces and therefore the imports of pulp are very high, but there are existing also exports of it (Fig. 5.66). For recovered paper production is higher than consumption, therefore there are more exports than imports of this product category. Much more paper and paperboard are consumed than produced, imports are high but also exports are considerable. Printing and writing paper is a divers product category that there are considerable imports and exports, although the needs of Italy could be supplied by own production.

5.13.4) Potentials, action fields

Potentials for closing regional processing chains

Potentials for closing regional processing chains are:

- If customers and communities use office paper, or purchase flyers and brochures with paper produced in their countries respectively in the project countries Germany, Austria, France, Italy and Slovenia, they could save a lot of CO₂ emissions from transports of imports and exports of paper. This should be addressed to communities in the Alpine space.

- Paper producers should be addressed to search for possibilities how to shorten their raw material purchase. For example the company Sappi produces one specific sortiment a lignin free nature paper for printing. The company uses roundwood from beech to produce a big part of its pulp itself. This enables comparable regional short distances material flows.

- Addressing of producers of paper in rolls to investigate opportunities to produce also a sortiment of office paper.

Other action fields

Other action fields are:

- Information transfer to retailers to request low carbon timber certified paper products.

- Addressing of bigger printing houses to consider in their purchase paper with a low carbon timber certificate.

- The same goes for publishers (e.g. publishers of child books or school books) not only to consider sustainable forestry (FSC, PEFC) but also carbon footprints while requesting Paper with a low carbon timber certificate. This could serve to develop unique selling positions, as also imported child books from China for instance often carry an FSC label.

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Fig. 5.66) Pulp and paper balance Italy (FAO, 2014).

Fig. 5.67) Pulp and paper balance Slovenia (FAO, 2014).
5.14) Package and Paletts

5.14.1) Introduction

Today estimated 400 - 500 Mio. pallets are in a circulation pool (websites pallet producers). There have to be distinguished between on-way-pallets and the Euro-pallets, which could be twice or three-times used. The amount of one-way-pallets on the European market is much higher. For example one-way-pallets have the same amounts on the German market like Euro-pallets. In other countries the one-way-pallets have much more market shares.

One-Way pallets. One-way-pallets are only constructed for a one-time use. They normally are made form sawnwood but also from plastics, paperboard or particleboards. If one-way-pallets and even Euro-pallets are send to private households, a pallet-change is not possible. One-way-pallets on the one hand highly reduce the work and administration effort, because there are not pooling or collecting costs. On the other hand one-way-pallets are less resource efficient because they end up in the stoves, although they are nor usable for domestic fuel. Their life cycle is therefore short and also there carbon storage potential in the wood. The chain of custody is highly important for that product.

Euro-pallets. Euro-Pallets are “reusable-pallets” and are designed for pooling and exchange systems. They are form sold sawnwood, have normed diameters and are repairable. In the principle they could be traded worldwide in pallet-reuse-pools. “Pallet-pooling” does not take place automatically. Behind that is a complex system, which is not common in all countries, even not within the European union. Today in the European Euro-pallet-pool are only six countries: France, Austria, Netherlands, Belgium, Luxemburg and Germany. Pallet-pooling is an individual agreement between sender and acceptor, a legal exchange bondage does not exist. The administration of pallets increasingly is out sourced to extern pool-contractors (e.g Chep and Contra load, Gütegemeinschaft Paletten e.V.), which regulate procurement and recycling of the pallets. An alternative for the pallets-exchange is the pallet-reselling. In the Alpine Space produced pallets mostly are from spruce and pine. Euro-pallets can - theoretically - be restored. Destroyed parts or the whole pallets, if not repairable, has to be shredded. Companies that wants to repair an Euro-pallet, need a licence (EPAL).

Industry pallets. Industry pallets have different measures and are constructed for special loads and products. They are mostly used in companies or industries that have automatic manufacturing transport installations and machine driven production.

Self-build-pallet-furnitures. There is a hype to buy or self-build pallet furniture. Normally only untreated pallets should be used. Unfortunately many pallets, especially from outside the Alpine Space and from imports into European union are treated with toxins. Even with pallets wearing an IPPC stamp (very few until now). Especially if the IPCC stamp contains the additionally sign „MB” there is an health risk. MB means, that the pallet is treated with the toxin Methylbromide, a contact toxin which is very harmful for the environment, humans, animals, plants and soil organisms and it is dangerous for aquatic and sea life. Pallets from imports to European Union mostly contains toxic substances like MB, especially products and pallets that were transported within sea containers are mostly purged with MB. In Europe MB underlies the REACH regulation.
5.14.2) Country overview

A Country comparison is not possible because of lacking data. But the principle aspects described for Germany could be valid for the other CaSCo countries as well. **Valuable or endangered wood species in pallets?** After a self-commitment of the members of the European Pallet Association e.V. (EPAL) the Euro-pallets can be or are made from 17 European wood species. Pallets from other countries outside the European union or regions with tropical forests, also contain tropical timber.

5.14.3) Country balances (example)

**Pallets from Germany**

The pallet production grows 5-6% every year and the annual German timber pallet production was 98.588.000 pieces in 2015 (www.hpe.de, values for 2016: 102.877.000 pieces). That corresponds, with 0,02 tons per pallet, to nearly 1,97 Mio. tons of wood. There are high overlapping material flows. Annually 31,62 Mio. pieces were exported to 107 countries worldwide, which equals nearly 0,63 Mio. t. About 65 Mio. new pallets for the first use were imported from 57 countries worldwide, equaling nearly 1,14 Mio. t timber (Fig. 5.68). The mean export destinations are Netherlands, Switzerland, Austria, Belgium, France, Italy. The main import origin countries are Poland, Czech Republic, Netherlands, Belarus, Latvia, Lithuania, Ukraine, Russ. Federation, Denmark and Austria. Additionally there are imports of sawnwood from these countries for the German production of pallets. These imports and exports are changing yearly in wide range. For example 2015 the main import countries were Poland and Czech Republic with 50% of the total import, but in 2016 these main import countries were Netherlands and Belarus (www.hpe.de).

In the entire sector of construction including both wooden houses and non-wooden houses in Germany only 1,83 Mio. tons of timber were used. That means, in German more sawnwood is used for the pallet production than for the entire constructive building sector.

Fig. 5.68) Pallet balance Germany (Destatis, data 2015).

Form the new pallets produced in Germany, nearly 15% were exported to Austria, France, Italy and Slovenia and only 4% from there are imported. The external trade with this highly exchangeable product occurs over long distances.

5.14.4) Potentials, action fields

**Potentials for closing regional processing chains**

Potentials for closing regional processing chains are extremely high. Pallets as a highly standardized product are completely exchangeable and independent from a specific origin. Therefore about 620.000 tons of wood, respectively the double amount because each ton of avoided export compensates for a ton of import as well, can be avoided, saving the corresponding carbon emissions. The potentials are very also because these products can be fabricated very easily from a broad range of companies. The crucial factor is a lack of awareness and responsibility in this sector. Up to now, the environmental footprint is no matter of concern. Regarding pallets, sustainability thoughts focus on reusability and timber origin from sustainable managed forests (if at all requested). The climate aspect not yet has been considered at all. A lever could be to address bigger customers and enterprises, which use pallets and packages and raise their awareness about the climate impact of the value chain of pallet production. Especially bigger companies, which inhabit several certifications like EMAS or which practice environmental reporting are valuable candidates.
5.15) Synopsis material flows by foreign trade

5.15.1) Import - export share

Total import and export and share of product categories.

This chapter represents a compilation of data regarding imports and exports of several wood products in a country comparison, presenting them from different perspectives. Based on these data the carbon emissions are derived, which are presented in the following chapter 6. This subchapter forms a bridge between chapter 5 and 6.

Through foreign trade of the participating countries Austria, France, Germany, Italy and Slovenia 93 Mio. tons of timber products are subject of foreign trade (Tab. 5.21). These transports cause carbon emission in the range of 7.5 Mio. tons. Whereas in total in Austria, France, Germany and Italy imports overstep exports, in Slovenia is the reverse.

Through foreign trade of the participating countries Austria, France, Germany, Italy and Slovenia 93 Mio. tons of timber products are subject of foreign trade (Fig. 5.69). These transports cause carbon emission in the range of 7.5 Mio. tons. Whereas in total in Austria, France, Germany and Italy imports overstep exports, in Slovenia is the reverse.

<table>
<thead>
<tr>
<th>Mio. t goods</th>
<th>Austria</th>
<th>France</th>
<th>Germany</th>
<th>Italy</th>
<th>Slovenia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>20,867</td>
<td>13,775</td>
<td>37,111</td>
<td>14,839</td>
<td>6,310</td>
</tr>
<tr>
<td>Import</td>
<td>13,057</td>
<td>7,147</td>
<td>21,142</td>
<td>13,640</td>
<td>1,987</td>
</tr>
<tr>
<td>Export</td>
<td>7,810</td>
<td>6,627</td>
<td>15,969</td>
<td>1,200</td>
<td>4,322</td>
</tr>
<tr>
<td>related carbon emissions [mio. t CO2]</td>
<td>1,131</td>
<td>1,178</td>
<td>3,416</td>
<td>1,353</td>
<td>0,379</td>
</tr>
</tbody>
</table>

Tab. 5.21) Exports and imports of timber products per country in total.

