MORE FROM WOOD.

MORE

www.egger.com

EGGER Group customer magazine
10

Changing cities

Urban populations are growing, prices rising. Solutions are needed.

Is this the start of a new construction era?

KNOWLEDGE MANAGEMENT
More than just learning and archives: The potential harboured by contemporary knowledge management.

BUILDING MATERIALS
The fuel of innovations: How new materials are revolutionising the construction industry.

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THE “CENTURY OF THE CITY” REQUIRES RETHINKING AND CREATIVITY FOR SUSTAINABLE LIVING SPACES.

The figures are both scary and fascinating at the same time. Over three percent of Earth’s land area is occupied by cities, and an estimated two thirds of Earth’s population will live in cities by 2050. Already the largest consumers of resources, approximately **76 percent** of harvested wood is used for goods in cities, says a report for the German Federal Government entitled: “The migration of humanity: The transformative power of cities.” The developments are so striking that we can now talk about the “century of the city”. This requires rethinking and creativity for sustainable living spaces.

The transformation is different for each world region. 90 percent of city growth is expected to take place in Africa and Asia - at a pace that often comes at the expense of quality and safety. There is no time for analyses and improvements. In Europe, on the other hand, the level of the discussion culture, urban planning and architecture is high. It’s understandable that there is a wish to keep this in place. However, dynamics and innovation are important for finding the right solutions in the face of societal change. The “century of the city” is why urban housing is the main theme of this issue. Is wood the material of the century?

MORE is already in its tenth issue. We took this opportunity to make a small change. To start with, there are two more focus areas. Find out how knowledge management is being rediscovered as a success factor, and how the fusion of technology and biology is revolutionising the world of building materials. From everyone in the EGGER team, we hope you enjoy our magazine.

EGGER Group Management

Walter Schiegl
(Production/Technology)

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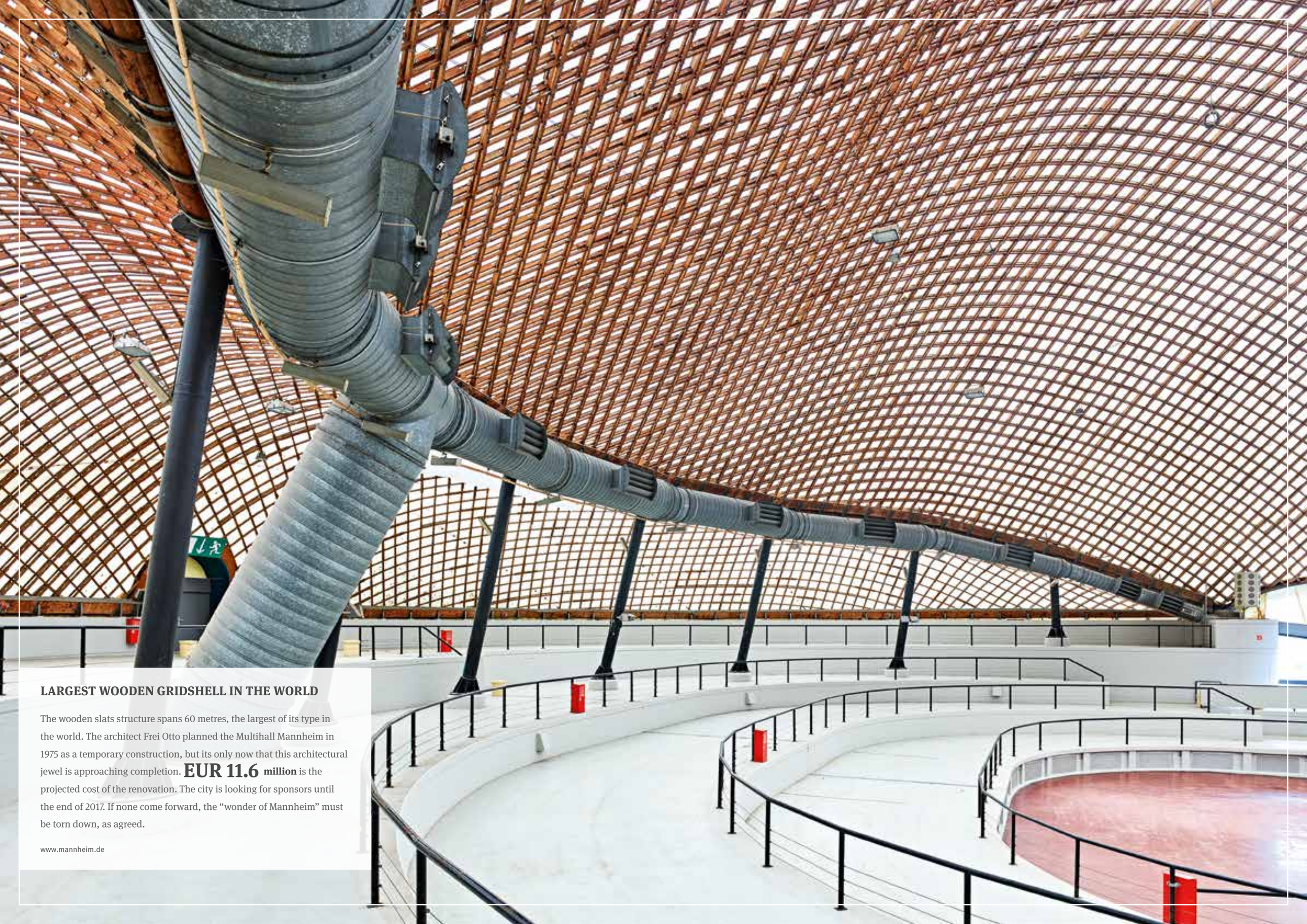
FIRST PRODUCTION SITE OUTSIDE EUROPE

EGGER has been present on the South-American market since 2012 with a sales office in Chile. But the potential growth of markets on the Andean continent can only truly be captured with a production site. For this reason, EGGER has invested outside Europe for the first time with the purchase of the Argentinian plant, Concordia, from the Masisa Group. Chipboard and MDF boards are to be produced and laminated. EGGER will take on all **500 employees** from the factory.



LARGEST WOODEN GRIDSHELL IN THE WORLD

The wooden slats structure spans 60 metres, the largest of its type in the world. The architect Frei Otto planned the Multihall Mannheim in 1975 as a temporary construction, but its only now that this architectural jewel is approaching completion. **EUR 11.6 million** is the projected cost of the renovation. The city is looking for sponsors until the end of 2017. If none come forward, the “wonder of Mannheim” must be torn down, as agreed.

www.mannheim.de

PRIME EXAMPLE IN THE MOSTVIERTEL

Regional, modern and innovative - this is what the builder of the “Passive house Eisenstraße” in Neubruck bei Scheibbs (AT) dreamed. It is made from **99 percent of ecological building materials,** including EGGER OSB 4 TOP and DHF boards. The passive house technology ensures excellent energy values on the inside, while the outside follows the clear, sober lines of the regional building tradition.

www.egger.com/case-studies

UNIQUE EVEN UNDER THE MICROSCOPE

It looks like the pattern on a designer scarf, but it is actually the cross-section of the coloured shoot of a **Norway spruce** (Picea abies). The microscopist Leopold Aichinger put the image together using 319 individual takes. The German Nature Conservation Society (NABU) named the Picea abies, the "breadwinner of forestry", the tree of the year **2017.** Due to climate change, it is becoming less common in Europe.

www.mikroskopie-forum.de

E_INSPIRATION

“Wood construction still needs a lot of basic research. This is even more true for quality construction using recycled materials.”

Sabine Djahanschah, expert in environmental and resource-friendly construction, DBU
Wood is good for us (pages 20 to 23)

Ideas for tomorrow

PLAYING WITH ANGLES

www.more-trees-design.jp

As a child, the Japanese star architect Kengo Kumo used to stack little wooden angular structures on top of each other. He is certain that this passion led him to his profession. Thanks to it, we now have large projects such as a stadium made of larch, which was built for the 2020 Olympics in Tokyo. But the wood construction pioneer never forgot where he came from. He designed the set of angular blocks “Tsumiki” from cedar wood (image on the left). In his opinion, dealing with palpable objects, most of all wood, is important to counter-balance the virtual, digital world. This inspired artists to work with Kuma’s angular structures for an exhibition in New York. The master himself contributed with the hanging sculpture “Cedar Cone” (right).

GLUE WITH A FUTURE

www.cam.ac.uk

They are 10,000 times smaller than the diameter of a hair and provide huge material strength. The world’s most frequent polymers, xylane and cellulose, stick to the cellular walls of wood in a way that researchers from the University of Cambridge have now deciphered. The researchers discovered this “glue” by chance on the thale cress (Arabidopsis thaliana), an object that is popular in genetics research. They believe their findings represent the key to a superglue that significantly exceeds the power of regular glues, and expect it to be useful for developing new wood-based materials.

A TABLE WITH A PAST

www.riva1920.it

The Earth is a disc. Specifically: a table top. “Earth” is the name of the stylised world map of Studio Riva 1920. The Italian brand is known for creating modern designs from historic wood - such as from old pillars from the Canal Grande in Venice. “Earth” represents a new record for Riva 1920. The golden Kauri wood cast in resin is 50,000 years old. It was extracted with great effort and heavy machinery from prehistoric swamps in New Zealand, where it has been since the last ice age. The Italians are worked with several famous designers - the table is the creation of the world-renowned architect Renzo Piano.

FOCUS ON THE FUTURE OF CONSTRUCTION

Changing cities

URBAN LANDSCAPES

GREEN WALLS AGAINST SMOG

The visionary Vincent Callebaut imagines Paris as a smog-free, green, smart city. For Rue de Rivoli, he proposes solar energy and hydrodynamic skyscrapers. The famous chimeras on Nôtre-Dame in the foreground would barely recognise their city.

OVERVIEW OF THE TOPICS

In developing economies, cities are growing into megacities. On the other hand, in North America and Europe, people's lifestyles are changing. Both trends require new concepts for building urban dwellings. Wood plays a very important role in this.

AUTHOR Jan Ahrenberg

Progress often begins with a utopia. Like Vincent Callebaut’s designs. For years, the Belgian architect has been designing visionary urban landscapes where forested skyscrapers reach for the heavens. In a 2016 interview, the French TV channel LCI asked him what their purpose is. The architect answered that they could help end the economic, environmental and maybe even political crisis that we are facing.

Even if not erected, Callebaut’s designs are at least admired, as they clearly reflect the times in which we live: the New York-based “Firefly” farm, the green train station in Paris (see page 14), and the many visions of green, environment and resource-friendly urban landscapes.

His designs are like the backstage of a science fiction film, although they are intended as solutions for very real, pressing questions. There is a good chance that we will get to see at least parts of Callebaut’s fictions as built reality. Indeed, it is already evident that architects are starting to include his ideas in their projects, whether they are aware of it or not.

For example in Italy, Stefano Boer’s pair of towers, the Bosco Verticale, the “vertical forest”, were completed in Milan in 2014. They are 80 and 100 metres high, and covered in 900 trees and 2,000 other plants. In 2015, an architectural council in Chicago named the building the “best skyscraper in Europe”. It can serve as the blueprint for green skyscrapers across the world, because not only does it save energy, but it also has an active contribution to the city's climate. And, in one of Callebaut’s designs, the Bosco Verticale harmoniously fuses with the surroundings.

