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# AFRY Insights

Bioindustry

Autumn 2022

## Interviews

Michael Doss – Graphic Packaging International

Riikka Joukio – Kesko

Tom van Aken – Avantium

## Topics

Multifunctional forests

Biodiversity – the next carbon!

Making society circular

# Editorial

Dear reader,

We at AFRY Management Consulting have challenged ourselves with this edition of AFRY Insights. We decided to showcase real life cases where clear steps have been taken to bring our world closer to sustainable business and circular economy. We decided to "show, not tell".

Our AFRY Insights magazine authors, my brilliant colleagues, continuously converse with our esteemed clientele, and have collected stellar examples from the industry showcasing true models of action, behaviour and results.

You may get acquainted with Graphic Packaging International's sustainability and innovation driven growth strategy and hear about the successful path towards becoming a leading provider of sustainable paper-based packaging solutions for a wide variety of products. You may also read how Finnish retailer Kesko has placed sustainability at the core of its strategy and executed it consistently, and has successfully enabled sustainable choices for its customers and driven change throughout the value chain.

One fine day is a time-travel themed article about the systemic change required to realise circularity. We also discuss forest carbon and biodiversity, both of which are on every conscious citizen's and decisionmaker's agenda – again through practical, real-world examples of industry leading operators.

On top of the pandemic, the war in Ukraine started, and activity in the M&A markets that was initially so promising faced new challenges. AFRY has investigated the packaging sector transactions and highlighted some success factors for our readers.

At Avantium, a leading technology company in renewable chemistry, CEO Tom van Aken discussed with us the company's recent pioneering investment project in renewable and circular plastics, and shared advice for players aiming to bring novel materials to the market.

We at AFRY stand proudly by our clients' side by helping them to succeed in delivering more sustainable solutions for the world. Every day. Making future.

Hope you enjoy the read!



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# Multifunctional forests



Multifunctionality is a word which should be considered synonymous with forests. Wood production, carbon sequestration, biodiversity enhancement, recreation and ecosystem services are a few of the widely acknowledged functions that forests can provide and the list is constantly expanding.

Just this year, researchers added another function to the lengthy list of purposes for forests: They have found that forests' biophysical functions move heat and moisture away from the Earth's surface, achieving a cooling – both locally and globally – of at least half a degree, on top of the cooling effect of carbon sequestration. But how do we make sure that we achieve the right balance of these functions to create the best value?

### Quantification

The first logical step would be to quantify the value. Traditional forest valuation is likely to be somewhat familiar to many readers: it's commonly a function of the amount and value of traditional forest products expected to be yielded at harvesting events (thinning or clearfell). Creating a realistic forecast of yields is essential, and relies on both accurate measurement of the current situation and reliable systems for forecasting. Combining LiDAR, drone imagery and remote sensing with analytical techniques such as machine learning is rapidly becoming best-practice, not just in the academic analysis of forests, but also in forest operations. This provides a strong basis for quantification.

How about quantifying the other forest functions? Carbon sequestration is of course the most prominent development at present. Forests are the most affordable and incredibly scalable approach to sequestering atmospheric carbon. Quantifying carbon sequestration can also use modern digital tools to create accurate measures and forecasts.

For other forest functions, such as biodiversity and ecosystem services, quantification remains a challenge, often requiring intensive fieldwork, and remains to a large extent in the academic realm. But given the global interest in these aspects and – more importantly – the financial interest, it surely cannot be long before we see more operationally viable approaches to quantifying these functions.

### Optimisation

Once we understand the values, they should be balanced to provide the maximum value possible through an optimisation process. Timber, carbon and other revenues can be compared with a cashflow analysis based on modelled forest growth and optimised harvesting. A carbon scenario analysis can be applied, for example, to determine the optimal price level for carbon or to assess the impact of different management practices on forest carbon sequestration, all while still considering the impact upon wood flows into traditional forestry value chains.

### Realising value

Quantifying and optimising are only the start of this story, though. The key to ensuring that multifunctional forest benefits are maintained into perpetuity is in realising returns from the forests.

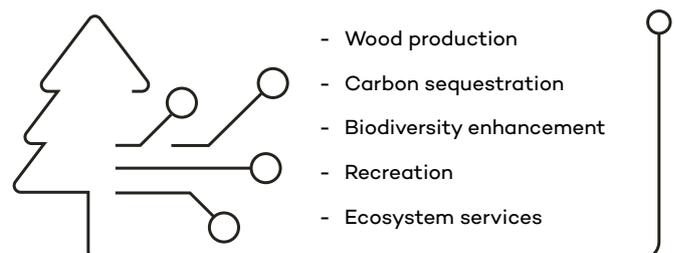
Where traditional forest products may have historically been dominated by the impact of local markets, increasing global demand has seen more and more impact of exports. Models optimising current and future local and global supply-demand balances help us to understand biomass markets more fully and can provide further inputs to enhance the optimisation step in maximising forest value.

When we look at carbon credits and other developing forest functions, they can be considered a truly global market with many consumers looking to platforms such as puro.earth, which represent an inspiring example of the needed system expansion to capture the full potential of forests in climate mitigation. Puro.earth provides CO<sub>2</sub> Removal Certificates (CORCs) that are generated, among others, from wooden building elements that store carbon for a minimum of 50 years. Incentivising the production of long-lasting wood products could lead to more efficient raw-material usage by means of cascading use of wood within the wood-processing industry.

However, when large multinationals like Microsoft publish reports discussing the criteria for high-quality carbon-dioxide removal, it is apparent that there is an increasing awareness of the fact that not all forest carbon has the same value. Carbon prices reflect this with large variability, so understanding what factors impact which carbon-credit value is a must. The added functionality of forest projects is often a factor here, given that we are yet to see widely applied quantification and crediting methodologies for other forest functions such as ecosystem services and biodiversity.

Existing and more general land use approaches, such as natural capital accounting may be another answer to this problem seeking to attribute value to all the functions provided by given land use.

To maintain forests' multifunctionality in the future, we must fully understand the potential value of all their functions and allow them to be optimised and see the value realised. 🌳





# Back to biodiversity

Biological diversity, the variety of life on Earth, plays a critical role for all life. It maintains the functionality of ecosystems and provides ecosystem services to nature and society. Ecosystem services are critical for economic development and human wellbeing. According to the World Economic Forum, over half of the world's GDP is moderately or highly dependent on nature. Biodiversity loss, on the other hand, is a great risk for nature and our society. The World Economic Forum's 2022 Global Risks Report ranks biodiversity loss and ecosystem collapse as one of the top five threats humanity will face in the next ten years.

## Our challenge

We are facing an accelerated rate of biodiversity loss due to direct and indirect human impact. This process disrupts ecosystem services and reduces natural capital. According to The Dasgupta Review, the value of natural capital depleted by nearly 40% per capita between 1992 and 2014 while the global GDP growth was 3.6%/a.

The biodiversity crisis is highly complex and multilayered. Biodiversity involves several levels of data, including spatial information on habitats, but also on species and genetics – all of them interdependent.

Small changes in the system can have large-scale negative impacts. This makes biodiversity challenging to measure and monitor even with high requirements for collecting and analysing appropriate data.

One of the main reasons for the decline is that the monetary value of ecosystem services is not adequately recognised in most decision-making processes, even though the annual benefit of ecosystem services is estimated to be USD 125-140 trillion. Furthermore, unlike climate, biodiversity is not yet similarly regulated by a binding global framework such as the Paris Agreement.

### Close interrelation

Forests are one of the most significant sources of biological diversity. They are home to a major share of animal and plant species in terrestrial ecosystems. Forest ecosystems also co-function with other ecosystems and provide a variety of services.

The richness of forests is their versatility. Forest types vary according to climatic conditions - from tropical forests to boreal forests and from natural forests to managed forests and plantations, all with varying scales of human intervention.

In addition to being a haven for biodiversity, forests provide direct values and benefits to society, ranging from the production of renewable raw materials as well as carbon sequestration and storage to aesthetic and cultural values. Benefitting from many of these values often requires human intervention. Forest management changes the natural development of forests and can thus impact biodiversity either positively or negatively.

The forest industry is among the most nature-dependent business sectors, according to the World Economic Forum and PwC. Without nature, there is no forest industry. Sami Oksa, the director of stakeholder relations at UPM's forest division, finds that biodiversity is crucial for UPM's business. Biodiversity sustains life and increases resilience towards climate change in forests. Biodiversity keeps forests healthy and prevents, for example, insect damage. Biodiverse forests with healthy growth are the key to fighting climate change as well as being a source of sustainably sourced wood to substitute fossil materials.

### Nordic forest sector response

Whenever an industry or sector is highly dependent on nature, it can be expected that biodiversity is at the top of the strategic agenda. Given these dependencies, as well as an increased overall awareness, the forestry sector has been continuously expanding its activities to safeguard biodiversity in forest management and wood sourcing.

An example of this is Finsilva, a major forest company in Finland. According to Finsilva CEO Juha Hakkarainen, biodiversity is a key component of its strategic mission to generate economic, social and ecological wellbeing from natural capital. Many large forest industry companies, such as UPM and Stora Enso, have included biodiversity in their strategic priorities.

Biodiversity related targets have been set and are monitored by a number of businesses. Sami Oksa, says that UPM has set the Net Positive Impact (NPI) for the biodiversity target for its own forests in Finland and Uruguay. In Finland, UPM monitors several elements of biodiversity such as the number of broadleaf trees and protection of valuable habitats.

Smaller companies are supported with industry specific biodiversity programmes. For instance, the Finnish Sawmills Association recently published good practice guidelines to account for biodiversity in wood sourcing for its members, independent sawmills.

Voluntary protection of forest areas with high biodiversity values or increasing the set-aside areas are frequent measures to protect biodiversity. In Finland, this has been greatly supported by government funded voluntary conservation programmes, such as Metso and Helmi.

The measures adopted by the forestry companies in their forest management and wood sourcing operations vary in degree and scale. The most advanced practices in the sector go beyond biodiversity requirements set by legislation, regulation and forest certification. Examples include increasing the share of hardwoods (diversification of species mix), avoidance of biodiversity-rich forest types and key habitats, diversification of age and forest structure, increasing the volume of deadwood with different means, increased rate of prescribed burning, increasing the volume of old trees, biodiversity price premiums for wood (compensation for the forest owner), restoration, biodiversity related guidance and services to third-party owners, planning to increasingly consider the interconnectedness of ecosystems and the transfer of key species to new locations. Sami Oksa tells us:

"UPM has already been working to increase the biodiversity value for over two decades. In this timeframe, we have taken many actions that go beyond regulatory requirements."