Austria imports enormous amounts of roundwood, sharing about 50% of total imports of timber products to Austria (Fig. 5.69). Slovenia imports bigger percentages of sawnwood and wood fuel. Percentages of pulp imports are big in France, Germany and Italy. In Slovenia roundwood is the main export product. In Austria and Germany sawnwood and panels show the highest percentages of export. In Italy exports of panels and pallets are the major proportions (Fig. 5.70).

5.15.2) Overlapping

Overlapping material flows

Often the same product or material is subject of import and export as well. To stress an image, that would mean, the lorries passing each other crossing the border. The overlapping amount of both flow directions could be avoided from a quantitative perspective. The lesser unique a product is and the more exchangeable, the easier these flows could be avoided through closing regional processing chains. But only very few products are so specific, that they cannot be replaced by a comparable from another
origin. In these overlapping material flows the biggest carbon saving potentials are buried.

To determine the order of such overlapping and avoidable material flows the sum of imports and exports of a product (grey bars in the figures) are compared with the lesser amount of foreign trade (either import or export), but which before is doubled, as the transport in both directions is dropped through closing regional processing chains. This value is indicated as red proportion of the bars. The results are shown for each product group separated by country of concern in the following figures (Fig. 5.71, 5.72, 5.73, 5.74, 5.75). Table 5.22 show the sum in total in country comparison.

<table>
<thead>
<tr>
<th>[Mio. t]</th>
<th>Austria</th>
<th>France</th>
<th>Germany</th>
<th>Italy</th>
<th>Slovenia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>20,867</td>
<td>13,775</td>
<td>37,111</td>
<td>14,839</td>
<td>6,310</td>
</tr>
<tr>
<td>redun-</td>
<td>8,303</td>
<td>8,179</td>
<td>22,327</td>
<td>2,362</td>
<td>3,223</td>
</tr>
<tr>
<td>dand</td>
<td>38 %</td>
<td>59 %</td>
<td>60 %</td>
<td>16 %</td>
<td>51 %</td>
</tr>
</tbody>
</table>

Tab. 5.22) Overlapping materials flows for timber product groups in Germany.

Extensive overlapping material flows regarding absolute height occur especially in Germany. Germany and France have the highest percentage of redundant material flows of all countries. Italy has the lowest percentage of redundant flows.

Remarkable are the high amounts of foreign trade in conifer roundwood in Austria, although only 1/6 of it to be stated as quantitatively avoidable, as well as conifer sawnwood, where at least 50% would be avoidable.

In France avoidable proportions of foreign trade are evenly distributed over the different products.

Germany show the same extreme high material flows of conifer roundwood and conifer sawnwood. However the avoidable parts of it are considerably higher than in Austria.

Very low avoidable proportions as well as comparably low amounts in total register Italy.
5.15.3) Transport footprints of foreign trade

As the environmental impact depends on the amount of transported material as well as from the distance, an average ‘distance load’ has been determined. For each participating CaSCo country and each product the traded amount and the distance from an originating country (import) or to a country of destination (export) has been evaluated from international statistics. For each import or export country the arithmetic product of amount and distance has been built (t*km). The sum for all these values has been finally divided by the sum of the traded product in total. With this a ‘distance’ footprint of each ton of a product regarding foreign trade has been generated. The results are described subsequently. The bars in the figures do not indicate directly the amount of a traded product but rather the transport intensity.

Austria

Noticeable for Austria are the high transport footprint of export of OSB panels (Fig. 5.76), due to the destinations China, Japan, Australia. This would only be changeable, if the product would be more requested for instance in the Alpin Space. Generally the highest transport footprints are due to exports. Nevertheless in most product categories both import and export are in the same range.

France

Conspicuous are the high transport footprint of sawnwood from maple and other species, from oak roundwood, sulphate pulp and wafer board (Fig. 5.77). This is due to far destinations like far East Asia and others. It may only be changed, if the respective products would be more intensively used in furniture and interior finishing in France or the Alpine Space region, at the same time potentially substituting tropical timber products.

Remarkable however are high transport footprints for some imported products as well, like veneer and sawnwood from maple, cherry and others.
• sawnwood other: Brazil, Cameroon, Gabon, Uruguay, Congo, Thailand, Vietnam, Indonesia.
• Veneer: Gabon (83% of the total t-km)
• Plywood: (China (62% of the total t-km), Russia, Gabon, USA.
• Wooden doors: China (62% of the total t-km)
• Chips: conifer: Brazil (97% of the total t-km), deciduous: USA, Belgium, Germany.
• Pellets: USA (88% of the total t-km).

These product categories are highlighted here, as for all of them in France itself as well as in neighbour countries are sufficient raw material and production capacities are available. For some of the sortiments like cherry France itself is famous.

**Germany**

Germany is conspicuous for several high transport footprints (Fig. 5.78) in the range of 10.000 km like sawnwood of ash, beech and maple, as well as roundwood oak and beech with following main destinations:

- roundwood beech: China (87%)
- roundwood oak: China (75%)
- sawnwood beech: China (54%)
- sawnwood oak: Vietnam (35%), China (22%), Indonesia (20%).
- sawnwood ash: China (62%)
- planks (!): 71% to: Unit. Arab Emirates, Indonesia, USA, Mexico, Qatar, Argentina, Chile, Malaysia, Philippines, India, South Africa.

But as well regarding import to Germany there are some remarkable heavily ‘transport ladied’ products like sawnwood of maple and cherry as well as plywood and prefinished parquet. This is due to far distances too:

- sawnwood maple: USA/Canada (97%)
- sawnwood cherry: USA/Canada (98%)
- plywood: Russia (31%), China (25%), Brazil (21%)
- prefinished parquet: China (69%)

It is to scrutinize, why an ubiquity raw material like roundwood of beech needs to transferred around the world, just to come back again as per fabricated product to be finished e.g. to furniture in the country of raw material origin. The environmental costs of this transaction nowhere are registered or internalized.

The same counts for sawn wood. Why are some of the saw mills forced to export their products to so far destinations, when at the same time the market for furniture and construction is growing? Why do they need to freight an exchangeable product of minor value like planks around the world, while the market for regular sawnwood for construction is declining? To transport short living products like planks over so far distances is ecologically precarious and questionable.

**Italy**

Although Italy does not have the high amounts of foreign trade (Fig. 5.79), it is conspicuous, that the transport footprint of various product categories is very high compared to other CaSCo countries. Regarding import especially sawnwood of cherry and others is remarkable as well as plywood and perfinished parquet.

- sawnwood cherry: USA (92%)
- sawnwood other: USA (31%), Cameroon (25%)
- plywood: Russia (34%), Brazil (27%), Chile (16%),
Indonesia (5.9%), China (4.4%), Gabon (3.6%) • perfinished parquet: China (86%)

Regarding exports a lot of products show considerably high transport footprints but which is complex and changeably only, if more of the products would be used in Italy or neighbouring countries.

©

ITALY
average transport pollution of imports und exports

Fig. 5.79) Average transport footprint of imports/exports for dif. timber products in Italy. Calc. with data from Eurostat, 2017.

Slovenia

Generally conspicuous is, that imports to Slovenia have its origin in closer distances compared to the other CaSCo countries like especially France, Italy and Germany (Fig. 5.80). Some products stand out through their high transport footprint regarding export as roundwood oak, sawnwood in general, sulfide pulp and prefinished parquet.

• roundwood oak: China (82%)

• sawnwood in general: in sum 69% to Algeria (40%), Yemen (78%), Saudi Arabia (6.4%), Japan (6%), Qatar (5.3%), China (3.8%).

• sulfide pulp: China (18 %), Egypt (15 %), Tunis (14 %), Korea (11 %).

• prefinished parquet: China (90%)

Remarkable regarding prefinished parquet is for instance, that Slovenia major export destination is China, whereas other Alpine Space countries e.g. Italy imports the same product mainly from China (instead from Slovenia directly, which would save a lot of carbon emissions !). This may serve only as an example for a common pattern.

SLOVENIA
average transport pollution of imports und exports

Fig. 5.80) Average transport footprint of imports/exports for dif. timber products in Slovenia. Calc. with data from Eurostat, 2017.

Some countries, from which various timber products are imported to the CaSCo countries, inhabit a high risk for a negative impact on environment connected to the timber originating from there. The next table summarizes some examples (Tab. 5.23).

<table>
<thead>
<tr>
<th>Country</th>
<th>Risk of poaching and forest destruction</th>
<th>Corruption risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Cameroon</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Canada</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>China</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Chile</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Congo</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Gabon</td>
<td>1-2</td>
<td>4</td>
</tr>
<tr>
<td>Indonesia</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Russia</td>
<td>2-3</td>
<td>4</td>
</tr>
<tr>
<td>Thailand</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>USA</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Uruguay</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Vietnam</td>
<td>1-2</td>
<td>2</td>
</tr>
</tbody>
</table>

Tab. 5.23) Comparison of risk for unsustainable origin of wood of selected main exporting countries. For more data see: www.holz-von-hier.de/produktumweltampel. Data sources: (I) FAO world forest report, (II) www.socialhotspots.org
Chapter 6: „Low Carbon Timber“

Important environmental aspects essentially bound to the material flows within the chain of custody.
6.1) Low Carbon Aspects

6.1.1) Introduction

Combatting Climate Change is one of the core environmental goals of the European Union. The European Union has developed a climate action plan, formulating various climate goals and related activities until 2050. This action plan underlines the enormous importance of climate protection for the European policy especially in the global context.