Buildings and greenery no longer exclude each other in the ideal city of the future, but are actually in a “perfect symbiosis”, according to the Graz-based architect Thomas Pucher. He is planning a green skyscraper in his home town - 68 metres tall, the structure will be covered in perennials, mosses and shrubs. In his vision, however, such buildings are only one, albeit important, element in the urban landscape of the future. His idea of a “smart city” is neither about “back to nature”, nor about cities made of glass, steel and concrete, like those that can be seen today all over the world. The green wouldn’t be only around the house, but everywhere. Forest façades instead of glass façades is the motto. “Green is the new glass”, he says.

Smart city stands for the successful adaptation of a city to tomorrow’s challenges. How this adjustment will look in the end forms the subject of passionate debates. Often, new technology characterises the image of a peaceful and liveable city of the future, →

“Green is the new glass. The ideal future of the city will be a perfect symbiosis between culture and nature.“

Thomas Pucher, architect focussing on smart cities

→ from self-driving electric cars to the digital networking of citizens, authorities and devices. Efficiency is the biggest demand right now, because the organisation of cities is becoming more complex due to their size. The UN predicts the world population will increase from today’s 7.3 billion to 9.7 billion by 2050. And, 50 years later, it will be 11.2 billion. And more and more of these people are moving to cities. In 1950, only about a third were urban dwellers, while today they are more than half. An estimated two thirds of Earth’s population is expected to live in cities by 2050.

Emerging countries are the largest growth driver. Excluding New York, Los Angeles, São Paulo and Mexico City, the world’s 20 largest cities are in Africa and Asia. In Europe and North America, it is less population growth than democratic and societal changes that drive the transformation. In this case, the city is needed for its short distances, given an ageing population. But young people increasingly have their own demands when it comes to the construction of homes.

TRAIN STATION

POWER FROM MANGROVE FORESTS

In his smart city concept for Paris, the Belgian Vincent Callebaut visualises the Gare du Nord as megasculptures covered in mangroves, which will supply the train station with environmentally friendly energy thanks to the photosensitive materials on the tower shell.

For purposes of the organisation of future cities, the Internet generation is creating utopias that merge digitalisation and sustainability. The smart city is characterised by intelligent networks for supplying regenerative energy. And it offers new social spaces that improve the quality of life of urban dwellers. Everyday necessities, from shops and medical care to kindergarten and schools, should be reachable on foot. Short trips save resources and promote social cohesion, which is the basis of a solid urban community that approaches problems together.

Is the lifestyle of today’s urban elite a solution for tomorrow?

The architect whose task it is to create new, affordable homes for many people finds only limited inspiration in utopias. But planners deal with global trends and phenomena and allow these to flow into the reality of construction.

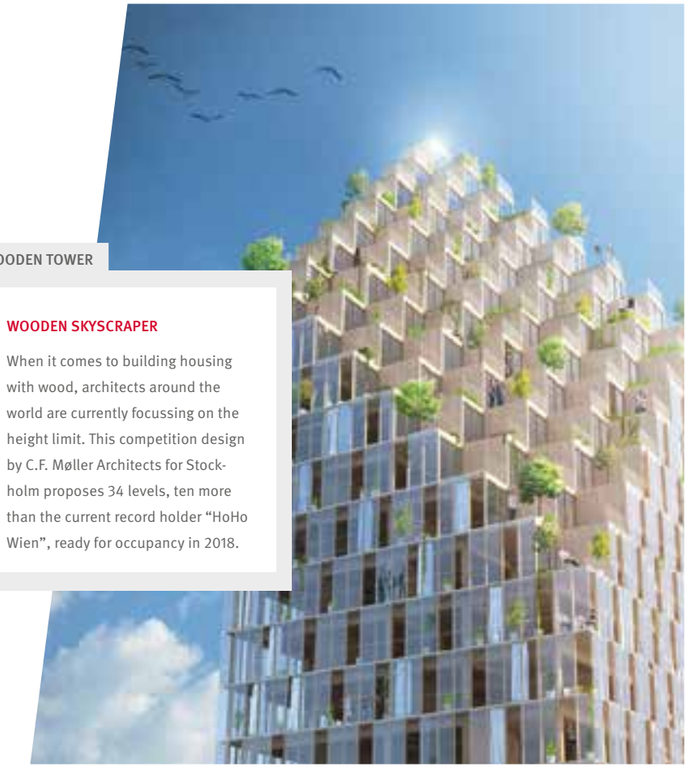
They experiment with new layouts, energy concepts and urban district concepts. These are aimed at a target group that wants to come across as trendsetters. They are young, financially strong, often single - and very mobile. They claim for themselves a considerable part of the good locations in medium to large cities. That is where formats arise that fit the new lifestyles and can show the way for the future.

The Pure House concept in New York, for example, has been serving a growing target group for several years. The supplier designs living situations for creative spirits and entrepreneurs. Small, furnished rooms provide basic retreats for each tenant. Infrastructure, such as power, Internet, and in some cases laundry services, are included in the rent.

But the main point of attraction for this living arrangement, known as “co-living,” are the common rooms, where inhabitants cook, party or work on a new business idea together. Pure House wants to export the concept. Fundraising for additional locations around the world is part of the concept just as much as a “lab” (laboratory) where the conditions and opportunities of this living model are explained and developed.

A ‘New York Times’ article named the experiment “the commune for millennials”. Similar offers can be found in cities such as Seoul, Barcelona, Nagoya, Munich or London; that is, in places where housing is expensive and newcomers on the overheated housing market have difficulty finding a place to live. Co-living approaches win on the social aspect. The London project called “The collective” makes reference to a study by the Mental Health Foundation, according to which 60 percent of 18-40-year-olds often or very often feel lonely. A good living community is more important than many square metres.

Of course, these are solutions for a comparably exclusive societal group. The ‘68 student movement communes didn’t contribute to the disappearance of the terraced house of the suburbs, and neither will the co-living model provide a 1:1 blueprint for future housing projects. Nevertheless, it must be admitted that the first communes made the living community model socially acceptable. This gave rise to new offers on the housing market. The following aspect is likely to draw in major support: when it comes to co-living, tenants meeting is one of the most important points. Together, they create retreat spaces that can be used jointly or individually, either to get to know each other or to live together, to maintain contact or to relax. One’s own room, the idea goes, is merely a place to sleep. Life happens in the shared spaces.



WOODEN TOWER

WOODEN SKYSCRAPER

When it comes to building housing with wood, architects around the world are currently focussing on the height limit. This competition design by C.F. Møller Architects for Stockholm proposes 34 levels, ten more than the current record holder “HoHo Wien”, ready for occupancy in 2018.

New concepts impose themselves as soon as they make economic sense

In many countries, architects are already experimenting with this idea, because it promises to solve two issues. The social isolation of big cities is countered by the ideals of a functioning village community. In addition, the rising rental and purchasing prices of individually-used spaces are counterbalanced by the fact that everyone contributes only a fraction to the costs of shared areas. Living together has economic advantages. Cost pressure and scalability according to the changing demands of different inhabitants - in Europe, existing buildings, but also the construction industry in general, is currently unprepared for the tasks of the future. Stone cities are difficult to adapt to the needs of younger generations. There is a need for building techniques and materials that are better suited to fulfil these demands.

A promising approach is modular design, ideally as timber frame construction. Because it has an excellent life-cycle assessment, it doesn’t increase the already significant environmental impact of industrial states and is economical to make and to scale. Last year, well-known Japanese architects showed what opportunities there already are in this sector during a construction fair in Tokyo. The special feature: all architects looked for partners in industry and construction to test the feasibility of their designs under real conditions. The project of Sou Fujimoto attracted a lot of attention. He created a small student town based on the principles of co-living. The housing service provider Daito Trust Construction in Tokyo was the client for this wooden construction made of cubes that can be freely combined. In the largest city in the world, living space is scarce, which is why it became one of the most innovative fields of experimentation for the reorganisation of living areas. In Fujimoto’s “Rental Space Tower”, private rooms are very small. Eating and leisure time are moved to the living room shared with the rest of the inhabitants. They share the costs of living areas. →

“Thanks to the very flexible planning process, in the future we will be able to offer customised solutions off the rack.“

Sacha Menz, Professor of Architectural Technology at the ETH Zurich

These new approaches start to make economic sense only from a larger project size. In Europe, the industry is still in the early phases, but certain trailblazing projects have already been gaining a foothold across the continent in recent years. The LifeCycle Tower, for example, built by Hermann Kaufmann in Dornbirn. For this project, the Austrian architect worked with prefabricated, certified wooden components that were put together on seven levels in a record two months, resulting in 10,000 sqm of floor space. Wood construction is catching on and continues to grow. By the end of 2017, the tallest wooden skyscraper in the world will be completed in Vienna, with 24 levels, 84 metres high.
But what does this mean for the housing sector? “A building plot is rarely square and flat”, says Sacha Menz of the Architectural Technology Department of the ETH in Zurich. In his view, more flexible construction methods are very promising for the challenges of the future. For example, on the subject of redensification, which will be the focus of certain cities, given rising housing prices and disappearing building ground. With the extension of the institute building on the grounds of ETH Zurich, Menz and his team have been exploring the possibility of using future-oriented construction techniques for urban redensification. The criterion: it should make economic sense, have a flawless energy balance, and a layout that meets the requirements of the modern methods applied by its users.

Creating large structures from little ones is the future of wood construction

Cooperation is key for researchers. Architecture should promote exchange between disciplines. In this case, the focus is also on large shared surfaces, and isolated retreat rooms have been reduced to a minimum. As in the case of co-living, the trick is to provide space for individual pursuits but at the same time to bring people together through a connecting concept.

The symbol and structural momentum of shared living is the spectacular roof construction on the new institute building. The 15 metre nailed lath wood construction is pioneering work. All of the 168 beams are made of squared timbers that are at most 1.40 metres long. They are cheap, light - and can be mounted by robots. A project such as this one requires close digital networking between the architect, programmers, supplier of materials and constructors.

What can be learned from the project that is useful for the future of urban construction? “We mainly pursue two strategies,” says Sacha Menz: “On the one hand, we promote the industrialisation of wood construction. This increases cost-effectiveness, but also the ecological balance, because wood is an ideal building material for sustainable structures.” In the future, it may even be possible to build large structures, such as the institute roof, using waste wood, in the spirit of saving resources. “On the other hand, in the future we will be able, thanks to a highly flexible planning process, to offer customised solutions off the shelf.” This will take future wood construction out of the pioneer niche and turn it into a real all-rounder on the construction site, just like steel, concrete and glass today.

Trees that grow on houses provide shade and a healthy climate in the city. Whether they can be turned into downtown sources of building materials we leave to the utopians. Designs that were once considered to be utopic are today on the verge of becoming real. One of Vincent Callebaut’s projects is now under construction. The Agora Garden Tower in Taipei is scheduled for completion by the end of 2017. It has 20 levels, the form of a double helix, and is covered in 23,000 trees. This confirms something Oscar Wilde once said: “Progress is the realisation of Utopias.”

CO-LIVING

NEWLY ORGANISED RENTAL SPACE

During an exhibition on the future of housing, star architect Sou Fujimoto presented his solution for rental space used innovatively. His “Rental Space Tower” saves space in small private apartments for the benefit of generous common space, such as kitchen, bathroom and terraces.

