



AFRY  
AF PÖRY

# AFRY Insights

## Bioindustry

Autumn 2021

### Interviews

Peter Oswald – Mayr-Melnhof Karton

Helmut Spiehs – Binderholz Bausysteme

Per Kristian Egseth & Pernilla Thessén – AFRY X

### Topics

Smart forestry

Global consumer behaviour

Sustainable packaging



## Imprint

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## Editorial

Dear reader,

Wherever and whenever AFRY is involved, we help our clients to safeguard successful, long-term, sustainable development and play a part in creating a more sustainable society for future generations. Finding new solutions to old problems is exciting, with digitalisation always top of mind.

The Covid pandemic treated bio-based industry sectors differently: Wood products were impacted far less than anticipated and the sector's healthy growth continues, driven by megatrends and valued functional properties of wooden raw material. In his interview, Binderholz Bausysteme's Managing Director Helmut Spiehs, emphasises digitalisation as means to capitalise on superior qualities of wood in construction through standardisation in design, production and construction.

Mayr-Melnhof Karton CEO Peter Oswald shares with us his company's strong strategy, which builds on cartonboard- and paper-based packaging solutions that serve sector needs such as recyclability and plastic substitution.

AFRY's strategic investment in building a strong position as leading digital transformation partner is AFRY X, led by Per Kristian Egseth and Pernilla Thessén. On the following pages, they describe how they aim to boost broader digital transformation across AFRY to achieve a more sustainable society with our clients and partners through digital solutions, one of which is AFRY Smart Forestry.

Growth in the forest-based sectors emphasises continued need for wood and biomass raw material, with sustainable forest management as a key factor for future success. This, however, is challenged by possible limitations on wood harvesting in Western Europe. Demand growth would in such case drive the sourcing to areas where sustainable forest management practices are not as widely applied.

We hope you enjoy and value our selection of topics and welcome feedback as well as comments to further improve our magazine. As always, we remain curious and make it our mission to bring you new ideas, perspectives and insights to prepare you for what is coming next. As we say at AFRY: We don't care about making history. We care about making future.

Enjoy reading!



A blue ink handwritten signature of Saara Söderberg.

Saara Söderberg  
Vice President  
AFRY Management Consulting

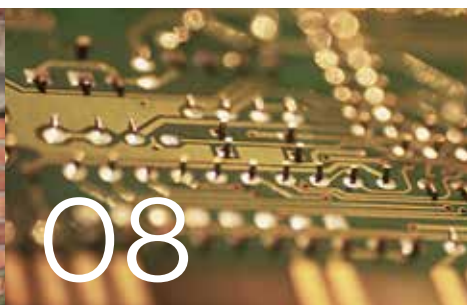
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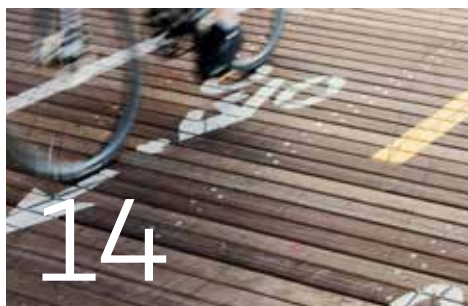
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Interview  
Per Kristian Egseth  
and Pernilla Thessén

# Dynamic Duo



Per Kristian Egseth and Pernilla Thessén have a demanding mission that requires them to bravely set foot into the future, as they develop new AFRY business models and products together with their team at AFRY X.

**Looking at the innovation hubs and accelerators within large corporations, one might get the impression that they are on a mission to save the world or produce a deus ex machina. What exactly is your job at AFRY X, Per Kristian?**

Egseth (laughing): No, seriously, our mission is much more tangible and straight forward. We are working towards accelerated digitalisation in transforming industry sectors, achieved through addressing our customers' key challenges. We at AFRY are stepping up to be a leading provider of digital solutions and data-driven applications across our core industries of expertise – in bioindustry, clean energy, future cities and food and life science.

As a part of this process, AFRY X sets out to instil a new culture of digitalisation across the company, one that harnesses all the digital competences already in existence at AFRY at the same time as driving innovation. If we are going to talk in terms of a mission, one of AFRY X's core missions is to fill the innovation funnel. We are here to build the new products that our clients and our own organisation will need to remain competitive in a future business landscape. To this end, we are combining what would normally be considered an in-house accelerator with methods that would be more commonly found in an industrialised software development company.

And we are not stopping there. We will go further. The point is not only to be an accelerator, it's also to build a sustainable business that will be able to significantly shift AFRY into the digital business space and secure strong source and recurring revenue streams.

**Developing a new business model seems easier at first glance than making old ones compatible for the future through digitalisation. What do**

**you see as the challenges and how is AFRY X positioned within the Group?**

Egseth: All roads lead to Rome, as the saying goes. Essentially our task is two-fold, to fortify existing products and to develop new software offerings based on client needs.

As you know, there is no shortage of digital capability or digital innovation across the AFRY group. The team at AFRY X will leverage precisely those capabilities and develop them into commercial software solutions, which correspond to the needs that are emerging in the transforming industries. We will be able to articulate value propositions that are much more customer-centric than they might be currently. This is another important aspect that we will leverage in order to add new capabilities and skills that better respond to the needs of the market.

We're setting up both an innovation team and a strategy team that will be tasked with understanding the dynamics of the market, where we see transformative trends, and where we think we can step in and create transformative digital products. That is the task that Pernilla will be taking on.

To answer the second part of your question, our big challenge right now is simply navigating this new venture and the cultural change process that comes along with it. This is where communication and leadership come into play. The position of AFRY X within the group is particularly compelling, because we at AFRY X have a view across all AFRY's transforming sectors and the business divisions within the group. This, along with having had many team members join AFRY X from various AFRY divisions, provides the necessary perspective to identify larger trends and opportunities that span industries as well as to drive collaboration in a broader way,

which of course has a big potential to make a positive impact. After all, it's all about making future at AFRY, so we at AFRY X feel very well positioned to support that vision.

**Pernilla, how do you develop a strategy for something that does not exist yet?**

Thessén: It is a question of understanding and extrapolating customer needs. You need to be very close to the customers to understand where they are today and where they are headed, so you can create offerings and solutions that match with where they are going, where there business is going.

Another point is understanding the legacy, heritage and knowledge of AFRY, so where AFRY is coming from. This is important as a foundation to understand where we can differentiate ourselves.

And then, of course, it comes down to a more general understanding of the markets in which we operate and the technology trends. When you put these elements together, you can get a pretty clear picture within each industry of where the customer needs are, how we can differentiate ourselves in developing solutions, where the technology trends are going, and how we can further improve our offering. Those elements will be our starting point.

**So, you will be quite a collaborator between the different divisions and markets that AFRY works in, considering how vast the sector expertise is in our company.**

Thessén: Yes, I agree and that is the key, or one of the key things, being very close to the divisions because a lot of the answers, not all, that we seek within X will be found within AFRY, with experts that know our clients and markets. I think where we add a new perspective, which

Per Kristian already touched upon, is the customer centric approach. I think when you develop these kinds of business applications and digital services the starting point always has to be customer need and AFRY X can ensure that we take that into account right from the beginning, each time.

Egseth: I see it the same way. Our view across the divisions will be an anchor point for achieving our goals. I think regardless of what we build in X, what already exists in the engineering parts will always be much bigger, this is where our legacy lies. Being able to connect closely to that legacy is the most important source of energy for our market presence. So, if we are able to develop customised business applications, which is our goal, then we also need to be able to really understand the needs of the customers, which certainly come from our divisions.

**When talking about the digitalisation of businesses, there is always a risk of getting caught up in technology debates. Yet applications and solutions are what the customer wants. How do you identify these use cases?**

Thessén: To be quite clear, we do not want to be technology-driven, but rather oriented towards the needs of our customers. It's been said many times before, but technology is not the problem. Instead, it's about finding the offerings and business models that solve real customer problems and enable implementation.

That is why AFRY X relies on the consulting and engineering competence that AFRY has, this very deep insight and competence. Because without the competence, it is quite easy to start to make ideas that are just too shallow. Really understanding the engineering view of the problem and then emphasising a lot with the customer and discovering where the underlying needs lie is key. Therefore, we aim to work very closely with customers and partners from day one and use design thinking techniques to gather customer insights as the foundation for our offerings. The starting question for us is what customers need, rather than what AFRY can offer.

**AFRY is active in very different industries. Will you address all of them or focus on a few?**

PER KRISTIAN EGSETH



PERNILLA THESSÉN



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Egseth: We will not be active everywhere. We will have a focused strategy which will take us deeper into certain topics and avoid the dilution that we'd face if we attempted to cover everything. In other words, we won't address all segments with the same force at the same time. We will focus on AFRY's footprint. We will guide our work along the different engineering and consulting business areas, for example pulp and paper is such a big part of AFRY's story, given that we have a world leading position in that industry, that it will of course be a critical focus for us. Energy is also an area where we have a lot of capability at AFRY. And in the industrial setting, AFRY is driving industry 4.0 topics. We want to be at the leading edge but also create a perspective on the maturity level across different industries and make sure that we push for transformation at the right time.

Another very important dimension we look at when evaluating which industries to enter is the sustainability position and what change is required in that industry to allow a clear positive impact on sustainability.

**The sectors you are referring to are digitalised to different degrees. How do you address these individual differences at AFRY X?**

We meet our clients at whatever phase of the digitalisation journey that they find themselves in, however it's particularly exciting to look at the sectors where we think there is quite a bit of a white space. In pulp and paper and to some extent forestry there is still quite a lot of potential for new novel, data-driven solutions and in these industries, there's an interesting interplay between very traditional processes and a huge potential for improvement through artificial intelligence, automation, drones, IoT, machine learning and many more technologies that can be interlinked, also with existing solutions, for example in manufacturing, which has relied on digitalisation for years. Although digitalisation has been around for a while in manufacturing, seeing tangible business benefits from industrial AI and industrial IoT it is almost a novelty. Very few companies have been able to meet major benefits from advancements in AI. In a nutshell, though, I do believe that no matter which industry, there are segments which can almost be considered as white space.

**Thank you for the interview, Pernilla and Per Kristian! A few more 'This or That' questions for our followers on social media?**

Egseth: Let's go! 🚀



# Simosol

## Now part of AFRY

Digital technologies are revolutionising forestry and wood processing industries around the globe. The returns on investment for precision forestry technologies are high. Corresponding gains can be found from digital forest inventory, advanced simulation and optimisation platforms, and improved wood supply chain management.



Integrated forest information system



Forest management optimisation



Forest supply chain management



Forest inventory and analysis

# MosaicMill

## Now part of AFRY

All new method for tree counting and species delineation – forest inventory without field work. Complete aerial imaging systems for surveys with light aircraft. Hyperspectral cameras for forestry and agriculture applications.