Within this action plan traffic is identified as the second most important cause for carbon emissions in the entire EU. This underlines the need of activities in this field. The commissions road map for a transition to a low carbon economy foresees that the traffic shall reduce its carbon emissions up to 2050 for about 60% related to 1990. However, up to now mainly technical innovations or alternative fuels have been and still are in focus. Transport reduction itself are not yet element of the strategy. Despite all former efforts to reduce the impact of traffic on the climate through higher efficiency of engines, better fuels, e-mobility and others, traffic represents the only sector, which did not reach a net reduction of emission, but in contrary even increased its total emissions in the past (Fig. 6.1).

The reason for that are so called „rebound effects“, which means, that improving or easing the use of a certain technology may often lead to a quantitative increase of the usage itself, overcompensating the achieved improvements. So if the specific footprint of traffic has been improved by e.g. 20%, but total traffic volume raised by 50%, the net emissions are still raising instead of decreasing.

Already within the 6. European Environmental program, „decoupling of transports and economic growth“ was stated as a very important action field. However no active measures towards this direction has been undertaken. Holz von Hier as the first environmental label adressing this issue and the test and implementation in other countries ini the frame of the project CaSCo for low carbon timber could be a best practise example for this action field of the European Union.

On a global scale extended material flows represents the third biggest cause for climate change. Yet it remains uncared among public authorities and architects. This problem refers to raw materials but especially to timber, which is a commonly used material in the Alpine Space. Unless a fabrication of timber products in regional low-carbon processing chains in the Alpine Space region could be done, especially timber products are characterised by very long transportation distances within chain of custody. A huge but fallow CO₂-reduction potential can be developed without bigger investments but only through awareness raising, policy development, innovative organisation of the supply chain and tools.

Moreover material flows and the connected transport does not only trigger climate change but affects as well other important environmental issues as acidification, eutrophication, water use and biodiversity. The next table (Tab. 6.1) compares the impact of material flows on different environmental factors. It shows examples from a database, collected in the frame of a research project, which was funded by the Federal German Environmental Foundation (DBU).
Data from SAVE

<table>
<thead>
<tr>
<th>Data Source</th>
<th>D (China)</th>
<th>Russia</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEPI [t CO₂/US$]</td>
<td>170</td>
<td>1,210</td>
<td>1,250</td>
</tr>
<tr>
<td>GWP transports [kg CO₂/kg/t]</td>
<td>&gt;0</td>
<td>473</td>
<td>553</td>
</tr>
<tr>
<td>RBL - poaching in primary forests</td>
<td>&gt;14</td>
<td>404</td>
<td>ca. 44</td>
</tr>
<tr>
<td>RBL - mining</td>
<td>15</td>
<td>113</td>
<td>27</td>
</tr>
<tr>
<td>RBL - country production</td>
<td>45</td>
<td>204</td>
<td>k.a. 374</td>
</tr>
<tr>
<td>RBL - by transports to Germany</td>
<td>16</td>
<td>872</td>
<td>72</td>
</tr>
<tr>
<td>WCI/GDPi [kg/US$]</td>
<td>5,56</td>
<td>23,7</td>
<td>&gt;30</td>
</tr>
<tr>
<td>water footprint transp [kg/1 t]</td>
<td>&gt;0</td>
<td>146</td>
<td>362</td>
</tr>
<tr>
<td>DMC/GDPi [kg/US$]</td>
<td>0,57</td>
<td>7,40</td>
<td>2,59</td>
</tr>
<tr>
<td>ADP transports [mg Sbäqv/t]</td>
<td>&gt;0</td>
<td>26,7</td>
<td>10,5</td>
</tr>
</tbody>
</table>

Tab. 6.1) Various impacts on environmental factors related to global material flows. Data from a research project „SAVE“ funded by the Federal German Environmental Foundation.

TheSAVE data base contains nearly 40.000 data sets with data for 270 countries worldwide. Examples are given here for: CEPI (climate efficiency of the industry, prod.), GWP by transports to Germany, RBL (Risk of biodiversity losses) by poaching, transports and production according to the international red list of the International Union for Conservation of Nature (IUCN), WCI/GDPi (water footprint of ind. production), water footprint of transports to Germany, resource efficiency of ind. prod. DMC/GDPi, resource consumption of transports as ADP.

The table shows that for instance the impact of transportation on biodiversity is in the same range or even worse than timber poaching in primary forests.

The purpose of this chapter 6 is to sensitize to the various climate effects of timber products as well as to define, what has to be understood under „Low carbon timber“ in the Frame of the project CaSCo.

In chapter 6.2 the specific methodology is described. In chapter 6.3 the general potentials for an optimised carbon footprint are considered and discussed concluding the approach within the project CaSCo. In chapter 6.4 the transport related carbon emissions and the saving potential are estimated for Germany and the CaSCo regions. In chapter 6.5 it is estimated, to what proportion final products may contain wood, which has been grown in the own country. Chapter 6.6 finally describes the definition of the term „low carbon timber“ to meet the project purposes and objectives.

### 6.1.2) Methods

#### Data sources

Within the investigations and analyses for the project mainly central and official data bases and sources are made use of. This shall ensure a maximum of comparability and reliability. Examples are for instance databases of the international food and agriculture organisation (FAO) or European as well as national statistical offices. Investigating structural data on timber industry and forestry in case of Germany existing national or regional cluster studies have been analysed. In the other project partner countries national statistics have been analysed.

#### Calculating carbon emissions

Generally the assumption was made, that production processes within the countries participating in the CaSCo project are more or less comparable. Moreover there are no exact data regarding the single carbon footprint of production processes in the different countries. The calculation of carbon emissions therefore refer only to the aspect and share of transport, as this is the main issue of the project. To calculate carbon emission related to transportation has been proceeded as following:

The amounts of various products have been evaluated from statistical sources. Due to a maximum of comparability for the classical products the databases of FAO and Eurostat has been used, as in most cases none or no comparable national data has been available. Besides the traded amounts also the partner countries (origin in case of import and destination in case of export) are recorded. So the specific transport related emissions has been calculated. Distances has been evaluated via google earth in case of shipping routes. These calculations the classic shipping routes of FAO are underlying. Terrestrial distances has been automatically calculated via google based distance calculators. Usually the centre of the partner country has been taken as start or endpoint.

Carbon emission factors for various transport vehicles have been taken from the comprehensive database PROBAS, run by the German federal environmental office (UBA). If necessary to convert from one unit to another (e.g. volume to weight) then following average factors had been used (Tab. 6.2).

<table>
<thead>
<tr>
<th>Unit conversion factors used.</th>
<th>volume [m³]</th>
<th>weight [t]</th>
</tr>
</thead>
<tbody>
<tr>
<td>conifer roundwood</td>
<td>1</td>
<td>1,0</td>
</tr>
<tr>
<td>deciduous roundwood</td>
<td>1</td>
<td>1,2</td>
</tr>
<tr>
<td>conifer sawnwood (fresh)</td>
<td>1</td>
<td>0,7</td>
</tr>
<tr>
<td>conifer sawnwood (dried)</td>
<td>1</td>
<td>0,5</td>
</tr>
<tr>
<td>deciduous sawnwood</td>
<td>1</td>
<td>0,7</td>
</tr>
</tbody>
</table>

Tab. 6.2) Unit conversion factors used.

Calculation of the amount of potentially „avoidable“ transport related emissions was based on the foreign trade balance. As the same product is as well exported as imported, parts of these amounts are not due to overproduction or deficiency and could be processed as well inside of the country in regional cycles. The smaller value (either export or import) gives the basic value, which might be avoided. This value - with regard to carbon emissions - has to be doubled, as closing a regional supply chain the transport in both directions could be spared.
6.2) Carbon reduction potentials in general

6.2.1) Life cycle considerations

Assessing the environmental impact of products usually a life cycle consideration is undertaken (Fig. 6.2, 6.3, 6.4). We follow this approach and describe the principle life cycle phases of timber products in the next paragraphs. The life cycle of products is set together through:

- Production process from raw material extraction to product finishing (‘cradle to gate’). This phase is signed with ’A’.
- The usage phase of a product. This phase is signed with ’B’ and
- The Phase after usage (end of life). This phase is signed with ’C’.

The last step of this life cycle stage is the transport from the production site to the place of final application, e.g. a construction site or customer (A4). This step is of considerable importance, as sometimes a product may be transported by multiple trading over long distances.

Timber products, in contrary to e.g. electronic devices, kitchenware, IT, lighting and others, do not consume energy during the usage phase. They are as materials ‘inert’. From environmental perspective timber products affect some issues during the usage phase like durability or health. However has regularly no influence on carbon emissions. For that reason, in the following elaboration the life cycle stage ’B’ is not further considered.

The treatment after a product has finished its usage it has to be treated somehow, either it can be reused in the same or another function, or it may be recycled to a secondary raw material for the same (recycling) or minor products (down cycling) or it needs to be disposed, either through deposition or through combustion. The order of listing normally equals the (increasing) impact on environment.
These processes of course affect the carbon balance of a product. Nevertheless they are only varying in a principal order for instance between different materials (e.g. renewable wood suited for combustion vs. PVC only to be disposed). Additionally the real treatment after end of life can hardly be predicted. So a product may be just disposed or combusted although it would be recyclable. Therefore this part of life cycle is not under consideration in terms of instrumentalisation to reach the objectives of CaSCo.

6.2.2) Carbon emission reduction potentials

Carbon emission reduction potential in PRODUCTION

In the timber industry usually certain standard technologies are used, like sawing, planing, drying or gluing of wood. Most of these technologies are quite similar to each other, differences may occur for instance regarding the fuel used for heating energy or the electricity mix.