"In the beginning, we carried out a valuable habitat and biodiversity survey in the company-owned forests in Finland that formed a basis for our actions. Later on, we set several targets, like doubling the number of broadleaf trees in UPM forests, and collaborated on many projects with stakeholders for biodiversity protection, such as a guide to protect one of our most threatened bird species, the white-backed woodpecker, in commercially managed forests.

"Our actions take place in all UPM owned forests and they are promoted in privately owned forests so we may say that the scale stretches to all our sourcing," reports Sami Oksa.

### The Nordic model

The Nordic forestry model is mainly based on even-aged management in which a tree generation is harvested at the end of the rotation, with a significant one-time impact on the existing nature. In comparison, the Central European model includes selective harvesting in which the frequency of intervention is higher and the area impacted is typically larger.

Consideration of frequency and strength of harvesting operations is increasingly on the agenda of the Nordic forestry sector, principally from the biodiversity but also from the carbon storage perspective. The main objective is to find a fit-for-purpose and site harvesting regime.

Juha Hakkarainen states that Finsilva applies increasingly uneven-aged forestry regimes on peatlands.

According to Hakkarainen, in addition to protecting forest areas on a voluntary basis, Finsilva keeps broadleaved trees in their forests, such as aspen, goat willow, bird cherry, mountain ash and alder. These species are important for biodiversity and will not be harvested. The company also restores wetlands and water streams. In the regeneration phase, more focus is put on mixed-species cultivation of softwood, pine and spruce.

### Road ahead

In recent years, the forest sector has been gradually upscaling its biodiversity efforts, which has led to some improvements. However, the pressure remains and requires further commitments and piloting of new ideas. One such pilot project is the UPM Forest Action programme that takes a holistic view of responsible forest management. One of the responsibility initiatives of the programme aims at improving biodiversity through the effective management of deadwood.

In the absence of a global biodiversity framework, one of the greatest challenges in sustainability management, in general, will be the development and refinement of indicators, metrics and methodologies to measure progress towards the targets that have been set by the companies. As pointed out by Juha Hakkarainen:

"Market values and mechanisms for biodiversity accounting may become highly relevant and need to be tied in with these metrics."

Initiatives such as the Task Force on Nature related Financial Disclosures and the Partnership for Biodiversity accounting Financials will likely play a significant role in this development, as they are being pushed by a lobby of leading global industry representatives and market service providers.

Biodiversity is the next frontier in sustainability management. And as with many frontiers, a lot of investments, experiments and tests are needed to find the right solutions. However, with uncertainty also comes opportunity, and companies who are willing to act now rather than later will stand a great chance to shape the ways out and solutions to one of the greatest environmental crises of our time. 🌿

### Road ahead?

- More pressure from investors
- TFND & SBTN alignment
- Biodiversity accounting (PBAF)
- Sets high requirements for data collection – digitalisation
- Market for forest ecosystem services – to some extent in place in the US
- Forest sector: journey has started but many miles and challenges ahead- in terms of research, good practices and other

TFND: Taskforce on Nature related Financial Disclosures, SBTN: Science Based Targets for Nature, PBAF: Partnership for Biodiversity Accounting Financials

# What's hot, what's not

In late 2021, when memories of lockdowns in Europe were fading and workers started to return to the office, M&A transactions came thick and fast. Postponed deals were resuscitated and many new deals came to the market. Credit markets were active, buoyed up by the continued low interest rate environment, and Private Equity firms had funds which had not been deployed during the pandemic.

Those paper and packaging companies exposed to the more discretionary end-use markets and which had been negatively impacted by the pandemic saw a wave of huge consumer demand and the consequent restocking resulted in companies returning to growth. In this post-pandemic period of optimism, many deals in the packaging sector came to market and were successfully completed; it seemed that a recovery in M&A activity was in full swing.

## **New paradigm**

However, beneath the wave of returning normality, an undercurrent of the long-term economic impact of the pandemic was evident. The outbreak of war in Ukraine served to fully expose the fragility of the economy and has put recovery into doubt; the prospect of a global recession has become a reality.

Towards the end of 2021 inflationary pressures were starting to take hold, such that the debt and equity capital markets became increasingly cautious.

For the period to July 2022, advisory and underwriting fee income at European banks fell 37% on average and US banks suffered a 49% drop for the same period. Global banks took USD 32 billion less in advisory, debt and equity underwriting and syndicated loan income in the first seven months of this year compared with the same period of 2021 as rising interest rates, inflation and the war in Ukraine deterred deal making. According to Refinitiv data, investment banking fees of USD 64 billion through to the end of July this year are 33% lower than they were for the same period in 2021 and were in fact at their lowest level since 2017.

The legacy of high leverage in deals previously done and rising interest costs, coupled with depressed profitability, spells covenant breaches and defaults. Lenders are exercising a high degree of caution such that in the lead up to the European summer break, risk spreads had widened across both corporate and high-yield borrowers to the extent that M&A deals in the market struggled to access financing at almost any cost.

At a time when valuations of companies and transaction multiples are compressing and credit appetite is tight and expensive, we are seeing a significant slowdown in M&A activity. Budgets and forecasts for 2022 and beyond now look optimistic and M&A deals which were preparing to launch post summer are now playing 'wait and see'.

**M&A activity will resume**

Notwithstanding difficult market conditions, history tells us that no matter the circumstances, M&A activity will resume. Acquirers may need to dig deeper and be more selective to ensure that the potential target displays characteristics which will prove resilient during the recession. Due to the diversity of the end-use markets served, the paper and packaging sector covers just about every risk profile that investors could possibly want. We explore here the key drivers of value within the paper and packaging universe to understand which niches of the sector are likely to attract the most interest.

**It is about the ROCE**

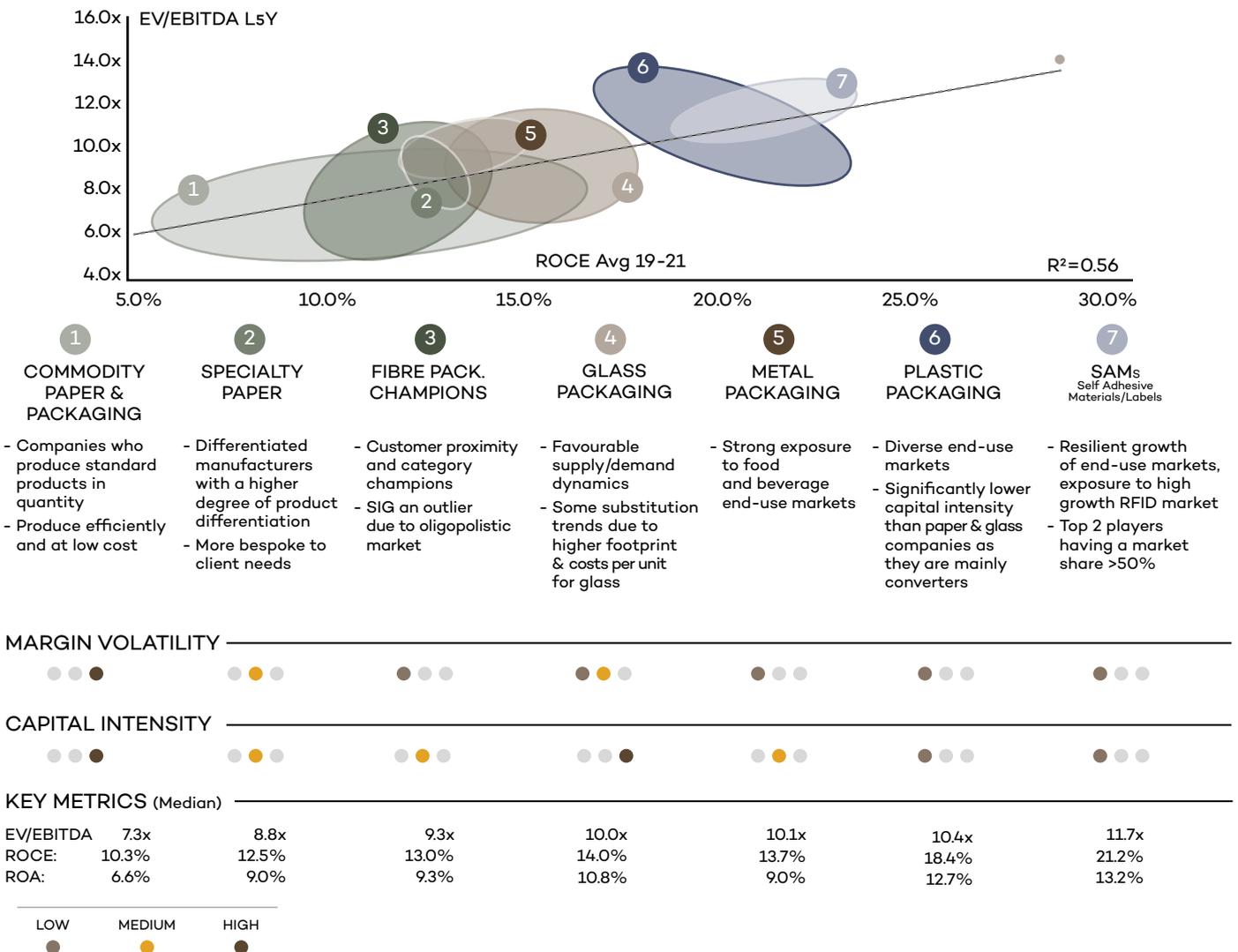
Pre-pandemic, high margin and high growth appeared to be the driving factors for high valuations in the paper and packaging sector. Yet with so much of the

packaging sector linked to resilient yet low-growth markets of food and beverage, acquirers needed to search to find niches with real growth in revenue.

Packaging concepts, which closely follow the convenience, sustainability and digitalisation trends, and which therefore display good growth and healthy margins, appear to consistently attract the highest multiples in the sector. Examples of such concepts include labels with RFID technology, dispensing closures with measured dosing, single-serve, easy-pour, easy-close packaging, game changing recycled packaging and cosmetic packaging; all of these niches have historically attracted high valuation multiples. However, with single serve being replaced by family packs and cosmetics being less relevant it was ironically some of the above areas which were hit the hardest by the pandemic.

It was this anomaly that led AFRY Capital to examine more closely which financial metrics really do drive valuation levels in the paper and packaging sector.

In a broad selection of paper and packaging companies it was surprising to find that there was a weak correlation between revenue growth and valuation, surprisingly the



link between pure profit margin and value was also unconvincing. The most compelling correlation is in fact the return achieved between valuation and return on capital employed (ROCE).

### Underpinning markets matter

The companies that are efficient and can drive good ROCE, attract the higher valuations. This being true, companies with strong ROCE serving resilient end-use markets with a good level of co-dependency between supplier and buyer will be the winners during a recession.

Good examples of resilient demand (rather than high growth) are healthcare and pharmaceutical packaging markets.