# Cubiq

## Now part of AFRY

Our success is based on the simplest equation:

The best Experts  
+ Freedom to develop optimal  
solutions for the customer

-----  
= Breakthrough.

We are not algorithms, we create them.

# The wave is moving

In 2021 AFRY made three key acquisitions to significantly strengthen its position in digitalisation.

Contact

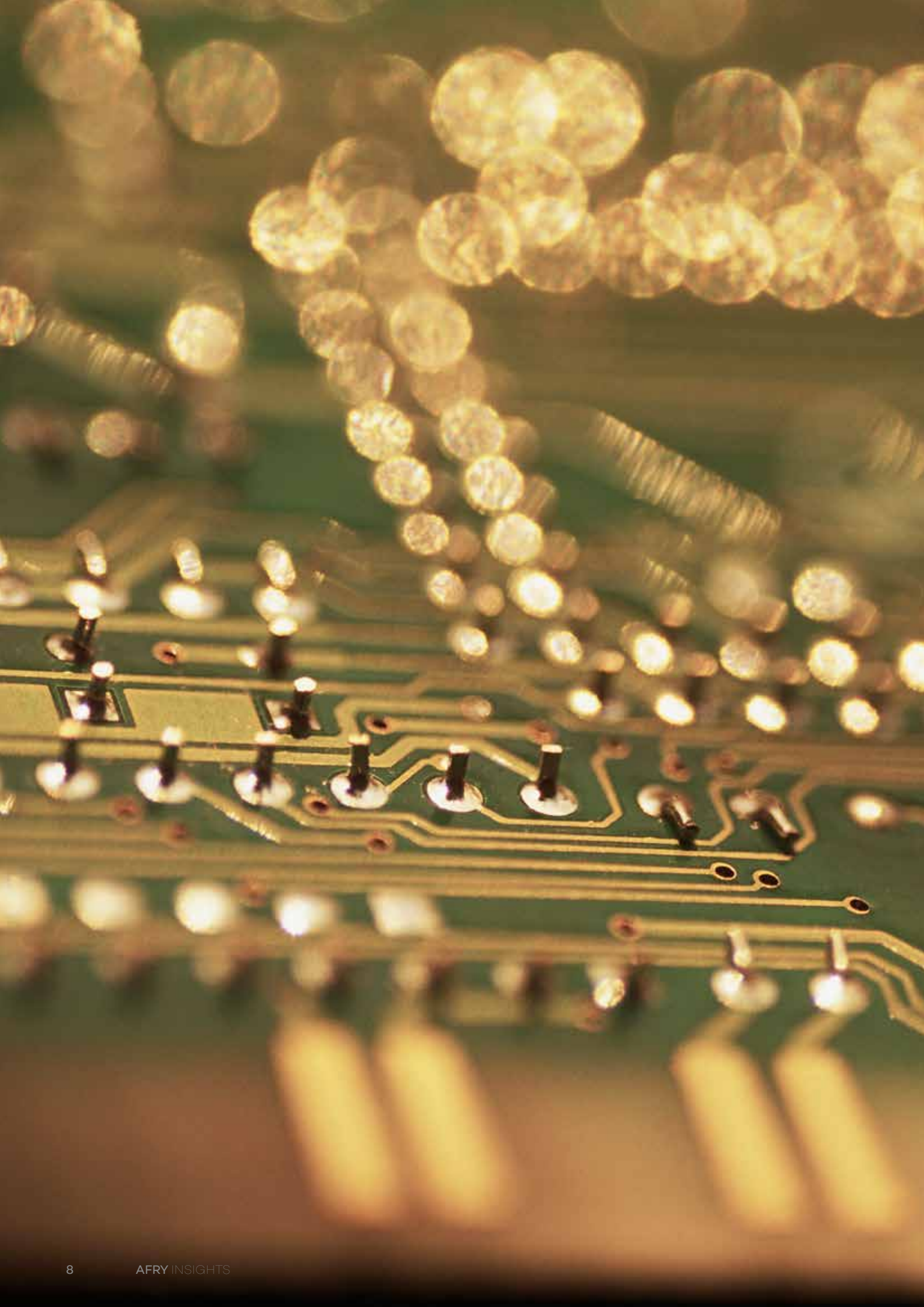
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# Green gold, digitalised

All companies know that, to run operations efficiently, it is essential to have facts straight. This applies to forestry as much as, if not more than, any other sector. Imagine any operation where inventory information has over 20% margin of error and how that would impact the operations. For optimal operations and continuous improvements, forestry companies must have real-time visibility and controls in place. When forest source information is accurate, the benefits carry throughout the operations. Precision forestry aims to identify and capture those benefits.

## Several areas of benefits

How does an accurate inventory affect operations in a supply chain? To answer this question, we need to look at operations, from planting trees to end of their life cycle.

We may identify several areas of opportunity. They may not always be obvious, as operations today are shaped to mitigate inaccuracies in source information and a large variety of operations and ways of handling assets exist. We may categorise the overarching areas of opportunity to forestry, operations, and sourcing, where the overall benefits may range from 2% to 10% combined of annual cost savings and output increase. Seemingly small improvements, yet in a scale of large forest companies, the impact starts from several million Euros annually, every year. Gathering the full picture of operational benefits is complex. The benefits run through different operational areas and divisions within the organisation and thus the decision making should be at the top of the organisation.

## Forestry – increased growth

In forestry, the goal is to grow healthy trees with expected rate to capture and store carbon as well as to supply for processing of wood and biomass. Tree growth is impacted by multiple variables such as soil type, weather, nutrients, pests, to name but a few, and the silvicultural management is based on those attributes. If the silvicultural actions were more precise and optimised to each condition, they could produce higher growth and allow earlier detection of possible damages in the forest. This requires managing optimally sized, accurate, homogeneous sub-environment units. This would also likely reduce e.g. fertiliser, pest control and use of other materials when directed more accurately. In plantation environment the cycle is a lot shorter than in boreal forests and the effect of actions faster and more visible. More accurate management of the sub-compartments of the forest will also give a valuable feedback loop to R&D for more optimised clone production.

Overall, accurate inventory information enables smart precision forestry with benefits in operational efficiency and increased growth measured with Mean Annual Increase (MAI).

## Operations – unit cost reduction

Today, operations are planned based on the assumed inventory on the forest. Operations, such as harvesting and related logistics, are a chain where one inaccuracy leads to another and can cause inefficiencies to pile up when things do not go as planned. For example, the harvesting crew not meeting the volume expectation leads to additional harvesting elsewhere in a less optimal location. As a result, log trucks may run excessive distances empty or with partial load. This is a cost on its own, and a clear inefficiency through the supply chain from forest to mill site.

## Sourcing – accurate pricing

In sourcing, the accurate information of the targeted forest asset removes

many variables within the purchasing process. Today's pricing strategies try to mitigate the risks in procurement to overcome the inaccuracies in valuation. Manual labour dominated sourcing of wood and biomass may be significantly improved through utilising accurate forest asset information, which would allow elimination of manual interference resulting in significant cost savings. When calculating the effects of a single incident and then applying that calculation to number of incidents on an annual basis, the benefit can be quite significant. Wood sourcing companies are willing to pay more for wood that has less quality and volume variability, as it may increase their competitiveness and efficiency.

### How is all this enabled?

Smart Forestry aims to make technology available to gain benefits. We have touched on major benefits that the technology has to offer, yet how do we do it?

Tree-level digital inventory and monitoring can be achieved today with RGB and/or LiDAR sensors in drones. LiDAR provides very accurate measurement of the tree, and multi- and hyper-spectrum cameras provide colour data to detect different tree species, potential pest or disease damages and even early detection of pest or disease damages based on colour changes invisible to the human eye. More up-to-date information and early prevention may save large forest areas from damage.

Frequency of forest monitoring determines the accuracy further. With long measurement cycles, the accuracy for growth and detecting potential damages becomes inefficient. With higher frequency, actual growth data can be corrected on each management unit against the growth model and changes applied to an inventory information. Damage identification & prevention require a higher frequency to stop potential damage on time. Measurement four times a year in a plantation forest environment and annual frequency in a boreal forest give significant improvements to accuracy for growth and damage control.

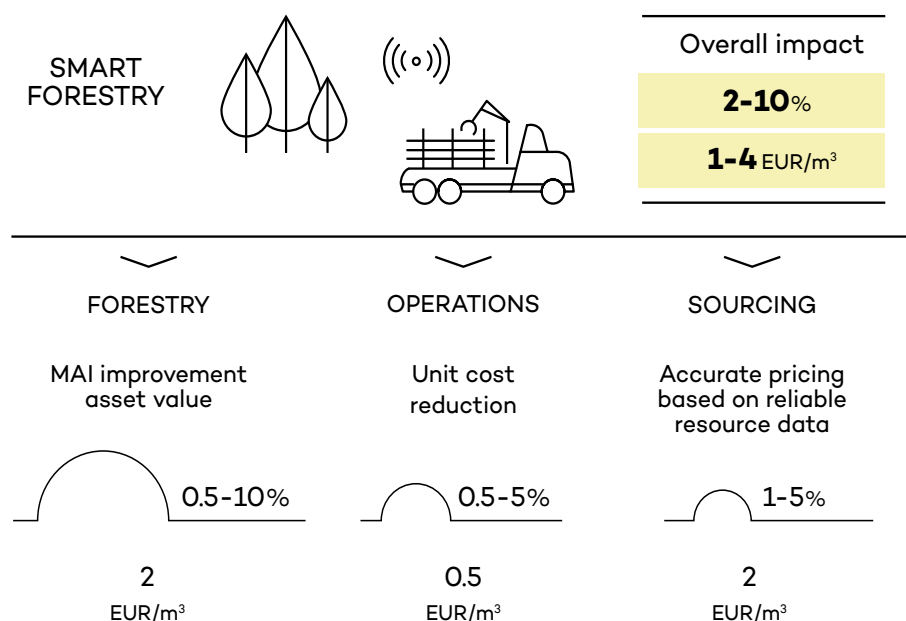
Forest management always uses multi-source data – the art is to use these sources in an efficient way. Satellite data allows detection of larger scale changes, drone sourced tree level data accuracy efficiently, and harvesting data the very truth of the harvested volume. When we combine these data sources in an inventory database, a complete digital twin of forest is created. With help of Artificial Intelligence (AI) algorithms, the growth may be automatically corrected on each measurement to match similar sub-compartments and areas. The inventory raw data is big and requires sufficient processing to translate the information to a meaningful inventory database that forest management systems may process and utilise.

### Planning & optimising for perfection

Forest management is always a matter of planning for years ahead on natural resources that grow at varying rates. Forest management must be carried out according to the desired outcome, with preparedness to make changes along the way. Applying growth models to forest assets is no novelty. However, basing on today's inaccurate source data with over 20% error margin, the 5–50-year planning cycle will undoubtedly cause large uncertainties as to the outcome. Whilst forests may be measured on tree-level, the management of the forest asset is not practical on tree-level. Each plan should be optimised to a smallest reasonable management unit. IoT sensors can be implemented in operational machinery to complement data sources for a further optimisation of operations.

