

# The Missing Billions

The real cost of supply chain waste



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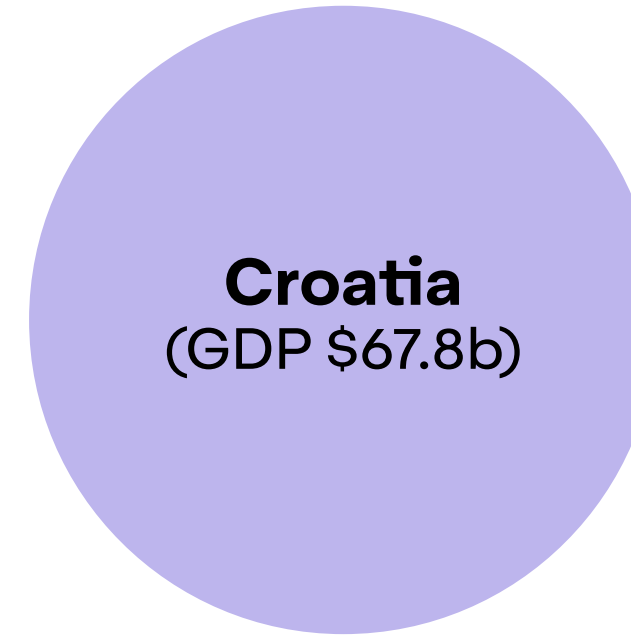
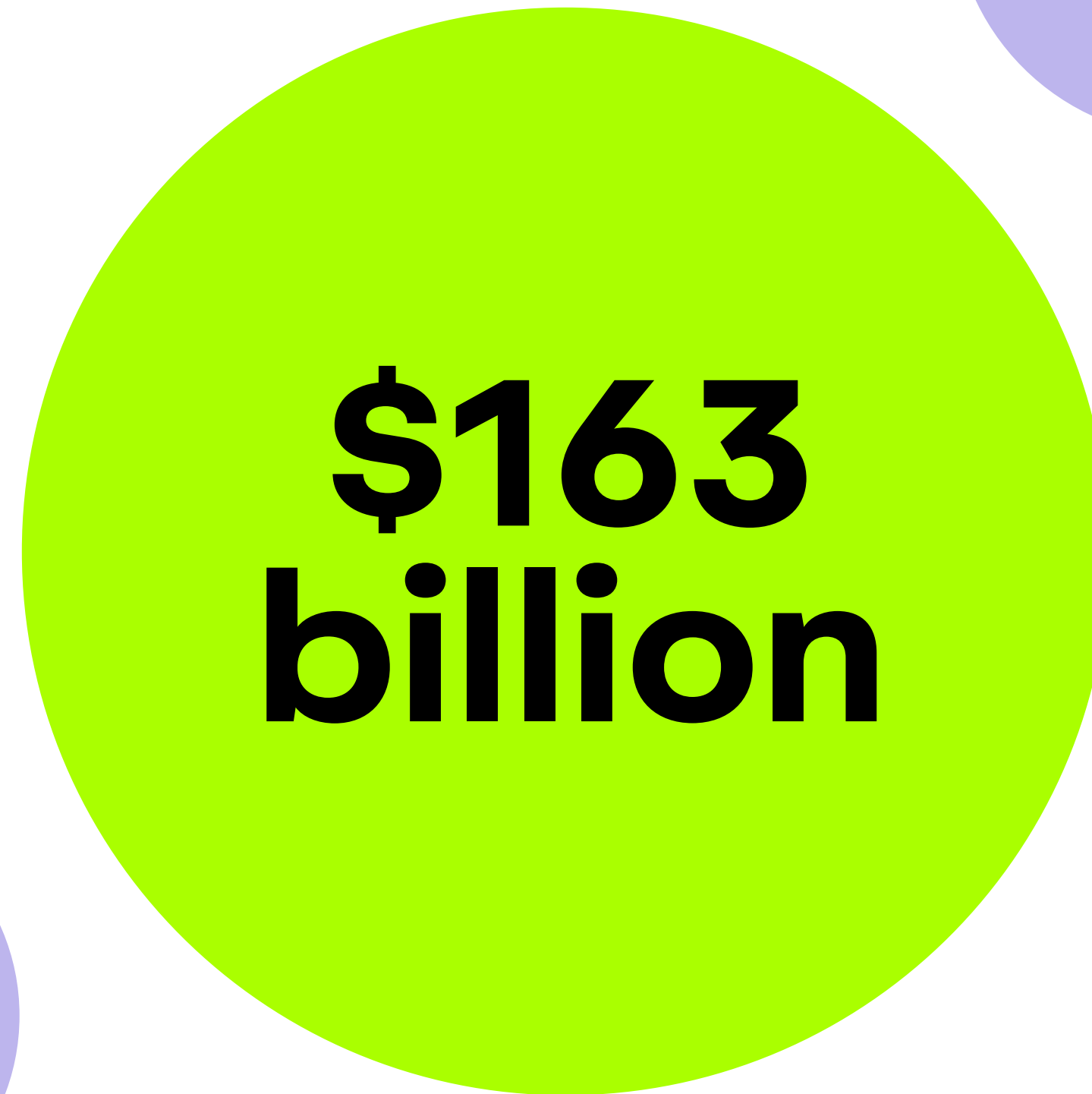
It's not news that billions of dollars worth of revenue is lost every year in discarded inventory, but that's just the tip of a quickly melting iceberg.

While the environmental cost of a complex supply chain can seem almost immeasurable at times, this report shows that making waste reduction part of your company purpose can benefit the planet, people and the bottom line.

# Introduction



# Let's take a look at the headlines...



👉 **\$163 billion** worth of inventory is discarded each year due to expiry or overproduction.<sup>1</sup>

USD \$163 billion is more than the GDPs of Croatia, Costa Rica and Iceland combined [The World Bank]

👉 **Nine in 10 global business leaders** are 'under pressure to become more sustainable' but only **4.4%** of technology budgets on average are dedicated to supply chain sustainability.

[AD Global Supply Chain Research, 2022]

👉 **Supply chain crisis** made worse as nearly **8%** of stock ends up in waste.

[AD Global Supply Chain Research, 2022]

👉 **For a new wave of 'cautious' consumers, cost, quality and durability** are among their top three concerns, significantly outranking sustainability.

[AD Global Consumer Insights Research, 2022]

# About this report

**Avery Dennison is a global leader in materials science and digital identification solutions that allow physical products to be born with a digital twin.**

→ [Full methodology p. 69](#)

## What's our purpose for driving the agenda?

Going green is a big selling point for consumers and businesses alike, with many moving away from companies that don't share their sustainability values. As people demand demonstrable climate action, there's an urgent need for brands to respond with more transparent and eco-friendly supply chains that effectively reduce waste.

Avery Dennison conducted this research to better understand the global supply chain waste challenges that companies face, and explore the innovative ways these issues are being tackled. Our goal is to improve transparency, trust and item-level visibility through data-led solutions; highlight the value of sustainable supply chains; and understand how consumer priorities have an impact on waste.

## What is this report?

**The Missing Billions: The real cost of supply chain waste** is an in-depth report of **300+** businesses and **7500+** consumers, which assesses the state of global supply chains and the issue of waste across the US, the UK, France, China and Japan. Our report focuses on five core segments — food; beauty; apparel; automotive; healthcare and pharmaceuticals.

## How did we make it happen?

Our findings leverage a rigorous mixed methodology research approach, involving a literature review; consumer and business quantitative surveys; and qualitative interviews with supply chain practitioners from global companies.

In this research we surveyed 318 global businesses, which we will refer to as the **Avery Dennison (AD) Global Supply Chain Research, 2022**, throughout this report. We also surveyed 7500+ consumers buying in apparel, beauty and food, which we will refer to as the **Avery Dennison (AD) Global Consumer Insights Research, 2022**.

# Executive summary

On average **8% of stock** perishes or is discarded annually, which is worth approximately **\$163 billion** worth of inventory.

The scale of what we uncovered is worth paying attention to. Global organizations are overproducing and exacerbating the supply chain crisis — **estimating that on average 8% of their stock perishes or is discarded annually, which is approximately \$163 billion worth of inventory.**

The data found that while companies are acutely aware of the problem, they are not yet investing the budget required to fix it. Of those surveyed, **an average of 29% say that their organization's overall sustainability impact comes from supply chain operations.** However, three quarters of businesses are investing 5% or less of their technology budget to supply chain sustainability improvement.

Unsurprisingly, cost and quality are the highest priorities for consumers globally when it comes to buying products. The data also reveals that sustainability still has a long way to go to make it into customers' immediate priority lists, **with just 16% of consumers putting sustainability in their top three considerations for buying products.**

That said, the research points to a shift in the desire for durable products, **with durability ranked by almost half of global consumers (48%) as a top five concern** — suggesting there is an opportunity for businesses to shape the future of sustainability by putting a greater focus on product durability.