Pressure on cities

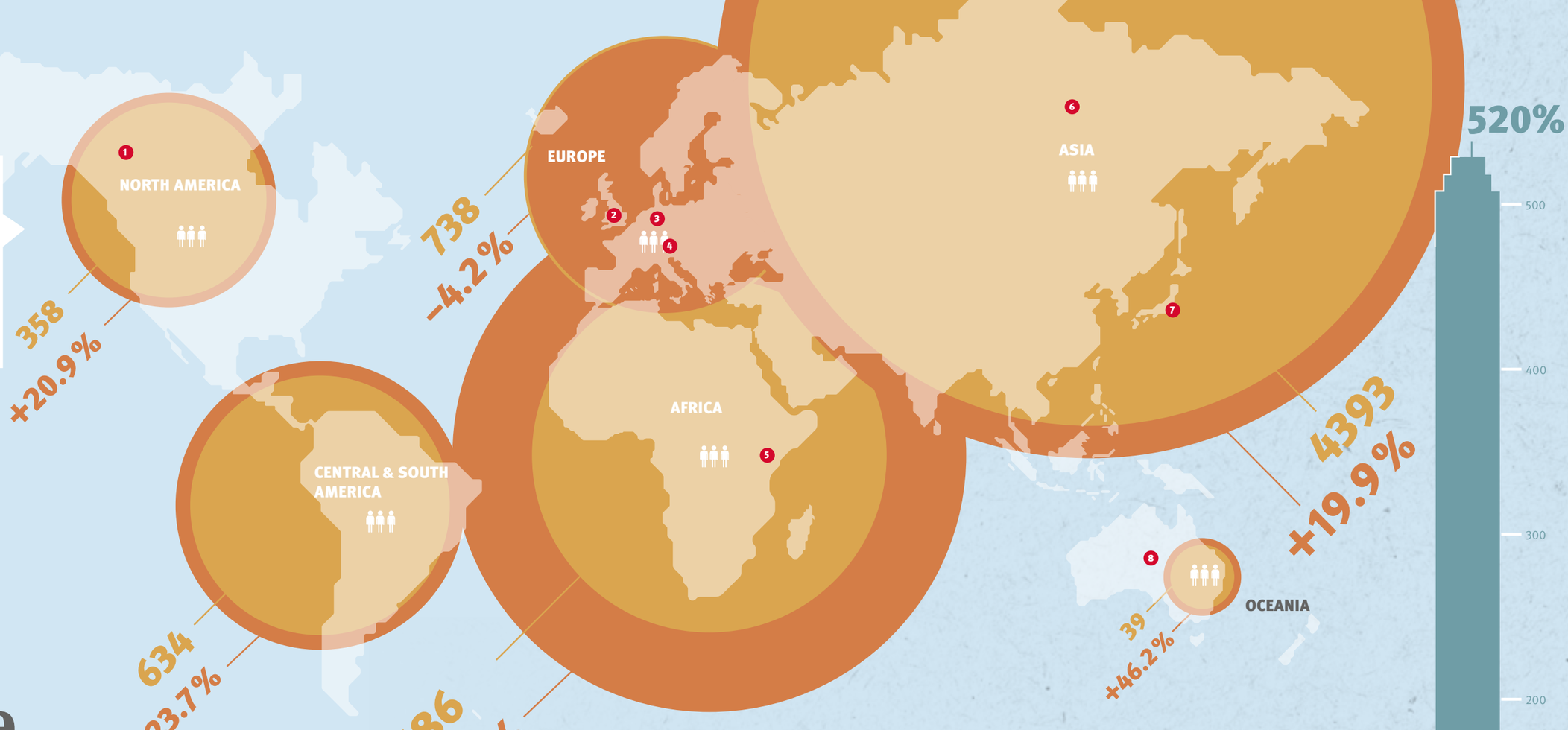
Europe's population is shrinking, Africa and Asia's growing. But the United Nations are forecasting the same trend for all continents: More and more people are living in cities. Solutions for affordable housing are needed.

Development of world population

2016: World population in millions (in total 7.3 billion people)

2050: Growth of world population in % (in total 9.7 billion people)

Source: UN United Nations

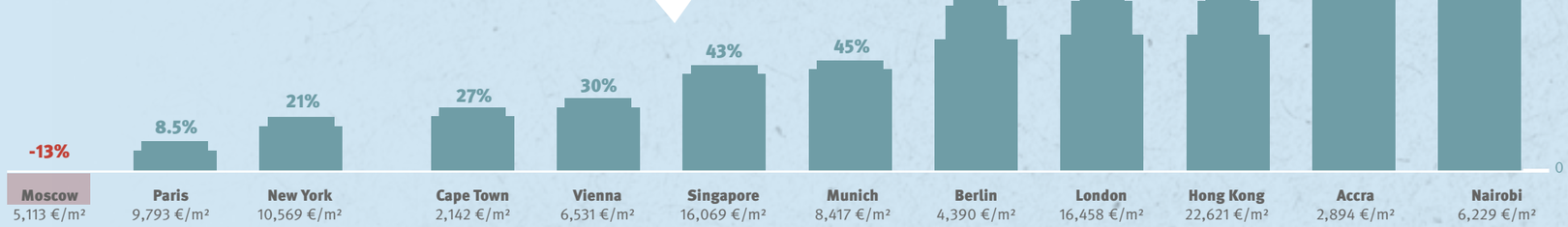


Housing is becoming expensive

Development of purchasing prices for residential housing (per m²) in city centres, between 2012* and 2017 in percentages. (*for Nairobi, 2014 - 2017)

Euro values represent square metre prices 2017

Source: Numbeo.com



The outlook for wood construction

1 NORTH AMERICA

Despite skyline clichés in steel, glass and concrete, skyscrapers in the US and Canada are traditionally made of wood, thanks to the big forests at hand. Canada is seen as the industry's innovation engine. The world's tallest residential building made of wood has 18 floors and is located in Vancouver (CA).

2 UNITED KINGDOM

The British wood construction industry is optimistic. It's not just housing construction in general that is growing, driven by a new governmental programme. The Structural Timber Association (STA) also expects the share of timber frame construction to increase significantly in the construction industry.

3 GERMANY

Key pioneering structures, such as the seven-storey wood construction E3 in Berlin (2008) opened the way in urban wood construction. But infrastructure is still lacking for larger projects. Only 3.4% of German wood construction companies employ more than 19 employees.

4 AUSTRIA

Wood is one of Austria's leading industries. This is also reflected in the building culture. In 2016, every tenth construction project was a wooden building. Orders increased by 4.3% compared to the previous year. And the turnover from steel and reinforced steel constructions during the same period? About 3%.

5 KENYA

Africa's population is growing at an amazing rate. People are moving into the cities of booming economies, such as Kenya. This means that, in the centre of the capital Nairobi, housing space that follows Western architecture is becoming expensive, while solutions are sought for dealing with expanding poor neighbourhoods.

6 RUSSIA

Traditional wooden houses are typical for the country with the largest surface in the world. Due to rural exodus, they are threatened by decay in many regions. There is great interest for modern wood construction. Western providers support architects and engineers with specialist knowledge.

7 JAPAN

Japan standardised wood construction elements back in the 17th century. The material is used today in 45 percent of houses. Lack of space and frequent earthquakes require innovations. Japanese architects are pioneers of elegant room solutions on small construction plots and high-tech using wood.

8 AUSTRALIA

Relative to its size, there are few forests down under, but wood is nevertheless everywhere to be seen. In 2012, the tallest residential building made of wood was built in Melbourne (32.5 metres) - an import from the Steiermark (AT). Innovative wood construction is seen in Australia as an opportunity to lower CO_2 emissions.

“Wood is good for us”

When wood construction was used in Diendorf, South Germany, to build a secondary school, there was a fear of vandalism. But even hooligans calm down when faced with quality.

Wood construction will play a key role in the future. Sabine Djahanschah, the architect and expert in charge with the German Federal Environment Foundation, is convinced.

AUTHOR Clemens Niedenthal

MORE: Ms. Djahanschah, you are the wood construction specialist within the German Federal Environment Foundation. What came first: your interest in the future of construction or your enthusiasm for the material?
Sabine Djahanschah: As a planning architect, I already wanted to work more closely with wood. But back then, in the ‘90s, wood construction was still limited to certain types of structures, such as stadiums. Then came the World Fair in Hanover in 2000, which acted as a trigger for us at the Federal Environment Foundation. We wanted to showcase the capacity of wood and prove that wood construction can be used in a great variety of structures.

Which Expo 2000 pavilions are you thinking of?
The very simple Swiss Pavilion made of stacked loose wood beams, without any screws or drill holes for example. It was a puristic and sustainable example. I would also like to highlight the self-supporting roof construction of the central events venue of the Expo, which we promoted as a Federal Foundation. Here we wanted to show what wood is capable of: structurally, aesthetically and ecologically.

But 17 years have passed since the World Fair in Hanover.
We need to admit that such transformation processes take a relatively long time. It takes some time until ideas and utopias take root in a built city. Wood construction was not promoted for a very long time, at least not in large structures. This may have had something to do with the experience of war, the fear of devastating fires. But, most of all, in the period after the war, there was a very specific euphoria about the future, a desire for the new, new technologies, and new materials. The technological developments that marked other materials didn’t really take place in wood construction.

“We wanted to show what wood is capable of: structurally, aesthetically and ecologically.“

Sabine Djahanschah, German Federal Environment Foundation

So one of the oldest materials has the greatest potential to develop?
But the structures must also be made for it. The average wood construction operation in Germany has six employees. This small structure, the oft-cited medium-sized enterprise, which otherwise is so incredibly important for our economy, receives way too little support in development work. There are numerous professorships for concrete construction in this country, but only three that focus on wood construction. That’s a lot of accumulated needs. →

ABOUT

SABINE DJAHANSCHAH

leads the project group "Construction, neighbourhood development, heritage protection" of the German Federal Environment Foundation. Since 1996, she has been initiating and supervising funded projects on behalf of the Foundation, lecturing on sustainable construction nationally and internationally, and is active in a variety of juries and boards. As a trained architect, she is a member of the panel for the German wood construction prize, and, since 2012, member of the board of the German Federal Building Foundation.

> ***"Everything we've built across the world ultimately also represents a huge deposit of building material."***
>
> **Sabine Djahanschah,** construction researcher

The housing complex built by KOX Architects in 2014 close to Paris is made entirely of wood.

→ **You are talking about wood construction theorists. But does the sector need more practitioners? Should we invest in wood professions?**
Absolutely, carpentry is a profession for the future. In any case, the image of carpenters only making roof frameworks is outdated. Due to the fact that the degree of pre-fabrication in modern wood construction is huge, most of the work no longer takes place on the construction site. Indeed, we should anticipate a massive lack of specialists. There is great career potential in handcraft.

What is contemporary and what is sustainable in the buildings that will be built by these carpenters? What does modern wood construction stand for?
First, I would like to sketch the social reality for which architects and urban planners design for. We are currently experiencing a rise in the world population living in urban spaces, specifically 2.5 billion people by 2050. About seven billion people will live in cities by then, so they will need housing.

And the solution is wood construction?
Compared to concrete structures, wood constructions save 70 percent of greenhouse gas emissions and 50 percent of primary energy. I would like to refer to Prof. Franz Josef Radermacher, who says that reafforestation is the key to reducing CO2 emissions. Reafforestation is environmental protection. Wood locks in CO_2, as long as it isn't burnt.