Digital inventory enabling simulation and optimisation of forest asset growth and usage provides the most accurate platform for planning, operations and forest valuations, inclusive of carbon storage. It takes the guessing away from your game regardless the role in forest utilisation. Smart Forestry gives you the tools and the platform to optimise forest operations, enabling operational efficiency and better preparedness to support forest growth in an optimal way. ☺

### Typical improvement potential in forest supply chain





# Acquiring sustainability

Mergers & Acquisitions supporting acceleration towards achievement of sustainability goals.

Whilst headlines continue to highlight the death toll the pandemic has levied upon humanity, some might say that we have neglected to pay attention to the health of our planet. The symptoms of the years of harm that consumers and industry have inflicted upon our planet are increasingly evident. A slow and painful death now appears inevitable.

What more evidence of the gradual destruction of our planet do we need than the astounding floods in Germany and China, the uncontrollable fires in Canada, California and Greece and most shockingly the fact that rain, rather than snow, is falling for the first time at the melting summit of Greenland.

Whilst companies grapple with the stultifying economic impact of Covid, it may seem unfair to expect them to

focus on expensive and distracting projects designed to meet ambitious sustainability targets which governments have imposed and which they, in pre-Covid times, happily committed to. However, if we really are to save this planet and reverse the impact of our indulgent and wasteful lives, our habits must change and this starts with the industries and companies which feed those habits.

The manufacturing and industrial sectors have the heaviest environmental footprint. The reality is that companies that manufacture will emit CO<sub>2</sub>. Packaging companies particularly so.

Worse than that, not only do packaging companies emit CO<sub>2</sub> in their manufacturing processes (e.g. glass furnaces



run at 1,300 – 1,500 degrees centigrade 24/7, whilst the manufacture of one ton of corrugated board creates 538 kg of CO<sub>2</sub>), the output of these processes, once used, is ubiquitous and associated with global pollution. Their products are one way, short life, disposable waste.

Packaging companies are painfully aware of the need to minimise their environmental footprint and whilst each substrate makes the most of its positive associations (and we have heard them all: "fully recyclable, recycled, prolongs shelf life, reduces transport, 100% biodegradable" etc.), the painful truth is that the packaging industry still needs to run as fast as it can to reverse global meltdown.

Billions of dollars are being spent across the packaging industry in R&D for efforts to find solutions for recycling, downgauging, minimising CO<sub>2</sub> and enhancing the inherent packaging qualities. Whilst some companies are happy to do so and will continue to be the drivers of innovation, others are taking a shortcut through M&A – and why not?

New infrastructures or technologies, which can support the achievement of environmental goals of the global packaging industry, if acquired and deployed by bigger and broader concerns, will have a bigger and broader positive impact on our planet.

Packaging companies are learning from each other, integrating and combining knowledge and technology – either through acquisitions or the creation of JVs. Teamwork makes the dream work – working together, using each others skills, ideas, investments and knowledge will accelerate our race to reverse or at least slow down environmental damage.

M&A is being used by packaging companies who wish to accelerate their journey towards a more sustainable future. Doing so brings benefits in the form of lower tax bills, lower penalty charges and a profile which is more likely to attract the new environmentally aware

consumer. Recent examples of sustainability driven M&A can be seen in the table beside.

### M&A across the substrates – an expedited path to improved sustainability

#### Plastic – PET

The EU has announced that taxes will be applied if bottle manufacturers fail to achieve certain levels of recycled content in their products and FMCG companies are using the promise of recyclability and recycled content in their packaging as a marketing tool. These sustainability drivers are forcing plastic packaging companies to rapidly accelerate the use of Post Consumer Recycled (PCR) content in their production.































Development of this capability, particularly when using mixed waste sources is complex and therefore companies such as Alpla and Resilux have been scanning the market for acquisition targets which they can integrate into their company to provide ready access to both the technological know-how and the recycled materials. For example, in October 2021, Alpla announced the acquisition of BTB PET Recycling – a company which recycles 20,000 t/a used PET bottles and earlier in the year, the company also announced a JV with PET recycling company Targu Mures and the UK's Biffa, all of which are destined to help Alpla support its needs in recycled pellets. Meanwhile Resilux is also focussed on obtaining access to the manufacturing of food grade PET by acquiring Swiss recycling company Poly Recycling in Switzerland.

To some it may seem ironic that AP Moeller, the family holdco which defines itself by its investments in businesses that have a positive impact on society "nyttig verksamhed", has recently acquired the plastic packaging company called Faerch. However, those in the know will appreciate that Faerch has in fact achieved the most impressive levels in producing plastic packaging from recycled content. The company

#### Resources used to make packaging

- Weight for 500 ml container

- Consumption and emission values represent 1 million 500 ml units

	PET WATER BOTTLE	BEVERAGE CARTON	PET SODA BOTTLE	ALUMINIUM CAN	GLASS BOTTLE (single use)	GLASS BOTTLE (10x refill)
						
AVERAGE WEIGHT g	8.3	21.8	22.2	19.7	300.6	300.6
						
GHG ton CO <sub>2</sub> eq.	50	75	141	155	383	85
						
FOSSIL FUEL USE GJ consumed	958	1 056	2 639	1 342	4 320	960
						
WATER USE million litres	174	51.9	47.3	28.4	1094	24.2
						



Recent examples of sustainability driven transactions:

Company	Target	Action	Sustainability rationale
Resilux	Poly Recycling	M&A	Access to recycling technology
Alpla	BTB PET recycling	M&A	Access to recycling technology
Alpla	Targus Mures	JV	Access to raw material
Alpla	Biffa	JV	Access to raw material
Jabil	Ecologic Brands	M&A	Scaling of novel solutions
Stora Enso	Cellutech AB	M&A	Scaling of novel solutions
Mondi	SK Recycling CE	M&A	Access to raw material
AP Moeller	Faerch	M&A	Business entry
Faerch	MCP	M&A	Market access
Huhtamäki	Elif	M&A	Market access

is ahead of its competitors already achieving 70% recycled content in its trays and has recently acquired MCP, a US manufacturer of recycled trays. This is the company's first step into the US market and represents another example of how companies can accelerate towards their sustainability goals through acquisitions.

### Metal & glass

Metal and glass packaging substrates are also in pursuit of stretching sustainability goals and are targeting acquisitions that will help accelerate their journeys. Both metal and glass packaging containers are recyclable and the availability of the recycled content is often better managed than for plastics.

However, it is the production process of both glass and metal substrates which are of concern. 2% of the world's human caused CO<sub>2</sub> emissions are from the aluminium production process, that is 1.1 billion tonnes of CO<sub>2</sub> emissions per annum. Aluminium is the metal of choice for packaging companies and so there is still much to be done in this area.

Similarly, running furnaces at 1,300 to 1,500 degrees centigrade 24/7 clearly has an impact on the environment. In response, glass packaging companies in Europe have for the first time agreed to jointly invest and collaborate in order to research the possibility of step change in the CO<sub>2</sub> emissions of the industry. The "Furnace for the Future" programme brings together 19 European glass packaging companies to invest in a 350 t/d furnace which will have 60% lower CO<sub>2</sub> emissions than normal. This will be made possible, because 80% of the gas used to heat the furnace will be replaced with electricity and the process will use a high quota of recycled glass.

Whilst this is not strictly an M&A route to improved sustainability, it is nonetheless a great example of leaning on each other's expertise to accelerate achievement. Teamwork is once again helping to make the dream work.

### Fibre

Companies active in the forestry and paper-based packaging segments are benefitting from the positive shift to their biodegradable and environmentally favoured substrate. However, the overall CO<sub>2</sub> footprint is not as favourable as perhaps the consumer may initially think, because whilst their end product is recyclable the process of manufacturing creates CO<sub>2</sub> emissions and effluent. These fibre-based packaging companies also recognise that they need to address

their environmental shortcomings whilst also not missing a trick to fully exploit the positive consumer perception of paper.

Forward thinking companies are looking for ways to further improve their sustainability credentials through M&A whilst deploying their fibre based know-how. Stora Enso for example has recently acquired Cellutech, which produces sustainable wood-based foam materials to enable its clients to replace polystyrene with fully recyclable inserts for packaging.

### Sustainable financing – a new imperative to support M&A

Packaging companies live with the threat of penalty payments should they fail to achieve governmental sustainability targets. They have the additional pressure of having to support the sustainability promises made by their FMCG customers.

In addition to these two important drivers, packaging companies are now also under pressure to demonstrate their ESG credentials in order to access both bank and capital market financing.

Credit committees at financing banks were once solely focussed on the creditworthiness of their prospective clients. They are now obliged to "de-select" those companies which do not pass muster on their ESG credentials. No doubt banks have developed an environmental conscience, but the threat of their brand being associated through a loan to a company which has a poor track record in sustainability is perhaps a bigger risk than the potential of a default of the loan itself.