The research highlights an intention from businesses to address these issues. For instance, **35% of firms plan to introduce technologies to identify unique item-level tracking and traceability to help fix inventory black holes.** Initiatives to achieve greater transparency along the supply chain can also have benefits for consumers. **Around two out of five shoppers surveyed (43%) report that transparency about a product's journey is important to them when buying clothing.**

## The Bigger Picture

**Global forces  
are driving supply  
chain disruption.**

**1 in 5 global companies cited  
increased cost of transportation  
as the single most disruptive factor  
impacting supply chain operations.**

[AD Global Supply Chain Research, 2022]

Global industries saw supply chain disruptions soar from 3,700 in 2019 to 11,642 in 2021, due to the pandemic and its ongoing impact.<sup>2</sup> However, with increasing geopolitical risks, inflationary pressures, labor shortages, spiraling energy and fuel costs, and the impact of climate change on production as well as shipping, manufacturers are bracing themselves for an even more volatile future.

# Consumers expect businesses to act.

Worldwide, 86% of people say they want a more ethical and more sustainable world, particularly since the pandemic, and consumers are becoming wise to the dangers of low-cost, high-volume production.<sup>3</sup>

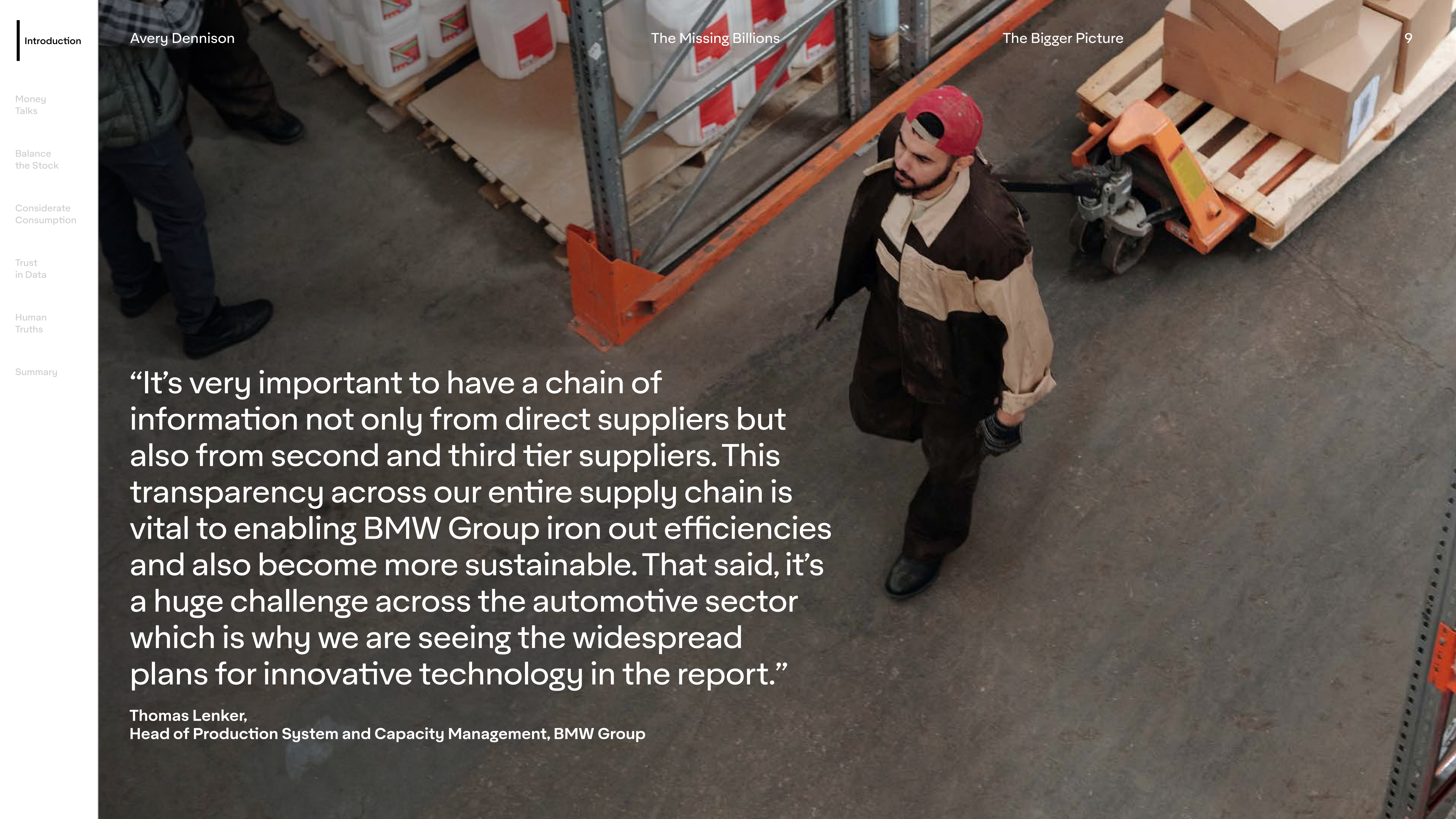
However, with product shortages, soaring grocery prices and record high fuel costs, value-driven consumers are facing tough choices between their own needs and the needs of the planet.

New waste-free processes are seen as the top way for businesses to make an impact on addressing climate change, followed closely by the use of sustainable and renewable materials.<sup>4</sup> Consumers know they can't do it alone and they expect businesses to do the heavy lifting and — 81% of people believe businesses have a significant role to play in addressing the climate crisis, and 51% say they aren't acting fast enough.<sup>5</sup>

**Whether it's for food, fashion or beauty, half of consumers expect sustainable manufacturing and distribution. (50%, 48% and 51% respectively)**

[AD Global Consumer Insights Research, 2022]





“It’s very important to have a chain of information not only from direct suppliers but also from second and third tier suppliers. This transparency across our entire supply chain is vital to enabling BMW Group iron out efficiencies and also become more sustainable. That said, it’s a huge challenge across the automotive sector which is why we are seeing the widespread plans for innovative technology in the report.”

Thomas Lenker,  
Head of Production System and Capacity Management, BMW Group



“Waste is a big area of focus for us because we get very little leeway from some of our customers, especially when we buy products on their behalf. If we over buy and waste or damage products, our margins are pretty tight. Overall, waste is a figure of 0.7%. This is very low, especially given the perishable nature of many of the goods and it’s been achieved through a lot of work supply chain visibility.”

**Richard Calder,**  
Director of Information Technology, Reynolds Catering Supplies

**Future-proofing  
the supply chain  
benefits people,  
planet and profit.**

Eliminating supply chain waste is key to addressing both the needs of businesses and consumers. Effectively navigating volatile demand increases margins, reduces environmental damage and even gives businesses an opportunity to divert the recouped losses back into better materials, increased worker wages and investment into corporate social responsibility (CSR). In the process, it also offers an opportunity to build connections with consumers who are looking for ways to close the value-action gap.

# Five key opportunities to reduce waste now

By analyzing the data, we've identified five key opportunities for businesses to reduce waste, future-proof their supply chain and make a big impact on people, planet and the bottom line.

## 1 Money Talks

Matching up environmental, social and governance (ESG) goals with supply chain investment can help reduce waste and improve margins.

## 2 Balance the Stock

Boosting the visibility of supply and demand can lead to less waste and more contented consumers.

## 3 Considerate Consumption

Offering more durable products to consumers not only reduces waste but also addresses their need for affordability and quality.

## 4 Trust in Data

Transparency in the supply chain can help to reduce waste and profit loss caused by damage and strengthen partner and consumer trust.