Doesn't that mean that recycled wood-based materials also necessarily become important as building materials?
Wood construction still needs a lot of basic research. This is even more true for quality construction using recycled materials. But it's definitely true that we need to understand the built city as a resource. We need to be aware that everything we've built across the world also represents a huge deposit of building material.

Especially since the solid wood house is still synonymous to wood construction in social perception.
Exactly. But at the same time it is also an opportunity, because that means that wooden houses have very positive connotations. People are made by very specific, sensual experiences. There is nothing we perceive purely rationally, not even architecture.

So wood structures are buildings that give rise to more emotions?
In fact, there is currently research going on in several colleges, trying to establish whether wood construction also triggers psychologically beneficial effects. There is too little data available until now, but I find it makes sense to take this factor into account. Wood is good for us. Think of the typical rooms in the Austrian Alps, clad in pine, where our heartbeat calms down. But back to what you actually wanted to know: in modern wood construction, we're long past the point where a wooden house automatically looks like a wooden house.

Wood has now even been included in skyscrapers.
The seven-storey building by Kaden Klingbeil Architects, built in 2010 in Berlin, was certainly a first. Current projects that I greatly appreciate include the secondary school in Diendorf, Oberpfalz, with a construction volume of 40 million Euro. I would like to underline a presumed fringe effect. There were initial hesitations that there will be a lot of damage from vandalism. In fact, the opposite is true: the users, that is, the pupils, comment on the quality of the building by dealing with it with care.

Where do you see wood construction in an urban context in 20 years?
I see it occupying a key position, especially due to the turn from handcrafted single-unit production to prefabricated components. When it comes to densifying, heightening or renovating the city, wood is the predestined choice. It makes it possible to set up what we call a "quick construction site", because time is money in the city. Standards will also change. An actual skyscraper built according to wood construction methods will no longer be a utopia in 2040.

1

1 EGGER supplies components with the patented connection system Clic.
2 Assmann Büromöbel uses EGGER's components for the containers of the Pontis series.

Unique pieces in series

Standardisation and a high degree of prefabrication are the main trends on construction sites. The furniture industry is leading the way, which is something EGGER realised early on. The manufacturer has been supplying customers with material ready for assembly for the past 25 years.

2

AUTHOR Jörn Käsebier

The demand for furniture components has increased at an amazing rate over the past 20 years. Smaller handcraft operations, medium-sized enterprises, and large producers are searching for providers able to supply them with desired parts cut to size and in a stable high quality. To this end, they prefer EGGER's furniture components in Central and Eastern Europe. The manufacturer has become a full-range supplier for furniture components. In collaboration with Horatec, EGGER responds to customer demands starting from 1 item and all the way to large project business and industrial series production.

It started 25 years ago with the development of components production in St. Johann in Tirol (AT), and today it is one of the main pillars of the corporate strategy. Together with its partner, Horatec, EGGER produces pre-cut parts in various order sizes in three locations: Bünde (DE) and St. Johann (AT) supply from batch size 50, and Rambervillers (FR) specialises in large series.

In 1994, EGGER took over the plant in Bünde (DE) and moved closer to its customers, given that Bünde is located in Ostwestfalen-Lippe. This region is the centre of kitchen and furniture production in Germany. "The most important German customers are located within a radius of 100 kilometres", says Georg Stolzlechner, Head of Sales Furniture Components within the EGGER Group. With the expansion of the components production in Rambervillers (FR), the components facility for large batch sizes was added in 2016. →

→ When developing the production lines, EGGER focused on a high degree of automation. There isn't a single forklift drive between saw, edge formatting facility and packaging of the goods. In recent years, EGGER has also developed a close partnership with a specialist. The furniture components manufacturer Horatec has been on the market since 1996 and is considered to be one of the pioneers of large scale production of furniture components ready to be assembled. The company invested early on in digitalisation. Since 2014, EGGER and Horatec have been in a partnership that is very well aligned with the needs of retail. Horatec primarily specialises in small batch sizes. The company's two plants are thus able to respond to individual demands from the carpentry sector.

"Thanks to a good network, utilisation can be controlled flexibly."

Georg Stolzlechner,
Head of Sales Furniture Components in the EGGER Group

"Thanks to a good network and intensive data exchange with the help of a SAP solution, the utilisation of our facilities can be controlled flexibly", says Georg Stolzlechner, who manages the sales of EGGER's furniture components. "We check which plant is best suited for the production or whether we should use several." Customers also profit from these synergies, for example through shortened delivery times.

But customers benefit from more than just the high degree of automation and modern software solutions. EGGER offers its furniture components in the complete decor world, which opens the way towards a high degree of flexibility and variety. The focal point of the business is currently still in Central Europe. But EGGER intends to gradually develop market shares in other countries. Worldwide deliveries are already in place today.

Investments in components production continue in order to develop the market position. As such, EGGER started operating a new drilling rig in St. Johann this year. Moreover, investments are made in the edging facility in order to further optimise the production of lightweight furniture parts with supporting edges and Clic technology. Bünde also wishes to obtain a new drilling rig. Automation is also extending - the wood-based material producer wishes to increase the use of production control systems and RFID in its plants in order to achieve even better quality control. This in line with EGGER's philosophy: there's always something to improve.

PRODUCTION

CAPACITY

EGGER achieves a production capacity of approximately 40 million furniture components in all four locations collectively.

SYSTEM SOLUTION

EGGER uses an integrated system solution with CAD/CAM, SAP, production control system and RFID.

MARKETS

EGGER delivers to the whole world. The focal point is in Western and Central Europe.

3 The production of components is highly automated and supported by networked control. This means that quality reaches a high standard throughout.

4

5

4 An edge formatting facility is part of the production line in Bünde. It is also integrated in Rambervillers.
5 A new drilling rig started operation this year at our site in St. Johann in Tirol (AT). Additional investments are planned.

E_SOLUTIONS

“Today, we are used to having unlimited access to information. This has changed the relationship with learning.”

Mathias Groß, business data processing specialist
A company's memory (pages 34 to 37)

We Are EGGER

THERESA KAISERGRUBER

Technologist CC Wood-based materials, Unterradlberg (AT)

Theresa Kaisergruber got to know the TechCenter five years ago during an internship. After graduating with a bachelor's degree in wood technology at the BOKU Vienna, she returned to her Lower Austria homeland and to EGGER. Since 2014, she has been in charge of organisational projects in the research and development department. The focus there is on alternative binding agent systems, that is, decreasing emissions. The work is varied, which is important to her. Because Theresa Kaisergruber doesn't just want to sit in an office, but wants to be in the midst of things. New tasks? Yes, please. Being present when the facility is tested? With pleasure. She also plans variety into her leisure time. If she isn't doing yoga, hiking or reading, she sets her creativity free while baking or doing handicraft.

STEVEN LAZZARI

CRM Sales Controller, Hexham (UK)

Steven Lazzari began working at EGGER 19 years ago. The combination of internationality and a friendly atmosphere between colleagues throughout Europe are some of the things the marketing student from Hexham enjoyed very much. When an Enterprise Resource Planning system (ERP) was introduced for the Group in 2000, he had completed his marketing studies and joined the company as SAP key user for sales and distribution. Today, he is part of the sales and marketing department in which he is responsible for Sales Controlling and Customer Relationship Management. His team collects and analyses data on sales figures, business contacts as well as the market environment, thereby providing a basis for important economic decisions. Outside work, it is his family and sports, preferably football, running and athletic activities, that matter most to Lazzari.

BEVERLY CRICHTON

Architect consultant, Chicago (US)

In 2016, a dream came true for Beverly Crichton from Hexham (UK) when she took the opportunity to move to her favourite country, the USA, to support the sales and distribution department at EGGER. Crichton showed courage and took this step by herself. She has enjoyed getting to know local customs and likes the informality of the place. As an architect consultant at EGGER she travels a lot through the United States. The city of Chicago is, however, where she feels most at home. There, she likes to relax at Lake Michigan or big sporting events.

OVERVIEW OF THE TOPICS

Knowledge needs to move

Customers obtain information about a product in an increasing number of ways. This makes today’s knowledge management complex. But certain things never change.

AUTHOR Till Schröder

Everyone knows what knowledge is - or so we think. So it seems obvious what knowledge management is. Knowledge management is currently being rediscovered as a powerful instrument. On the one hand, there is increasing awareness of the fact that knowledge represents the decisive, exclusive wealth of a company. So it must be managed efficiently. On the other hand, a product is only used inefficiently if the customer hasn’t heard about it. Knowledge has to be transmitted, in the form of information. Thanks to digitalisation, the quantity of information is growing at an amazing pace, and thus the dissemination of information is becoming an increasingly complex task. But an old philosophical problem also has an impact on today's knowledge management: information is not knowledge. Not everyone knows what knowledge is, after all.

“Knowledge arises from putting together different pieces of information with patterns of activity and this leads to practical applications”, according to the definition of the Research Institute for Business Education in Nuremberg (DE), which focuses on knowledge management. This means that, whether you “know” if a piece of information represents a danger or an opportunity is all a question of your interpretation.

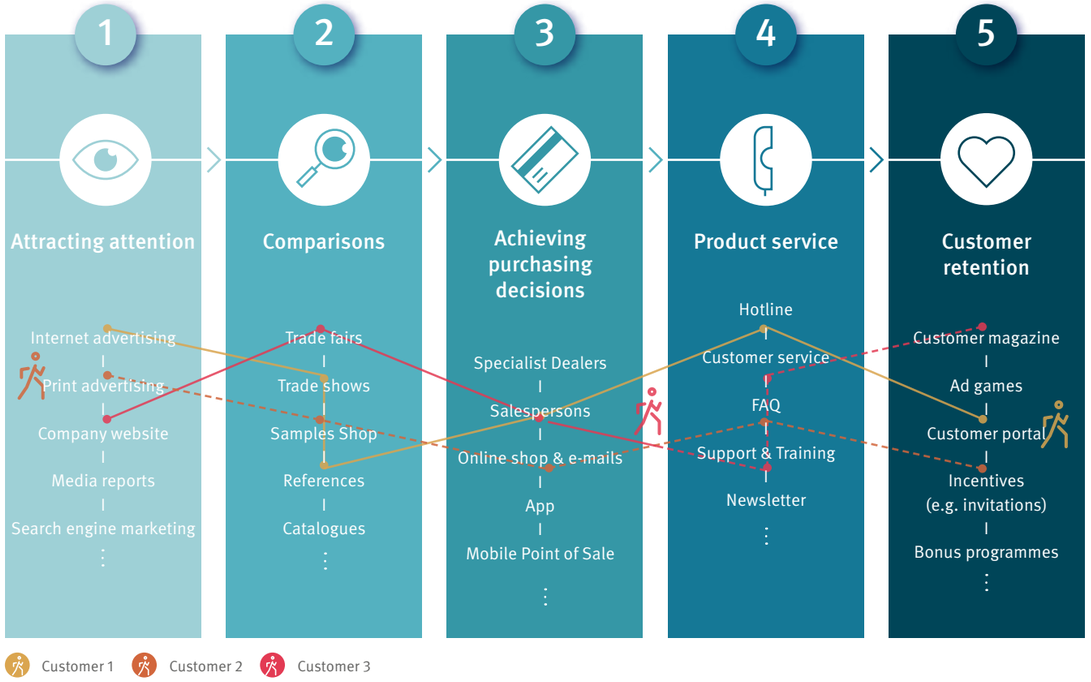
In a networked society, it isn’t only product information that counts, but also the experience

Knowledge is a “liquid substance”, says the presentation of the research institute. “It must constantly be regained and cannot be provided only once.” In order to secure competitive advantages, companies should organise so that knowledge can move. That is the only way in which it becomes a competitive advantage.