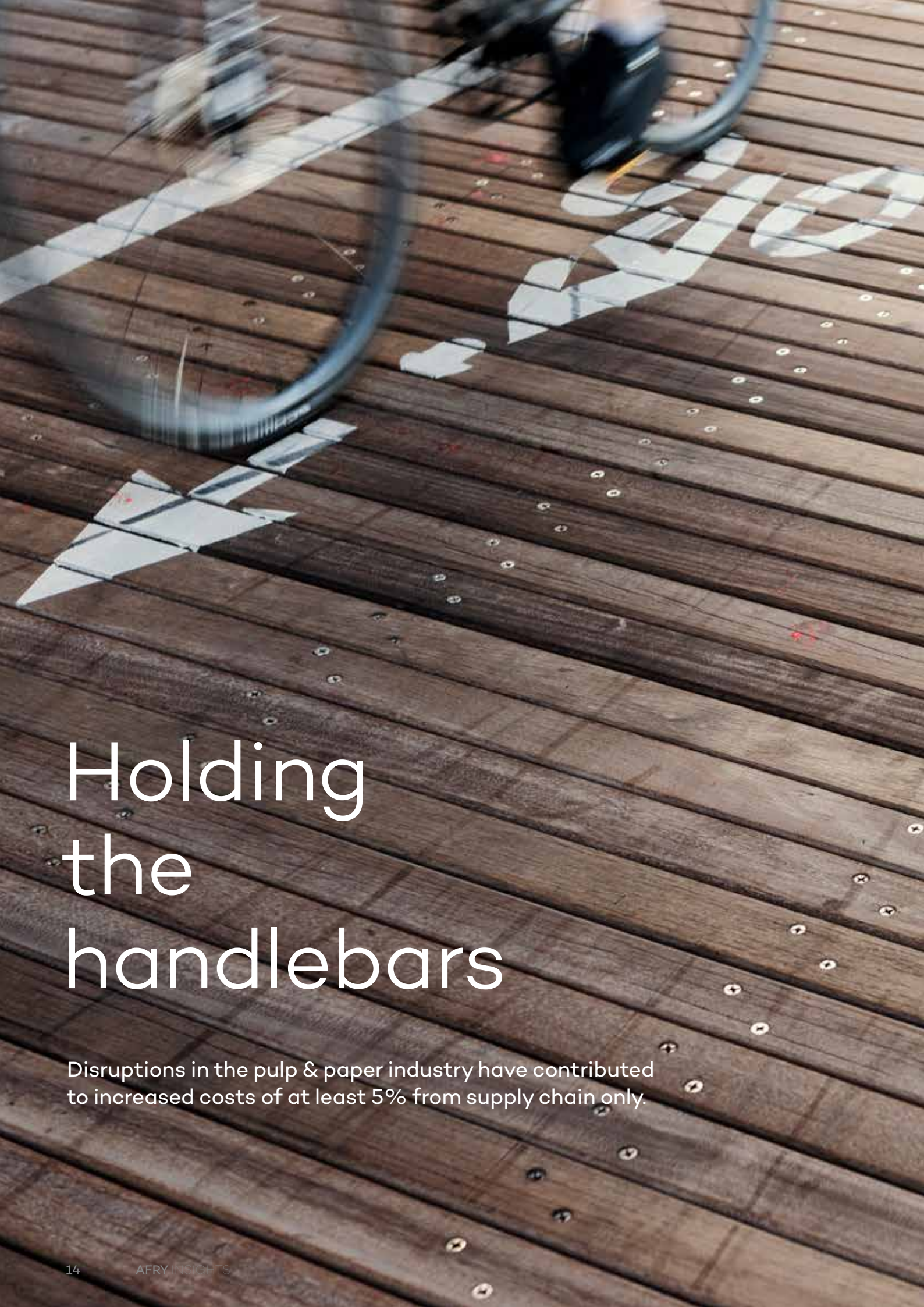
Capital markets investors are now also focussed on "green funding". Pension and investment funds around the world are increasingly selective about the sustainable profile of the assets they invest in. The Swedish invention of Green Bonds has now garnered popularity around the world and is being used as a tool to encourage companies to focus on their environmental footprint.

In every other way, these bonds are exactly the same as normal bonds. However the funds raised with their issue must be applied to finance an environmentally driven project, which may include the acquisition and integration of a company that will serve to enhance the acquiror's environmental footprint.

Examples of Green Bonds in the packaging sector: Logoplaste, Smurfit Kappa, O-I, Graphic Packaging, Ardagh.

In summary, it is fair to say that our universe of packaging companies does not only want to, but is also obliged to, meet the sustainability agenda. Covid has created a temporary mist. However, government direction, incentives, penalties, the sustainability commitments of their client base and the ongoing need to access financing ensure that packaging companies will continue to focus on improving their CO<sub>2</sub> footprint. The critical condition of our planet demands that they do this urgently; and M&A will continue to be one of the most useful instruments in their strategic toolbox to support them. ☺





# Holding the handlebars

Disruptions in the pulp & paper industry have contributed to increased costs of at least 5% from supply chain only.



## Navigate the volatility

Changes in consumer behaviour and shifts in operating patterns within the pulp and paper industry during the pandemic triggered some longer lasting effects globally, such as fluctuations in paper and pulp supply and demand and consequently, recurring price increases. While in 2020, paper mills were facing increased inventories of unsold paper, the rebound of economy and paper demand in 2021 brought down the inventories to historically low levels.

Disruptions in the market have been intensified not only by a quick increase in pulp prices, but also by an increase in mill costs. The effects of the supply chain disruptions are still fluttering – gaps in supply have driven domestic transportation and logistics costs up, international shipments have been impacted by paused and delayed shipments, companies have been forced to rely on the spot market to ensure timely availability of products while some existing long term supply agreements have been jeopardised. All together, these disruptions have contributed to increased costs of at least 5% from supply chain only.

### Define a way forward

Acknowledging the cyclicity of the industry, particularly regarding product prices, expectations are that sooner or later, the current strong pricing environment will level off or even fall. It is therefore critical for companies to gather a deep understanding of the underlying trends, particularly on the cost side, to prepare for a rainy day.

As an example; the trend price in real terms for OCC (old corrugated containers) in Europe has been increasing faster than the corresponding price for testliner. Yet, fibre costs are not the only headache in the industry, costs for energy, chemicals and labour have increased significantly, with energy currently being the biggest challenge influencing all variable costs.

As long as producers are able to pass on cost increases, the problem remains limited. However, industries and markets are constantly restructuring. Let us take the European containerboard market as an example: There is a constant stream of new capacity entering the market, anything from machine upgrades, new machines to repurposed machines from other grades. Typically, capacity has been growing faster than demand, ultimately forcing high cost mills out of the market. As new capacity is more efficient than older, marginal costs fall and induce margin pressure. Demand growth alone is not sufficient to ensure current profitability. It is therefore paramount to keep a constant focus on mitigating cost increases to protect margins.

While the inflation of costs may have quite different factors triggering the increase on either the demand or supply side, there are generally three main types of factors to be considered when looking at cost increases:

- Demand pull – the classical case on the demand cost curve when the increased demand for products or

services exceeds the installed production capacity and more consumers or companies want the same thing at the same time.

- Cost push – in this case, although the demand remains stable, either the supply is restricted due to capacity constraints, or the production costs have gone up.
- Built-in inflation – a typical example of this case is the unionised expectations on close to automatic price increases for labour and consequently the increase of wages and salaries triggering increased production costs.

In theory, all looks quite straight forward. However, in real life and in a production environment particularly, all ends being a mix of different contributors from wood supply, chemicals, energy, employment costs to capacity constraints.

### Stay ahead

There are a few things to consider when aiming to stay ahead for good:

- Implement technical upgrades, however, such solutions normally take longer to implement, require investment and result in heavy capital costs as well as generally involving a long payback.
- Take into use smart production solutions which will enable reduction of input cost factors, eliminate variations, increase staff responsibility and accountability and avoid past errors made with “mechanical cost cutting initiatives” that do not consider the human factor or digital capabilities.
- Develop a clear strategy to build commercial capabilities to quickly enable price adjustments to accommodate raw material availability and cost changes.
- Diversify sourcing and integrate within the supply chain – manage and mitigate supply uncertainties with suppliers of all sizes, identify alternative sources for suppliers in severely affected areas as well as identify alternative raw materials.

The need for focus on continuous performance improvement is evident. Forecasts indicate gradually increasing inflation in Europe; Thus producers need to stay alert and keep a lid on costs to stay on the treadmill. The key is to link cost evolution challenges to strategic decisions:

- Do you keep focus on operational excellence (OE), no matter what?
- Do you have a clear view of how capacity changes will impact your markets’ supply and demand balance in general and your company in particular?
- As trade flows change, will your sourcing and supply chain adjust accordingly?

We have helped our customers based on AFRY’s proven OE methodology to improve their operational cost and achieve sustainable efficiency improvements in more than 270 projects in the pulp and paper industry, yielding identified cost savings beyond 3 billion Euros and thus effectively helping our business partners fight cost inflation. ☺

# Into the wood

Station →

Interview  
Helmut Spiehs  
Managing Director  
Binderholz Bausysteme

Building with wood has become increasingly popular, especially in recent years. In this sense, Helmut Spiehs may consider himself very fortunate.



**The construction industry is running out of sand for its concrete and hardly a day goes by without a new wooden house being praised in the media for its sustainability. Wood as a building material has been declared to be the cure-all that will make the construction industry green. How realistic do you think this evaluation is?**

This is not an evaluation, this is reality. The technical developments over the last 20 years have brought timber construction to an enormous level of marketability, so that there no longer exists any structural or economic reason not to build in wood. The task now is to make modern and contemporary timber construction accessible to all consultants and builders involved in the implementation of a construction project through standardisation, systematisation and knowledge transfer. A significantly higher share of solid wood construction within the building sector "automatically" leads to greening of the construction industry.

**How can wood, as a resource, contribute to making the construction industry more sustainable?**

Wood is a renewable, ecological resource. Just this fact alone does not guarantee that the use of wood as a building material makes the construction industry more sustainable. It is better to use all of the wood raw material for long-lasting wood-based products rather than burn parts of it for energy. In addition, the use of mass timber products should be matched in a balanced design for manufacture and assembly process individually but at the same time systematically in each project. Only after being reused several times, should the wooden component be ecologically recycled at the end of its life cycle. The Binderholz group implements this process every day. From trees to high-end mass timber solutions according to the zero-waste principle.

**The construction industry increasingly has to face the demands of networked digitalisation.**

**Construction with Building Information Modelling (BIM), sensor-controlled component tracking or virtual reality are becoming standard procedures. How do you at Binderholz embed your natural products in the context of digital construction?**

The use of BIM in the construction industry varies widely around the world. If our products or construction systems are used in a BIM-based project, we achieve all requirements in our structural engineering departments to professionally map all necessary processes. With our Binderholz mass timber concept for affordable housing, called "b\_solution", we even go so far that every building is mapped down with each single detail in a digital twin. Material procurement, work preparation, production control, logistics, construction processes, etc. are derived directly from this digital twin. Thus, with b\_solution we have fully digitalised all the processes involved in the production and construction of a residential building. From planning and cost quotation to production and the digitally controlled and monitored construction site. This does not only achieve price advantages for customers, but also leads to an enormous improvement in quality assurance and a reduction in construction time.

**In the current sustainability debate, you are in a comfortable position. Your business model is based on a renewable, sustainable raw material and your products are a prime example of the circular economy. Where do you see your challenges in terms of sustainability?**

Sustainable management is and stays the top priority in European forestry, following the principle of not consuming more in the present than can be regrown in the future. Accordingly, the three basic functions of the forest – utility, protection, and recreation – need to be and remain available also for next generations. In this context, utilisation is a very important fact to

secure healthy forests and sufficient timber for reaching the Sustainable Development Goals (SDGs) from the UNECE list. Therefore, putting the forest out of use is the wrong way. This slows the growth and the health of the forest and reduces the speed of CO<sub>2</sub> storage. The "out of use position" has catastrophic effects, such as the forest fires in the Northwest region of the US or in Russia.