Ironically, during COVID, parts of the healthcare market were negatively impacted as healthcare systems around the world were overloaded with the immediate needs of the pandemic. As visits to doctors and elective surgeries were postponed, and fewer medicines were prescribed, packaging related to these medicines temporarily dipped. However, investors have conviction around the long term growth of healthcare assets and continue to be attracted to invest in these healthcare packaging assets and will pay high multiples for acquisitions in this niche. Key attractions being:

- healthcare is resilient
- healthcare packaging requires regulatory sign-off
- self-care and self-treatment are increasing
- the cost of the packaging in relation to the contents is immaterial
- IP drives a higher price and margin in primary applications and dispensing.

### Platform assets

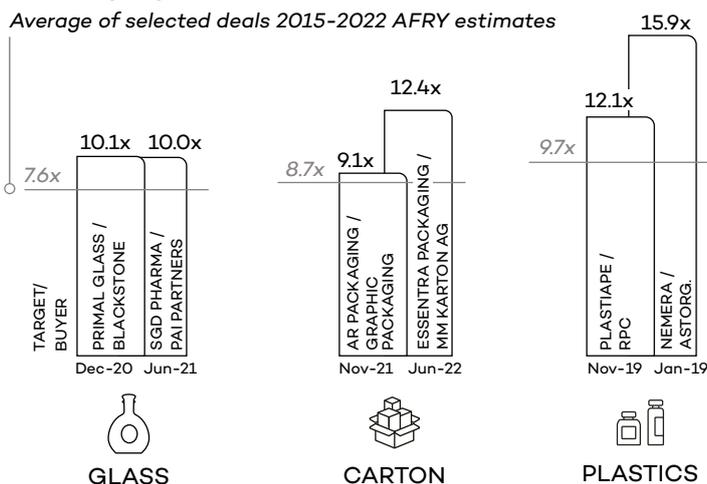
Names of even the very largest packaging companies: Westrock, Amcor or Owens Illinois will not mean anything to laymen and yet they are amongst the largest in what they do. Despite the strong consolidated top end, there are hundreds, even thousands of niche operators covering the specific needs of packaging markets. These companies tend to be leaders in their region and are often owned by families.

Specific niches of packaging such as label and carton board converters and flexible packaging companies continue to be fragmented. Companies in these niches often have lower capital intensity and benefit from a diversified client base. These attractive targets often have strong, long-term relationships with their customer base of smaller clients, which allows higher margins in the business. They bear less risk and will therefore continue to be sought out for acquisitions.

The strategic players in these segments are actively looking to consolidate the market whilst Private Equity companies continue to seek out opportunities to buy mid-sized operators to which they can then add to a string of pearls, achieving synergies as they consolidate the market.

## Packaging deals

Average of selected deals 2015-2022 AFRY estimates



### “Green” packaging

Over the last 5 years, concerns relating to the climate crisis have intensified significantly. Certain materials have become villainised. For a short period of time, anything made out of plastic was off the menu. Companies manufacturing one-way plastic packaging for the food and beverage markets attracted the most scrutiny and have been continuously substituting plastic with other substrates. Indeed, the production of plastic packaging in Europe has been gradually decreasing since 2017. During the first wave of the pandemic, this decrease accelerated – in fact, a decline of almost 230,000 tonnes out of an EU total of 1.45 bn tonnes was observed in the period from April to October 2020.

Investors have, however, come to recognise that plastic has an important role to play in product preservation, shelf-life prolongation and protection. Companies which have made exceptional strides in their ESG profile and approach to recycling e.g., Logoplaste and Faerch, will attract premium multiples. Whilst those companies which have proactively addressed their use of non-recyclable plastics and have increased their quota of recycled content will in our view continue to be “doable”.

### Paper is the stand-out winner

However, it is true that investor appetite for assets in one-way plastic packaging businesses is increasingly difficult to secure. The substrates, which are used to substitute away from plastic have been growing in popularity and of all the substrates which have benefitted from this phenomenon, paper stands out.

Fibre-based packaging companies have demonstrated tremendous resilience during the pandemic, as we saw a short-term blip but an incredibly strong recovery. This was partially due to the very strong momentum in ecommerce and delivery packaging being made primarily out of paper. The plastic to paper (P2P) trend continues way beyond COVID and we see increasing demand for paper based packaging companies from financial sponsors and strategic buyers driving valuations ever higher. ☺

Interview

Michael Doss

President and CEO of Graphic Packaging International

# Change in the carton



When it comes to adapting to inevitable change, Michael Doss is certainly the man to talk to. The President and CEO of the Fortune 500 corporation Graphic Packaging has been with the company for over 30 years. Old-fashioned? Why it is not and how Mike's shaping the challenges posed by a pandemic, digitalisation and the circular economy.

**Mike, you have worked at Graphic Packaging for over 30 years having been President and CEO since 2016, yet, we learned that you have the feeling of having worked for different companies in that time due to the changes at Graphic Packaging, especially due to M&As. What role does change in the business play for you personally?**

My career started almost 32 years ago at a company called James River Corporation and it was a very different industry at that time. I remember walking into our carton plant in Kalamazoo, Michigan. In those days there were nine printing presses running Kellogg's on a number of the presses, including Corn Flakes and Rice Krispies and other brands that I had grown up with.

I was halfway through my MBA and I only wanted some practice interviewing, but I remember just being so taken aback by what they were doing there in this factory that I said to myself, you'd better get your act together here. This is a real company. You may want to work here and get your head in the game. And so the rest is history. They made me an offer and I started in the sales and marketing training programme, from there progressed into operations management, general management, then senior management and finally the role that I am in today.

Along that journey, we went through four major evolutions in terms of acquisitions and different companies that I felt that I had been working for. Every one of those phases was

different from a cultural standpoint and the needs of the business, the people and the customers were different. During such processes, I think that it is important to take the opportunity to figure out what is really core, what are you really good at as a company and what can you change. When I say change, I mean that the company you are merging with or acquiring is probably doing something better than you and that is why you are interested in buying them. If you can identify what that is, it is about working to scale that across the whole corporation. I grew tremendously as a manager in that environment.

**How do you inspire new talent and give them that WOW feeling that you show for your work and the industry?**

It's important to get our message out as an industry. We have such a good story to tell about opportunities for the bio-based economy, forest products and pulp and paper. One of the things I really want to do is work hard to attract younger people who are contemplating a career in our industry.

The best way to do so is by getting them excited about what we do. And I'll tell you something, our employees get excited. They go on vacation and they see the products that they make on the shelves. Or they go into a coffee shop and they see Graphic Packaging on the top of the lid. And they'll shoot pictures of that on their phone and they'll send them to me. I could not be happier about that because, that is really what you want, that ultimate pride in what we make and the role they play as

essential workers. During the pandemic it was very apparent that when you are 40% market share on folding carton in the US, it is important to do your job and get your products to the customers, or people would not eat. That helps our employees understand how important their jobs are and that they play a critical role in the supply chain here in the US, Europe and elsewhere around the world.

We produce fibre-based consumer packaging based on both virgin and recycled raw material. The raw material can be recycle up to 5 to 7 times to make primary packaging, not just recycled into other downstream uses. This is appreciated by our employees and customers alike.

We can take the hydra pulper and skim off all the low-density PE on the surface and then take that fibre and reuse it again in a cereal box, which is just incredibly exciting. To me that is a kind of intersection to the circular economy.

**When it comes to climate change and its impact on the industry, Graphic Packaging has a great sustainability story to tell. Do you see yourself as a pioneer on the road towards a circular economy?**

I do not really know that we are pioneers because the technology has been out there for a while. We need the end-users, i.e., consumers, to really embrace it. I think we have done a good job in getting our message out in building our company to be able to really leverage circular economy from an operating standpoint.

Sourcing certified fibre from sustainably managed forests to go into our virgin mills is very important. We make sure that the logging is done correctly and that we are replanting at a rate that far exceeds what we're actually harvesting. We see this as a crop and a critical raw material for us. It is very important that we do that as an industry globally. And then we turn the virgin material into something like a paper cup or a beer carrier.

We reclaim the used packaging through good curbside recycling and other collection systems and get it back to our mills. Today we collect over one million tonnes a year.

Then it goes back out in a primary package and we start the whole process over again. What we are doing on new product innovation and development is important, as are the big investments we are making to drive meaningful capability development.



Cost efficiency is another important factor, because we have to work the cost side of the equation for the customers, too. Particularly in a world where energy is going to be more expensive, we need to reduce water use, consume less electricity and improve fibre yields. The technologies are out there to enable us to do so.

**Your strategy has been characterised by a strong focus on growth and sustainability. What is your vision for the future and how are you, as the leader, taking the company forward on its road?**

This is the only job I have ever had and it is the only job I ever want to have. Some people move from industry to industry and that is fine for them. For me, this really is something I am passionate about. I really care about it.

One of my frustrations right now, which I am working with our end use customers to improve, is that recycling in the United States is still not where it needs to be. When you look at Europe, the curbside is so much more advanced and statutory in terms of how things are recovered. The waste streams are just a lot cleaner. There is more value in that. When I drive down the road here in Atlanta, I am constantly faced with how we recycle, which is largely by throwing everything in the trash. The single stream is better than nothing, yet it is not enough. We have made more progress with people really understanding that climate change is real. If we can use that as a backdrop to get better drive, even incremental changes, as things won't happen overnight, I am encouraged.

Another thing I am encouraged about is that the bio-based by-products from pulp production are becoming incredibly valuable. Corn cannot be used as a feedstock for many applications anymore because we need to make sure we feed people. In our industry, by managing the virgin mills efficiently, we create a lot of our own electricity by burning our black liquor. By-products such as tall oil and acidulated soap, turpentine and rosin that are used in various other industries are quite valuable to us. We spend a lot of time at Graphic Packaging considering value adding uses for our by-products, which on

one hand lowers our overall cost and on the other hand helps our communities. For example, 100% of the tree is used, including the bark that we are burning instead of purchasing natural gas, which in turn reduces our use of fossil fuels and puts less pressure on natural gas prices. It is about becoming as efficient as possible and that is why we are adding resources at Graphic Packaging to help us think differently. We are working with folks like yourselves to understand which projects will be most impactful in the long term.

**What are the key lessons you have learnt from the progress made in product innovations and how are you planning to take that to the next level as one of the key levers for growth?**

I think the answer is twofold. Our end-use customers are facing a lot of challenges right now, such as inflation; there are troubles not just in packaging, but also in food and transport logistics. This means that our customers need to raise prices, which opens a risk of losing elasticity on their brands and ultimately consumers may be trading down or trading towards store brands.

But they need to do that to offset their inflation, keep their gross margins where they want them to be. At the same time, we support them in increasing visibility on the crowded shelves of grocery stores through our technologies that help advance the sustainability of packaging, as that is an increasingly important factor for the end customers.