Whether a company’s knowledge keeps moving also depends on the willingness of its employees to learn. Learning means leaving routines behind and accepting the effort needed to make something new. The goal is to trick the nature of the brain, because it is an organ that prefers solutions that save energy. If a person always does certain things in a certain way, synapses are formed that make sure thinking is almost no longer necessary. This saves energy. If a person changes routine, the synapses must be rewired, too. Modern brain research calls this capacity of the brain neuroplasticity. The network of brain cells changes throughout a person’s life to allow them to adapt to their tasks. But only if it’s absolutely necessary.

Rewiring synapses and creating new routines is at the core of what we call “learning”. Positive feelings support this process. Good salespeople know how to use this phenomenon. They not only understand a product, but also present it with enthusiasm. In this way, they also aid the customer, because he or she is getting to know a new product and “learning” to appreciate it. The purchasing experience plays an important role in this regard. “We are in the middle of →

From Googling to incentive: The customer journey



Prior to a consumer becoming the loyal customer of a company, he or she will come into contact with the product up to 40 times. Each of these so-called touch points is a stop along his or her individual customer journey. Good knowledge management has a comprehensive overview of all touch points.

→ the age of experience", says the "Digital Trends 2017" from the market research institute Econsultancy and the software developer Adobe. "A company's value does not correspond to the value of the product, but to the overall experience that links customers with the brand." Almost three quarters of the 14,000 specialists surveyed worldwide think the greatest potential of their marketing strategies lies in improving customer experience.

However, they are faced with the challenge of making customer experience positive in an increasing number of places - anywhere where customers come into contact with the product, the so-called touch points. Marketing used to concentrate on three touch points. advertising in classic media, catalogue and retail sales. However, with the booming Internet trade of the Noughties, the number of touch points have increased from three to approximately 40, according to a study commissioned by the software developer Cisco for the end consumer market. And there will be even more through the automated communication between devices linked digitally, from the fridge to the car's dashboard computer and all the way to the online shop: "Thanks to the Internet of things, the purchasing trip will likely expand to approximately 800 different variants", says the Cisco study.

The shopping trip (see the graph above) often starts with a search on the Internet and ends, ideally, with good service for loyal customers. A decisive moment of the purchasing trip is the personal contact between the manufacturer and the buyer. However, today's providers must note that 57 percent of the purchasing process was already complete in B2B business, before the buyer has even called the salesperson, as a survey conducted by Roland Berger consultancy shows.

Manufacturers become innovation drivers for new formats of further education and training

It is that much more important for this dialogue to be successful. Up-to-date product knowledge presented enthusiastically also has a contribution that cannot be overestimated. Retail partners must be regularly trained to this end, despite any risk that knowledge might quickly get lost due to fluctuation among salespersons.

Digitalisation offers new opportunities for knowledge that are independent of employees, location and time. EGGER was one of the first in the industry to introduce e-learning for sales and distribution (see page 38). Sectors with products that require a lot of advice and support have long been using innovative technologies for product training. For example, distributors of Stihl motor saws mainly acquire theoretical knowledge about products via e-learning, videos and webinars. Stihl's platform even offers 3D software for virtual reality glasses, allowing participants to get to know the motor saw in a virtual forest glade. No wonder that Stihl won the eLearning Award 2017. "Training is anchored in the corporate mission", says Marbod Lemke, who is the head of International Training Services and Product Training at Stihl. Excellent transparency is considered very important.

Although the (paid) in-person training sessions offered by the producer are very popular, Lemke assures us that online and analogue complete each other. "Retailers that use our online offer generally acquire a taste for it and then also register for classic training sessions." In addition to the learning content, there are also social aspects, such as feeling good and networking, that speak in favour of in-person training. It also provides the manufacturer with valuable feedback that can be passed on to departments, as long as it also operates systematic knowledge management, just like Stihl.

An international company can no longer do without eLearning. "As a global, sustainable company, we use all forms of e-learning and virtual education for internal training", says Elisabeth Wursche, Communication Manager at SAP. "For us, this means a smaller environmental impact, fewer travel costs and less time spent."

SAP offers its customers many types of training and further education. So-called MOOC courses via the learning platform openSAP expand classic e-learning. MOOC, which stands for Massive Open Online Course, is characterised by playful formats and forums for students.

With the training offer, the company also secures its own future market. "SAP new blood and SAP specialists are in high demand, as topics such as digital transformation and Industry 4.0 solutions will require great numbers of well trained employees", says Elisabeth Wursche. However, despite digitalisation, the software pioneer still doesn't completely exclude in-person training, both internally and externally.

Knowledge needs to move for a company to remain competitive, in the head and throughout the value creation network. Due to digital networks, product knowledge must be adapted for an increasing number of touch points. Nevertheless, the most classic of all touch points hasn't lost its importance. The handshake after a successful discussion remains significant.

Stihl customers can practice operating the motor saw using VR glasses in a virtual forest. The application won the eLearning Award 2017.

A company's memory

Computers, smartphones and tablets make the decisive know-how of a company available everywhere and at any time. But does that mean that it is also used when the decisive moment arrives? Would be nice.

INTERVIEW Till Schröder

For centuries, masters have been passing on their skills to apprentices, and time-honoured libraries store the knowledge of humanity. But with modern technology (almost) everything changed. The scientist Mathias Groß deals in many projects with today's hugely increasing quantity of information. He knows that knowledge only has the desired effect if it is managed effectively. And that some knowledge management never changes.

MORE: A company's knowledge is apparent in the spontaneous ideas that arise during everyday production, a customer's feedback and the valuable advice of an experienced colleague. How do you put it together so that all employees can access it?
Mathias Groß: Of course, a company's knowledge consists of a lot more than just that. But what you are mentioning is still difficult to solve, despite digitalisation. The majority of people learn from more experienced employees. Many companies also try with digital media. But the phone calls that can help quickly clarify a question, and the exchange in the canteen or during a coffee break haven't lost any of their relevance for the knowledge management of most companies.

Does that mean that digitalisation hasn't really arrived in today's knowledge management?
To the contrary, the topic of knowledge management, somewhat forgotten until now, is experiencing a new momentum. Today, we are used to being reachable all the time, as well as to having unlimited access to information. This has also changed our relationship with learning. Today we learn less, but we Google more and hopefully find the right information. For example, a sales team employee uses smartphone and tablet to answer customer questions regarding very specific product details. He or she only accesses this information at the moment when it is needed. Not before. This is called "performance support".
Does this mean learning is now all in the past?
No, you will still have to learn many things. For example, languages. A discussion has an entirely different quality for me if there is no language robot between me and my interlocutor. A sales pitch should also first be practised one on one, prior to launching it successfully. Training is absolutely necessary for solid customer support. Which is why a good trainer cannot be replaced by anything. But, given that they aren't so easy to find, and they can't be everywhere in the world at the same time, knowledge transmission must be complemented through the learning media available today. This has an impact on the structure, content and duration of in-person training.

In what way?
Training requires time. A retailer's salespeople need to travel, and are thus missing valuable days in their own company. For this reason, retailers expect suppliers to provide well-prepared product information that the salespeople can study at home and in the workplace. This makes on-site training more efficient. Following good preparation, manufacturers and retail partners can concentrate short training sessions on consolidating knowledge, practising and incentives: getting to know each other, exchanges and maintaining contact.

How do manufacturers deal with the expectations of retailers?
Innovative manufacturers offer their training sessions via different channels. Instead of long lectures with PowerPoint slides, knowledge is transmitted through an interesting mix of online offers and in-person events. We are talking about the "choreography" of knowledge transmission. The knowledge regarding a product must be prepared differently depending on the target group and it must be transmitted via the right channels. For example, a salesperson has little time and likes competition. Therefore, the right formats for him or her are short, interesting videos and knowledge games. The playful transmission of knowledge is popular now, but not with everyone. A quiz makes almost no sense for architects. Their everyday activities are more welcoming of attractive representations of style worlds on an iPad.

Isn't this knowledge lost once the trained salespeople change jobs?
Yes, this is, unfortunately, the case. This makes it all the more important for manufacturers to prepare and digitally preserve product information and more, independently of training. Videos, web based training sessions, knowledge networks, and so-called collaboration software can be useful here. But a company's digital memory only develops its effect if it is also used. And this is the even greater challenge for companies. Because there must be an advantage for them if their employees "buy" the training courses - just like it's an advantage for them if customers buy their products. I need to promote the training course, connect it with incentives, that is, package it as attractively as possible. →

ABOUT

MATHIAS GROSS

has been Professor of Business Informatics at the Leuphana University Lüneburg (DE) since 1998. He focusses on e-business and knowledge management. He is also director of the Institutes for Interactive Media "congenius" and for Electronic Business Processes (IEG), which he helped found.

→ **Certain large retailers offer platforms where manufacturers can upload their videos, knowledge games and texts. What are your thoughts on this trend?**
We know this from the electronics trade. Manufacturers such as Sony, LG and Bose, Miele, Liebherr and Bauknecht place their online product training on the learning platforms of retail chains. But this information is driven by marketing. Retailers thus find themselves faced with the problem of reformulating this information into comparative knowledge, so that salespeople are able to explain to customers the differences between the brands. That means that retailers still have to invest in their own training, even if their platforms are filled by the manufacturers.

"In the future, more and more people will be able to learn, because the means for it are becoming better and better."

Mathias Groß, Leuphana University Lüneburg

Where is this trend heading? Towards manufacturer platforms that salespeople access or retailer platforms where manufacturers upload their product info?
Both are possible. The manner in which platforms are accessed provides valuable information regarding the interests of customers and the training needs of the sales staff. Everything revolves around these data today. Everyone would like to maintain data sovereignty.

Information material and training cost money. That is why loss of knowledge should be kept to a minimum. Is this a new problem?
This problem is like a piece of soap that keeps sliding out of one's hand. Employees change their employer more frequently than before. Moreover, the amount of knowledge available today has increased enormously. This isn't just because products come on the market at shorter and shorter intervals. The data quantity about markets, customers and competitors has increased dynamically. But information only becomes knowledge through linking, interpretation and (subjective) assessment. In theory, every employee should make this transfer, and then also put in the effort needed to document this knowledge. In practice, this remains an exception.

Why is that?
Depending on corporate culture, employees lack the time and recognition for knowledge management in addition to their actual task. They ask themselves: Why should I do this? It is precisely the few employees who know the most, the know-how carriers, who have the least time. But companies can counter this trend through a culture of valuing knowledge management. You approach experienced employees and tell them: What you know is important to me. You will retire in three years. How can we document your knowledge until then?

How is knowledge documented?
There are companies that take a lot of time for it. They interview the employee, make videos of his or her work routine. For this type of documentation, there are specialists who have developed a well structured system that they use to prepare and store the knowledge, and, where necessary, even make it medially accessible. However, there is significant danger that these folders, CDs and online indexes gather dust "on the shelf", untouched.