**In the future, we will face more climate challenges, hotter summers, which will lead to bark beetle infestations. This will have an impact on forest assets and changes in the allocation of wood species. What is Binderholz's position in the forestry value chain and how will your wood procurement and wood mix/ species potentially change?**

For the whole Binderholz group, softwood will stay in focus for production. We collaborate with different forest laboratories to research more resistant spruce, which is our most important wood species. However, a mixture of species in the forest is getting more important for us too. Mixing the forest with some deep roots species such as fir is just as important as growing some other sorts like douglas and/or pine. The latter are more resistant against droughts and stormy weather conditions. In order to be able to guarantee sustainable forest management, we run our own forest service companies at Binderholz group. With their corporate slogan 'Together strong for the forest', TTW Waldpflege GmbH and Waldprofi GmbH provide a professional structure for managing all relevant forestry services. We offer solutions to forest owners for a profitable and sustainable forest cultivation in the highest execution quality.

We are concerned about strengthening regional corporate structures and the deployment of local skilled personnel, as well as complying with all criteria to ensure sustainable forestry management. ☺

US



70%

GER



79%

UK



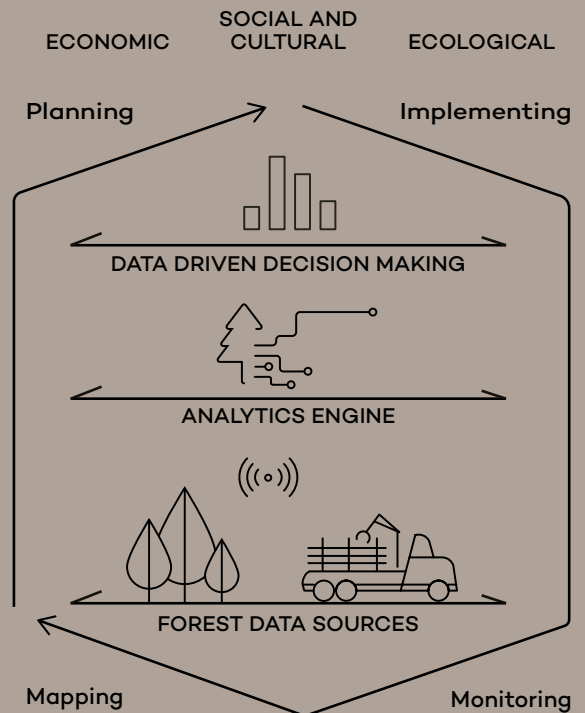
80%

CHN



90%

AFRY's consumer survey shows a clear preference for sustainable packaging. Over 70% of respondents strongly agree or agree that the sustainability of packaging materials used in products they buy is of primary concern.



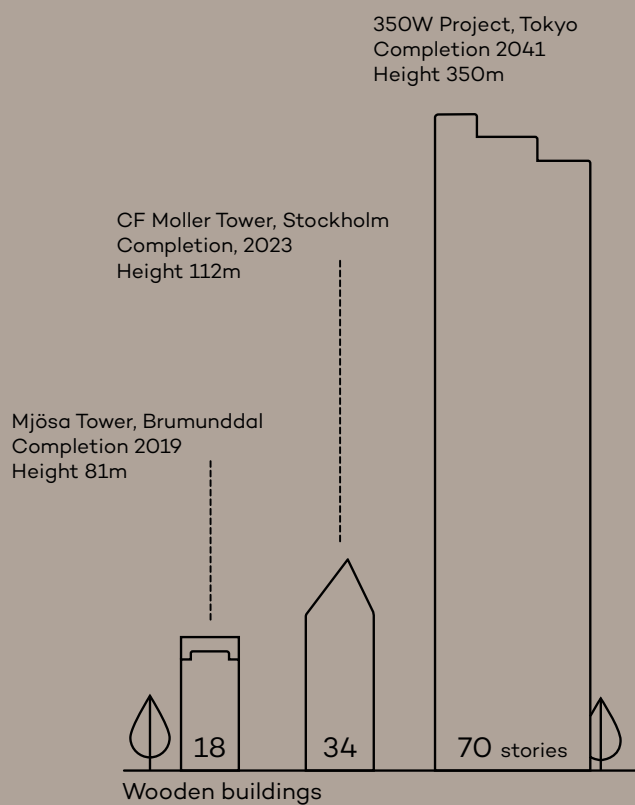
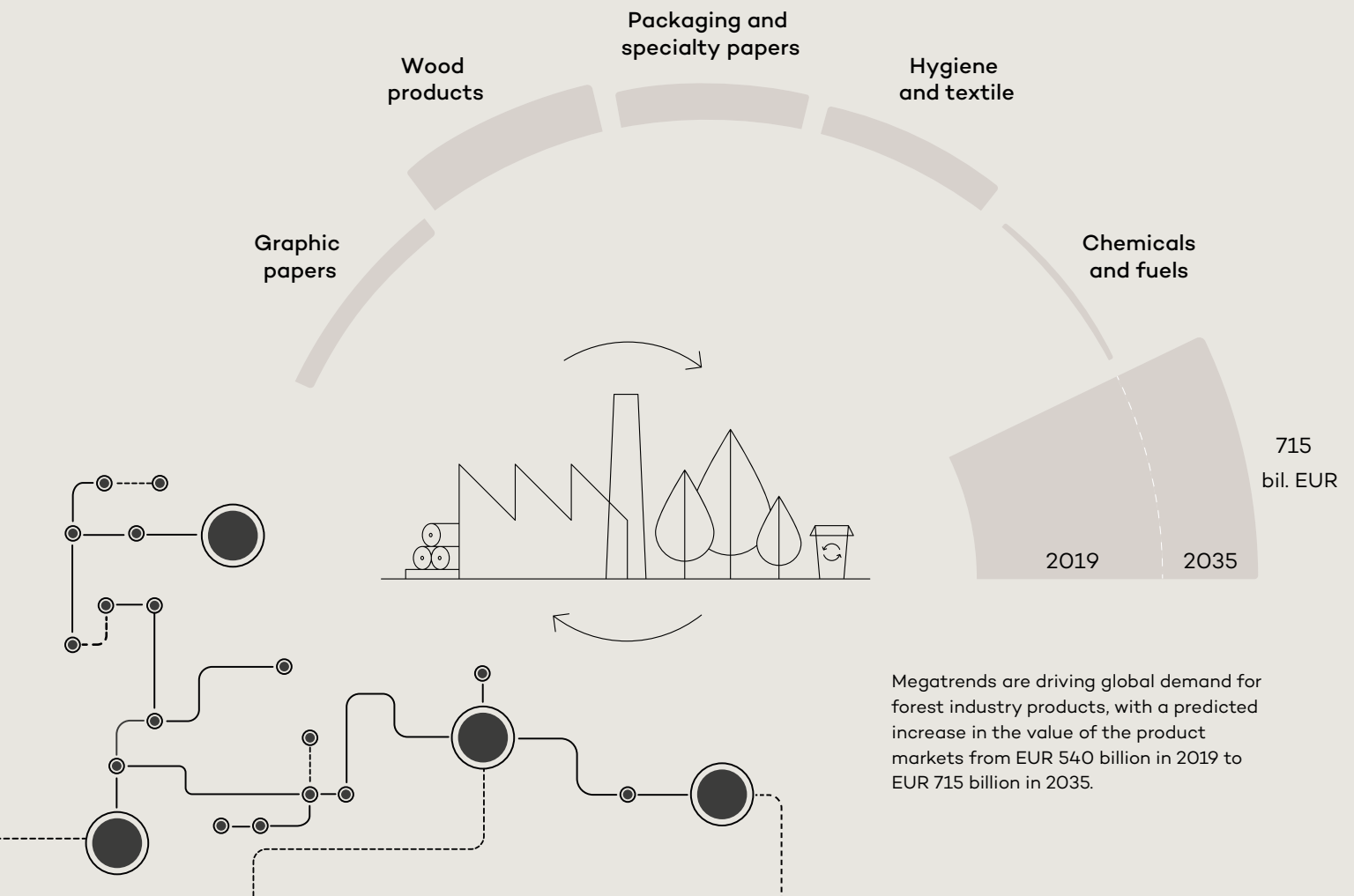
Smart Forestry concept



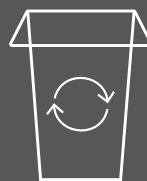
# How can digitalisation accelerate the sustainable transition?

Digital technologies and processes are our most powerful and universal tool for tackling climate change and reducing global emissions. Within the bio-based and circular industries, connected sensors, smart meters, AI and machine learning are driving operational efficiency throughout value chains and thus improving flexibility and quality. Digitalisation is now expected by customers and consumers, as it can significantly improve their experience and enables a data-driven approach for managing business and life.





Recycling  
1 tonne  
paper



=

17 trees

+Oil	1400 l
+Energy	4000 kW
+Water	26.5 m <sup>3</sup>

500

The artificial intelligence (AI) market is estimated to grow by 500% from EUR 36 billion in 2021 to 190 billion in 2025.

# Consumer voice echoes

It will soon be two years that the world has been dealing with the Covid-19 pandemic. We at AFRY launched a global survey of 2,000 consumers to get a pulse on what the recovery and new normal look like across global regions and whether there are differences in consumers' confidence and attitudes.

The first aspect we wanted to explore was consumer confidence on speed of the recovery and at what point consumers felt safe to return to life outside the walls of their homes. All in all, the survey revealed a wide range of confidence levels among the consumers, with some people already back to restaurants, travel and entertainment events, while

others took a more conservative stance and preferred to wait until deep into the next year before returning to the crowds. German and Chinese consumers expressed a more conservative view on returning to restaurants, travel and events than consumers in the US and the UK. On average, global consumers anticipated returning

to restaurants by the end of the year 2021, and traveling and joining events by early 2022. The speed of recovery directly impacts the business outlook for many pulp, paper and packaging companies manufacturing products that are consumed in away-from-home settings, such as playbills, brochures and tickets in entertainment events,





washroom products at airports and restaurants, or paper cups at coffee shops on the way to the office. Some of this demand may never entirely recover as people's habit of going to office buildings and shopping malls like before the pandemic may not fully return.

### No place like home

During the pandemic, people increased their online shopping. A staggering 94% of the surveyed Chinese consumers, living in urban regions, noted that they had increased online shopping during the pandemic. More than 50% of the Chinese consumers expected that they would mostly shop online even after the pandemic. In the UK, Germany and the US less than 30% of the survey participants said they would prefer online shopping to a brick-and-mortar experience even after the pandemic. The expected growth in online shopping is good news for corrugated box manufacturers, heavy duty envelope manufacturers, and other developers of sustainable and cost-effective protective shipping packaging solutions.

In addition to the way we shop, the pandemic also changed how and where we work. Working from home became the norm for many during the pandemic. Based on our survey, more than half of the people in the Western countries plan to continue to work from home at least some days of the week even after the pandemic. Meanwhile, in China, 64% of the respondents expect to return commuting to offices, hence increasing the foot traffic for all the businesses servicing office workers' needs from corner coffee shops to food halls and cafeterias.

### Better choice

Regardless of where we spend our time, whether at home, in the office or enjoying a sporting event, concern over the environment and sustainability are here to stay and increasingly part of the new normal.