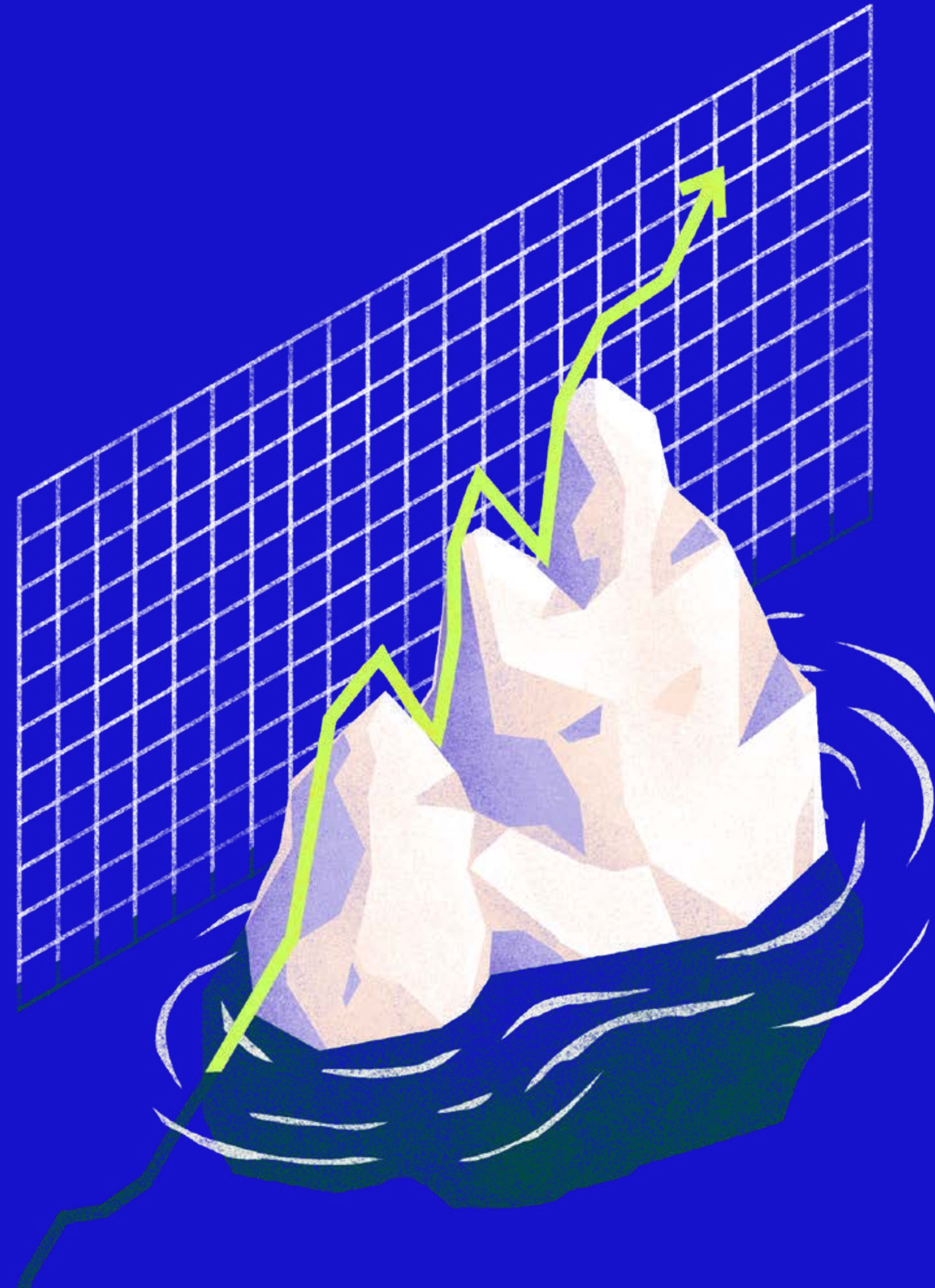
## 5 Human Truths

Helping consumers make waste-free purchasing choices through education and transparency.



# Money Talks

Matching up ESG goals with supply chain investment can help reduce waste and improve margins.



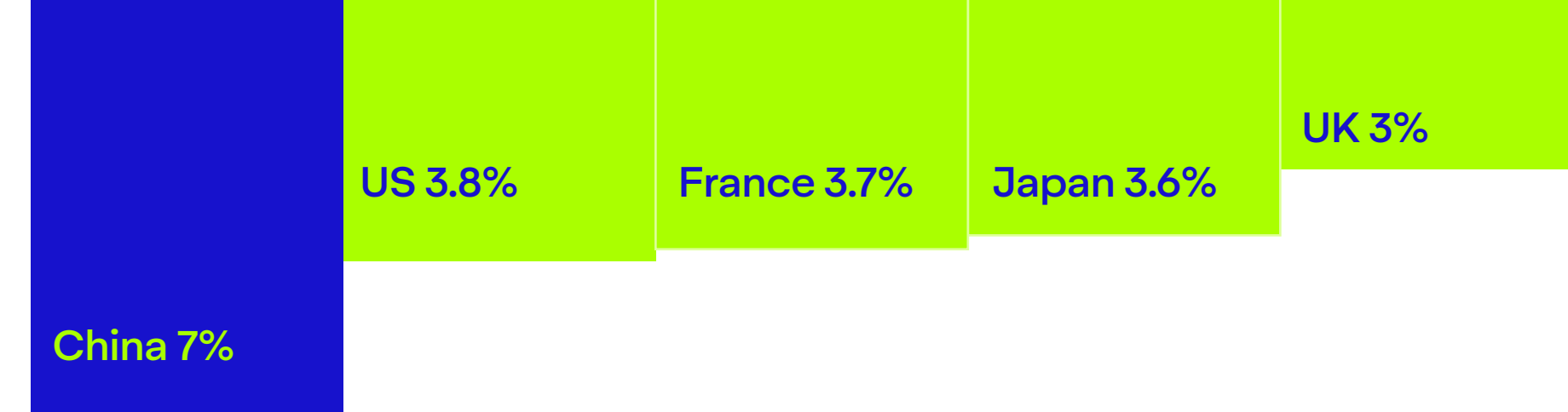
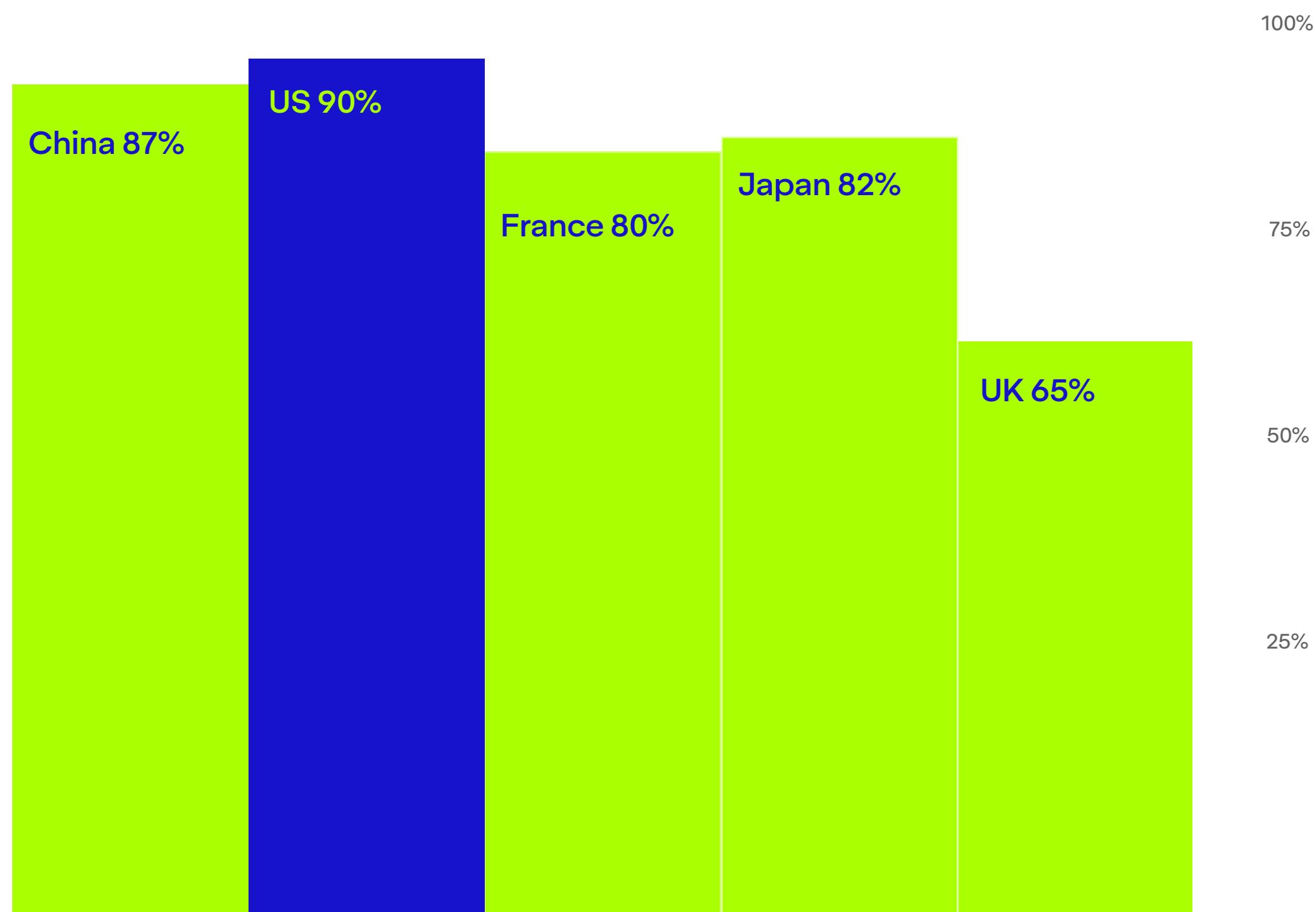


👉 How can combining sustainability and supply chain initiatives **increase profits and benefit the environment** at the same time?