So the right mediation choreography is needed here too?
Knowledge must be prepared differently depending on employee. Technological developments help in this regard. Using learning software is becoming easier. In the future, we will talk to devices, or, even better, to a virtual trainer, the avatar. It will adapt to the individual learning needs, capacity and progress of each employee. The learner receives daily customised portions he or she can go through. This so-called adaptive learning will lead to people receiving the learning offer they need. And virtual reality (VR) and augmented reality (AR) will dramatically change digital learning over the coming years. Dry subjects, such as safety in the workplace or fire protection become exciting with VR. With the help of the 3D glasses, I find myself in front of a fire, I turn, the fire extinguisher is behind me... VR will revolutionise the training market! There are some great things coming.

Professor Groß, thank you very much for talking to us.

Virtual reality can make further education more of an emotional process in many areas, and thus more successful.

E-LEARNING TERMINOLOGY

E-LEARNING
Since the first books on wheels, which allowed the simultaneous reading of several books, more than 400 years ago, technology is making learning more efficient. In electronic learning, abbreviated e-learning, electronic and digital media support the learner.

COLLABORATIVE SOFTWARE
Workspace platforms, such as BSCW, Microsoft SharePoint, or IBM Notes, are becoming increasingly popular as alternatives to e-mail, allowing teams to work together across distances in space and time.

WEB-BASED TRAINING
Unlike computer based training, the learning content in WBT is transmitted not only via video, animation and text, but also complemented by direct exchange via media, from e-mail to video conference (webinar) with the trainer.

GAMIFICATION
People and many species of animals learn key skills through playing. Gamification (from "game") refers to the trend towards using game design principles on learning media as motivation.

Support through app and play

The wood-based material manufacturer is opening a new chapter with EGGER's Decorative Collection 2017 – 2019. Training no longer only happens on site, but everywhere. Thanks to the Internet.

AUTHOR Meike Wöhlert

The new EGGER App, with all key knowledge regarding the current collection, makes consulting more effective.

"The web based training is a huge success. The new formats were received well."

Stefan Müller, EGGER, Head of Digital Marketing

"Investing in knowledge still has the best returns," the famous inventor and statesman Benjamin Franklin once said. The quote applies to knowledge about a product as well. Because even the best decor collection doesn't guarantee any success if the knowledge needed to convey it is missing. The end customer only perceives what is already in the mind and heart of the retailer and distributor.

Stefan Müller, Head of Digital Marketing at EGGER, thus asked himself a key question: "How can we help our partners sell more effectively?" His answer: "By providing them not only with our products, but also with our knowledge." For this reason, starting in 2017, retailers, fabricators and architects are given access free of charge to the same digital offers that are used to train EGGER employees.

In order to put together the internal and external knowledge management, it was first necessary to integrate the Marketing and HR departments in the digital preparation of learning content, a task made for Jan Glowik, management expert with IT inclinations from the HR department of the Wismar (DE) plant. Since 2016, he has been in charge of the Group's new "Learning Management System". He compares the platform with a book shelf. "We set up a shelf. For example, one book is the in-person training, another the web based training. And everyone takes out what they need." The shelf is stocked by the Marketing and specialist departments. The launch of the EGGER Decorative Collection 2017-2019 came with four new e-learning instruments online: the aforementioned web based training (WBT), the game EGGERmind, and two videos, one objective and informative, the other one emotional and inspiring.

"The web based training is a huge success" says Stefan Müller. He presents current decors and style worlds as well as consulting and sales support, like the Virtual Design Studio (VDS) in 40 to 60 minutes. Employees use the WBT as a complement to their in-person training and for presentations to the sales team. Retailers gather information in this regard and train their employees and apprentices.

Today, gamification, the playful learning in the online world, can no longer be avoided. The new game EGGERmind is used by more and more employees, retailers and fabricators in order to practice the acquired product knowledge in a fun way: simply choose an opponent and get started. There are 30 seconds per question to test your knowledge. The questions (with four possible answers each) range from: "Which style world includes the decor H1116 Dark Barmenda Wenge?"(Correct answer: Effective Surfaces") to "What is the original meaning of the word 'to dance"? (Correct answer: "Joy of living"). The score is saved after three questions and it is then the opponent's turn. EGGERmind allows an unlimited number of attempts. Several rounds are possible before repetitions occur in the approximately 1,000 general questions and 300 questions regarding the collection.
The use of mobile devices is now also unavoidable. The EGGER App has been in existence since 2017. "Thanks to it, information can be accessed any time, any place", says Stefan Müller. One swipe with a finger is enough to show the customer a decor and access details. However, this doesn't replace swiping with your finger across the real surface. The physical impression, the precision of the colour gradient and processing cannot be represented on a screen. "At EGGER I also need a sample in my hand in the end", says Müller. "Without materiality it doesn't work." But samples have other limitations: They are small. It takes a little bit of imagination to envisage the effect of a decor in a room. That's where the EGGER App comes to into play. The Virtual Design Studio illustrates decors as worktop or kitchen front.

With the new digital offer, EGGER is one of the first companies in the industry to support a trend that is already more dynamic in other sectors. In the future, EGGER will offer webinars for all product groups, customised in terms of level and content to the respective target group. The next flooring collection is a good occasion for this. The use of innovative technologies is conceivable as well. "We've already taken the first steps in this promising direction", says Jan Glowik.

"We've already taken the first steps in this promising direction."

Jan Glowik, Head of Learning Management System

E_NATURE

“The biggest innovation of the 21st century will be the fusion of biology and technology.”

Steve Jobs, entrepreneur and visionary

More robust, more simple, more intelligent (pages 42 to 45)

Sustainable living

BUILDING WITH BARK

www.barkhouse.com

Those looking for the most environmentally-friendly of all façades will find it in Spruce Pine, North Carolina. This town of 2000 people is home to the Bark House, a company that makes shingles from bark, which is otherwise a waste product of forestry. Its tulip tree cover for the outdoors is now the first ever product to be awarded a Cradle to Cradle™ PLATINUM certification. This requires top grades in five categories: material safety, recyclability, renewable energy and CO_2 management, water consumption, as well as social justice.

HEALING WITH WOOD

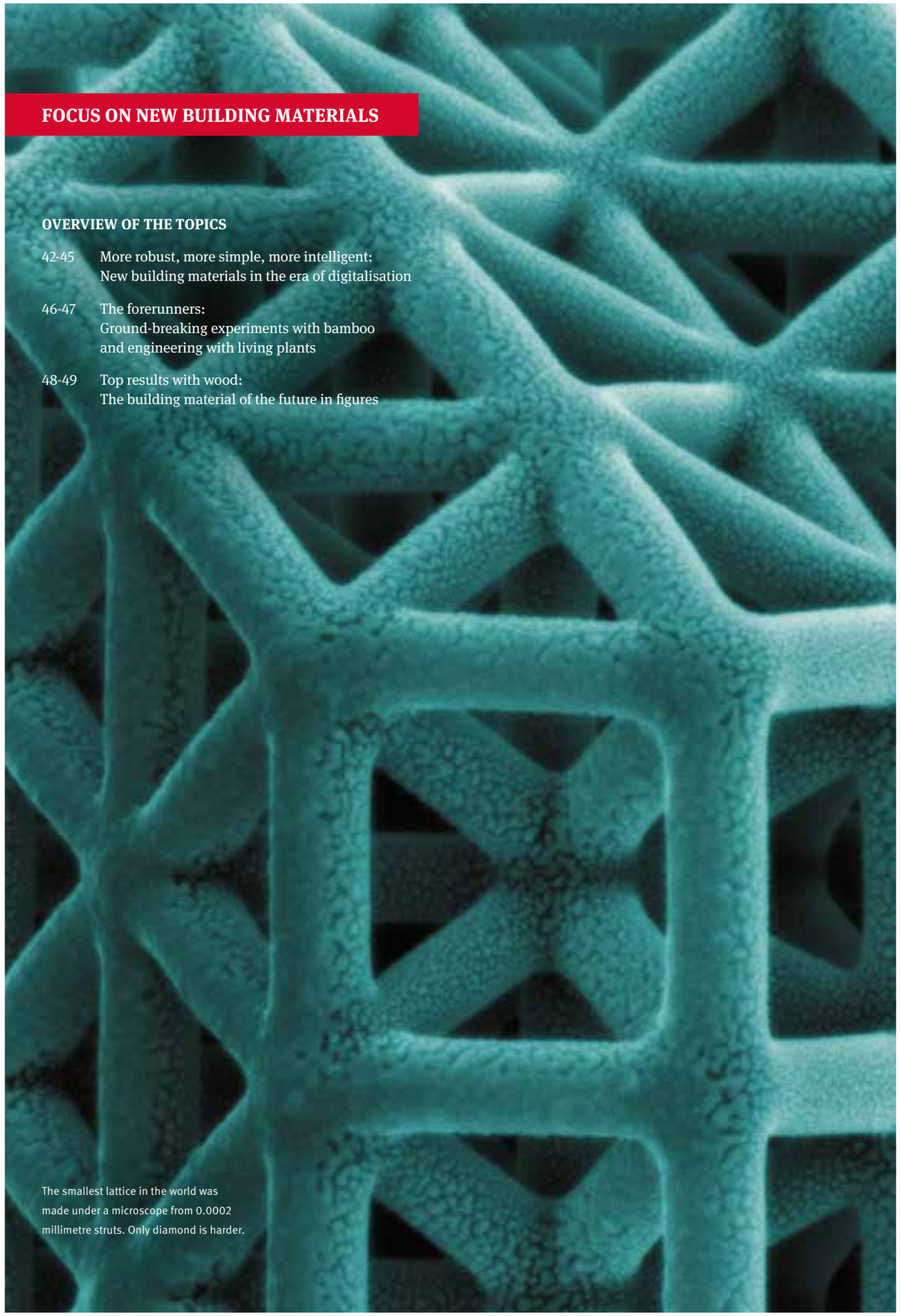
www.woodcast.fi

It is amazing what can happen when two chemists mix the leftovers of their experiments. In the case of the two Finns Antti Pärssinen and Petro Lahtinen, it was a plastic based on lactic acid and woodchips. Three years and many experiments later, they founded a company, another two years later their Woodcast came on the market: a non-toxic, biodegradable plaster replacement. It can be shaped from 60 degrees and, if it is pressed, it can easily be readjusted through heating.

WOOD INSTEAD OF STEEL

www.kyoto-u.ac.jp/en

Highly stable steel, aluminium, carbon: e-car designers already have a great range of hightech materials available for saving on weight and thus power. Kyoto University (JP) wants to expand this selection with a mix of wood and plastic. It’s supposed to be five times lighter and shatterproof than steel. But the cost of approximately eight Euro per kilogram is still too high. Steel only costs two Euro. A new procedure, through which the wood is broken into small micrometric fibres during the mixing, is expected to drastically reduce costs. An initial prototype will be available in 2020.



FOCUS ON NEW BUILDING MATERIALS

OVERVIEW OF THE TOPICS

The smallest lattice in the world was made under a microscope from 0.0002 millimetre struts. Only diamond is harder.

More robust, more simple, more intelligent

The boundaries between artificial and natural become blurred when developing new building materials. Digitalisation is revolutionising material technology. But megatrends such as health and climate change also drive important innovations. An overview of the state of materials.