Sustainability of packaging material is of primary concern to 90% of consumers in China, 80% of consumers in the UK and Germany, and 70% of consumers in the US. The respondents across all global regions

recognised paper-based packaging as a more sustainable solution than plastic packaging. Furthermore, a vast majority of the respondents noted that they are actively limiting the use of single use plastics. 94% of the Chinese consumers said they were committed to limiting the use of single use plastics, followed by 88% in Germany, 84% in the UK and 78% in the US.

Across the global regions, consumers agree on the importance of products being packaged in recyclable or recycled materials. Access to recycling is one of the key drivers for recycling or at least for the recovery rate of materials. Based on our survey, European consumers claim to have overall better access to recycling than consumers in other regions. However, China appears to have the best access to recycling of paper boxes, to feed its massive recycled fibre-based containerboard manufacturing industry.

### The new normal paves the way

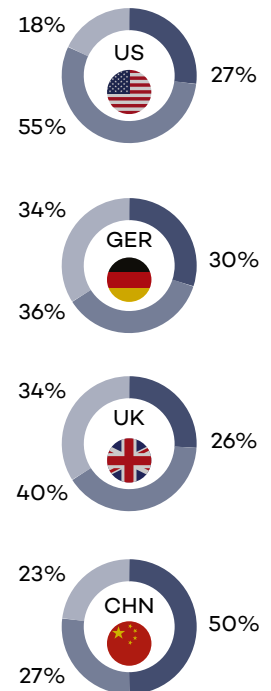
Sustainability is part of the new normal. Fibre-based packaging products have a clear sustainability advantage in consumers' minds over plastics. Together with consumer attitudes, legislation to curb the world's plastic addiction is bound to pave a positive outlook for fibre-based packaging in future. Online shopping is part of the new normal. Containerboard box makers and other producers of protective shipping packaging are expected to benefit from the structural change in people's "click & deliver" purchasing habits.

Foot traffic will return to the office buildings and business hubs. But, most likely at lighter volume than before the pandemic, as a significant portion of the workforce will be participating in hybrid work models, balancing their work and life based partly at the office and partly at home.

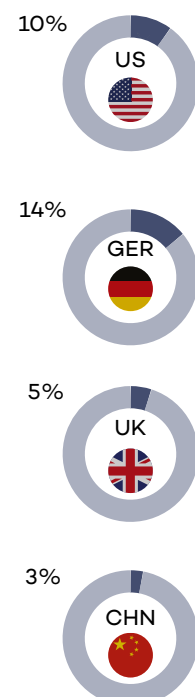
"Change is the only constant in life" (Heraclitus). The Covid-19 pandemic was a catalyst for change in our way of life, health and safety, working, shopping, and interacting with people. New routines will be in place, but we will revive the habits to go to movies, sporting and entertainment events. We will travel for business and pleasure again. 🌐

Which channel do you prefer for your shopping after the pandemic?

- Prefer online
- A mix of online & offline
- Prefer offline



Percent of respondents who do not have any recycling habits



Interview  
CEO Peter Oswald  
Mayr-Melnhof Karton

# The Karton King





Since Peter Oswald took over in 2020 as CEO, the price of Mayr-Melnhof Karton has risen to an all-time high. What does he know that we don't and what does he do differently? Time for us to talk with him.

**Mr. Oswald, since you took over as CEO the MM shares reached an all-time high. How did you manage this coup?**

At our core, we are a family company and I am actually not looking so much at the share price. We think in the long term. As I have a long track record of successful acquisitions, capex, turnarounds and shareholder value creation, several of the MM investors assume that MM will show more growth and some margin expansion to go forward.

**Is your growth strategy also part of the secret? MM has just recently completed the acquisition of two new businesses in Poland and Finland.**

Shareholders appreciate that the acquisitions of the plants in Kwidzyn and Kotkamills have an excellent fit with our strategy and were executed at reasonable valuations. Both Kotkamills and Kwidzyn, but especially Kwidzyn, will provide MM with a platform for growth for the next decade. With these acquisitions, MM has strengthened its leading position in cartonboard in Europe and has extended its portfolio into interesting new businesses, such as kraft and uncoated fine paper. In addition, both acquisitions provide a number of growth options, whereby the growth potential of Kwidzyn is more long-term and bigger overall.

**Wood as resource and raw material is growing in popularity – how does this impact your business environment?**

Austria has a long tradition in the wood industry. Almost half of the country is covered with forest. And the forests, contrary to what a lot of people think, are increasing year after year even though trees are cut down. This is a good example of sustainable forestry, as is the case throughout Europe. The popularity of wood overall is positive and it makes sense ecologically. By acquiring Kwidzyn and Kotkamills, MM now has a well balanced portfolio between virgin and recycled fibre. This provides us with more stability: it reduces our dependency on the more volatile prices of the recycled paper market and it spreads our wood supply geographically.

**In the current packaging discussion, you state that MM wants to offer new opportunities for the substitution of plastics through innovative and competitive solutions made of cartonboard and paper. What do these solutions look like?**

We are all familiar with the situation that plastic waste is globally growing to incredible proportions worldwide, knowing that each tonne that is not recycled stays with us for hundreds of years. For this reason, it is very important to do our best to recycle as much plastic as possible.

However, as we all know, this is very difficult. So the real solution is only to reduce plastic or at least to slow the growth of plastic. And here paper and cartonboard have an important role to play. In fact there are many opportunities to replace plastic with more sustainable cartonboard such as in the product packaging of consumer electronics, for example, or in the packaging of fresh food or bottles and cans. If barrier properties are required, innovative barrier solutions involving cartonboard come into play. MM has been very innovative with barrier coating against mineral oil migration (Foodboard) and grease. The acquisition of Kotkamills has added barrier solutions for cupstock to our portfolio. Jointly, we are working on a reduction of water vapour transmission. It is our ambition to become the leader in barrier solutions.

In this respect, it is unfortunate that the SUPD (Single Use Plastic Directive) has defined plastic too widely: the important question is not whether there is a polymer or not, but whether the product is water soluble or not. This wide definition is very unhelpful in the fight against plastic waste. Also, whilst the European Union has implemented a tax on plastics, many governments still pay it out of their general budget instead of passing it on to polymer producers. As a consequence, it does not have the steering effect it should have.

**The seriousness of the sustainability goals that MM set itself is also illustrated by the fact that you are measured by your adherence to them. Was this move a paradigm shift for your company?**

On the one hand, it has to be said that MM has always been strongly rooted in sustainability, let's say in a broader sense especially in terms of environmental and social aspects. On the other hand, since I became CEO, we have gathered an understanding of sustainability that's more strongly based on a scientific and more transparent basis. At MM, we have moved sustainability to the core of our strategy. MM's major contribution to a more sustainable planet Earth and to an effective circular economy will be plastic substitution. In addition, we are committed to climate change mitigation by reducing our absolute CO<sub>2</sub> emissions.

**Digitalisation is considered the holy grail on the road to greater sustainability and profitability. What role does it play at MM and how do you implement new digital solutions?**

With regard to the digitalisation of the supply chain, MM is a digital pioneer in the cartonboard industry.

With MMK Digital, we have developed a platform that makes it possible for the first time to map all business processes online – from production previews, to product selection and booking, to call-offs from stock and delivery tracking including GPS tracking – and to carry them out within seconds. MMK Digital is an industry leading digital interface with best-in-class customer experience, which was awarded with the Digitalisation Award from PPI in 2020. In the next stage of development, the platform will

include more and more AI. Another current project in this regard deals with the digitalisation of our sourcing.

As far as the digitalisation of our production and our mill operations is concerned, we are just at the beginning of a long and exciting journey, which will ultimately bring us closer to reaching our financial and sustainability goals. ☺





# World Fibre Outlook up to 2035

AFRY's World Fibre Outlook up to 2035 provides an in-depth analysis and long-term forecasts of major economic and market trends affecting the demand, supply and pricing of papermaking fibre and specialty pulps in all key regions of the world, this time with online access and result visualisation.



Global fibre resources



Driving forces for the global pulp and recovered paper businesses



Papermaking fibre industry and markets by grade



Specialty pulp industry and markets including fluff pulp and textile fibres



Other key topics including pricing and quality implications

NEW

Digital platform for data download and visualisation

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## AFRY Smart

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# China in your hand

## Structural change accelerating in the China paper industry

In the past 20 years, China's paper industry has experienced a rapid development. Nearly 100% of the net growth of global paper and board demand was attributed to China, mainly in the packaging and tissue sectors.



The sudden outbreak of the global Covid-19 pandemic put a pause to the global economy, negatively impacting pulp and paper industry development – with depressed consumption and production, disrupted supply chain and sea freight. However, in China, with robust and effective control of the virus, industrial production resumed swiftly after a short period of suspension in early 2020 and the country achieved positive economic growth. The Chinese paper industry was less impacted by the pandemic with demand increasing by 2%, reaching 111 million tonnes. The pandemic has caused many changes in Chinese daily life and work culture and led to new business models, some of which will have a lasting impact.

Besides the pandemic, other factors are also driving the reform and upgrading the Chinese paper industry at the onset of the forthcoming 14<sup>th</sup> five-year period and beyond.

#### **PfR ban**

China's PfR (Paper for Recycling) import policy has led to a fibre shortage for paper production and resulted in market turbulence. In response to the new market environment, some leading paper companies have accelerated the deployment of overseas recycled pulp and virgin pulp to ensure stable fibre supply. This hunger for fibre is evident in growth of recycled pulp. Meanwhile, Chinese paper companies are actively investing in new paper lines overseas to serve the local markets and increase exports to China. An expansion of the strategic cooperation between Chinese and overseas companies is also observed.

China's PfR ban has definitely changed the global trade flow – PfR which used to be sent to China has gradually flooded South East Asia to meet the increasing needs of recycled pulp and paper production. Major exporters of PfR have also tightened their exports to a certain extent to meet local demand growth.

In addition, Chinese paper companies have increased investment in domestic virgin pulp, which has added up a total of 20 million tonnes in planned capacity.

This would add significant pressure on global wood market considering China's heavy dependency on offshore wood supply.

#### **Plastic ban**

The revised plastic ban in China has brought new opportunities for sustainable packaging and promoted the market growth for fibre-based products. AFRY estimates that by 2030, Chinese demand for paper and paperboard will increase by 20 million tonnes. Currently, the Top Ten producers have a 38% market share in terms of capacity, increased from 28% in 2011. With the elimination of less competitive capacity, the concentration of China's paper industry will be further improved.

As an alternative to fill the fibre gap, the imports of paper and paperboard increased significantly, and China became a net importer in 2018. As the Chinese fibre market reaches new balance and production resumes, China may gradually cut imports and expand exports to ensure the full utilisation of the installed capacity, once again becoming a net exporter.