Whether it is KeelClip or PaperSeal, or our fully enclosed cartons for beverages that are replacing shrink film in Europe, it is all important because our customers have big goals to reach. By 2030 they want to cut down the amount of carbon they are generating by 40, 50, 60%. We can be part of that solution with the products that we are providing. One of the biggest lessons we have had to learn is to make sure we are focused on a few key platforms where we can really target our resources and make a difference. If you try to do everything that comes down the pike, the result will not be as good as if you kept focus. That is why we have put out 100-200

basis points of growth as part of our Vision 2025 and we have now outperformed that for three years in a row. We have been up 300 basis points and the analysts ask, "Mike, shouldn't you reset the target?" I am like: No, we are outperforming right now. I think it is better to outperform than to put new targets out there and then not hit them. This keeps everybody focused on improving our products and allows our product development team to take what I call moon shots, working on farther out technology that – if it hits – will really be game-changing for our customers.

**What can other industries learn from the (fibre-based) packaging industry in harmonising climate friendliness and business success?**

In the same way that there are opportunities within our by-products, almost every industry has got some things they can take advantage of. The question is how to find them, how to really create a sustainable business model that encapsulates that something that you do and that you can invest in – and to have the courage then to actually make those investments. In our case, I have to give our board a lot of credit for this because, in our industry when you announce a new paper machine no investor gets really excited. They worry that there is going to be too much capacity, exceed budget or it may not work. Those are fair concerns given some of the notable failures that have happened. Yet, if we do not make investments, we will not have a competitive industry that is there to really take the opportunities that our customers need our help with. It has been eye opening for me how many of our end-use customers have said they are glad we made an investment.

**You invested over USD 600 million in a new papermill in Kalamazoo, Michigan. What has been the effect of this investment in terms of digitalisation and sustainable production for Graphic Packaging?**

Right now, we at Graphic Packaging have what I call a hundred years of paper-making technology on display. We have our K3 machine in Kalamazoo, which is a cylinder machine. It is largely valves and

controls and is hand driven by operators who are in their sixties. We have some in their seventies, they just love working there. Then we have our K1 machine that is 30 years old running at 2,000 feet per minute with a curtain coater on it producing high quality product. We have to have a highly professional workforce that knows how to operate the machine with numerous unsupported nips at such a high speed. Should you break one of the webs, a whole paper machine is down. And then we have K2, which is the most modern machine in North America – I think maybe even in the world in terms of how we operate it. Particularly with natural gas prices now being where they are, I would imagine it is probably the lowest cash-cost CRB production line in the world.

We have operators that we hired with really no paper industry experience at all. They learned in the classroom and now we have to train young people who are very savvy digitally. These are kids that grew up playing video games and are very comfortable with technology. Now they are in our control room, making paper and we are spending a lot of time thinking about the digitalisation part of K2, or the gamification. I think it comes back to what we were talking about at the beginning, on how to create attractiveness in the industry to reach the new generations.

The more we can do to create an umbrella of interest and get people excited about what we are doing and have them see that this is a career they can have for 10, 20, 30 years, upon which they can build a life and raise a family, the better. It is so important to have that. ☺





# Merry go round

## Plastic oceans showing the gravity of the problem

Plastic waste is forecast to triple globally by 2060 (i.e. 238 kg/a/person in OECD, 77 kg/a/person in non-OECD countries), with half of it ending up in landfill and only a fifth being recycled, according to an OECD report published in June 2022. This comes as a result of rising population and incomes driving an almost threefold increase in plastics use (from 460 Mt in 2019 to 1,230 Mt in 2060). Two-thirds of the waste will come from short-lived items, e.g. packaging, low-priced products and textiles. Lately, microplastic leakages from, e.g. industrial plastic pellets, textiles and tyres have also drawn attention to a potentially serious problem for ecosystems.

Despite the rise in the share of recycled plastic waste, from 9% in 2019 to 17% in 2060, the increased use of recycled plastics, as well as technological advances and sectoral economic shifts resulting in a 16% decrease in the amount of plastic required to create USD 1 of economic output by 2060, plastic consumption and waste are expected to surge. Moreover, commitments to climate neutrality and the shift away from fossils for geopolitical and environmental reasons put pressure on plastics use. Swift action is needed to control demand, increase

product lifecycles as well as improve recyclability and waste management. In spring 2022, UN member states pledged to negotiate a legally binding agreement by 2024 to end plastic pollution.

## Circular economy driven regulation prefers recycling

Policies to reduce the environmental impact and support the circular use of plastics include taxes, e.g. on plastic packaging, fit-for-purpose eco-design rules, incentives to reuse/repair, targets for recycled content in products and extended producer responsibility (EPR) schemes. Owing to the interaction between the plastics lifecycle, fossil fuels and climate change, actions to reduce GHG emissions could also cut plastic pollution.

In a move away from the linear production model, the EU Single-Use Plastics Directive (SUPD) aims to reduce waste generation in the first place, or exempt some products designed for re-use.

Under the SUPD, plastic drink bottles must contain at least a quarter of recycled material by 2025, and 30% by 2030. As the EU is pushing its circular economy ambitions via waste management legislation and the Single-Use

Plastics Directive, the plastics and chemicals industry is increasingly trying to place chemical recycling methods on the European and global policy agenda.

The European Commission's review of the Packaging and Packaging Waste Directive is to be published on 30 November 2022 as part of the second circular economy package. The revision of the Directive is likely to contain specific minimum recycled content targets for a range of packaging types. Moreover, the proposal will outline a policy framework for bio-based, biodegradable and compostable plastics. The industry lobby Plastics Europe has also called for a 30% recycled content requirement, revolving largely around chemical recycling and an mass balance approach to account for the recycled content. The industry plans to invest EUR 7.2 billion in chemical recycling by 2030.

### Regulations and consumer preferences

Legislation combined with voluntary undertakings by brand owners, not only in the food and beverage but also in the textile industry, has resulted in a steadily growing demand for recycled plastics. Consequently, the trade association UNESDA Soft Drinks Europe and groups representing fruit juice and mineral water firms are pushing for a closed-loop system to prevent food-grade plastic from being downcycled by other sectors looking to boost their green credentials. Other alternatives, such as plastic substitution by fibre-based packaging and reusable alternatives for packaging, exist but plastic recycling will play a role in the years to come.

Increased activism on the part of consumers in ending plastic pollution has very recently taken the form of a lawsuit, as ClientEarth, together, with 13 other environmental organisations, filed their claim against INEOS in July 2022 to appeal the approval of its EUR 3 billion plastics plant project in the Port of Antwerp, Belgium. The idea is to change the modus operandi of the whole plastic industry.

### Availability of sorted plastic waste

In 2020, almost 30 million tonnes of plastic post-consumer waste was collected in Europe with one third sent to recycling facilities. Based on Plastics Europe, the installed recycling capacity in Europe in 2020 was 9.6 million tonnes, which experienced an increase of 1.1 million tonnes the same year, supported by the EU's ambitious recycling targets and brand owner initiatives – particularly in the packaging sector.

However, despite the efforts to increase recycling capacity, the industry has been running at lower capacities citing the reduced availability of sorted plastic waste. Recyclers have been highlighting the gap in the supply of sorted waste and calling for collection practices and infrastructure that can ensure stable feedstock quantities with improved qualities.

### The infrastructure: collection and sorting

In 2020, one quarter of plastic waste was sent to landfills – a significant loss of resources that could be collected and recycled. Municipal waste collection and recycling rates vary greatly between EU member states, from 67% in Germany to 9% in Malta.

Increasing consumer awareness, introducing extended producer responsibility schemes to improve waste management in the region, separate collection schemes for targeted plastic waste streams such as packaging, efficient sorting infrastructure for municipal residual waste and landfill restrictions are some of the proven pathways to address both the difference between member states and to improve the collection and recycling rates where it is already high.

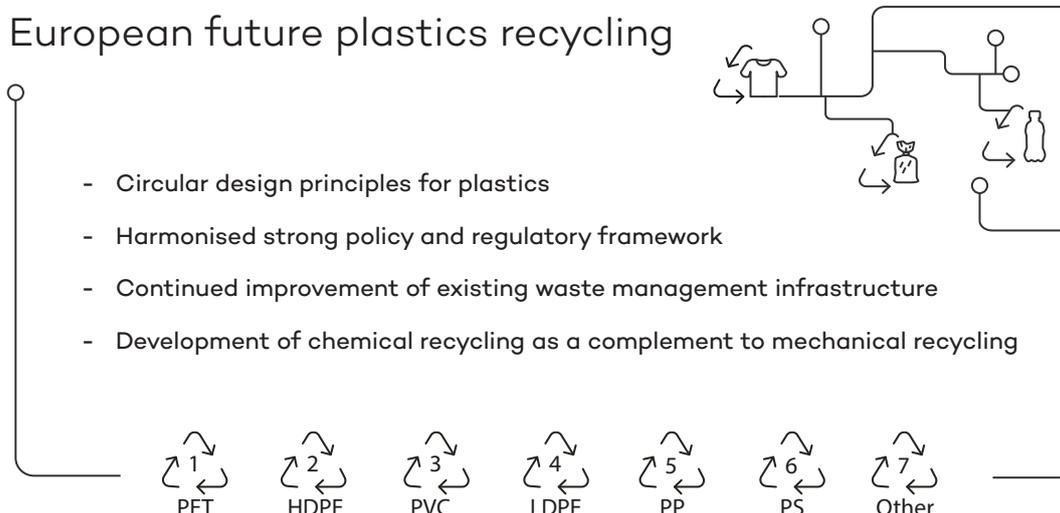
As the output quality depends highly on the quality of the plastic waste, investing in advanced mechanical recycling and sorting technologies and introducing deposit return schemes will aid in increasing the sorting efficiency, produce higher recycling yields with higher quality output material.

### Towards successful circularity

Chemical recycling of plastic waste, where mechanical recycling is not a solution, can be a strong tool to improve both recycling rates and the quality of the output material. In Europe, plastics manufacturers plan billions of euros in investments until 2030 to accelerate the development and deployment of chemical recycling technologies.

Establishing policy frameworks and clear guidelines for a mass balance approach, which is a set of rules for determining the use of recycled content in a final product, are critical matters to be clarified before chemical recycling can become mainstream. 