However assessing the contribution of these parts of the life cycle related to specific producers are extremely difficult, as most of the mainly small and medium sized enterprises can not afford to conduct an own product and company specific life cycle assessment study. Existing data basis from the in CaSCo participating countries is so scarce, that it is neither possible nor senseful to integrate this question into a monitoring instrument for low carbon timber.

However there is one comprehensive study existing, which examined the average environmental footprint of various classical timber products for Germany (Thünen institute, 2013). The published results refer themselves as well only to a product specific average, so that every product fabricated in Germany has the same value for the life cycle stage A3. Nevertheless the study helps to tackle this question into a monitoring instrument for low carbon timber.

A comparison and evaluation of different studies and environmental footprints for building products (Bruckner & Strohmeier, 2016) showed, that only transports of raw materials vary strongly (Fig. 6.5).

A comparison and evaluation of different studies and environmental footprints for building products (Bruckner & Strohmeier, 2016) showed, that only transports of raw materials vary strongly (Fig. 6.5).

Fig. 6.5) Deviation of carbon emissions from average in raw material production, fabrication and transports.

The figure 6.5 shows two important facts:

1. the contribution to the entire carbon balance for instance for conifer sawnwood as construction material is in average highest for transport.

2. the potential variation between two single products resp. two different producers or providers is to the greatest part influenced by transport.

Carbon emission reduction potential through TRANSPORT

The European „Bioeconomy“ strategy promotes the usage of wood products with regard to the carbon storage or sink function. But this is only true if (1) the timber originates from forests that are sustainable managed and (2) depends clearly on the real entire carbon balance covering all life cycle stages including realistic (!) transports within the supply chain. Point 2 is highlighted subsequently being a focus of the project CaSCo.

As foreign trade and global material flows are common practice in the forest and timber industry and high proportions of the wood in a product may derive from such long distance origin (see chapter 6.5), one have to take such transports into account, when the carbon balance is addressed. The meaning shall be demonstrated at the example of glue laminated timber from Germany. Russia or Poland are two main import countries for conifer roundwood or conifer sawnwood, which is used for production of glue laminated wood as an important contemporary construction material.

The carbon balance for the final product at the gate (without life cycle stage A4, which needs to be added as a further transport related impact) has been calculated based on the average value for fabrication of glue laminated timber as stated in the study of Thünen institute. It was added by calculation of the
transport related emissions in comparison of the different origin of wood: local wood with Holz von Hier certificate, wood from Poland and wood from Russia. The calculation followed the methodology described in chapter 6.2 (numbers shown in Fig. 6.6).

Influence of transport on carbon footprint of construction timber

![Influence of transport on carbon footprint of construction timber](image)

Fig. 6.6) Influence of different raw material origin on the total carbon balance of glue laminated timber.

The effect or contribution of transport to the carbon balance of a product may even be stronger in little processed products like wood for energy use, any kind of sawn wood, packaging or wood for outdoor purposes. It might be slightly weaker in complex products like doors, furniture or other multiple treated products. However as timber for construction purposes is a core product with regard to the applied quantity as well as geographical availability this example may serve as a generalized model.

6.2.3) Tools to assess and monitor transport related carbon emissions

After having shown, that material flows through the supply chain are a crucial factor and with regard to the project objective to influence actively the carbon balance of timber products in various applications a key question is the assessment and monitoring of these material flows respectively their impact on the carbon balance. There is one investigation existing, which gives a systematic comparison of different existing types of assessment systems (Bruckner, Strohmeier, 2016). In this research project, funded by the German federal environmental foundation, various existing monitoring and assessment tools had been analysed. Among that, for instance more than 80 EPD of classical construction materials. The results a shortly described in the following paragraphs with regard to their applicability in the frame of the project. A more detailed description will be found in the report of project activity 1.2. In general there are three main categories of assessment instruments, potentially giving information about or influencing the size of the carbon footprint of products and constructions. They are subsequently characterized.

Category A: Environmental label

Environmental label type I according to the standard ISO 14024 are third party controlled label, which mostly consider a broad range of life cycle stages of a certain product. They designate products, which are better than legal provisions or the average, related to the specific criteria of the label.

With regard to wood and timber products there is a set of potential labels:

- **FSC / PEFC (and other comparable)**

These labels designate the sustainable management of the forest, the timber is harvested from. They fulfill a very important function to protect forests from overexploitation. However they do not address climate issues or carbon footprint information. As they are international labels, the timber may originate from far away with high carbon emissions related to the transport. Therefore they are no appropriate instruments to reach the objective of the CaSCo project.

- **Blauer Engel, EU eco label, NaturePlus (and other comparable)**

These labels designate environmental friendly products in a broader product perspective and life cycle range comprising as well health aspects of the product. Nevertheless - in case of timber products - in the range of criteria they do not address specifically the carbon footprint or give detailed information about it as a basis for a product choice and thus reduction of the carbon emissions. They are not suitable to meet the necessities for the project.

- **Label for regional wood**

There is a big number of labels, awarded by initiatives for promoting regional wood in Germany as well as in France, Austria and Italy, which designate a regional offspring of the wood in a timber product. Doing so, they prompt a low carbon footprint of the labelled products. However they give no quantifying information about the real carbon footprint. Moreover they are hardly usable in public procurement procedures as they emphasise the geographical reference. Furthermore they normally are not conform with ISO 14024 requirements.

- **Holz von Hier - certificate of origin and environmental footprint**

Disregarding the title, which first prompts the proximity, this label designates products, for which the wood originates from sustainable managed forests and has been transported lower than average along the whole processing chain. The criteria are based on a scientific development process and the label is conform with ISO 14024. Additionally because of underlining the carbon footprint and trans national cross border functionality it is as well suitable for procurement procedures. In combination with this
Certificate of origin, designated products can be joined as well by an environmental footprint, generated in the same controlling and assessment process. This tool is described below (see 'EPD').

**Category B: Assessment schemes for sustainable construction**

In the European union and globally exist various systems to assess and certify the sustainability of buildings and constructions. The most popular are for instance LEED (international), BREAM (international), DGNB (Germany) or others. Also the ITACA protocol in Italy is to be classed among them. These schemes address a broad range of criteria along the life cycle of the building of concern. They comprise not only ecological aspects but also economical ones. The pure environmental aspect is only part of the assessment and due to the complex catalogue of criteria, the impact and carbon footprint at the level of single materials and products is peripheralised and down levelled.

Additionally they are only usable for whole buildings. All other single applications of wood are not covered. Moreover they are very cost intensive to obtain for the principal of the building, thus being not suitable for smaller cities and communities. They rather give a frame to incorporate as well the specific low carbon issues, but for the named reasons they are not suitable to actively trigger a carbon emission reduction related to timber products, purchased in public procurement.

**Category C: Environmental product declarations (EPD) or similar LCA-tools**

These environmental label type III according to ISO 14025 have the objective to quantify the environmental impact of various products and make them comparable among each other. They explicitly do not assess or score products, e.g. dividing them in ‘good’ or ‘not good’ ones according to certain principles. EPD claims to give neutral information on ‘good’ or ‘not good’ ones according to certain principles. EPD claims to give neutral information on the environmental impact of a product under concern, including the carbon footprint (GWP) in kg/unit. Therefore they might be judged as a instrument fitting to the project purposes, but nevertheless there are a set of limitations and characteristics of EPD, which make the application unsuitable:

1. **In practice EPD are lacking comparability.**

   In accordance with the relevant ISO 14025, while developing an EPD, different assumption can be made and various definitions of the frame conditions and scope of the EPD are possible to be set. As the environmental impact depends on the set frame conditions and assumptions, a comparison between different products may be impossible. Additionally the presentation of the data often differ from one EPD to another, e.g. sometimes all life cycle stages are summarized, sometimes they are splitted, which hampers a comparability for the recipient.

2. **Lack of transparency.**

   The calculation algorithms as well as a lot of relevant information often are not described or exposed in the EPD. Therefore it is impossible to a recipient, to cross check or prove the plausibility of results and values. The recipient is constraint to rely on the external auditor of the EPD. But there are justifiable doubts, whether an external auditor always proves every assumption and the data sets used for calculation. It can been assumed, that rather the conformity of the proceeding with ISO 14025 is assessed, than the correctness of the data sets as such.

3. **Great uncertainty in the life cycle stages before the production site.**

   EPD regularly elaborated as ‘cradle to gate’. That means, from extraction of raw materials up to the finalizing of the fabrication of a product of a certain company. With regard to the company and the production process itself, the investigations normally are fairly exact and detailed. Nevertheless, regarding all preliminary stages and processes EPD are rather uncertain, as they are dependent on assumptions and the usage of standard data sets for certain processes. This uncertainty increases with every processing step and ‘distance’ from the origin of the raw material. This uncertainty is due to the ‘backwards’ direction of the assessment logic. So EPD prompt a scientific exactness (e.g. values in decimal places), which is ill-founded.

4. **Underestimation of real material flows and their impact.**

   In most of the analysed EPD a quite similar range of transport distances of purchased materials has been found, mostly between 50 - 350 km. Often it is not clear, whether this is due to a (inappropriate) assumption or due to statements of the company of concern and often it is referred to standard data sets (e.g. GaBi Software). With internal knowledge from practice and considering foreign trade numbers these ranges are obviously too low, so transport related emissions are highly underestimated. Moreover trade normally is not part of the EPD calculation. Thus, if products are traded over several steps, which is nowadays a common appearance in the timber industry, these environmental impacts are not reflected in the EPD.