#### **Guidance on sustainable and low-carbon development**

Power outages and related topics have recently been hot search terms on social media in China, since as many as 20 provinces are suffering from power shortages, leaving businesses and ordinary residents impacted by power rationing. The power curbs have been enacted in response to Chinese provinces failing to meet energy emission goals. Like many nations around the world, China aims to reduce carbon emissions to combat climate change.

Of course, short supply of coal and its soaring price has also impacted the electricity generation, which has led to a wider power gap considering the increasing demand driven by the robust recovery of China's manufacturing industry. Such large-scale halts in industrial production have added some uncertainties and risks on capacity expansion and may also accelerate the closure of the outdated capacity.

As for the paper industry, alternating paper machine downtime plans were announced by many producers such as Nine Dragons, Lee & Man, APP, Chenming, Oji and others in response to the mandated energy-saving measures issued by provincial governments. Other sectors including packaging, chemicals, textile, steel industries etc. have also been impacted. These activities may be short-term and temporary countermeasures, and in the long run, China will speed up industrial upgrades to support low-carbon industries through promoting green technologies and making more of an effort on energy management and introducing effective measures and policies to meet the commitment to 'carbon peak' by 2030 and 'carbon neutrality' by 2060.

#### **Upgrades in sight**

The energy-intensive paper industry must in the future shift to high-quality development through technological upgrading, production and operation optimisation to reduce carbon emissions. Renewable energy and CHP will also play a key role. Leading paper producers in China have also included "carbon footprint reduction" as one of their strategic development targets and are working diligently toward this direction by using clean energy, developing bioenergy, digitalisation transformation and adjusting fibre mix, for example.

In addition, a series of recently issued environmental policies would steer and drive the packaging industry towards sustainable solutions to reduce waste, which is probably to have both positive and negative impacts on fibre-based packaging.

As the world's biggest paper and board producer and consumer, China's dynamic market and related policies will continue to reshape the development of the global fibre-based industries and trade flows, which breeds both challenges and opportunities for all participants in the value chains. ☺



Jenni Kärkkäinen  
Janne Logrén  
Fanny Henriksson

# Unpacking the myth

Sustainability has become an increasingly hot topic in the packaging industry, partially driven by new EU regulatory frameworks, which set out new requirements for packaging.



### **Sustainable packaging**

Consumers, brand owners, packaging makers and legislators unanimously agree that sustainability is important and that something needs to change. However, it is often relatively unclear to value chain stakeholders, what “sustainable packaging” really is.

Sustainable packaging actions can be categorised into three key efforts: 1) improving circularity, 2) reaching carbon neutrality and 3) eliminating waste leakage into the environment.

### **Circularity focused on recyclability and increasing recycled content**

In response to growing pressure to address sustainability challenges, many brand owners and retailers have made moves to promote circularity and have incorporated 100% recyclable packaging into their sustainability goals. While this is a step in the right direction, actual recycling rates are low.

Only by addressing this next-level challenge, through investment in recycling infrastructure, finding markets and value for recycled materials and educating consumers in sorting practices, can the industry move from ambition to action and the packaging from recyclable to recycled. As an alternative to recycled packaging, types of biodegradable and compostable packaging have been introduced. However, care must be taken to find the correct applications, as this type of packaging can create confusion in the market and dilute the benefits of end-user recycling efforts.

### **Increased awareness of carbon neutrality and collective action**

Fibre-based packaging can have advantages, if originating from sustainably sourced raw materials. At the same time, it is important to factor in the impact of deforestation, energy-intensive manufacturing processes and an overall heavier packaging weight, which can lead to increased end-product logistics emissions. Stakeholders are currently putting effort into reducing the carbon footprint in the parts of the value chain that they can control, however this is just the beginning. Through redesigning the value chain in collaboration with all participants, a lightweight, innovative, net-zero packaging is possible in the future.

### **Stopping the flow of microplastic waste leakage**

In a move to reduce microplastic waste leakage into the environment, EU legislation is driving a reduction of fossil-based materials, which is strongly backed by consumer views. Material reduction has already been trending for a decade and has especially affected secondary packaging usage. These days, the focus has shifted towards light-weighting of materials and redesigning of solutions. Consumers consider fibre-based packaging more eco-friendly due to its recyclability, renewability and compostability. And, although this is true in many cases, it's important to keep sight of those cases where fibre-based packaging can be less than eco-friendly. Even though fibre-based packaging producers have found a sweet spot for now, development of highly functional barrier solutions will be necessary to make fibre-based packaging truly fit-for-purpose, for example in food packaging.

### **Covering all the bases**

Achieving true sustainable packaging performance relies on optimally protecting the product inside the packaging as well as prioritisation of the three sustainability aspects. Ideally, the three key elements – circularity, carbon neutrality and zero waste leakage – can be achieved simultaneously. As this is often not possible, current reality is that one often ends up being prioritised over the others. Through a crystal clear understanding of the requirements and priorities along the whole packaging value chain, future success is in sight.

### **To be or not to be?**

Let us consider “truly sustainable” packaging through two topical cases:

Case 1: Can e-commerce packaging market growth continue at the expense of circularity?

E-commerce is predicted to continue to increase, which poses an important challenge, even if fully recyclable corrugated boxes are the primary packaging format used. Circularity relies on packaging materials staying within the raw material supply loop, which was easier when the bulk of used containers could be

collected from traditional sales outlets. Through the diffusing nature of e-commerce, there is no longer the same consolidated pool of used raw materials. There are further factors to overcome related to e-commerce, in addition to the setback in circularity. Products require individual transit packaging for shipping and are delivered one-by-one to consumers, who return a large share of products received. How can the packaging industry prepare itself to respond to future increased sustainability requirements for e-commerce?

### **Case 2: Moulded fibre –**

A sustainable challenger for traditional packaging materials?

Food service packaging items easily end up as litter in the environment. The EU's newly introduced single-use plastic directive aims to tackle this issue by banning or reducing consumption of certain packaging types, such as straws, EPS containers, cups and plates. While polymer coated fibre-based products fall under the directive as well, moulded fibre products might avoid this, thanks to barrier properties typically achieved without surface coating. Moulded fibre currently represents only a minor share of today's packaging market, however interest has been growing rapidly. State-of-the-art moulded fibre comes at a competitive cost level, even compared to traditional plastic products. The catch is that moulded fibre contains synthetic polymers as well, just added in a different production phase.

### **Wrapping it up**

Amidst a wide array of improved-but-not-perfect packaging solutions, the packaging industry is racing to find new solutions that come closer to enabling the recyclability and recycling that are fundamental to circularity. Real and sustainable progress demands change and the whole value chain must be re-evaluated, as it is clear that improving one sustainability parameter at the expense of others is not the answer. The answer can only be a future where sales are generated through packaging that is not simply perceived as sustainable, but that is truly sustainable. ☺





# A circular future

AFRY has worked across the waste sector for several decades. In recent years, the growth in the market has escalated. There has not been a more exciting or determined time within the industry for turning waste into value. The key to achieving sustained waste to resource management has been the public interface and interaction connection, which through a single programme, BBC's Blue Planet II, highlighting the waste issue has led to 88% of those watching, changing their behaviour as a result. With this universal support from the public, industry and policy makers, significant progress and shifts in consumption models are leading to a rapid modernisation of previously embedded practices.

## **Re-defining success**

Waste is defined as a material or substance that is discarded for no longer being useful or required after the completion of a process. Therefore, the more processes are successfully completed, the more waste is potentially generated. This is a linear and generally flawed process, making us, on a global scale, the victims of our own success. This is why the Circular Economy principles are the catalyst for re-defining a successful process, with the use of previously defined 'waste' as a 'resource', as it is still required to allow for a continually extended life cycle of the given resource. Facilitating the 're-definition' is how resource and waste management consultants will implement positive change and growth.

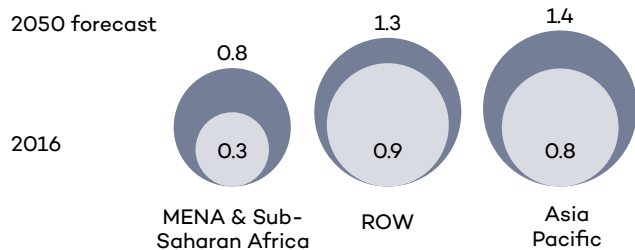
## **A maturing waste market**

The current global waste market size is valued at approximately 2,000 billion dollars per annum and is expected to reach 2,340 billion dollars per annum by 2027 (a 17% increase). A combination of policy changes intended to meet sustainability targets introducing improved collection and treatment is fuelling this increased market. This is strengthened further by a rapid and intense urbanisation of populations, as throughout the world in 2012, urban populations produced 1.3 billion tonnes of municipal solid waste (MSW), and is anticipated to reach 2.2 billion tonnes by 2025 (a ~70% increase) placing greater pressure on disposal services. However, this continuing development of the waste market includes industrial waste along with MSW through the increased industrialisation in strongly growing economies such as India and China. As the economic structures of these countries develop, the amount of associated waste will overshadow individual prosperity, for at present, people living in India produce 0.34 kg of waste per day, whereas a typical American produces 2.58 kg of waste per day. Whilst Sub-Saharan Africa does not reach the same levels of overall waste quantity as Asia Pacific (which is projected to double by 2050), it is expected to more than triple current levels of waste streams. This tripling of waste output has



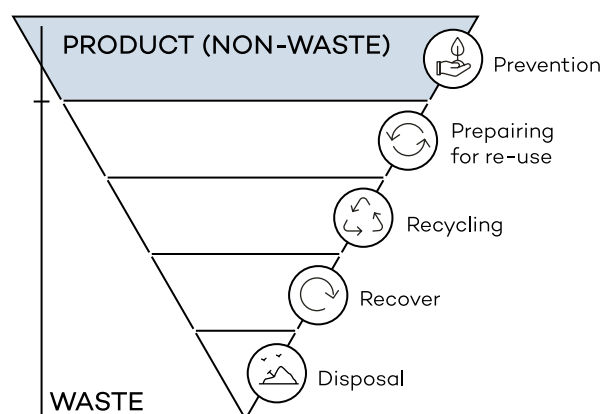
an even greater impact in the context of limited waste management infrastructure, typically having the highest impact amongst vulnerable communities.

Throwaway world – Regional waste generation – Billion tonnes



### Environmental policies – a double-edged sword

As mentioned, environmental policies play a significant role in driving long and sustained improvement in general waste management practices. Within the EU, acceleration of environmental targets and greater government and public support for these targets has made successful movement up the waste hierarchy more readily achievable.