## European future plastics recycling



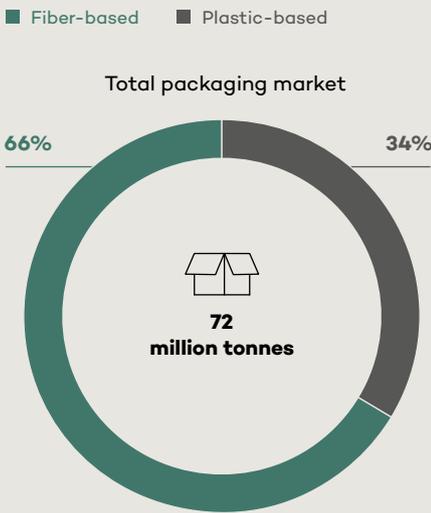
# Advancing to a circular bioeconomy

Circular bioeconomy shows how industry, energy and food production can work together to reduce the use of raw materials, the destruction of biodiversity and eliminate waste and pollution. Human prosperity is dependent on the natural world. Over half of global GDP is moderately or highly dependent on biodiversity, while harmful human activity accounts for a 10% loss of GDP each year. Circular bioeconomy interconnects industries, using renewable and biological resources to produce food, materials and energy by keeping raw materials and products in use as long as possible. To achieve significant change, people across the spectrum - from policymakers to consumers in both public and private sectors - must work together and support the circular approach.

## Bio-based products and production

Biomass materials such as sugar, starch, plant oils, wood and natural fibres offer alternatives to products made entirely from non-renewable resources. They can be used in a wide range of products in construction, packaging, pharmaceuticals and textiles. By turning to reusable, recyclable or biodegradable materials, it is possible to reduce the pressure on raw materials and the waste causing significant harm to our oceans and ecosystems.

### Europe's packaging market by material in 2019



## Process and mechanical engineering

## Food production

Crop production and livestock farming have the largest impact on biodiversity. Food systems use 70% of freshwater and 30% of energy and produce over 25% of greenhouse gas emissions. Nevertheless, over a third of the food produced is wasted, while nearly 1 billion people are suffering from hunger. The circular bioeconomy promotes efficiency and sustainable farming methods to prevent waste and biodiversity loss.

### Distribution of mammals on the earth



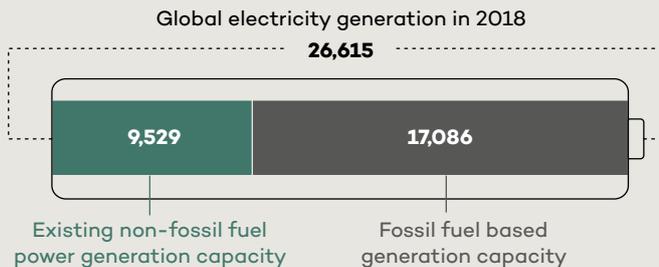
We believe that change happens when people with brave ideas come together. Visit [afry.com](https://afry.com) to

Sources: AFRY, Bio-based Consultancy, European Commission, European Union, Futurum Careers, FAO, GTK, IEA, Mordor Intelligence, OECD, PNAS, Statista, Sitra, World Economic Forum

## Energy system

In the transition to clean energy, multiple zero-emission sources are required, and energy-saving technologies are utilised. Within the cascading system, fossil fuels can be partially replaced by biofuels produced by biomass found in agriculture, forestry and marine ecosystems. However, non-fossil substitute technologies are less efficient, and we need more capacity to phase out nonrenewable energy.

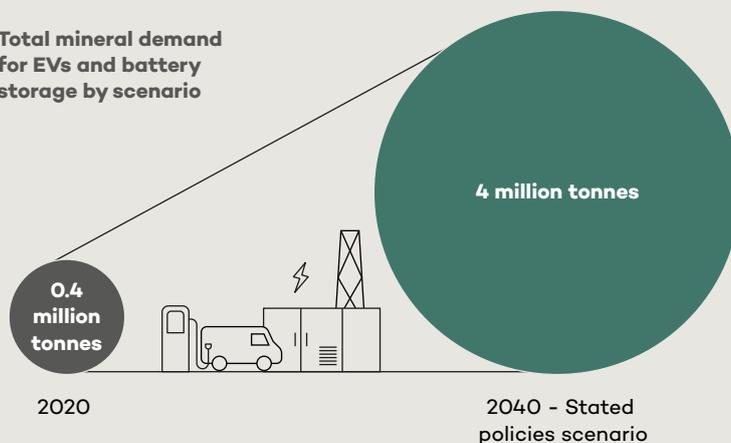
## Additional non-fossil fuel power generation required to phase out fossil fuels in TWh (worldwide)



## Mining and metals

Critical metals and minerals are essential in producing clean energy technologies such as solar panels, wind turbines, transmission networks and e-vehicles. The green solutions require valuable and critical mineral resources, many of which are currently not recycled. Circular bioeconomy has a crucial role in the systemic change in mineral resources exploitation towards sustainability.

## Total mineral demand for EVs and battery storage by scenario



## Material development and product design

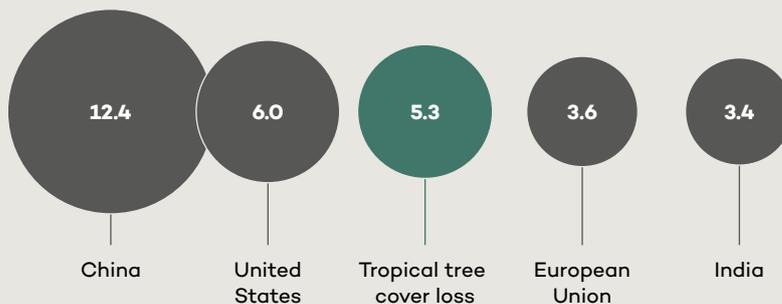
## Policy and legislation Agreement and contracts

## Built environment

## Digitalisation and smart solutions

Digitalisation provides countless benefits to a circular bioeconomy, from sourcing materials and ensuring their level of sustainability to providing access to recycling, reuse and repair services. Integrating biology and automation also speeds up the design-build-test process by promoting the innovation and optimisation of bio-based products. Satellite technology can be used to prevent deforestation and forest degradation and to assess forest carbon stores that are critical to mitigating climate change.

## Estimated annual CO<sub>2</sub> equivalent emissions of selected countries and of tropical deforestation in gigatonnes per year



## Infrastructure construction

# One fine day

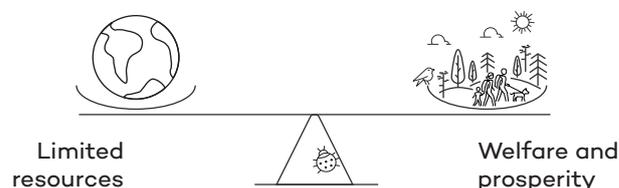


We understood a long time ago, already around the year 2022, that we could not continue the way lived. We woke up. Our current economy is based on the balanced use of the natural resources of the planet. The report Limits to Growth, published by the Club of Rome in 1972, revealed truths that made us think. Yet it took another 50 years for the information to sink in. 50 more years of pursuing an economic model based on overusing natural resources.

## We woke up!

The year 2022 constituted the beginning of carbon neutral circular economy as the 'new normal'. The game was up for linear economy. In hindsight, it is easy to say that we could have done this transition earlier. Nevertheless, the reason we finally understood how serious the situation was may have been unwanted chains of events including extreme heat waves, forest fires, floods and the recurrence of weather warnings all over the world.

## Balance



In many ways, the year 2022 was a watershed between two eras. In addition to the sustainability crisis, we understood how vulnerable our current economy was – with over dependence on imported materials and goods, lack of many raw materials and water shortages. We reached the limit of growth built on ruthlessly exploiting natural resources.

Back in the early 2020s, 90% of biodiversity loss was caused by the use of natural resources, around 40% of CO<sub>2</sub> emissions came from processing materials, and we recycled only around 10% of materials.

Only when we accepted the reality, that the impact of human behaviour, industry activities and urbanisation was affecting the capability of living in some parts of the planet, did we begin to develop a new kind of economy and implement processes and measures in every sector of our society.

One of the most important drivers for the transition towards a carbon neutral circular economy was money. Successful business activities in trade, supply chains and industrial value creation chains were, and still are, a global tool for change in society.

The adoption of business practices based on circular economy solutions opened a wide range of opportunities for companies, for example via industrial symbiosis, eco-industrial parks, product design, improving material efficiency, different maintenance services or circular economy business models, such as selling products as a service. Companies that promoted circular economy solutions tended to improve their financial performance as well.

### Everything rethought

A new day is rising in a coastal city somewhere on planet Earth. The birds are singing at dawn. The fishermen come from the sea and distribute their haul to production facilities, where the catch is utilised 100%.

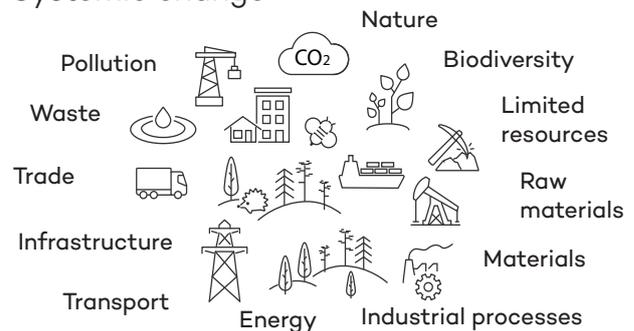
Carbon neutral cargo vessels and passenger ships arrive and leave the port in good order. Materials flow in an automated way. Waiting times at sea no longer exist. Maritime transport as a whole has decreased significantly over the past few years as we have cut down consumption and industrial production has been returned to areas in the local vicinity. The vessels are carbon neutral, and their lifecycle is under control from the beginning to the end – vessels have a long lifespan, maintenance services are in use, recycled materials are used, and materials will be recycled to a new life cycle after the first use. The same procedure applies to all products.

Land transports from the port are mainly carried out by rail. When the harbour was in its construction phase, by-products from a steel mill in the vicinity were used as the raw material for concrete. Global value creation chains have widely adopted circular economy business models. Products and materials as a service are already considered normal business.

Different service platforms are in use around the world. Digitalisation plays a significant role in enabling sustainability, and it is designed to be sustainable itself as well. Data and digital solutions are used wisely – only where necessary and where they are the best or only solution.

Industrial enterprises and plants are located outside the city in eco-industrial parks, where companies can collaborate, buying services and educating employees together, as well as buying and selling industrial residues and creating new kinds of businesses. Smooth and flexible permitting processes have sped up development.

### Systemic change



Agreements, contracts and procurement procedures include sustainability indicators. All the funding and financing is based on sustainability assessments. Natural resources can be used only if the feedstock needed is not available as recycled. If virgin raw materials are used, they must be guaranteed to remain in use beyond the first use.

The smart-city model is based on sustainability in every phase and in each of its parts, including infrastructure. An urban planner has designed the built environment so that car traffic is mainly outside of residential areas. Modular solutions and recycled materials are used in buildings, products and components.

Energy systems are built the same way – recycled materials are used in the infrastructure. There is enough renewable energy produced to meet society's needs. However, at the same time it has been understood that energy is not an inexhaustible resource, because implementation of infrastructure requires valuable natural mineral resources, where demand exceeds supply.