# Over 80% of organizations are investing in tech solutions to address sustainability...

The US has the largest number of organizations investing in **sustainability** solutions

% of organizations investing in sustainability solutions



Average % of technology budgets being dedicated to supply chain sustainability

Organizations in China are investing significantly more into **supply chain sustainability** than other markets

## ... but only 4.4% of technology budgets on average are being dedicated to supply chain sustainability.

[AD Global Supply Chain Research, 2022]



## What's happening?


# Supply chain initiatives are not being driven by sustainability goals.

In the midst of the climate crisis, many businesses have adopted solutions and initiatives to curb their environmental impact – 67% are using more sustainable materials (such as recycled materials or lower emitting products) and 66% are increasing the efficiency of energy use (for instance, improving the energy efficiency of buildings).<sup>6</sup> However, considering the wealth of opportunities available to make sustainability savings in the supply chain, on average only 4.4% of technology budgets are being invested into sustainability initiatives.

This is not to say that businesses aren't investing in supply chain solutions related to waste, they are. Our data shows that over 85% of businesses are actively tracking supply chain waste, but instead of being environmentally driven, the primary motives of these investments are logistics, management and inventory handling. Viewing these motivations through an ESG lens, the environmental benefits of an optimal supply chain are clearly significant. Efficient inventory handling, for example, directly cuts down on overproduction and eliminates unnecessary transportation, thereby cutting down on CO<sup>2</sup> emissions and packaging waste. This has the added benefit of creating a more efficient and satisfactory working environment for workers along the chain too.





A man wearing a blue beanie and a tan and brown work jacket is sitting in a warehouse. He is holding a handheld device in his right hand and a tablet in his left hand, scanning a blue barrel. The background shows industrial shelving and various items in the warehouse.

“From a sustainability perspective, RFID (radio frequency identification) will give us inventory visibility. Frankly, we didn’t think that inventory visibility was useful for achieving sustainability goals. The business case for RFID lies in reducing expired and obsolete products. In hindsight, we see RFID will ultimately help to reduce waste and sustainability, but that’s not how it’s being framed currently.”

Global cosmetic company  
[anonymous]



## Why it matters

# Better education is helping to sell new sustainability initiatives to senior stakeholders.

Smart businesses know that reducing waste in the supply chain can benefit people, planet and profit, which is why many of them are collaborating with organizations that focus on sustainability benchmarking and assessing CSR. Consultants are helping companies to navigate legislative pressure such as corporate sustainability due diligence (CSDD); and monitor the performance of supply chain sustainability initiatives, selling these new solutions to stakeholders in the longer term.<sup>7</sup>

There is an opportunity for organizations to set their supply chain efficiency goals in a way that aligns with company-wide ESG targets, reducing waste to benefit the environment, working conditions and the bottom line. Profitability

is a key driver for businesses, often standing in the way of investment in new solutions, such as sustainability performance benchmarking or digital identification solutions. Goals need to be hit and selling a new product with an unknown ROI to stakeholders can be a challenge. Educational help is out there, advising on business development strategies and setting realistic goals based on evidence in practice. With the right partners, people at all levels of the business can help to show the financial benefits of waste reduction in the supply chain and push through future-focused ideas.



# Legislative forces

## EU

The corporate sustainability due diligence directive (European Commission, 2022) will require businesses to set up and oversee the implementation of due diligence processes to mitigate any negative impacts to human rights or the environment in their supply chain operations and value chains.

→ [Read more](#)

## China

China’s Action Plan for Reaching Peak Carbon Emission by 2030 has been released, this plan provides a framework for how China’s economy will move towards the adoption of sustainable energy and methods, ultimately to reduce the growth of high carbon industries within the economy.

→ [Read more](#)

## Japan

Japan’s Economic Security Promotion Bill (ESPB), which was passed in May 2022 and will come into effect by February 2023, has been designed to promote economic measures related to ensuring national security effectively. This act aims to make supply chains more resilient for ‘critical products’, which will in turn protect the economical infrastructure in Japan. Businesses will be supported in producing critical or raw materials in times of crisis and will need to provide reports about procurement and production.

→ [Read more](#)



A man with dark hair, wearing a white t-shirt and a brown jacket, is looking intently at a handheld device. The device has a glowing orange light at the tip. The background is dark and out of focus.

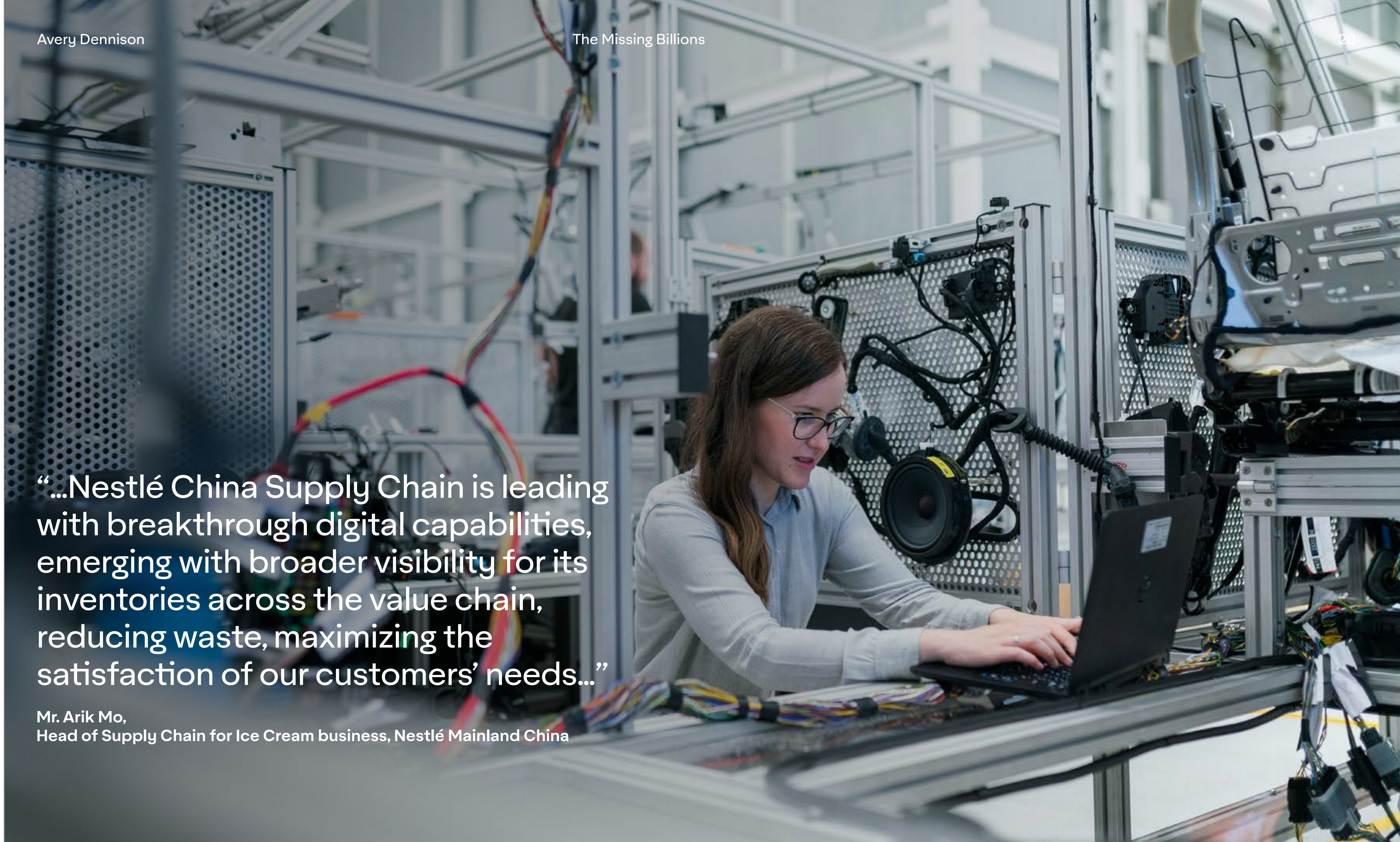
“Following the fastest-ever transformational speed of the Chinese marketplace, precipitated by enormous changes to shoppers’ behavior, it became critical for us to develop highly innovative technological solutions. With RFID being in its infancy stage within FMCG in China, the application of our indigenous digital supply chain centers (DSCC) and assorted high-tech tools, are responsive to our commitment to driving customer-centricity, while extending our contributions on sustainability...”