However, there is another side to these changes, in 2017 China's 'Operation National Sword' policy initiative provided a standpoint to limit and more stringently review recyclable waste imports. Replacing waste exports to China, led to the following changes:

- Improved the quality of renewables
- Banned certain items
- Reduced volume licences

These combined changes provided the conditions for a more stable and controlled input of materials which has prompted higher overall quality of resource outputs from existing infrastructure and laid the foundations for further sustained growth domestically and on the international market. Consequently, further South East Asian countries are considering the application of similar policies. Hence, the waste industry will need to adapt to forthcoming significant supply chain amendments and a new focus towards responsible disposal and extended duty of care for all materials on an international level.

### Data driven solutions & digitalisation

One of the biggest changes to the waste market has been the digitalisation of previously analogue systems, which has been powered by use of waste data such as smart waste collection systems, radio-frequency identification (RFID) and smart bin sensor designs leading to the improved collection and quality. Yet key to understanding the data are the metrics behind waste, especially as waste material is driven higher up the hierarchy. As the ultimate goal for resource and waste management is the 'prevention' of waste, there have to be robust and confident metrics to quantify the material that has never existed for customers or consumers. At this point, carbon comparisons or expressing waste in monetary value are becoming ever more valuable tools in defining environmental performance, resulting in identifying new channels for waste minimisation and value creation from waste.

### Resource and waste management post-Covid

The market is currently in a process of adapting to an environment of post-Covid waste management, returning to a similar form prior to the significant challenges that were posed to the waste management sector, for healthcare type waste and single-use plastics. As temporary relaxation on use of single use plastics will have altered previous consumer behaviour, renewed initiatives for social responsibility, corporate action, and government policy will increase in frequency to return to previous long-term circular economy targets. This means a requirement for innovation in existing products and technologies to achieve sustainability whilst building additional capacity for future challenges.

### What does the new normal mean for circular economy?

The following are the key highlights anticipated for the future of resource & waste management:

Development of more sustainable waste management

Increasing environmental awareness

Waste management adaptation to rising population, rapid industrialisation and urbanisation

Growing adoption of advanced waste collection and treatment solutions

We are constantly expanding our work in these dynamic fields and bringing together the diverse resource and waste management skill sets within AFRY. If you have any questions please reach out to us. 📧

# Bubbling innovations

Accelerating bio-based innovations in the chemical industry  
by developing business plans that deliver on the promise.



A strong pipeline of bio-based innovations is emerging, driven by increased consumer and corporate interest in sustainability, circular economy and carbon neutrality. Public and private sector investment in research and development for bio-based products is bearing fruit with product launches across sectors, including home and personal care, food, buildings and apparel.

Advancement of industrial biotechnology and green catalysis have been one of the cornerstones for growth. Industrial biotechnology harnesses nature, employing biology for the production and processing of everyday chemicals, materials, and energy. The use of microbes instead of chemical processes to produce ingredients for everyday consumer goods is an excellent example. It has benefitted from advances in computing power and machine learning and the decreasing cost of DNA sequencing. Industrial biotechnology is already used in the production of biofuels, but it may also be used to produce novel chemicals and materials that can not be accessed by conventional chemical processes.

Leading brand owners are delivering an important message on the need for renewable carbon in a circular, carbon neutral economy and sustainable, bio-based innovations are there to respond to this need. In the light of this enthusiasm, it is important to remember that there have also been some high-profile failures on the market and to consider the critical factors for success.

### **Know the market**

Each product has a unique market and business environment. Some markets have overcapacity, others a strong demand, and in some markets large existing players leave very little room for new entrants. Identifying potential applications and understanding the market, business and regulatory environment for each application is essential. Specialty chemical value chains have limited transparency, which highlights the importance of first-hand experience of the industry. Thorough market

analysis at an early stage steers research in the right direction and helps to turn an opportunity into a feasible business case.

### **Verify the value proposition**

Some novel chemicals and materials are already cost competitive with the incumbent, mature technology, or commercially available products, while others are unlikely to ever reach parity. In either case it is essential to understand what attributes add value to the end-user. This may include improved performance; new functionalities such as biodegradation; and sustainability attributes such as cruelty free and GHG emission savings. It is critical to validate the value proposition with each stage of the supply chain and the end-user. This may take time, but ultimately builds a better sales plan. All communications should be transparent and supported with quantified claims.

### **Find the right technology and business model**

Bio-based innovations can be realised via inhouse process development, technology licensing, open innovation, contract manufacturing, and in many cases a combination of these business models. Different degrees of horizontal and vertical integration may be adopted. Some producers are focused on the supply, whereas others have built strong brands and/or are working closely with existing brand owners. More and more companies are redefining their innovation strategies to accelerate stage-gate processes and to develop core, adjacent and transformational innovations in line with company's overall targets, unique strengths and capabilities. It is crucial to benchmark not only the technology but also the business model to ensure that the business plan has the greatest likelihood of success.

### **Build the right partnerships**

Partners may share development costs, speed up market entry or provide bankable off-take

agreements, but they can also be a major constraint, limiting business opportunities and restricting future revenue streams. In the end, many large brand owners have little risk in committing to conditional off-take agreements with carefully defined technical and commercial milestones. However, the length and complexity of commercial negotiations is often underestimated in project implementation plans. Developing a balanced partnership portfolio can go a long way in limiting exposure to market risks.

### **Secure cash flow**

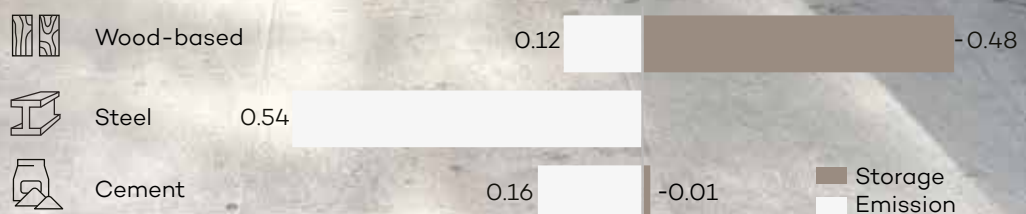
New process and application development takes time and sufficient cash flow is key. Before implementing a 10-year strategy, the business must be able to survive the next few years. Well aligned growth stage funds and strategic investors can help to support scale-up, but it is also advisable to prepare for lower capacity utilisation rate in the first few years of operation. Quality control, and particularly side-stream utilisation, can only be fully validated once the first-of-a-kind commercial production is in operation. There are warning examples in the industry where the cost of rebuilds have far exceeded the initial capital investment.

We at AFRY Management Consulting are proud to have supported our industrial clients at all stages of the bio-based innovation process, from idea generation and screening to implementation and launch, to develop business cases that deliver on the promise. Our unique combination of management consulting and engineering capabilities have enabled us to carry out a wide range of transactions on first-of-a-kind technologies and biomaterial businesses with solid track record and appreciation from the finance community. ☺

# Concrete alternatives

Sustainable products in construction

Building materials' carbon emission and storage capacity (t carbon/t)



Three things are indisputable in Europe's transforming construction sector: Construction is becoming more digital, more integrated and will use greener materials. Nordic and Central European countries have traditionally been strong in wood construction compared to the continent's average. On the other hand, countries such as Great Britain, France and Germany undergo demographic changes and suffer from increasing constructions costs. In September 2020, when EU President Ursula von der Leyen addressed the construction sector for its potential to turn "from a carbon source into a carbon sink" using biogenic building materials, the expectations for a "wood-based post-Covid recovery" were set high. Now, a year later, has the construction market met the expectations?

### The post-Covid recovery

The Central European construction industry is in a good position. It is one of the sectors of economy that suffered least from the pandemic. Following the national management policies, new housing construction in the UK fell by more than 25% in 2020, while in France the drop was only 12%. The German construction sector only fell by less than 1%. In 2021, a corresponding recovery has been observed in all three countries.

The use of sustainable products in the construction sector is no longer a niche, but has become a serious alternative to concrete, steel, and petrochemical polymers.

Wood-based construction accounts for 5% globally (11% in the EU) and shows positive trends towards substituting conventional materials. The wood construction quota has been increasing constantly in the three major European economies, independent of crises and raw material availability. The use of wood and wood products in construction differs due to the national industry structures, building codes and culture. While in France, the wood construction share of new residential construction has risen sharply to 10% and continues its path, Germany's quota has been growing in small but steady steps and reached 21% lately. The front-runner is the UK, where over 50% of all newly built houses are wood-based, driven by the popularity of timber framing.

### Increasing demand for sustainable products

The total demand for wood products in the European construction sector in 2019 accounted for more than 115 million m<sup>3</sup>, of which 65% were used in Western Europe. The champions in volume are innovative sawn wood-based products, such as solid structural timber and cross laminated timber. The demand outlook is not only positive for sawn wood: More than 80% of oriented strand boards (OSB) and 50% of plywood is used in construction in the UK. In France some plywood goes to other end-uses, while OSB is mainly used in construction. German construction use accounts for around 70% of the OSB and plywood demand.

Although engineered wood and wood-based panels still represent small market shares, they make up ground

substituting concrete and steel. Development of incentives in building codes offer upside potential for multi-storey and modular building methods in which high material volumes are consumed.

### Wood-based outperforms rivals for climate

The construction industry already accounts for 35% of global CO<sub>2</sub> emissions and demographic trends underline the urgency to reduce its contribution to climate change. Following the urban population growth, 75% of the building infrastructure needed by 2050 must still be built.

Traditional building materials carry fossil emissions as an outcome of their raw material base and production processes, yet, they store only negligible amounts of carbon.

In contrast, every cubic meter of wood used as a substitute for another building material reduces emissions into the atmosphere through four mechanisms.

- The longevity of wood increases and transfers the carbon sink from forests to the built environment.
- The potential to substitute conventional building materials reduces emissions from fossil sources in steel and cement production.
- Wood processing generates residues usable in other bio-based production processes or in biomass-based energy generation. Additionally end-of-life waste wood may be utilised for energy generation replacing fossil-based energy. The calorific value of spruce is half of that of fuel oil.
- In the long run, transferring wood to long-lasting products fosters the carbon sequestration in managed softwood forests.

### Trends accelerate

The cost structure of the wood processing industry differs notably from that of cement and steel producers. While only 3% of overall costs come from energy in wood industries, energy accounts up to 13% of cement and 20% of steel production costs. In the past, concrete and steel construction resulted in approx. 6% lower costs than a comparable wood construction. With the planned expansion of the 4<sup>th</sup> phase of the EU ETS from 2021-2030 and the introduction of the nEHS, an impact on construction costs per square meter is expected. In Germany, the cost increase due to rising certificate prices is compensated by a relief of the "EEG Umlage" resulting in an expected slight net cost reduction, while energy intense industries will carry a net burden ten times higher than before. Home owners, architects and contractors have become aware of climate-friendly methods and are likely to choose wood in the future, even purely from a cost perspective. Climate change may not be stopped only by building with wood. However, alongside climate-smart solutions in energy, mobility and industry, sustainable wood products in construction are a significant part of the equation and will be in even greater demand in the future. ☺



# Making Future