5. **Transportation from production site (‘gate’) to product implementation or construction site (life cycle stage A4) can not be covered and assessed.**

   As EPD are elaborated with a validity of several years covering every product of the related category, they are systematically unable to include the transport from the production site to the place of implementation for a single product. The emissions of these transports however may form even the main part of
carbon footprint of a timber product (e.g. glue laminated wood from Russia vs. regional origin, as described above).

6. Potential great deviation of environmental impact between a certain product and its related EPD.

EPD, as described in 5, are covering all products from a certain type, which are produced within a time span of several years. Within this time span, normally the production technique or used fuel etc. does not change. Whereas origin and thus transports from raw materials and half ware may switch from one day to another from a regional purchase to even far distance import, related to market situation. This can make an enormous difference in the environmental footprint, which is not reflected in the EPD. So a purchased and applied timber product may have a far worse carbon balance than indicated in the EPD.

7. No usability for procurers or decision makers of public authorities.

As EPD themselves do not judge about the environmental friendliness of a product, they are not directly applicable in call for bids. The usage requires a superior assessment system, which ranks the single EPD according to a set target. Such instruments for instance are the under letter ‘B’ described systems. In fact a purchaser or decision maker, yet even an architect is hardly able to define for various products of concern a certain GWP target value in kg/unit, which can be rated as especially climate friendly. This leads to the fact, that EPD are no suitable instrument to be implemented in public procurement to reach the goals of the project.

8. No steering function or incentive to reduce carbon emissions.

The main potentials for a reduction of carbon emissions along the whole processing chain up to the final product are concealed in minimizing material flows and transportation (see above). These potentials also are the quickest and easiest to achieve, e.g. without any investment. But EPD do not acknowledge or honour transport related differences between single specific products as they do not operate with concrete products and real differing transport loads. The multiple purchasing structure and material flows in processing chains will not undergo any change just by setting a concrete value for GWP in a call for bid. As this would require from deliverers to present a life cycle analysis for this specific product, moreover this would disadvantage small and medium sized enterprises, and thus exactly the most appropriate ones, because they can not afford the elaboration of an EPD or LCA for their various products.

For this reason, EPD are no ‘change agents’, which would, through requesting them, trigger a development towards a reduction of carbon emissions in the processing chain.

6.2.4) Conclusions

As described in this chapter, transport can be judged as the crucial factor influencing the carbon balance of timber products. Therefore the following chapters are concentrating on the impact of transports on carbon emissions and which reduction potentials are laying in transport limitations. In the last chapter these limitations are concretised.
6.3) Carbon emissions from trade of timber products

6.3.1) Carbon emissions from trade: country comparison

Statistical data from the Eurostat database allow an exact allocation of traded amounts to definite countries of origin or destination. These analyses have been undertaken for all main timber product classes, which are statistically recorded. Based on the recorded amount related to specific countries, the carbon balance can be calculated. This has been done, as described in chapter 6.2.

Roundwood

The highest carbon emissions of all Alpine Space countries related to foreign trade of roundwood has Germany. This is due to especially the import of conifer roundwood and the export of deciduous roundwood (Fig. 6.7). Austria in fact imports more roundwood than Germany, but from closer distances, so that carbon emissions in total are lower. Import countries to Austria are mainly neighbouring European countries, while Germany considerably amount imports from Russia.

Sawnwood

Carbon emissions by foreign trade of sawnwood are highest in Germany, while nearly in the same height in both directions (Fig. 6.9). France and Italy show far higher emissions through imports than exports of conifer sawnwood, while Austria and Slovenia are reverse in that. The highest single carbon emissions are due to import as well as export of planed sawnwood in Germany. It is noticeable, that emissions of import and export are almost in the same range for all sortsments (Fig. 6.10).

The highest value for emissions related to deciduous sawnwood originates from German exports of beech sawnwood (Fig. 6.11). This is due to the weak demand from German market for beech. As kind of a paradox situation a lot of the exported sawnwood comes back as final products from the destination countries like Furniture from Poland or China.
Swanwood conifer and deciduous - imports and exports

Fig. 6.9) Carbon emissions due to import and export of sawnwood. Data Eurostat 2017

Veneer - imports and exports

Fig. 6.12) Carbon emissions due to import and export of Veneer. Data Eurostat 2017.

Boards

Germany show the highest carbon emissions of foreign trade of boards, due to especially export of fibre board and import of plywood (Fig. 6.13, 6.14). In both cases though there is only few quantitative overlapping of reverse material flows. Regarding plywood this is due to almost lacking production capacities, as a lot of former producers are gone. Austria as well has comparable high carbon emissions through exports of particle boards and fibre boards. Imports of particle boards to Germany reach a high amount, but as they are imported mainly from neighbouring countries, this is not reflected in carbon emissions.

Veneer

Import of veneer causes far higher carbon emissions than export, in total three fold (Fig. 6.12). In Germany for instance this is due the sparse production capacity, a lot of former producers have closed in the past decades resp. switched to pure trading. France and Italy show the highest carbon emissions through import of veneer, although the amount of export from Germany is in the same order.

Fig. 6.11) Carbon missions due to import and export of deciduous sawnwood. Data Eurostat 2017.

Panels - imports and exports

Fig. 6.13) Carbon emissions due to import and export of wood panels. Data Eurostat 2017.

Particle boards (total) - imports and exports

Fig. 6.14) Carbon emissions due to import, export of particle boards (more detail). Data Eurostat 2017.
**Pallets**

Pallets are as well object of foreign trade. Import oversteps export, but trade occurs in both directions. But in every Alpine space country and especially in Germany there are much more carbon emissions by imports (Fig. 6.15). In total import related emissions are three fold higher than export related. This is due to higher numbers of imported pallets but as well to far distances of import countries.

![Paletts - imports and exports](image)

Fig. 6.15) Carbon emissions due to import and export of pallets. Data Eurostat 2017.

**Wood Pulp**

A very significant contribution to carbon emission is due to the import of pulp (Fig. 6.16). In any of the CaSCo countries imports are higher than exports, mostly by magnitude and only in Slovenia they are at least in the same range. Carbon emissions through import of pulp are as well the highest ones of all wood sortiments.

![Wood Pulp - imports and exports](image)

Fig. 6.16) Carbon emissions due to import and export of wood pulp. Data Eurostat 2017.

**Windows and Doors (wooden)**

Windows are subject of an intensive foreign trade, a big parts of the sold windows on the market originating from import, mainly from Poland (Fig. 6.17). As windows contain rather small amounts of wood, the carbon emissions are low compared to other sortiments like sawnwood or roundwood. Nevertheless, windows have symbol character and regionalising supply chains sets an important sign.

In Austria, Germany and Slovenia carbon emissions though imports and exports of components are the same height. Whereas in France imports of components cause considerably higher emissions than exports. In Italy export of doors produce the highest emission in this sector.

In country comparison the amount foreign trade with components are highest in Germany, but as the origin, resp. destination are comparably near, this is not reflected in the carbon emissions.

![windows and doors - imports and exports](image)

Fig. 6.17) Carbon emissions due to import and export of windows. Data Eurostat 2017.

**Wooden floors**

Foreign trade of solid wooden floors seems to have very low impact on carbon emissions, although for instance in Germany imports of solid parquet contribute almost to half of the consumption (Fig. 6.18). This might be due to a very low usage at all. Carbon emissions through imports of prefinished parquet though are noticeable and mostly higher than from export, except for Austria. Comparable figures can be found as well regarding total amounts of floors under foreign trade.

![Floors - imports and exports](image)

Fig. 6.18) Carbon emissions due to import and export of half ware for parquet production. Data Eurostat 2017.
Wood fuel

It is remarkable, that even in countries, who take a considerable amount of wood fuel out of their forests, like Italy, Germany and Austria, the carbon emissions through imports of firewood are 4-5 times as high as through export. This is extreme for Italy, what as well corresponds to the amount of fuel wood via foreign trade.

Regarding the German situation with Pellets for instance it is noticeable that the production capacities are not at their limit (Fig. 6.19). At the same time half of the carbon emissions is due to import from Russia. Also carbon emissions through foreign trade of wood chips and residues reach considerable values (Fig. 6.20). Mostly import related emissions are higher than export related, which is corresponding with the quantitative amount of the products.

6.3.2) Avoidable carbon emissions from overlapping

Although of course the internationally traded amounts of timber products have a cause and reason, in quantitative meaning transports are avoidable for overlapping amounts of imports and exports of the same material or product. The emissions due to these overlapping transports also are avoidable. To calculate this, the sum of carbon emissions of import resp. export of a certain product has been calculated. Then the respectively lower part (either due to import or export) has been doubled, as the transports in both directions are redundant. The following figures show results as total emissions through foreign trade (grey bars) of the CaSCo countries and the avoidable proportion of them (red filled bars). The values show considerable differences between sortiments and between countries. The most conspicuous potentials for avoiding transports are laying in foreign trade of conifer sawnwood in Germany - at the same time with 750.000 tons the highest potentials at all - and pulp in Germany and France.

Austria records 370.000 tons of CO2-equiv. as avoidable through closing cycles instead of overlapping foreign trade (Fig. 6.21).

France records ~ 500.000 tons of CO2-equiv. as avoidable through closing cycles instead of overlapping foreign trade (Fig. 6.22).
Germanys foreign trade for example of raw materials and halfware of wood annually produces more than 3 Mio. tons of carbon emissions. But these emissions do not contain foreign trade of final products like floors, furniture and even complete houses, which occur as well in huge numbers. With around 1,6 mio. tons per year more than the half of these emissions are estimated as quantitatively avoidable (Fig. 6.23).