Mr. Tony Domingo,  
SVP of Supply Chain & Procurement, Nestlé Zone Greater China



“...Nestlé China Supply Chain is leading with breakthrough digital capabilities, emerging with broader visibility for its inventories across the value chain, reducing waste, maximizing the satisfaction of our customers’ needs...”

Mr. Arik Mo,  
Head of Supply Chain for Ice Cream business, Nestlé Mainland China





In practice

# Reynolds

→ [Read more](#)

Founded in 1945, William Reynolds started as a fruit and vegetable business, which now also offers meats, cheeses, dairy and prepared salads. The company sells to some of the most well-known names in the catering and food service industries, delivering over 3,000 orders every day. Their mission is to deliver quality of service and care to their customers.

In 2016, many of Reynolds’ customers were facing increased waste disposal costs and were looking for a more sustainable approach based on changing from cardboard to returnable

plastic crates. The plastic crates being used cost ten times more than cardboard boxes and the challenge was to track the crates to ensure that they were promptly returned for reuse.

Combining tags and readers, ultra-high frequency (UHF) RFID provided Reynolds with exceptional benefits across its supply chain, offering a new opportunity to leverage a sustainable solution, reduce waste and environmental impact and enhance their capability to deliver quality food efficiently.

“Most purchasing decisions are based on price, but sustainability gives Reynolds an advantage over competitors, and this is important because the larger clients are pushing for this. We expect that eventually this will be part of contract negotiations.”

Richard Calder,  
Director of Information Technology, Reynolds Catering Supplies



ITEM	DESCRIPTION	QUANTITY	UNIT
SECOND 17270	3658070		
A162	LETTUCE RADICCHIO	1	322EA
A163	POTATOES RED BAG P/P	1	3187EA
B171	LETTUCE ICEBERG XI	1	3403EA
B173	LETTUCE ICEBERG XI	1	3186EA
B174	LETTUCE ICEBERG XI	1	3154EA
B174	MUSHROOM BUTYON P/P	1	3815EA
B183	CORN BABY X 89G SP	1	3414EA
B191	VAC PAK BEETROOT 1X50	1	3378EA
B204	GALANGAL X 1KG SP	1	3412EA
B204	TENDERSTEM BROCCOLI	1	3412EA
B212	GRANA PADANO SHAVED	1	6778EA

ITEM	DESCRIPTION	QUANTITY	UNIT
SECOND 17270	3658070		
A101	CABBAGE WHITE XI EA	1	3071EA
A111	TURNIPS BABY LEGUMES	1	2849EA
A112	FETA 1X200G	1	6830EA
A113	CABBAGE SWEETHEART X	1	3073EA
A123	BEANS FINE TOPPAIL X	1	3022EA
A131	BEETROOT SOFTSH APP	1	3282EA
A133	RADISH P/P X 1 PK	1	3611EA
A134	CARLIC STRING X 1 EA	1	3188EA
A142	APRICOTS DRIED X20G	1	4102EA
A171	AVOCADO SMALL PP 1X3	1	2870EA



# Key takeaways to minimize waste



**Sustainability and supply chain initiatives tend to sit separately, but if aligned can reach targets more quickly**

There is an opportunity to align supply chain efficiency goals and company-wide ESG targets as a starting point for new investment that benefits people, planet and profit.



**Corporate ESG goals are frequently being developed without specific input from line of business**

In order to align supply chain efficiency and sustainability, the value of investment needs to be recognized by key stakeholders, and the process of integrating new solutions needs to be shown to be simple to encourage adoption.



**The impact of investments in digitizing supply chain networks needs to be quantified to show value**

Increased understanding and education is needed on the benefits of digital identification technology to help organizations clearly see the positive impact on planet and profit, and alignment to new and upcoming legislation.



Boosting the visibility of supply and demand can lead to less waste and more contented consumers.

# Balance the Stock

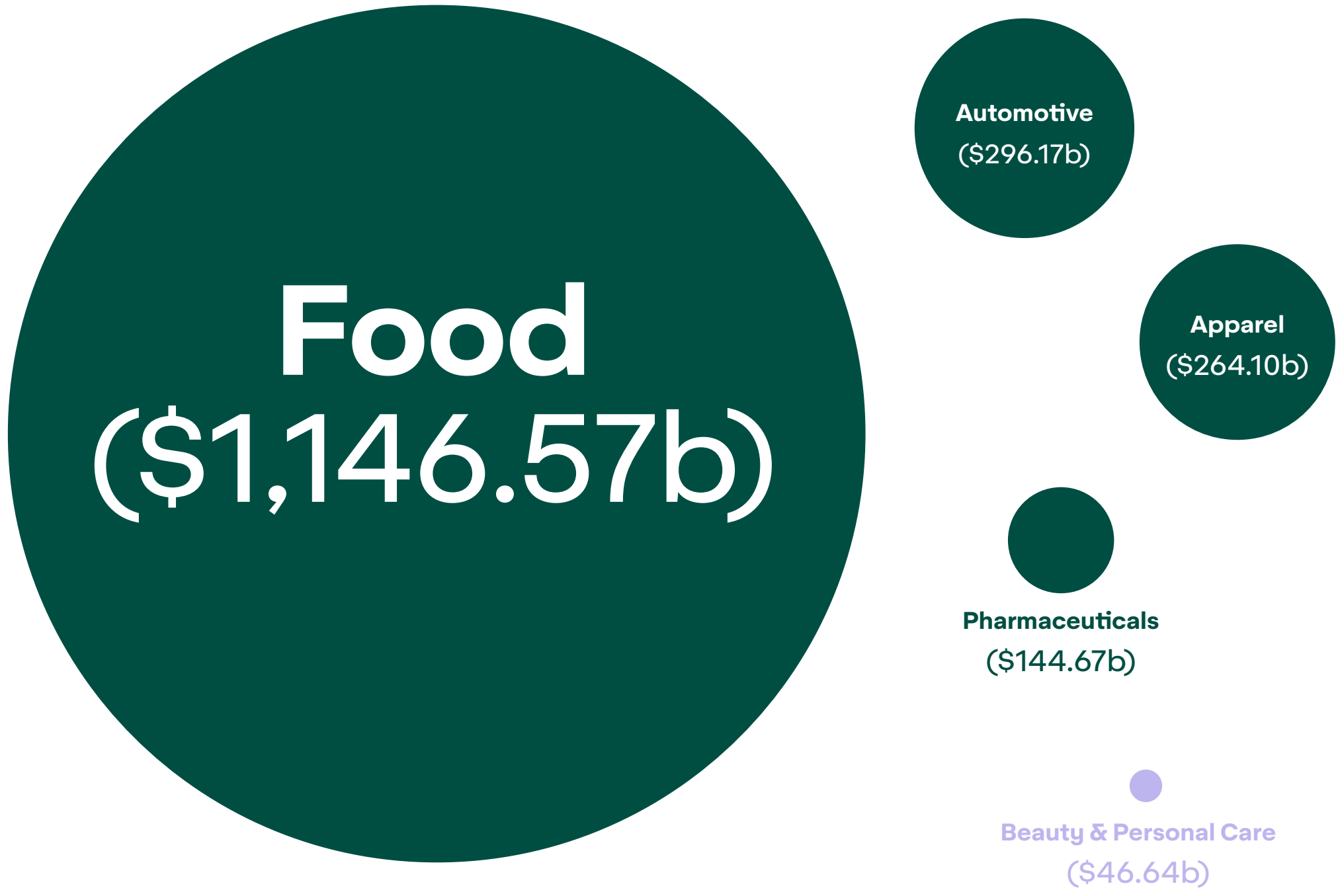
👉 How can improved inventory visibility reduce waste and keep items in stock for customers?



An average of **3.4%** of inventory is wasted per year due to **overproduction**. More than the entire global inventory value for **beauty and personal care**.