AUTHOR Till Schröder

"The biggest innovation of the 21st century will be the fusion of biology and technology", Steve Jobs said in 2011. There are more and more things suggesting that the visionary Apple founder was right. Digitalisation doesn't only lead to today's machines and networks appearing more and more intelligent and alive. It also supports the processing of increasing quantities of data. This gives humankind unprecedented insight into nature's construction plans. And these can be used to develop new, natural materials. Material technology is currently developing as dynamically as digital technologies. Architects and builders are also discovering the new possibilities. But to this end they must be prepared to think outside the box.

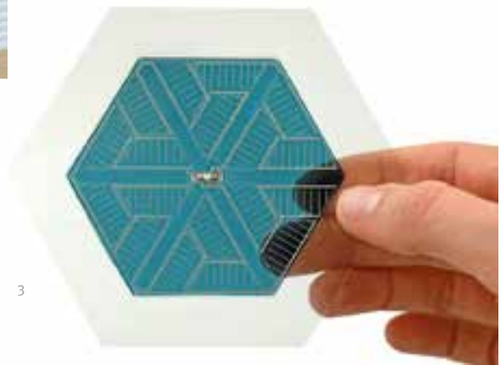
"I doubt that wood will only be considered real if it was grown and cut", says the market observer Hannes Bäuerle."

Hannes Bäuerle, market researcher and director of raumPROBE

The pioneers of sensational material innovations are mainly in the aircraft industry and military and medical technology. Implants made of biomimetic, literally "imitating life", materials imitate the properties of grown body parts so well these days that they are accepted by the body for the rest of its life as something of its own. On the other hand, aerospace technology focuses on making materials lighter and at the same time more robust. They also have properties that for the onlooking layperson border on magic. They deflect light in such a way that they act like a magic cap. Foams mislead the sense of touch by redirecting punctual pressure in such a way that things hidden underneath →

1

2



3

1 The construction of beech marks the style of current load-bearing structures. 2 OSB technology with quickly growing poplar wood could become an alternative to spruce. 3 Organic photovoltaics turns surfaces into power generators. 4 The freely shapeable lightweight structure won the material prize 2016.

→ cannot be felt. Or they are so efficient at swallowing sound and radar waves that they disappear from the radar screen. The key to literally supernatural properties of these so-called metamaterials is in their fabric structure, which is newly developed at a microscopic scale. It is true that nature offers wonderful examples of stable constructions that use a minimum of material, from bones to sponges, from wood to granite. But everything can be improved. The Institute for Technology (KIT) in Karlsruhe managed in 2013 to develop a structure made of laser-hardened photo-lacquer with a size of only 0.01 millimetres (see image p. 42). Despite the filigree diameter of its struts of only 0.0002 millimetres, this construction is much more stable than unstructured, glassy carbon. Only diamond is stronger, says KIT.

Materials with quasi intelligent properties are popular now. “Today’s promised smart materials will be significantly more intelligent in the future and will take over more varied tasks”, says Hannes Bäuerle, who has been keeping an eye on this market and its innovations for the past ten years as founder of the material library raumPROBE. Surfaces with special powers are representative of the trend. Thanks to the lotus effect of their coating, they clean themselves, as ultra-thin wall panels they heat entire apartments, decorate rooms as bright textiles, or generate power as organic solar cells on house façades.

The boundary between repair and self-healing is being redefined

Self-healing powers are also increasing. Small scratches and cracks disappear on their own. This makes the aerospace industry safer, and streets and concrete structures require less maintenance. And decors and design floors maintain their flawless surface for years in offices and residential areas. How is this possible? The basic principle is the following: enclosed capsules burst when damaged and release a binding agent that closes the crack faster than an injury.
At the same time, researchers and manufacturers are intensively looking for alternatives to adhesives made of fossil raw materials.
There are many possible approaches. Experiments with natural binding agents based on starch from wheat, potatoes or corn, or proteins from soya have been taking place since the ‘70s. Tannin or lignin from wood could also awaken certain binding forces. Lignin is a by-product of paper production, but it isn’t optimal. “Natural phenols such as lignin are very slow to react”, says Detlef Krug. In the form of glue, they required much longer pressing times when making chipboard. “Double the time, to put it mildly.” The scientist at the Institute for Wood Technology Dresden (IHD) specialises in formaldehyde-free glues.

Research success on chipboard, MDF and laminated wood fuels the dream of a pure natural product. But things that work in the laboratory don’t always transfer simply to industrial production. In addition, the quality of regular materials today is high. “We’ve reached a level where it is difficult to find formaldehyde-free alternatives that are also economical”, says Detlef Krug.

The search for alternatives to spruce brings exotics onto the stage

While glue made of natural substances is still immature from a technical point of view, materials based on synthetic alternatives, such as isocyanates, epoxides, or formaldehyde-free aminoplast resins fulfil highly technical criteria. But such materials are toxic during processing and lead to significant expenses for occupational safety.

One variant with formaldehyde-free binding agents has nevertheless made it as a niche product: the cement-bonded chipboard. However, mineral binding agents make the material significantly heavier than a regular chipboard, and this comes during a period when lightweight construction is popular.

Because lightness also plays a role when it comes to resources. Softwood is lighter than the wood of deciduous trees. That is why pine and spruce are the most popular types of wood. But a shortage is expected when it comes to spruce. Many Central European forests are undergoing transformations due to climate change. Non-native varieties, such as Douglas fir and deciduous trees, mainly beech, are gaining ground. But the supply of Douglas fir is not (yet) sufficient for industrial orders of magnitude. The growing supplies of beech on the other hand allow innovations such as construction beech, which today – after a long development period – makes for breathtaking load-bearing structures. But beech is not suitable for chipboard and OSB.

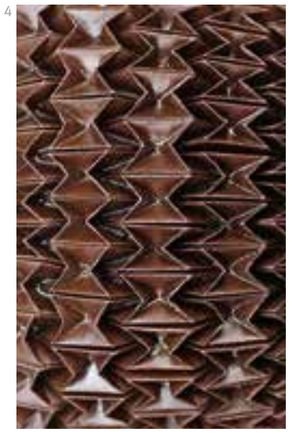
What type of wood are future materials made of? Does it grow in laboratories, like metamaterials? Or does it come from fast-growing trees, such as the poplar, which has long been processed into OSB in Italy? Or from exotics such as the paulownia from China? The princess tree or kiri tree has already been named the “aluminium of wood”. It grows fast, it is solid, and nevertheless lighter than spruce. A long-term experiment at the TU Munich confirms its suitability. But will it manage to impose itself in Central Europe?

”We’ve reached a level where it is difficult to find formaldehyde-free alternatives.“

Detlef Krug, scientist at the Institute for Wood Technology Dresden

Wood doesn’t need to be reinvented. Those who value solid wood when building do not want to replace it. “But I doubt that wood will only be considered real if it was grown and cut”, says the market observer Hannes Bäuerle. “I think it’s more likely that composite materials or sandwich materials will be developed that look like wood and also feel like it, but offer additional technical advantages.” You can always make more with wood. It was like that in the past, it still is like that, and will remain so in the future.

4



The forerunners

One makes load-bearing structures grow, another develops sustainable composites from bamboo. Looking at these researchers' work means getting a glimpse of the future.

AUTHOR Meike Wöhlert

BAMBOO REPLACES STEEL

Architect Dirk E. Hebel

Strictly speaking, bamboo isn't even wood, but its ligneous stems guarantee high tensile strength. As a wood replacement in tropical areas of the world, bamboo is strong, light and flexible. This makes it interesting for **Dirk E. Hebel** from the Department of Sustainable Construction at the German Karlsruhe Institute for Technology (KIT). Together with a processor of polymer solutions, Hebel has developed a composite material consisting of 90 percent extracted bamboo fibres and ten percent resin. After three years in the laboratory, the environmentally and climate friendly building material is undergoing full scale testing. It could solve many problems at once, particularly in Asian developing countries, where bamboo grows and megacities proliferate.

With partners, Dirk E. Hebel develops reinforcements made of bamboo that can save countries without their own steel industry the cost of expensive imports.

MORE: Mr. Hebel, what led you to develop a bamboo fibre composite?
Dirk E. Hebel: The belief that humankind should be using less material per person, so that there is enough left for future generations. Many building materials, such as lead, sand and copper, are finite, so we are researching regenerative, cultivated alternatives.

What are the advantages of bamboo?
It grows fast, it doesn't need to be replanted, and it is cheap. In Ethiopia, a whole truck of bamboo costs less than 100 dollars.

What are the features of the composite material you've developed?
It is more rigid and has higher tensile strength than wood. You can use it as a beam, but you need less material. It also functions as a replacement for steel where a bending moment occurs in a static load situation. But, unlike steel, it doesn't rust, and its high flexibility makes it relevant for earthquake areas.

What difficulties did you encounter during its development?
When different materials are combined with each other, the expansion coefficient must be right, meaning that they should expand and contract at the same rate under the same circumstances - temperature, air moisture, etc. In the case of steel and concrete, this functions very well, which is why the combination is so successful.

How long will it take until it is ready for the market?
I don't really care. The research must be done properly. Then we see what's next.

ENGINEERED NATURE

Architect Ferdinand Ludwig

Engineering with living plants uses growing trees as building material, not only aesthetically, but also as a construction element. Root bridges have been built like this for centuries in the north-east of India. In Europe, architect **Ferdinand Ludwig** and the Institute for the Principles of Modern Architecture and Design (IGMA) at the University of Stuttgart play a pioneering role in climate-control tree construction. As Ludwig is moving to the TU Munich, the research concerning engineering with living plants is moving with him from IGMA to Munich (DE). Ludwig has contributed to the invention of the Plane-Tree-Cube, which until now is the largest project involving engineering with living plants in Nagold (DE). The multi-storey structure with more than 1,000 plane trees was built in 2012. The trees are expected to take over the primary load-bearing function in 2028.

The Plane-Tree-Cube in Nagold (DE) is the largest project of architects Ferdinand Ludwig and Daniel Schönle to date.

MORE: Mr. Ludwig, are you a patient man?
Ferdinand Ludwig: Yes and no. I am a persistent man, because my projects develop slowly and I don't get derailed by setbacks. But sometimes I do wish things could go faster.

Slow cooking instead of fast food, vinyl instead of downloads - is engineering with living plants also a counter-trend to fast-paced technical development?
My answer is once again: Yes and no. We do want to confront people with the speed and the boundaries of nature. But, at the same time, nature is engineered, aspects such as precision and speed fuse with nature. In the shortest possible time, we artificially make a tree that has the size of a century-old tree that has grown naturally.

How do you make trees grow the way you want them to?
We mainly shape them through bending and link them at nodal points so that they grow together. This creates three-dimensional trunk structures that look like networks. Through regular pruning, the development is controlled so that they don't block each other's light.

What else can be built with trees, except bridges, overpasses or pavilions? A house requires walls, windows and a roof ...
In fact, bridges, overpasses and pavilions are very useful. They can be used by pedestrians, protect against sun and rain, and are key design elements of parks and gardens. We think engineering with living plants has a great potential for designing free spaces, particularly in densely built, urban areas. But houses that use these methods can also be envisioned. We aim for hybrid structures that use plant and technical elements, for example a façade made of trees and glass.