Italy records 245.000 tons of CO₂-equiv. as avoidable through closing cycles instead of overlapping foreign trade. The considerable carbon emission through export and import of pulp in Italy is barely avoidable (Fig. 6.24).

Slovenia records 380.000 tons of CO₂-equiv. of which 157000 tons could be stated as quantitatively avoidable (Fig. 6.25). The highest emissions originate from foreign trade to conifer sawnwood, although roughly only 1/4 of it is quantitatively avoidable.
6.4) Origin of timber in the final product

6.4.1) Introduction: how regional are processing chains?

A vital question with regard to the project objectives is to evaluate the proportion, to which the wood in a certain product usually can be judged as ‘low carbon’ respectively originating from regional processing chains. Usually actors and decision makers in policy as well as in timber industry are stressing the regional added value which the application and usage of wood in various forms would provoke. They are mostly convinced, that timber is a highly regional processed material. Many cluster studies (so for instance the cluster study of Baden-Württemberg) or branch reports (e.g. annual report of ForstBW) underline the regionality of product sales.

This might be still true for the first step of the value chain, which means the sales of roundwood to the saw mill industry and other producers, although the analysis of foreign trade shows remarkable long distance material flows and exports even of roundwood (see chapter 5). From there on however the flows are splitting considerably and find their way to other regions far away or even into other countries.

With every step of the processing chain this split exponentiates. A concrete number is barely exactly to be determined, as every material flow through purchase and sales of all participating actors along the processing chain would have to be monitored. This is obviously not possible. But nevertheless it is possible to draw some scenarios to estimate the potential proportion of regional or domestic wood contained in a product of a certain type.

At least this can be done based on the statistical data of foreign trade. For this purpose from the extraction or production of raw material upwards the share of import at consumption of a specific product along the processing chain is considered. Doing so, two scenarios are existing:

**Scenario a) „Lowest share“ scenario.** Here the assumption is made, that all (or at least the maximum) imported material is used inside the country in the appropriate target group (e.g. Sawmills for industrial roundwood). At the other side it is assumed, that all exports originate first from domestic production of the respective product.

**Scenario b) „maximum share“ scenario.** Here it is assumed, that the country of concern is rather a transit country for imported and exported products. At the other side it is assumed, that all (or at least a maximum proportion) of domestic production is used in the domestic consumption of the product by the target group.

Both scenarios mark the limits, between which the real facts will move. However the probability is higher for scenario a), as it would not make very much sense to import a product and exporting the same again, as this would just lead to a loss of added value. The scenarios are illustrated in two flow diagrams based on the same hypothetical numbers for production, consumption, import and export of material. The figures are described subsequently. These scenarios are applied to the statistical data for production, consumption, import and export of a certain product for each of the CaSCo countries. The concrete numbers are modelled for coniferous sawnwood in construction, for deciduous sawnwood in furniture and others. The results are shown on the next page.

The figures representing a symbolic simple chain of custody with three steps. Reality often is more even more complex, what sharpens the trend which is expressed in the models. Both figures are based on the hypothetical frame condition, that a forest production of conifer industrial roundwood of 500 m³ occur, while consumption of the saw industry ranges at 600 m³. The saw mill industry itself produces (loss factor!) 400 m³ of sawnwood. Export and import of roundwood as well as of sawnwood occurs and is modelled with an import of 200 m³ roundwood and 50 m³ sawnwood, whereas export of both ranges 100 m³.
From ratio of the amount of raw material in the processing stage from domestic deliverer to the amount consumed in total the share of wood is calculated, which has been grown in domestic forests. For the second processing step the timber already ‘carries’ the import ratio from first step, which therefore has to be multiplied with the own import ratio of the related product.

The model situation document different aspects to be considered: (1) the share of wood from domestic forests in any product decreases continuously stepping forward in the processing chain. (2) The share value varies remarkably depending on the assumed model, however in reality it will be close to scenario A with the lowest proportion of domestic timber. (3) Shifting material flows from foreign trade to closed domestic cycles (partly represented by scenario B) would increase the share of domestic grown wood noticeable (Fig. 6.26, 6.27).

Fig. 6.26: Flow diagram to visualize modelling the lowest share of wood in a product, which has been grown in domestic forests.

Fig. 6.27: Flow diagram to visualize modelling the highest possible share of wood in a product, which has been grown in domestic forests.
6.4.2) Timber constructions from conifer wood

One main application or usage of conifer wood is in timber constructions. The usage of Wood in buildings and constructions usually is stressed as a major contribution to climate protection because of carbon storage as well as to regional development and regional added value. However it may be interesting to recognize, how much of the wood used in buildings in fact originally has been grown in domestic forests. This is compared with the following figures for the partner countries.

In some figures the percentage starts with 100% in some already the starting point is below 100%. That means, that generally the domestic production of the raw material is not sufficient to provide the domestic demand or consumption. Starting with 100% indicates, that domestic production is at least as high as domestic demand. But still then import may occur, which thus reduces the domestic share of raw material. Interpreting the figures (Fig. 6.28, 6.29, 6.30, 6.31, 6.32) show various aspects:

- The deviation between optimum and (more realistic) pessimal scenario vary considerably between the countries. Sometimes pessimal and optimum are almost identical (Italy). This is, if export of a raw material is close to zero with high imports of the same. Sometimes the deviation is 100% to 0% (Slovenia). This is, if the foreign trade even overstep the domestic production.

- An „over-production“ (100% starting point) not necessarily leads to 100% share of domestic wood in the final products.

- The lowest share of domestically grown wood in the product ranges between 0% (Slovenia) and 76% (Germany). However even in Germany this only is valid for raw sawnwood. The more a product is processed, the more the share of domestic wood is reduced. For example with glue laminated wood (KVH), the share of domestic grown wood inside of constructions is by far lower.
6.4.3) Furniture and interior with deciduous wood

Deciduous wood mainly is applied in furniture industry, interior finishing and wooden flooring. Regarding such products, fabricated from domestic companies the following figures give an estimation of the potential amount for wood in such products, deriving from domestic forests.

The figures (Fig. 6.33, 6.34, 6.35, 6.36, 6.37) show some interesting results:

- Except France all countries have in average probably (scenario A is the more realistic one) less than 50% share of domestically grown wood in flooring and furnitures, even if they are produced inside of the country!

- This is the case as well for Germany and Slovenia, although both countries produces more deciduous roundwood, than inside of the country consumed!

- Another conclusion is, that increased usage of timber is not automatically connected to a higher „regional added value“. As well sufficient production of raw material in domestic forests is by far a guarantee for its factual usage in domestically fabricated products or in domestic applications.
6.5) Definition of 'Low Carbon Timber'

6.5.1) General approach

As outlined in chapter 6.3, material flows and related transportation along the supply chain are the main influencing factor on the carbon footprint of timber products and especially construction materials. Therefore it is legitimate, useful and appropriate to define 'low carbon timber' (LCT) products based on the footprint of transports, the product accumulated from the raw material extraction along the entire processing chain.

Doing so it is the most appropriate and practicable way to define limits of transportation distances for single processing steps. The definition of such limits afford a scientific analysis to set a benchmark the defined limits could be checked with. This analysis had been conducted during the development process of the environmental label Holz von Hier.

In the following chapters 6.5.2 and 6.5.3 the defined transport limitations according to the standard of Holz von Hier are described and the current validation of the former premises are discussed. In chapter 6.5.4 and 6.5.5 the validation of the defined limitations are considered with regard to an implementation in the other participating CaSCo countries.

Especially with regard to the objectives of the project it shall be noticed, that the definition of the transportation limits need to consider various issues:

- All relevant products and sortiments shall be covered and deliverable within the scope of LCT
- At least several enterprises of a certain type or product shall be present in the reach of a purchaser to ensure that there is still competition (important for purchasers and procurers)
- The definition shall not result in a nationalistic or administrative approach and especially be open for suppliers of neighbouring countries (procurement regulations, transnational approach).
- The definition should be coherent in all regions, where LCT is applied (international standard)
- The limits should distinguish between different products and should range below the average of transportation of certain product categories.