### New knowledge and new skills

The key to successful change was to increase the level of circular economy competence in every sector of society and every part of the industrial value net. In the past, around 2022, an important shift took place when we all found our own roles in the transition towards a sustainable society. Education from primary schools to academia played a significant role. There were dozens of courses where professionals from different fields could learn more about circular economy. We all found out how to rethink and redesign our everyday lives.

The players - private companies, public organisations, the education sector, trade, transport and services - are at the heart of the concrete implementation of change. In addition, enablers such as funding organisations, research institutes and permit authorities play a crucial role in carbon neutral circular economy society.

## Education



Circular economy is a change in mindset and practical actions. Its implementation requires, in addition to education, new business models, policy instruments, data, indicators and new kinds of management.

When the school bell rings and the children's school day ends, the parents' turn starts. Continuous learning is part of our everyday life. Looking back, we can only wonder about the old habits when it was normal to use energy and raw materials endlessly as if there were no limits.

### We all have a role

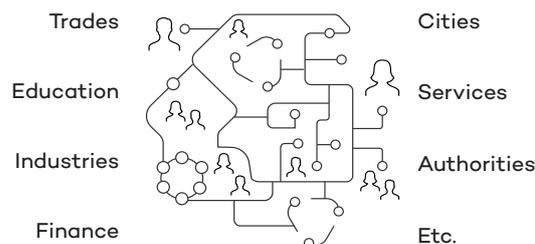
The sustainable lifestyle is now visible everywhere. We plant crops in our parks, produce energy on rooftops and use industrial by-products efficiently. We ride bikes, walk and using public transport and carpooling is the new normal. Single-use packaging in the retail sector is mostly history. Only for health and safety reasons and if the packaging increases the product's lifespan, such as in the food chain, single-use packaging may still be used. Also, in this case, all materials are recycled. There is a return system for different packaging materials. The financial sector is actively investing in and funding sustainable solutions.

A teacher, an engineer, a police officer, a material scientist, a warehouse worker and a gardener enthusiastically discuss how air transport emissions have been significantly reduced again. It is not just about technology – engines and fuels – but equally about choices made and behavioural changes impacting for example driving speeds, air flows and fulfilment rates, that allow for a continuous reduction in transport emissions.

An architect, a material developer, a real estate owner, a product designer and an end user work with great zeal. They will design and build a house using only second-hand materials and products sourced from urban mining in the neighbourhood.

In addition, there will be a roof garden, where half of the surface will serve as a meadow for pollinators, and the rest will be used for growing crops. The local food store will be interested in buying herbs from the housing company.

## Collaboration



The giant leap was taken when we noticed that no sector could make the transition by itself. We need a cross-sectoral collaboration between organisations, different professionals and the private and public sectors. We began to focus more on collaboration towards a mutually beneficial goal than competition.

A carbon neutral circular economy is a fair economy. The entire value chain is responsible for production. In the new global economy, outsourcing waste and pollution is no longer possible.

### The continuum

It is necessary to add "to dos" to our calendars – the sustainable future will be made today, and we need to make it! There is still a need for new solutions, technical development, new business models, fair trade, energy reserves, new kinds of skills, competences and collaborations. The world continually evolves.

Happiness and welfare are no longer based on material capital, but rather on intellectual and social capital. Actually, it is hard to even remember why consumption played such a big role in our lives in the past.

The present global economy is carbon neutral, natural resources are used in line with the planet's limitations and the economy is based on circular business models. Business is running and people still travel; we have food and health and a roof over our heads. We learned our lesson and when we found new ways to share existing resources fairly, we discovered a new kind of good that we had forgotten.

The transition towards sustainability and a carbon neutral circular economy meant a systemic change in society. We needed to make changes at every level and in every sector of society, from strategies to operations. The systemic change, often called a paradigm shift, was comprehensive and required rethinking and changing almost everything. The systemic change required must address many aspects of the problem at the same time.

In reality, we do not yet live a circular economy. Ask yourself:

- What does a carbon neutral circular economy mean to you and your sector?
- What targets do you set yourself?
- With which actions do you achieve the set targets? 🌱

# Bring your whole self to work



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Riikka Joukio  
EVP Sustainability  
and Public Affairs  
at Kesko

# Sustainability in motion

The urgency of climate change and other environmental, social and economic concerns are motivating businesses to take action for a green transition and move towards sustainable solutions and production. Leading edge companies today want to make a real impact, but in the cross pressure of different demands and the need for fact based information, this is not always easy.

A new way of planning – both in the short and the long term – is required. Traditionally strategies are built based on financial metrics and prospects. Environmental and social issues are monitored separately, and they are reacted to when there is pressure from, for example, customers or regulators, or when criteria of various sustainability programmes need to be met. Until a few years ago, environmental topics were primarily used in communication and marketing in the form of environmental claims. Next, they became a part of product development. Recently, more and more companies have been moving to a multi-agent perspective: Instead of pursuing a separate sustainability strategy, advanced companies aim for one corporate strategy, where sustainability with its three pillars is at the core.

Finnish Kesko is a leading trade sector company in Northern Europe operating the grocery trade, the building and technical trade and the car trade. Kesko has around 1,800 stores engaged in chain operations in seven countries. The retail sales of K Group, which is Kesko and K-retailers together, totalled some EUR 15 billion in 2021.

Riikka Joukio, EVP Sustainability and Public Affairs at Kesko, tells us: Kesko is the only company in the world to have been on 'The Global 100 Most Sustainable Corporations' list every year since it was launched in 2005.

"Kesko's sustainability vision is to enable sustainable choices for its customers and drive change throughout the value chain", says Riikka Joukio.

Sustainability is embedded in Kesko's growth strategy that is based on investing in three main elements: customer experience, digitalisation, and sustainability, emphasises Riikka Joukio, the company drives 'sustainability in action'. This includes minimising impact on climate and nature, as well as challenging suppliers and encouraging customers to make sustainable choices.

### **Bold targets require a solid plan**

Kesko aims to reach carbon neutrality by 2025 and to cut emissions from own operations and transports down to zero by 2030, in only eight years. In addition to own operations, emission reduction targets extend to the whole value chain. For Kesko, one of the most important means to make energy consumption more efficient is the ingenious heat recycling system used in K-food stores. It utilises the condensation heat generated as a by-product of refrigeration for heating the premises.

Moreover, Kesko is supporting wellbeing and success of its personnel by fostering diversity and inclusion and offering equal opportunities for both current and future employees. On the governance side, it says that it creates long long term value by embedding sustainability in everything it does, as a part of everybody's job.

Ideally, corporate strategy is based on solid, science-based information providing a foresight-driven foundation for making sustainable business.

To understand what changes are needed the current situation must be well analysed. This is followed by setting targets, identifying points for further action, monitoring the progress and, most importantly, communicating the process transparently both internally and externally. The identification of effective measures requires a comprehensive assessment.

### **You get what you measure**

Riikka Joukio describes that in addition to international indices, such as the Dow Jones Sustainability Indices and other leading ESG ratings, Kesko monitors five internal key performance indicators covering climate and supply chain data, share of sustainable products, and wellbeing of people. However, obtaining reliable data about multiple products and their value chains is a challenge and this area still requires continuous development at Kesko, says Riikka. Developing reliable sustainability measurement currently appears to be one of the key actions.

"As part of the sustainability strategy, Kesko decided also to set sustainability related criteria for the corporate share-based commitment and incentive plans. In addition to financial indicators, the award plan includes targets linked to emission reductions and international sustainability indices and ratings. This stresses, for example, the requirement for energy efficiency investments to proceed annually to allow reaching the overall emission reduction targets."

Future-looking strategies require a new level of planning and cooperation. Businesses need to create new ecosystems and collaborate more closely. While the transition brings challenges, it also offers great new business opportunities. ☺



# Mind the gap

It has been 25 years since the late Harvard Business School Professor Clayton Christensen introduced the world to the theory of “disruptive innovation” in his most well-known and highly respected book, *The Innovator’s Dilemma*. In his book, Christensen asked the question: “Why do well-managed companies fail?” Through thorough analysis, he concluded that these companies often fail because the very management practices that have allowed them to become industry leaders have also made it tremendously difficult for them to develop the disruptive innovations that ultimately steal away their markets.

Considering the immense interest as well as R&D and investment activities currently taking place in the field of textile fibres, we wondered: Is this market already under attack by disruptive innovation or is it still standing on the cusp?

## **Customer demand and product performance trajectories**

In any market, customers can be segmented into three distinct groups: the low-end, the mainstream, and the high-end. Naturally, high-end customers demand higher-performing products and are willing to pay higher prices. A company predominantly serving these customers can expect higher profits.

Following good management practices, an incumbent within a given market will continuously improve its product performance based on its customer requests, thereby following a “sustaining trajectory”. This company will aggressively invest in innovations that facilitate superior product performance and will target larger and larger markets, and seek higher and higher margins to match its growth ambitions. However, in doing so, the incumbent risks exceeding the needs of many mainstream customers and particularly low-end customers, resulting in a “gap” that needs to be filled.

## **Positioning of wood-based and novel textile fibres**

Speaking about gaps – when originally introduced into the market, wood-based textile fibres, and in this case, specifically referring to viscose fibres, were positioned as a substitute for cotton to close the growing “cellulose gap”. We have since seen significant improvements in the environmental performance of the viscose process, and we are in the midst of witnessing the commercialisation of the lyocell process, which, unlike the viscose process, does not use harmful chemicals such as carbon disulphide (CS<sub>2</sub>). There has also been a gradual shift in raw material usage where an increasing proportion of pre- or post-consumer textile waste has been incorporated into these fibres.

These innovations have emerged in response to more environmentally conscious consumers, regulatory requirements, and the push towards circular economy and resource efficiency. We have also seen that some incumbents have positioned themselves to primarily serve high-end customers, offering “premium”, “niche” or “specialised” products as they forge ahead as industry leaders.

In recent years, we have also been witnessing the unprecedented development of novel textile fibres, hinting that disruption in this market could indeed be imminent. However, up until now, the primary challenge for commercialising most of these innovations has been viewed as a technological one i.e. improving the textile fibre qualities to suit the requirements of the known markets.

This approach is unfortunately time and capital intensive and, as with any innovation, the possibility of failure inevitably exists. So, what if the primary challenge was reframed to a marketing one instead? According to the disruptive innovation theory, the companies that have been the most successful in commercialising a disruptive innovation either built or found markets where their products' current (lower) performance was valued. They established a commercial base and then started to move upmarket (following a “disruptive” trajectory) to ultimately address mainstream customers. According to Christensen, this approach is more effective than that used by those companies that frame the challenge as a technological one.