FOCUS ON **NEW CONSTRUCTION MATERIALS** E_NATURE

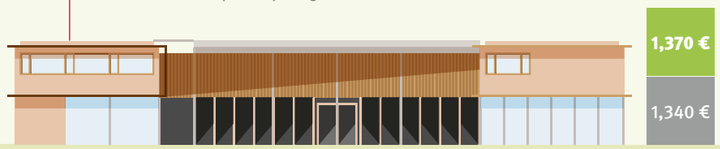
BETTER FOR CLIMATE AND BUDGET

If existing Austrian wooden structures had been built the standard way, they would have had a greater impact on the environment at a similar cost. This is shown by calculations made using the software Legep. Among other things, the shorter construction time leads to lower CO_2 emissions.

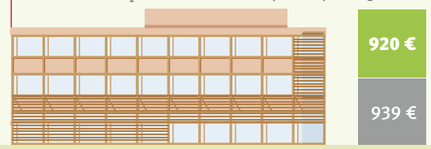
Cost of construction in Euro/m² Wood Standard

The apartment building Samer Mösl in Salzburg
would have produced 438 kg/m² CO_2 **as a standard construction**. Thanks to the **wood construction method**, the building only produced 5 kg/m² CO_2.

The community centre in Ludesch
would have produced 387 kg/m² CO_2 **as a standard construction**. Thanks to the wood construction method, each square metre reduced the CO_2 content in the atmosphere by 47 kg.



The Campus Kuchl in the FH Salzburg
would have produced 312 kg/m² CO_2 **as a standard construction**. Thanks **to the wood construction method** each square metre reduced the CO_2 content in the atmosphere by 120 kg.



Source: FNR, Legep, "Standard Materials": depending on the project, brickwork from clay, calcareous sandstone, or cellular concrete, otherwise reinforced concrete. Insulation mineral wool or polystyrene, window plastic or aluminium frame.

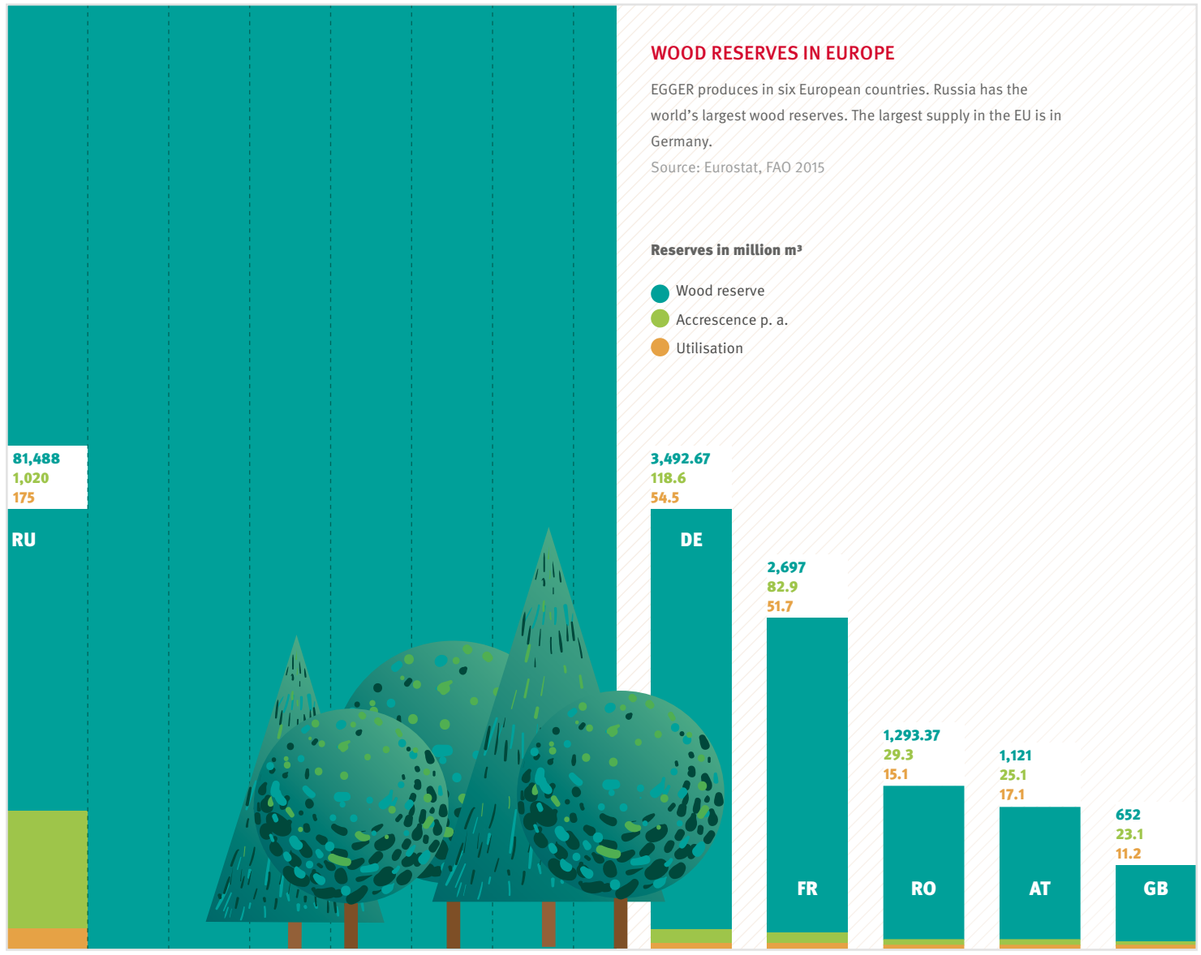
Top results with wood

Thanks to its environmental properties, wood is the best raw material for the future.

But this resource is also finite, a fact which requires measured handling.

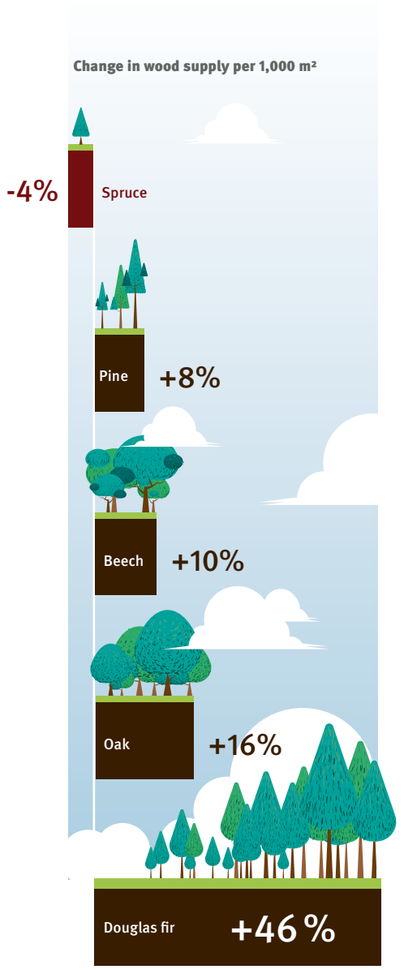
WOOD RESERVES IN EUROPE

EGGER produces in six European countries. Russia has the world's largest wood reserves. The largest supply in the EU is in Germany.
Source: Eurostat, FAO 2015



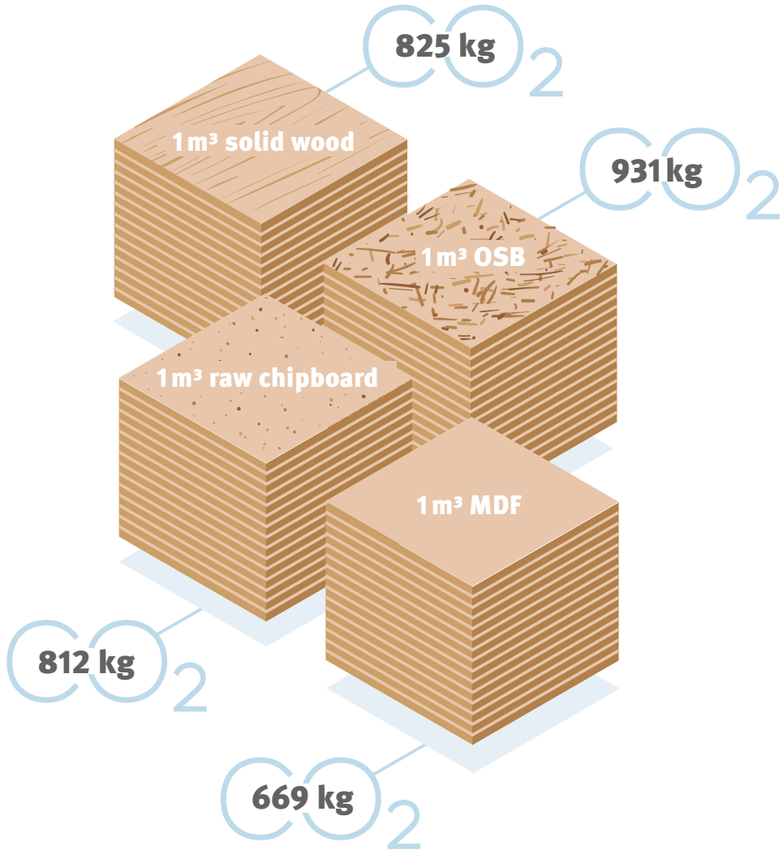
THE WOOD OF THE FUTURE

The supply of spruce, "the breadwinner of the wood industry", is still large. But it is becoming less common in Europe due to climate change. Instead, there is more beech, pine and Douglas fir growing than in the past, as figures from Germany (2002 - 2012) are showing. Beech is mainly suited for wood construction, thanks to new technologies.
Source: National Forest Inventory 2013



WOOD-BASED MATERIALS BIND GREENHOUSE GASES

The wood products made by EGGER during the business year 2015/2016 saved Earth's atmosphere 5.3 million tonnes of CO2. During the previous year there were 5.2 million tonnes of this gas damaging the climate.
Source: EGGER



55% of a tree can be used to make solid wood furniture, glued panels, solid structural timber. All the way to the roots, remaining sawmill by-products, such as chips, bark and brushwood, are turned into wood-based materials. The sawdust generated is used as biomass for process heat and eco-power.

PICTURE PUZZLE

Who is hiding in the forest?

For ten long years, the army attacked with brutal violence (but without success) the high walls of the city, located on the territory of contemporary Turkey. The war took place during the mythical times of European history. And it might have never ended if this tree hugger hadn't used a trick to bring about a decision. His trick is so famous that even to this day it gives its name to a certain type of malware. The Trojan horse looked like a harmless present. But in its belly there were, depending on who's telling the story, 23 or even 3,000 (!) warriors. As soon as the beleaguered army had drawn the "wooden horse" inside their city and started celebrating, the attackers roped themselves out of the hardwood structure and ended the war as destructive victors.

Who invented the Trojan horse?

Write to **MORE@egger.com** with the name of the inventor. We will randomly choose a winner from all the correct entries received. He or she will receive a mobile Bluetooth audio system "Get together mini" made of wood. The deadline is 31st March 2018. The decision of the judges is final.

In the picture quiz in MORE 09, the wooden animals represented Noah, the builder of the eponymous arch. Thank you for your answers. Jean-Claude Ginicis from Pompignac (FR) won the "Alfons" sunglasses made by Kerbholz in the colour of African blackwood.

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