[AD Global Supply Chain Research, 2022]

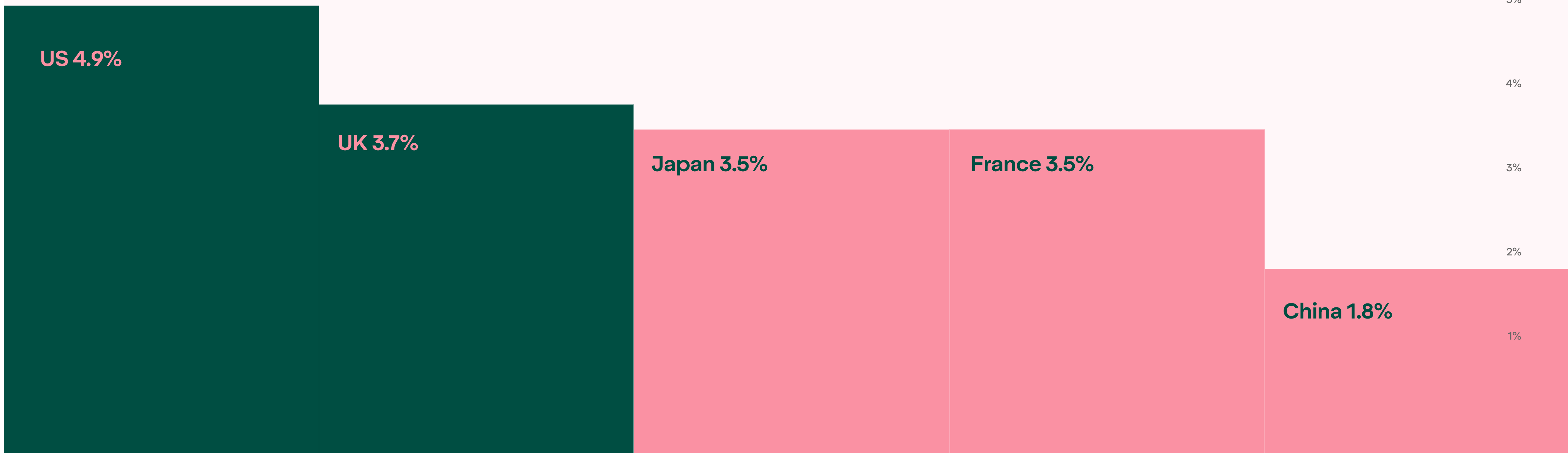
Total global inventory values per year<sup>1</sup>



Total global inventory wasted due to overproduction

**\$64.5 billion**

# Waste due to overproduction is largest in the US and the UK



## What's happening?

# Faced with uncertainty, businesses are overproducing to fulfill deliveries and navigate customer anxiety.


Confronted with operating their businesses at a time when consumer demand is unpredictable, supply chain practitioners are encountering difficulties managing inventory and forecasting stock. A survey conducted in April 2022 by consultancy McKinsey & Company found that when shopping for groceries and essentials, 68% of European consumers had adopted a new shopping behavior in the last six weeks, this new behavior could be anything from switching to a different brand or store than normal, to trying a new digital shopping method.<sup>8</sup> Faced with this volatility, many companies are playing it safe with additional inventory, rather than risking leaving consumers empty-handed and frustrated. The result of this trade-off is overproduction, which is a significant cause of waste in the supply chain.

Furthermore, overproduction is costing companies billions in revenue, this especially impacts the pharmaceuticals industry with an estimate of \$25 billion that could be saved through inventory reduction alone.<sup>9</sup> Product loss is also costing the pharmaceutical industry greatly, an estimate of \$35 billion is lost every year due to issues storing and transporting temperature sensitive medical products, such as vaccines.<sup>10</sup> Improved traceability and inventory

management of prescription medication using digital identification technology is key for reducing waste and adhering to legislations such as the US Drug Supply Chain Security Act.<sup>11</sup>

Reassuring customers that they can get what they need when they need it is a legitimate concern. The research found that, globally, 47% of beauty consumers and 47% of apparel consumers reported thinking more about the availability of items since recent global events, this increases to 51% for food consumers. Despite this, availability of goods is being outranked by other priorities, such as cost, quality and durability. The reason for this could be that businesses are opting to overproduce to mitigate supply chain disruptions affecting their customers' everyday lives. Scarcity fears are highest within the food sector, with 57% of people feeling concerned about food shortages, compared to only 40% in fashion and 39% in beauty.





“Chipotle has no preservatives and uses fresh ingredients. Chicken, for example, lasts 15 days from slaughter to end of life, which includes shipping across the country. If demand drops you’re stuck with some short shelf-life items. With RFID we can push it to restaurants and rebalance inventory to mitigate the waste and avoid the potential of writing off hundreds of thousands of dollars of inventory.”

**Jordan Roth,**  
Director of Planning, Chipotle

# Legislative forces

## France

Restrictions on destroying unsold items have already been extended to a number of products including textiles, furniture and electronics in [France](#); and similar measures have been proposed in the EU under revisions to Extended Producer Responsibility (EPR) laws. These interventions make manufacturers financially or practically responsible for post-consumer waste. In textiles, this could also include responsibility for garments left over as a result of overproduction.

→ [Read more](#)

## US

The 2030 Food Loss and Waste Reduction Goal was first announced in the US in 2015. Its primary goal is to cut food loss and food-related waste in half by 2030. This initiative is helping to improve food security for people and businesses across the US, while also reducing negative environmental impact to the planet.

→ [Read more](#)



**Over a third (36%) of consumers selected 'availability' of items as one of the top five priorities when purchasing items.**

**57%** of respondents are worried about food shortages, compared to only **40%** in fashion and **39%** in beauty.

[AD Global Consumer Insights Research, 2022]



## Why it matters

# More visible supply chains for businesses keep disruptions invisible for consumers.

Overproduction, triggered by demand volatility, is resulting in an average waste of 3.4% of inventory per year according to our research. This might seem like a small number, but the reality is a huge cost to businesses, people and the planet. For this reason, keeping on top of distribution and inventory tracking end-to-end is vital for achieving supply chain resilience and reducing this loss. Better visibility is enabling supply chain practitioners to improve their forecasting accuracy and pinpoint the optimal amount of stock for their business; enough to prevent consumers from experiencing scarcity of essential items and not so much that it leads to excess waste.


Overproduction is playing out differently across sectors, and there is an opportunity to tailor how businesses approach this specific waste issue.

The research shows that the beauty category has the highest amount of lost inventory due to overproduction per year, sitting at 6.2%, compared to apparel (3.9%), pharmaceuticals (3%), food (2.9%) and automotive (1.1%). This shows that the beauty industry is most in need of change and investment to curb overproduction and improve the handling of inventory. That said, the beauty industry has the smallest inventory value of our five industries at USD \$46.64 billion, so the 6.2% wasted represents USD \$2.9 billion. A drop in the ocean when compared to the food industry. With an inventory value of USD \$1.9 trillion, 2.9% equates to a whopping USD \$33.3 billion wasted due to overproduction.

Furthermore, businesses run the risk of losing customers if availability of goods becomes a pain point. In fact, recent research shows trust in physical retailers significantly drops if an item a consumer wants to buy is not in stock.<sup>12</sup> Achieving a resilient supply chain to meet consumer demand is a key competitive advantage and will alleviate consumer concerns around scarcity of goods.

There is also an opportunity for organizations to consider the concerns and feelings most salient to their consumers. For example, consumers in the food category experience the highest concern around availability of goods compared to other industries. Therefore, it is important for organizations to tailor their messaging to reassure consumers and provide them with certainty when they need it most.