In the world of business, discretion is paramount for value creation. So, one has to wonder: What approach will be used by the successful disruptive innovator(s) that will shake up the textile fibre market? And, will these innovations be in your portfolio or your competitors'?

### Bracing for impact

Disruptive innovation can happen in any industry and, as a member of your company's management

team, one of your tasks is likely to spot and take advantage of these opportunities before they impact your bottom line.

We at AFRY Management Consulting help our clients to identify and assess internal and external growth opportunities, and formulate innovation strategies and management systems tailored to their needs. We are constantly in discussion with various players along the textile value chain. This, paired with our long standing industry presence, in-house engineering expertise and global reach allow us to provide our clients with unparalleled advice in every assignment.

### Final food for thought

The latest projections by the United Nations suggest that the world's population could grow from 7.7 billion people in 2020 to 8.5 billion people by 2030. During this time, the proportion of middle class citizens is set to increase at the fastest rate, growing from approximately 3.9 billion to over 5.3 billion people. The vast majority of the next billion people entering the middle class will come from Asia, particularly from India and China.

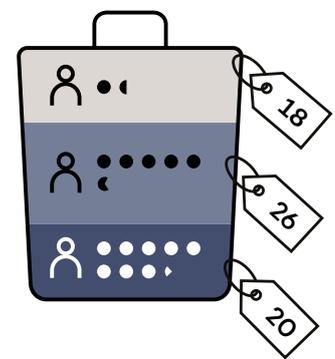
The middle class is already the largest spending group, accounting for more than two-thirds of global spending, and by 2030, this group is expected to further increase its spending by USD 18 trillion. Although the upper middle class and wealthy elite will lead in consumption per capita, the largest overall spenders will be in the lower middle class – those earning 11 to 50 USD/day.

Unavoidably, the increasing world population will put additional strain on our environment as the demand for food and other necessities, including clothing, will increase. Closing the cellulose gap with affordable fibres produced in a sustainable manner will thus be essential in securing the future for generations to come. 🌱

## Population and spending changes

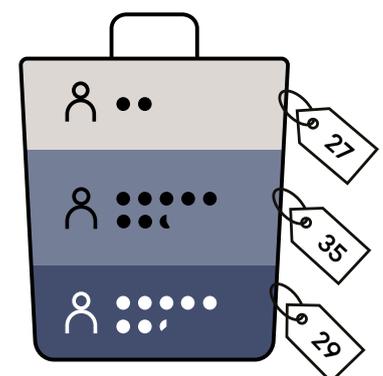
2020

7.7 billion people spend USD 64 trillion



2030

8.5 billion people spend USD 89 trillion



- 500 million people
- Lower middle
- Upper middle
- Wealthy and poor

Interview  
Tom van Aken  
CEO Avantium



# Game changer

Avantium is a pioneer in the emerging industry of renewable and sustainable chemistry. Its lead product is PEF, a novel, plant-based, recyclable plastic material. CEO Tom van Aken talks about the company's journey and the importance of partnerships.

**First of all, congratulations on the financial close! You have been leading Avantium for almost two decades. How does this feel now, and can you tell us a little bit more about the journey?**

Thank you. Yes, this is an exciting time for Avantium. It has been a fascinating journey right from our start. In the beginning, the company was completely different: we worked with a very small team, and many people thought we were completely mad to develop furandicarboxylic acid (FDCA) and polyethylene furanoate (PEF). That was considered too ambitious by most people.

We are now a much more mature, professional organisation. As CEO, it has been a very exciting journey to transition from a R&D focused company with traits like innovation and creativity to a commercial company where project management and engineering are equally important.

We went from financing an R&D chemistry project to full commercialisation. It has taken more time and effort than expected, but I cannot wish for a better experience.

It has been a phenomenal journey with many ups and good moments that offset some of the deep valleys we had to battle through. So yes, I am very blessed to be the CEO of such a great company.

**Thanks to your hard work, many of us in the industry are becoming very familiar with the terms FDCA and PEF. Can you share with our readers what makes these chemicals so unique?**

We describe FDCA as a sleeping giant. Sleeping, because no one knew how to produce it economically at a high quality. And a giant because it has a huge potential as a plant-based version of terephthalic acid. Which is, of course, one of the key building blocks to produce the well-known plastic PET.

The beauty of FDCA is that it is costly to make from petroleum. So, it is logical to make it sugar-based. However, once we were able to produce FDCA, everyone started wondering: Congratulations, now what are you going to do with it?

There are many polymers that you can produce based on FDCA, but we were particularly focused on polyesters and in particular on PEF. Around 12 years ago, we found out that this polymer has phenomenal properties. It is a 100% plant-based and fully recyclable product, which, if it unintentionally ends up in nature, will not accumulate there because it ultimately will be broken down by natural processes. We see this as a safety valve, we of course don't encourage people to litter PEF in nature.

The really differentiating factor is its performance and barrier properties. The superior mechanical and thermal properties of PEF make it a very interesting polymer. This makes it very suitable for bottles and packaging.

Now it is a matter of finding the right partners to use and purchase PEF. By now, in the packaging industry, PEF has become a product that people are aware of. As 100% plant-based, it fully fits into the circular economy. It is the first plant-based product with better properties and performance than, e.g., the petrochemical versions of this polyester.

I always like to see the surprise among brand owners and packaging experts regarding the fact that it is really better than PET and other types of polymers they are used to. Their perception is that if it is bio-based, its performance should be worse, as shown by history.

In that sense, we bring a polymer to the market that sets new performance standards. If PEF did not have superior performance, I am not sure we would have reached this point. In combination with the performance, the ecological footprint is the driver to bringing the polymer successfully to the market. It would have been very difficult if one of them had not been present.

**You are developing PEF for a wide range of applications such as packaging, textiles and films, and have managed to partner with many industry leaders such as LVMH Group for cosmetics packaging, Carlsberg for novel beer bottles and Salomon for joint textile yarn development. How important are partners for Avantium?**

Right from the beginning, partnerships have been extremely important for us. As a small company, you will never be able to launch such a new product on the market. You need partners that help to build up a value chain.

Everyone likes to talk about the brand owners because these are the names that most people are familiar with. Ten years ago, Coca-Cola Company and Danone were the first brand owners to support us. More recently, we have partnered with brand owners such as Carlsberg, Louis Vuitton, and InBev. There is a whole list of other partners we are working with to bring PEF to the market. Currently, we are constructing the world's first commercial plant to produce PEF, and the material will be available in 2024. That it comes to market in such a short time frame, also makes it appealing for brands to consider partnering with us.

The most challenging time for us was when we had to sell a concept, and there was no prospect of the product hitting the market any time soon. In that sense, I really want to compliment companies like Danone and Coke for being visionary ten years ago.

It made a difference for us, bringing these well-known brand partners on board. The world suddenly understood what this was about.

**How do you see the timing of your investment from the perspective of today's operating environment? On the one hand, there has never been stronger support for bio-based recyclable plastics, while on the other, we are amid an unforeseen energy and geopolitical crisis.**

The current situation has got an impact on our project. This is not an ideal time to build a plant, and we see other companies stopping similar projects or putting them on hold. For Avantium, this is not really an option as we have customers who have planned product launches based on this commercial facility that's currently being constructed. Maybe more than ever, this energy crisis highlights our unsustainable dependence on fossil feedstock. The need to switch to renewable materials – that are circular and can help us reduce our dependence on petroleum – is more evident than ever. We thus must move on and find our way to deal with the current challenges. With our partners, we are stronger than ever before. We at Avantium are used to headwinds and how to overcome them.

**Our team gave you a bit of a hard time over the past two years. Can you describe the benefits of working with AFRY in the process of raising loans for the investment?**

Our team never considered this process to be a hard time. We saw your tough questions as a sort of catalyst to help us professionalise and improve. You were setting standards. I can guarantee you that we will be better prepared the next time we run a project like this. ☺

# A decade of action



Climate risks can no longer be ignored. The latest report from the UN's Intergovernmental Panel on Climate Change issued a strong warning that current action is causing irreversible damage, significant investments are needed to mitigate the crisis. This stresses the need for urgent technological and financial reform, as well as business re-engineering.

A global net zero scenario would require transformational changes across all business sectors, the energy ecosystem and the global economy.

Emission reductions and the transformation of current energy systems require annual investments in the magnitude of 1 to 1.5% of global GDP annually. The IPCC, in its

1.5°C Report, estimates that by 2035, 2.5% of the global GDP, will have to be devoted annually to sustainable energy related investments, of which more than a third constitutes additional net investment needs.

Therefore, business must reduce greenhouse gas (GHG) emissions wherever possible. Part of the global

challenge is defining responsibility for the generation of GHGs. The level of influence and control each company has over emissions through the value chain, is divided into three scopes.

While we have long seen a wide range of concrete action in business for owned and controllable emissions



## Scope 1

### Upstream emissions

Direct emissions from owned or controlled sources

- Freight
- Business travel
- Goods & services' production
- Capital assets



## Scope 2

### Inside company

Indirect emissions from the generation of purchased energy electricity, heat and steam

- Own vehicles & fleet
- Buildings (consumption of fossil fuel & electricity)



## Scope 3

### Downstream activities

Indirect emissions that occur in the value chain, generated upstream by suppliers and downstream by customers

- Freight
- Customer travel
- Sold products & services' uses
- Sold products' end-of-life & waste produced

(known as Scope 1 & 2 emissions), less attention has been paid to reducing the so-called Scope 3 emissions along the whole value chain. Despite the challenges of addressing indirect emissions, Scope 3 does not only have a huge potential to prevent the worst impacts of climate change, but it can also lead to substantial business benefits, new partnerships, innovations and revenue growth.

#### **Transformational change needed**

Together, energy generation and use account for about 75% of global GHG emissions, including both the sectors' own emissions (Scope 1 & 2) and downstream in the value chain (Scope 3).

However, the direct responsibility – as reflected in Scope 1 & 2 reporting – accounts for a relatively low share of 1/3 of total emissions.

Hence, most businesses do not have insight into the magnitude and nature of their Scope 3 emissions.

Governments have a key role to play in implementing standards, regulations and incentives to support decarbonisation of Scope 3 emissions. This is happening both in the US and EU. In parallel, companies working to reduce Scope 3 emissions can mitigate risks within their value chains, unlock new innovations and collaborations, and respond to mounting pressure from investors, customers, and civil society.

#### **Key areas of action**

Companies that are successful in building new coalitions and partnerships, with a shared ambition to reduce emissions, reinvent business models and innovate new products and services, will be better positioned to capture future growth.