6.5.2) Holz von Hier as a benchmark for 'Low Carbon Timber'

Holz von Hier© is currently the only environmental label, which is specifically addressing the issue of low carbon regional timber providing a toolset for a practical operationalisation. Against the backdrop of the challenges and requirements in the project it inhabits several specifics and advantages:

- it is a real environmental label type I according to the ISO 14024
- it is suitable to be implemented in call for bids
- it operates crossborderly
- it is applicable with minimum effort even for smallest enterprises
- the principal or purchaser is able to prove validity of certificates easily in time by himself
- it assesses and quantifies the transportation footprint of products along the processing chain.
- it is applicable and implementable without a lead time

The certification scheme operates with maximum transportation limits, defined for each sortiment. The actual limits are shown in table 6.3 on the next page.
## Average transport distance by sortiment

<table>
<thead>
<tr>
<th>Sortiment</th>
<th>max. distance under HVH [km]</th>
<th>Average (!) distances in various LCA-studies [km]</th>
<th>Examples of transport distances for main import countries to Germany [km]</th>
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<td></td>
<td>Thünen Institute</td>
<td>Wegener et al.</td>
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<tr>
<td>roundwood, coniferous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spruce</td>
<td>75</td>
<td>104 - 111</td>
<td>144</td>
</tr>
<tr>
<td>Pine, Fir, Larch, Douglas Fir</td>
<td>150</td>
<td>no data</td>
<td>no data</td>
</tr>
<tr>
<td>roundwood, deciduous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beech, Oak</td>
<td>200</td>
<td>100 - 796</td>
<td>144 - 914</td>
</tr>
<tr>
<td>other</td>
<td>250</td>
<td>no data</td>
<td>no data</td>
</tr>
<tr>
<td>Sawn wood, coniferous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sawn wood rough, sawn wood for packaging</td>
<td>100</td>
<td>up to 700 (A4 to construction site)</td>
<td>1.200 (Lithuania, Latvia)</td>
</tr>
<tr>
<td>planed sawn wood, sawn wood for construction</td>
<td>150</td>
<td>175 – 827</td>
<td>254</td>
</tr>
<tr>
<td>KVH, spruce</td>
<td>200</td>
<td>no data</td>
<td>300</td>
</tr>
<tr>
<td>KVH, other</td>
<td>250</td>
<td>no data</td>
<td>300</td>
</tr>
<tr>
<td>BSH</td>
<td>250</td>
<td>no data</td>
<td>271</td>
</tr>
<tr>
<td>DUO-/TRIO</td>
<td>250</td>
<td>no data</td>
<td>468 – 827</td>
</tr>
<tr>
<td>Sawn wood, deciduous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beech, Oak</td>
<td>200</td>
<td>100 - 510</td>
<td>no data</td>
</tr>
<tr>
<td>Other</td>
<td>250</td>
<td>100 - 510</td>
<td>no data</td>
</tr>
<tr>
<td>Wood residues</td>
<td>200</td>
<td>100 – 562</td>
<td>no data</td>
</tr>
<tr>
<td>Veneer</td>
<td>350</td>
<td>no data</td>
<td>no data</td>
</tr>
<tr>
<td>glued wood for windows</td>
<td>350</td>
<td>no data</td>
<td>no data</td>
</tr>
<tr>
<td>End products (A4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Components</td>
<td>350</td>
<td>no data</td>
<td>no data</td>
</tr>
<tr>
<td>Floor boards</td>
<td>300</td>
<td>no data</td>
<td>259 - 502</td>
</tr>
<tr>
<td>Parquette</td>
<td>400</td>
<td>no data</td>
<td>259 – 502</td>
</tr>
<tr>
<td>Thermic treated wood</td>
<td>450</td>
<td>no data</td>
<td>no data</td>
</tr>
<tr>
<td>Fire wood</td>
<td>50</td>
<td>no data</td>
<td>no data</td>
</tr>
<tr>
<td>Wood chips</td>
<td>250</td>
<td>no data</td>
<td>no data</td>
</tr>
<tr>
<td>Pellets</td>
<td>350</td>
<td>no data</td>
<td>no data</td>
</tr>
</tbody>
</table>

*Tab. 6.3* Transportation limits.
The development of the label Holz von Hier was undertaken on a scientific basis, to ensure a reliable and quantifiable documentation of the environmental impact. The scientific analyses conducted comprises various relevant aspects as the choice of relevant environmental impact paths, the choice of certifiable product categories, the analysis of obstacles against low transportation and others. Therefore following analyses had been undertaken:

- Comprehensive analysis of existing studies and literature related to life cycle assessment and material flows, regionality, customer preferences and other issues.
- Material flow analysis for Germany based on statistical data and own surveys.
- Actors- and structure analysis of the forest and timber industry to evaluate the spatial distribution of various production processes.
- Systematical analysis regarding the interrelations and influences on material flows.
- Target group analysis regarding consumer preferences.

A product certified according to the standard of Holz von Hier may be accompanied by a product specific environmental footprint. This footprint indicates as a short real time life cycle analysis the impact of the product on various classical environmental factors like climate, resources, energy consumption end others.

6.5.3) Developmental trends

A) Increasing overlapping material flows through foreign trade - examples

As foreign trade has a massive contribution to a high carbon footprint of timber products, the development of material flows in the past decade has been compared for various products. The numbers for different product categories are shown in Fig. 6.38 to 6.43.

(1) Conifer sawnwood

There is an obvious increase in material flows via foreign trade while domestic production even decreases (Fig. 6.38 and Fig. 6.39).

Conclusion conifer sawnwood. There is no indication to reduce the set transportation limits for conifer sawnwood within the frame of the Holz von Hier standard, as the tendency is rather opposite.

(2) Deciduous sawnwood

Indeed the amount of foreign trade decreased from 2007 to 2016, but at the same time, the domestic production decreased as well (Fig. 6.40). This prompts, that transportation distances remain in the same ratio and so rather stable. Furthermore, the application of deciduous wood is different from that of conifer wood. As conifer sawnwood is rather the final target product, applied at the construction site, deciduous wood is not. In this case furniture or floors are the target product. Therefore a reduction of traded volume of deciduous sawnwood may also be due to increased foreign trade of furniture themselves. This in fact can be observed. The market of furniture production changed dramatically. The German Association of Furniture Industry stated, that nowadays almost the half of all Furniture sold in Germany originating from import.

Conclusion deciduous sawnwood. There is no indication to reduce the set transportation limits for deciduous sawnwood within the frame of the Holz von Hier standard.
(3) Veneer

Veneer is mainly used in the furniture industry. The analysed figures show a slight reduction in domestic production while material flows via foreign trade remain more or less on the same level, shift from export to import included (Fig. 6.41). Furthermore material flows and transport distances in veneer are rather a matter of production structure.

Conclusion. There is no indication to reduce the set transportation limits for veneer within the frame of the Holz von Hier standard.

(4) Particle boards

Particle boards are mainly used in furniture production and partly as well in construction (Fig. 6.42). Material flows through foreign trade a rather increasing in total, while at the same time the domestic production decreases. This prompts an increase in occurring transport distances for particle boards. However up to now, no transportation limits are set within the frame of the Holz von Hier standard.

(5) Plywood

Plywood is a special product mainly used in furniture production and interior finishing (Fig. 6.43). There are very few producers in Germany which are quite specialized. Therefore Plywood was also in the past decades a classical import product. This will not be changed in upcoming times. However up to now, no transportation limits are set within the frame of the Holz von Hier standard.

B) Development of freight traffic volume in general

Increase of trafic - example Germany. The prospective real average transport distances are influenced as well by the development of freight traffic in general. To estimate this, a statistics and forecast of the freight traffic for Germany is stressed (VDA, 2010 Heavy weight vessels - efficient, flexible, future save). Therefore the traffic volume has increased from 1990 to 2010 more than two fold, with the biggest share through Lorrys (Fig. 6.44). A continuous increase up to 2025 is forecasted. Also in future freight by lorries experience the strongest increase.
Conclusion. There is no sign, that transport distances will be reduced in future but rather increasing. So there is no indication to lower the set transportation limits within the standard of Holz von Hier.

C) Changing market share of products and sortiments

The specific type of a product has influence on the connected material flows. Some products may be more regionally produced along the processing chain than others. So a change in market share between types of products or sortiments also change the material flows and related carbon emissions.

A classical and important example is glue laminated timber for construction (e.g. KVH). In Germany for instance KVH has won enormous market share at cost of traditional dried sawnwood. In the last 4-5 years a lot of saw mills needed to close production or to switch the sortiment from classical construction timber to e.g. packaging. Whereas dried sawn wood was a classical regional product used by wights from saw mills closed by, glue laminated wood can only be fabricated from few producers, which logically are less dense than saw mills. Longer transportation distances are the constraining consequence.

Conclusion: The rapid shift from classical sawn wood to glue laminated wood does for sure rather raise the real transportation distances, so that there is no indication to lower the originally set transportation limits under the standard of Holz von Hier.

D) Changes in the structure of production chain.

Transportation distances are influenced as well by density of production structures. The lower the density the longer the necessary transportation distances (The reverse is not mandatory, that means that a high density does not automatically mean short transportation distances!). As especially the number of saw mills as the first and most important actors of the wood chain has decreased dramatically in the past decade, not only in Germany but also in all other countries of the Alpine Space, the factual transportation volume for sawn wood rather increased.

The same situation exists with respect to producers of veneer or parquet. Today in Germany only a handful of producers of parquet for instance are left. Some Veneer as well as parquet companies switched from producing to pure trading of the product.

Conclusion: Also with regard to the production structure of the timber industry there is no indication to lower the originally set transportation limits under the standard of Holz von Hier.

6.5.4) Low Carbon Timber in the CaSCo countries

This chapter shall consider the question, how ‘low carbon timber’ has to be defined in the other participating countries resp. the partner regions with the purpose to test the implementation of the tools and instruments of Holz von Hier. For this reason a structure analysis and material flow analysis had been conducted or existing data collected.

A) Average transport distances

Up to now there are existing only few detailed investigations regarding material flows and their distances or destinations (except from national statistics regarding foreign trade, as treated before.

There have been estimations regarding the percentage of wood coming from outside of the region for Joglland, but without information on distances. Material flows have been investigated in the region of Piedmont, but yet information on average distances are lacking. The only quantifying information regarding the height if transport volume and transport distances are existing for Vorarlberg. Here, based on the provided templates from Holz von Hier expert interviews with key actors in the region has been conducted to estimate average distances and origin of certain products and sortiments. The results are following (Tab. 6.4).
### Tab. 6.4) Transport distances from and to Vorarlberg for various sortiments.