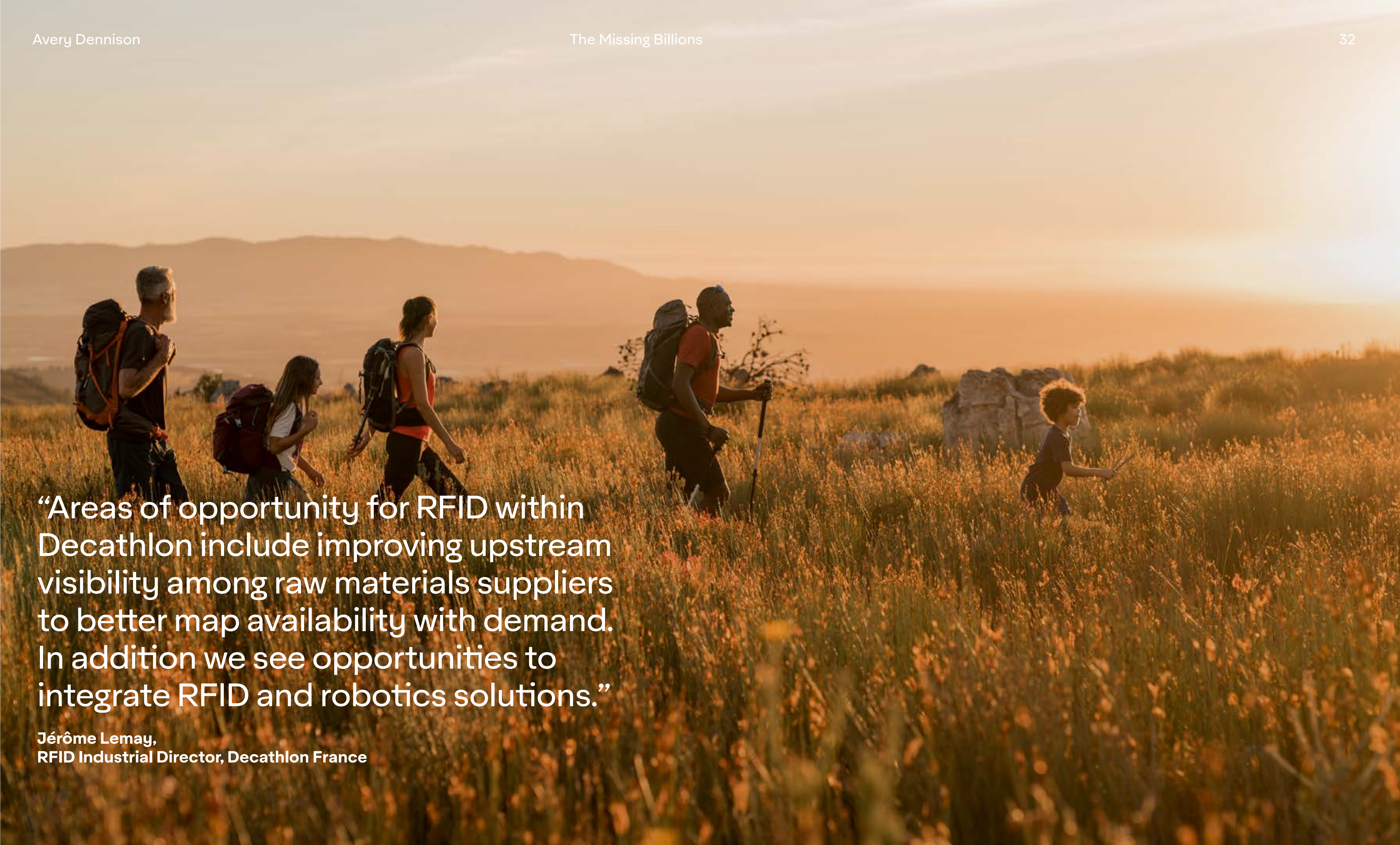




**“A key use case for RFID is FEFO (first-expired, first-out), which eliminates most product expiration and allows us to balance inventories between the front- and back-of-house.”**

**Eduardo Kawano,  
Supply Chain Digital Transformation Senior Manager, Grupo Boticário**





“Areas of opportunity for RFID within Decathlon include improving upstream visibility among raw materials suppliers to better map availability with demand. In addition we see opportunities to integrate RFID and robotics solutions.”

Jérôme Lemay,  
RFID Industrial Director, Decathlon France



In practice

# Grupo Boticário

[→ Read more](#)

Seeking end-to-end traceability across its increasingly complex supply chain, Grupo Boticário hired EY to help the company test RFID tagging for six months in 2018. The results, made possible in part by on-metal tags and other solutions, included stockouts reduced by as much as 97%; identification of hidden stockouts increased by more than half; a 14% decrease in labor; and an increase in revenue. The company is now fully deploying RFID across one of its brands, with an eye to further expansion.





# Key takeaways to minimize waste



**Item-level visibility of inventory end-to-end negates the need for safety stocks**

Overproduction occurs due to a lack of clarity on the amount of stock already being produced, distributed and purchased. Therefore, item-level visibility and accurate forecasting can provide this clarity and prevent problems before they occur.



**Consumers need reassurance and open communication about the availability of goods**

Consumers don't like feeling the effects of scarcity or low stock levels, they want reassurance that they can get their hands on the essential items they need day-to-day. Food companies especially should aim to dial up reassurance when communicating with customers due to scarcity fears being strongest in this category.



**With supply chain visibility brands can better implement FIFO policies**

The world continues to be intricately interconnected by the global supply chain. While demand volatility is impossible to eliminate, it is possible to manage. With greater stock visibility, brands can better implement "first-in, first-out" (FIFO) policies — meeting consumer desires for reduced waste, while maintaining levels of stock that can cater to unforeseen disruption.



# Considerate Consumption



Offering more durable products to consumers not only reduces waste but also addresses their need for affordability and quality.



☞ How can championing durability **connect the needs** of the consumer with the needs of the planet?



# On average across beauty, apparel and food **48%** of people rank **‘product durability’** in their top five most important factors when making a purchase...

Most important factors affecting purchase in retail segments are quality, cost and durability.

(% ranking each factor in top five most important)



**...versus only 30% for ‘sustainability’.**

[AD Global Consumer Insights Research, 2022]



France leads the pack when it comes to prioritizing the purchase of durable products.

China 48%

US 45%

France 52%

Japan 49%

UK 46%

90%

80%

70%

60%

50%

40%

30%

20%

10%



## What's happening?

# Consumers are prioritizing cost, quality and durability over sustainability.

While businesses might talk about purpose over profit, when it comes to sustainable supply chain initiatives, profitability is still the driver. Similarly, consumers are looking to help the environment in a way that won't put them out of pocket. With financial uncertainties caused by a cost of living crisis, the Russia-Ukraine conflict, and the residual effects of the global pandemic, two Deloitte studies found that 73% of consumers are concerned about the escalating price of everyday purchases. The studies also showed that sustainable decision-making, such as the switch to an electric car, was being driven by a desire to save on fuel costs.<sup>13</sup>

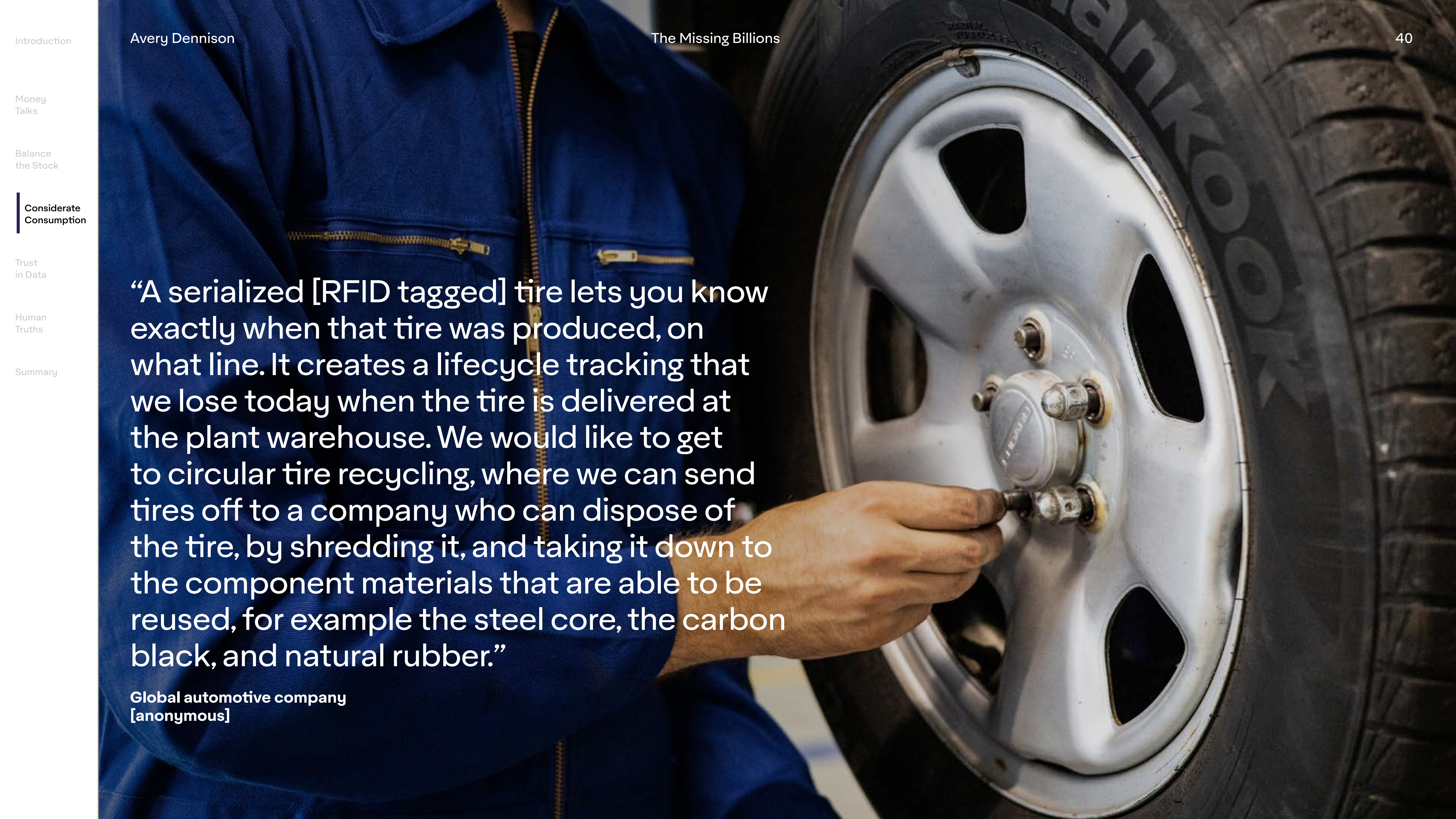
It's perhaps not surprising therefore that our survey data found that consumers rank cost and quality above all other factors affecting purchase decisions.<sup>14</sup> The outlier here is China, where people are more likely to factor

sustainability into their purchasing decisions with 37% ranking it in their top five priorities, compared to 30% at a global level.