Efforts on multiple fronts can create a virtuous cycle where every company actively works to reduce emissions in their value chain while simultaneously benefitting from the efforts of other companies. This also creates more robust data to base

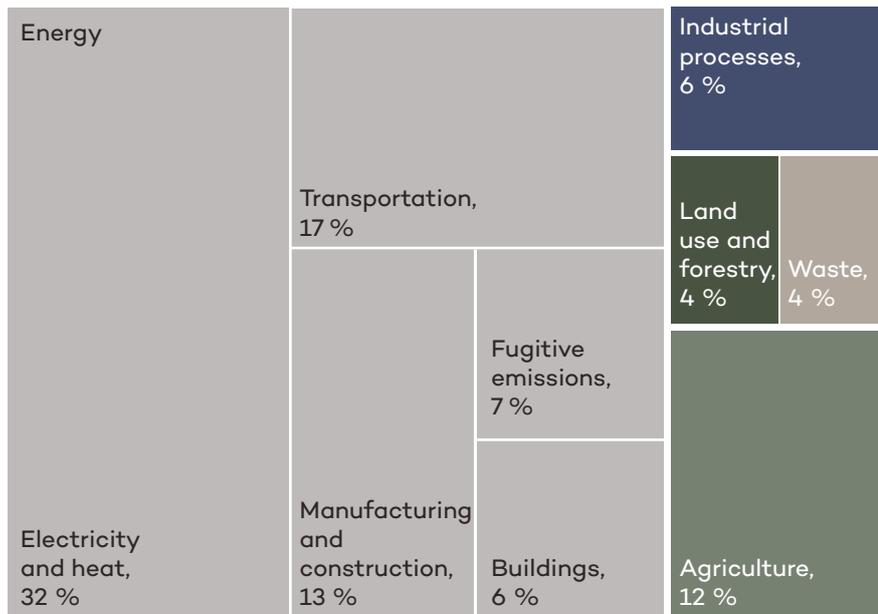
targets and performance tracking on and helps to create new innovative solutions built upon a value chain system's perspective.

#### **Business model innovation**

Companies can shift to or create new innovative business models to substantially reduce their Scope 3 emissions. Reconsidering what the company can offer and how it can be offered at a systematic level can help it meet marketplace demands and generate revenue in new ways while reducing emissions across the value chain.

Emissions performance can also be assigned a monetary value by putting an internal price on carbon that covers Scope 3 emissions. A carbon price can also be used to collect fees that can then be reinvested in new low-carbon activities, products and services. A price on carbon can cover both upstream and downstream emissions. It can also financially quantify the environmental

## Global CO<sub>2</sub> emissions by sector



performance of products or services relative to those of a company's competitors.

According to CDP, in 2017 nearly 1,400 companies were already factoring an internal carbon price into their business plans. This includes over 100 Fortune 500 companies with annual revenues of approximately USD 7 trillion.

### Circular business models

Creating successful and profitable business models that reduce the promotion of unnecessary consumerism, and decrease material demand, are much needed. Product service systems, for example, provide services as well as products for collaborative consumption with the intention of reducing environmental impact.

Redefining the way we think about product ownership by sharing eliminates the aforementioned emissions associated with new products. Belongings can remain idle for long periods of time, e.g. the average European car is in use only for 2% of its lifetime.

### New technologies – change enablers

"Fourth Wave" technologies such as data analytics, smart sensors and blockchain will help companies manage their Scope 3 impacts by offering powerful insight into complex global value chains and will help reduce emissions in new

ways. These technologies are playing an increasingly important role in business innovation, and business executives agree that implementing new technologies will not only improve their company's environmental footprint, but also its bottom line.

### From product to service

Among the most powerful tools for a company to mitigate its Scope 3 emissions is to focus on lowering lifecycle GHG emissions already during the design of products and services. The design process can play a crucial role in defining the range of reductions in GHG intensity that can be achieved.

If a product is designed to be manufactured using a specific material, the possibilities to lower embodied GHG emissions and processing emissions, the range of options for upstream and downstream logistics, the optimum possible use phase efficiency, and the feasible end of life treatments are all invariably determined by the design choice.

A circular economy approach can achieve large improvements in environmental performance by redesigning systems and business models to simultaneously reduce upstream and downstream emissions. According to Material Economics estimates, a circular economy could reduce up to 3.6 billion tonnes CO<sub>2</sub> in heavy industry per year globally.

## Engagement

An important lever for reducing downstream emissions is customer engagement. There are several different approaches a company may take to deliver such an intervention. Successful businesses partner up with clients and are working together to reduce emissions through innovation of new products and services. Engaging consumers and helping them understand how to reduce energy usage and individual carbon footprints are also becoming more frequent.

Many businesses invest in low-carbon projects and companies as well as in resilient development, such as transformational, interconnected technologies and solutions to support their pathway to net zero; renewable energy, carbon storage/CCS, clean hydrogen and battery storage.

### The challenge ahead

The world's population is estimated to reach 10 billion by 2050. 68% are expected to live in urban areas, and the growing population will expect to see improved standards of living. It is not difficult to understand that a larger and more affluent population will want to consume more, putting increasing pressure on scarce resources like land, water and energy.

COP27, the annual UN climate conference, is taking place in Sharm el-Sheikh, Egypt on 6-18 November 2022. The conference represents what is likely to be the final opportunity to take global collective action on the climate crisis and achieve net zero emissions across the economy, in line with the Paris Agreement.

To mitigate and adapt to climate change, and provide livable conditions for the global population, governments and companies must lead the way. Reducing Scope 3 emissions and partnering up with both suppliers and customers is critical activity for all businesses leaders who aim at managing responsibly and at the same time create societal value.

Now is the time to act. 🌱

# AFRY Management Consulting

We at AFRY Management Consulting are committed to accelerating change towards a sustainable world in the interest of future generations. We are passionate about transforming industries and creating value for clients and society.

We strongly believe that change happens when exceptional people with brave ideas come together.

AFRY Management Consulting works globally to address challenges and opportunities in the energy, bioindustry, infrastructure, industrial and future mobility sectors through:

- Strategic advice
- Forward looking market analysis
- Operational and digital transformation
- M&A and transaction services

With more than 500 consultants across over 20 offices on 4 continents, and supported by 17,000 experts at AFRY in engineering, design and digitalisation, we are driven by the idea of helping our clients find solutions to business-critical questions.

We don't care much about making history. We care about making future.



For more information visit  
AFRY Management Consulting.



# AFRY Future Stars

Talented young people from diverse backgrounds drive change in AFRY Future Stars programme.



## How do we make the world a better place to live in?

Climate change has become a topic we face every day, from the school curriculum and work projects to advertising, news and conversations in our free time. Some of the individuals starting those conversations at AFRY are our young colleagues and trainees. They bring fresh insights as they combine their studies with gathering experience in the workplace at AFRY.

In Vantaa, Finland, the latest set of AFRY Future Stars trainees feel that their work can make a change – and this is the perspective they choose over the vortex of climate anxiety that challenges many young people today, who have grown up with an acute awareness about climate change.

## Meet Siiri and Väinö, our AFRY Future Stars trainees

Siiri Kalliovalkama and Väinö Vahteristo joined AFRY in May 2022. They were selected from a massive number of applicants for the well-known AFRY Future Stars programme in Finland, one of the original trainee programmes at AFRY. The Future Stars trainees in Finland feel empowered to contribute as full team members while experiencing collaboration with various experts and professionals and getting to know the working culture at AFRY.

Väinö Vahteristo works as an AFRY Future Stars trainee in the Bioindustry team while studying at the University of Helsinki:

“Studying Forest Bioeconomics, Business and Policy was not my first choice when I applied to university. However, I found it fascinating after having familiarised myself with the field, especially since forestry is a vast sector in Finland, where I am from.

“In the business environment, it’s exciting to work on topics as they come up and not stick to a fixed plan like in high school. That is how I found myself working on the Bioindustry topics. I believe that bioeconomics plays a significant part in providing sustainable solutions for society, and at AFRY, I feel that I can contribute to that discussion and support progress there. My studies and work at AFRY have been a great match, and it’s great to put the theory into practice. In my studies, I’ve focused on the forestry sector and market analyses while minoring in Industrial Engineering, which is helpful as I can also use the engineering part of my traineeship, which I am eager to learn more about.

“So far, I have got to know my team, and everyone has been very welcoming and friendly. It’s pretty amazing to know that there are about 17,000 colleagues at AFRY, which is why I look forward to meeting more people and learning from them!”

Similarly, while Siiri Kalliovalkama is studying at Tampere University, she also works as an AFRY Future Stars trainee in the Bioindustry team in Vantaa, Finland.

“Leadership and different business challenges intrigue me, and being interested in the bigger picture made me study Industrial Engineering and Management. I believe that the degree I’m pursuing will give me a broad

understanding to build on as I evolve in the future. Even though I’ve only recently begun to work at AFRY, I recognise the potential of our employees and the amount of knowledge this company has. That makes me eager to learn from my colleagues and develop myself as an expert in my field.”

## What does AFRY’s vision, Making Future, mean to you?

Making Future are words you often hear when working at AFRY, as they are core to our vision as a company. Those words link our daily work with a higher purpose and our contributions towards a more sustainable future for generations to come. We asked Siiri and Väinö what the words mean to them:

– Siiri: “I reckon that Making Future means the same to us as it means to everybody else at AFRY: We get to be, more or less, part of creating positive change towards a more sustainable future by helping with actual client projects. In addition, we are simultaneously developing our skills.”

– Väinö: “Even as a Future Stars Trainee, I’ve been working as a full-time team member just like any of my colleagues. Making Future stands for an opportunistic view of our whole team’s work, which contributes to a more sustainable lifestyle in the long term.

Climate change and the phenomena around it are topics Siiri and Väinö have grown up with. We also asked them how they felt about the future:

– Siiri: “I feel a bit tense when talking about the future and climate change because the topic is still not resolved, and a lot of uncertainty occurs around it. However, working at AFRY has opened my eyes and made me feel more comfortable since I can contribute to work that revolves around sustainability and a better future.”

– Väinö: “Climate change is a topic that comes up every day in school, at work and in our free time. It’s a challenge that touches us all, so we must take action. The contribution of a single individual doesn’t have to be big, but everyone needs to make an effort. We can solve the problem by working together towards a mutual goal.”

AFRY Future Stars programme is a trainee programme for engineering, natural science, business and information technology students. The one-year programme gathers students from various backgrounds to meet each other on training days throughout their traineeship. The training days focus on AFRY’s business, work in a consulting environment, presentation and facilitation skills, sustainability, brave leadership and career planning while recognising one’s strengths as an employee.

The programme strongly focuses on self-development, career planning and work-life balance, specifically within the engineering and consulting environment, which is considered relatively dynamic, challenging and fast-paced. We believe that employees who feel good and enjoy taking responsibility can drive results exceeding clients’ expectations.

Students in Finland can discover more about the programme and the schedule for next year’s application period on our website [afry.fi](https://afry.fi). The programme is held in English. ☺



AFRY  
ÁF PÖYR

# Making Future