<table>
<thead>
<tr>
<th>Sortiment</th>
<th>proportion [%] according to transport distances [km]</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 100</td>
<td>100-200</td>
<td>200-500</td>
</tr>
<tr>
<td>Distances inside region or ‘export’</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>saw logs, domestic prod.</td>
<td>50%</td>
<td>30%</td>
<td>15%</td>
</tr>
<tr>
<td>industrial roundwood, domestic p.</td>
<td>0%</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>fuel wood</td>
<td>95%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>wood chips forest</td>
<td>80%</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>sawn wood (to trader?)</td>
<td>40%</td>
<td>5%</td>
<td>50%</td>
</tr>
<tr>
<td>residues</td>
<td>50%</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>conifer sawn wood to construction site</td>
<td>40%</td>
<td>40%</td>
<td>20%</td>
</tr>
<tr>
<td>deciduous sawnwood for furnitures</td>
<td>50%</td>
<td>25%</td>
<td>25%</td>
</tr>
<tr>
<td>Glue laminated wood</td>
<td>60%</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>sawnwood to DIY super store</td>
<td>20%</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>packaging</td>
<td>30%</td>
<td>30%</td>
<td>35%</td>
</tr>
<tr>
<td>Distances from ‘import’ into the region</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>saw logs</td>
<td>0%</td>
<td>30%</td>
<td>20%</td>
</tr>
<tr>
<td>industrial roundwood</td>
<td>0%</td>
<td>40%</td>
<td>20%</td>
</tr>
<tr>
<td>fuel wood</td>
<td>0%</td>
<td>60%</td>
<td>40%</td>
</tr>
<tr>
<td>wood chips forest</td>
<td>0%</td>
<td>60%</td>
<td>40%</td>
</tr>
<tr>
<td>sawn wood (mills?)</td>
<td>40%</td>
<td>10%</td>
<td>45%</td>
</tr>
<tr>
<td>residues</td>
<td>50%</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>conifer sawn wood to construction site</td>
<td>40%</td>
<td>40%</td>
<td>20%</td>
</tr>
<tr>
<td>deciduous sawnwood for furnitures</td>
<td>20%</td>
<td>40%</td>
<td>30%</td>
</tr>
<tr>
<td>Glue laminated wood</td>
<td>40%</td>
<td>40%</td>
<td>20%</td>
</tr>
<tr>
<td>sawnwood to DIY super store</td>
<td>50%</td>
<td>40%</td>
<td>10%</td>
</tr>
<tr>
<td>packaging</td>
<td></td>
<td>80%</td>
<td>20%</td>
</tr>
</tbody>
</table>

### Tab. 6.5) Transport distances from and to Vorarlberg for various sortiments.

Comparing the average values from Vorarlberg with other studies from Germany shows, that they range mostly in the same magnitude. Only in the case of chips and residues the transportation limits which are defined within the standard of Holz von Hier are slightly higher, than average values in Vorarlberg.

Therefore it can be stated as practical and reasonable, to leave the defined limits of Holz von Hier also for an implementation in Austria. This shall be valid for the listed sortiments. But it can be assumed as valid as well for sortiments, where data are lacking in Vorarlberg, like Veneer, parquet, thermowood and others.

How ‘low carbon timber’ regarding transportation limits is to be defined in the other participating countries may only be concluded through analogy and indirect indicators, which is described subsequently.

### 6.5.5) Other indicators

#### A) Share of domestic wood in products

The share of domestically grown wood in certain products can be an indicator for transportation volume. As the comparison among the CaSCo countries for coniferous sawnwood (e.g. for constructional purposes) and deciduous sawnwood (e.g. for furniture and flooring) have shown for coniferous wood the share in all other countries is even lower than in Germany. For deciduous wood only in France the share of domestically grown wood is slightly higher than in Germany. These comparisons give no indication, that transportation limits in the other CaSCo-countries should be defined lower than in Germany done by the Holz von Hier standard.

#### B) Foreign trade balances

It can be assumed, that the real transportation volume and distances in the timber industry of two countries will probably comparable, if e.g. the amount and share of foreign trade in certain sortiments are in the same range. Or vice versa: if the share of import in consumption of a product raises, the factual transport distances will be probably higher then. This is most likely the case, as the average distances from imports range considerably higher than domestic transportation distances. That is one reason, why EPD mostly do not reflect the real material flow situation. Based on this consideration the ratio of import / consumption has been built,
based on the FAO data 2014. This comparison was made for all relevant product groups for which data has been available and which are already part of the standard of Holz von Hier or where it is aimed for.

For coniferous roundwood only France and Slovenia have a slightly lower index than Germany. For deciduous roundwood Germany and France have the lowest index (Fig. 6.45). For coniferous sawnwood Germany has the lowest index, for deciduous sawn wood only France show a slightly lower index (Fig. 6.46). For veneer only Italy has a slightly lower index than Germany. For particle boards only France show a lower index whereas for fibre boards Germany has the lowest index (Fig. 6.47). For fuel wood only France show a lower index than Germany. For residues Germany’s index is the highest (Fig. 6.48).

The comparison of the ratio of import vs. consumption of certain products, indicates that in most cases Germany exhibit one of the lowest indices. An exception is for wood residues from saw mills. But in the main product categories the other CaSCo countries are in the same range or higher in index. From this it can be concluded, that there is no indication for a necessity to lower the transport distance limit, which are defined within the Holz von Hier standard.

C) Structure of timber industry

The distance of transportation for certain products and sortiments among other depends on the density of corresponding production facilities. The lesser producer of a certain product located in a given geographical region, the farer the distances are to deliver these products. Thus an indirect indicator for real transport distances can be the density of companies of the timber industry in the participating countries resp. regions. The next table (Tab. 6.6) give an overview of the data available.

The density is expressed in number of companies per 1,000 km². The source of data though is varying from region to region. As for instance in Slovenia the data originate in national statistics, surely all existing companies are recorded. The same counts for the Piedmont region. For the Austrian regions this is not quite sure. The same goes for the German parts of the project region. Only for carpenters and wrights in Bavaria there are statistical data, which inhabit completeness. The other categories might inhabit an even higher number of enterprises.

For veneer, solid timber boards, particle boards, furniture industry, components, flooring and building timber products, which are crucial processing steps regarding availability of products other countries are in the same range than Germany. Regarding crafters like carpenters or wrights, the German parts of the
project region show some of the highest densities. However these branches are no limiting factor regarding low carbon timber, as in almost every bigger town or community some of these enterprises are located. Rather limiting are producers of certain materials and sortiments.

For instance saw mills (which might not be fully recorded for the German parts) could theoretically be limiting. However they are sufficient in German to be able to provide a low carbon timber supply area covering. The density of saw mills are lower in Italy, but even higher in Vorarlberg and Slovenia.

The overall density of enterprises of the wood sector is in the same range in Piedmont and Vorarlberg and lower in Joglland and Slovenia.

see above:

Tab. 6.6.) Density of production and processing facilities of various wood products and applications (see next page).

### 6.5.6) Conclusion

As transportation is the only sector in the Europen Union, which has despite all afforts and activities raising carbon emissions, it is justifiable, to concentrate with actions to reduce the carbon footprint of timber products on this issue. This has been supported through life cycle considerations, showing that carbon reduction potentials are mainly burried in transport reduction, both with regard to quantitative potentials and simplicity of implementation. Following this idea it has been shown that most of the existing assessment tools are barely suited to operationlize this approach. The toolset of Holz von Hier, provided for test and implementation in the project regions, however is tailored to the specific needs and requirements. The necessity of this approach has been underlined on the one hand by highligthing that probably very low proportions of wood in final products, applied in the CaSCo countries are grown in domestic forests. On the other hand through the calculation, that in avoidable material flows by foreign trade carbon saving potentials of up to 7.5 mio. tons per annum are burried.

It has been outlined, that setting transportation limits is a suitable and practicable approach to assess and trigger carbon savings along the processing chain. In analysing material flows on the basis of available data and comparison between the different CaSCo countries ist has been shown, that it is appropriate to adopt the set of transportation limits according to the standard of Holz von Hier as a bench mark and to apply them in the different project regions for test and implementation.
Literature and Sources

(1) Data for the CaSCO regions in the Alpine Space

Data provided by
- Slovenia: BSC Kranj, E-Zavod, Ptuj, RAS Development agency Sinergija, Morawske Toplice
- France: Auvergne-Rhonealpe Energie et environnement, Villeurbanne
- Italy: ENVIPark, Turin, ARPA Piemonte (Federal Environmental agency), Turin, Unione Montana dei comuni della Valsesia.
- Austria: Regio-V, Vorarlberg, LAG Joglland, Styria
- Germany: Holz von Hier, Creußen/Bayreuth

(2) General data on country level

(a) Data from databases:
- Ökobaudat (German) database. Datas from 80 EPD, analysed by Holz von Hier.
- Wecobis (German) database.

(b) Data from regular reports and inventories
- ZMP report. Last data from 2007
- German forst inventory with last data from 2012.
- ProHolz report, aktuell proHolz.at.
- HvH network, data from the HvH network.
- Informations from Pro Holzfenster e.V.

(3) Literature

EU Reports (20xx): „EU road map for a sustainable economy 2050“ - with carbon emissions through traffic.


Clusterstudie Bayren (20xx).
Clusterstudie Baden-Württembreg (20xx):

Baumarktstatistik (Germany, 2005): GDI study.


parkett-bericht.de (2014): Parkett report

Study from the German federal environmental office 2010

Paletts. Data form the website of the „Gütegemeinschaft Paletten e.V.