The research findings show that the much talked about sustainability intention-action gap is, for most consumers, minimal. In fact, people tend to display a realistic and pragmatic understanding of their priorities, and their behavior reflects this. Even in apparel, where the impact of fast fashion is a hot media topic, 27% of respondents featured sustainability in their top five factors informing their most recent purchase, matching 28% that recorded it in their top five factors informing a future purchase. While sustainability might not appear as high up the list of priorities as expected, the research points to a shift in the desire for longer lasting products with durability ranked by almost 30% of global consumers as a top three concern. A 2021 study from Deloitte

further supports this finding, with 52% of UK consumers considering durability when making a purchase and 45% agreeing that choosing a durable product is a sustainable purchase.<sup>15</sup> So, with budgets being squeezed, people are opting for products that are reliable and made to last, even if they require larger outlays upfront — 38% of UK consumers paid extra for a product considered to be long lasting or more durable.<sup>16</sup>



A close-up photograph of a person wearing a blue zip-up uniform jacket, working on a silver alloy wheel. The person's hands are visible, using a tool to adjust the tire valve. The tire is dark and has a tread pattern. The background is slightly blurred, showing more of the wheel and the person's uniform.

“A serialized [RFID tagged] tire lets you know exactly when that tire was produced, on what line. It creates a lifecycle tracking that we lose today when the tire is delivered at the plant warehouse. We would like to get to circular tire recycling, where we can send tires off to a company who can dispose of the tire, by shredding it, and taking it down to the component materials that are able to be reused, for example the steel core, the carbon black, and natural rubber.”

Global automotive company  
[anonymous]



## Why it matters

# Longer lasting products create less waste and mean less cost to consumers.

With extreme weather events becoming more frequent and intense, the reality of the climate crisis is inescapable.<sup>17</sup> Consumers know steps must be taken to actively reduce environmental harm, but are also faced with the reality of financial uncertainty. These opposing forces create a tension that brands and businesses can help address. With durability high on the priority list, consumers are looking for products that last longer. If a product lasts longer it needs to be replaced less, meaning less waste — from the people and materials used to make it, to the packaging waste at the end of life. And reducing the need to buy more also means less money spent.

Furthermore, products made to have a longer lifespan are more likely to be reused, recycled or upcycled. This circular economy paradigm is a useful communication tool for consumers caught between a proverbial rock (cost of living concern) and hard place (climate change concern). There is an opportunity for brands to deliver on the promise of durability by framing their communications around a longer lifespan or second life. The uptick in embracing the circularity of goods is being reinforced by legislative updates including the European Commission's Circular Economy Action Plan, the Circular Economy Development Plan in China and the UK's Ecodesign regulations.<sup>18</sup> Technology helps close the loop to circularity.

A key example of this technology is Avery Dennison TexTrace — custom-made woven and knitted RFID inlays which can be sewn onto or inserted into products. The integrated nature of this technology means that in the near future it could last the entire lifecycle of the product, enabling circular applications through resale and recycling.<sup>19</sup> Circularity and product lifecycle tracking can also be achieved through Digital Product Passport (DPP) approaches. Avery Dennison's connected product cloud atma.io, is a member of the CIRPASS consortium which aims to prepare the ground for the gradual piloting and deployment of the DPPs from 2023 onwards, with an initial focus on the electronics, batteries and textile sectors.



# Legislative forces

## EU

The European Commission Circular Economy Action Plan will see the Ecodesign Directive of 2009 updated to focus on extending product lifecycles by improving “product durability, reusability, upgradeability and reparability”.

→ [Read more](#)

## China

The Circular Economy Development Plan encourages firms in China to expand upon their recycling facilities and leverage green designs to contribute to a circular economy by 2025.

→ [Read more](#)

## UK

The UK government’s Ecodesign regulations are expanding to include requirements for durability and repairability that will work in tandem with Right to Repair regulation requiring producers of durable goods to design them such that they can be repaired with widely available tools for up to 10 years after purchase.

→ [Read more](#)



## In practice

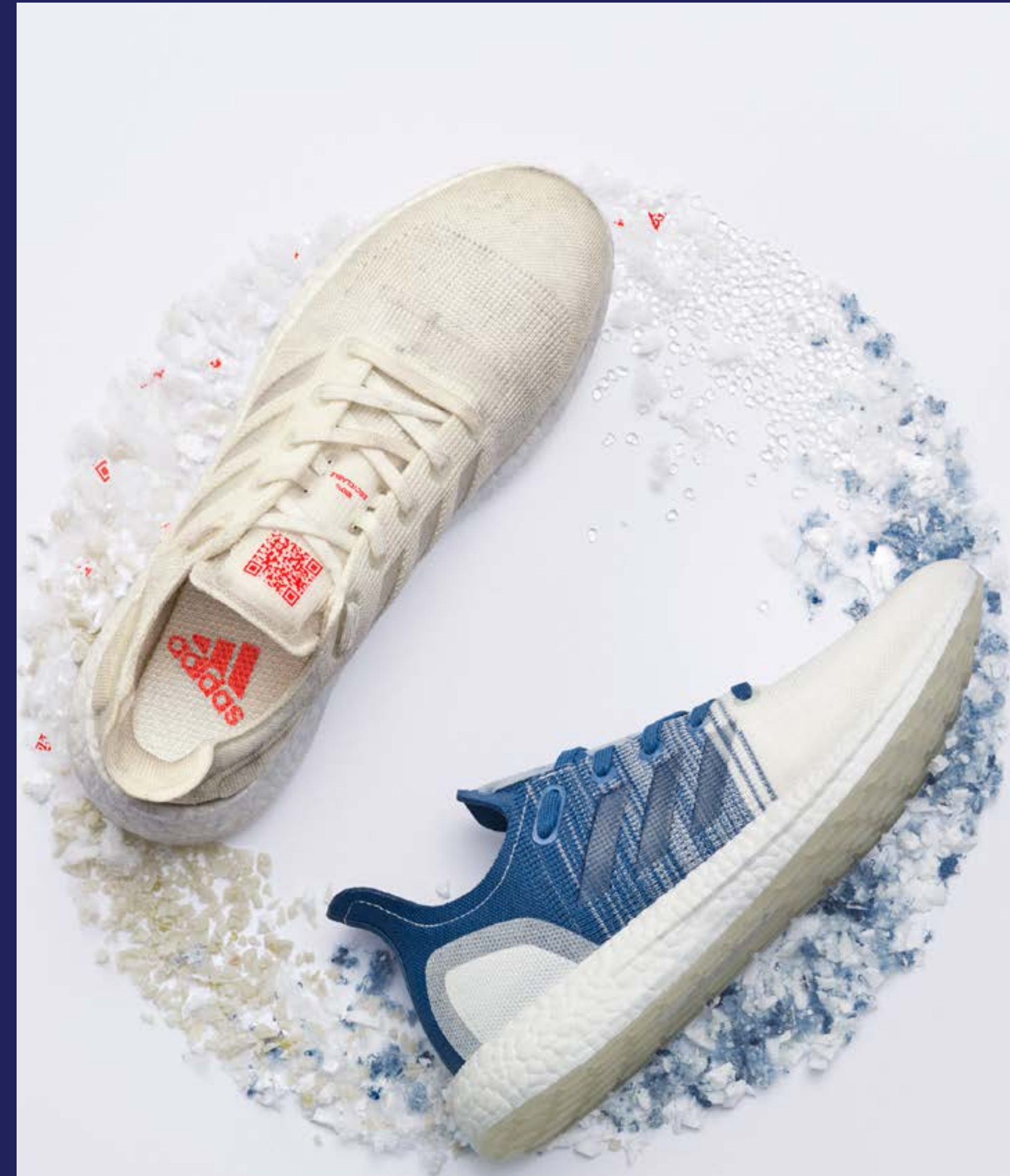
# adidas x atma.io

→ [Read more](#)

Global sportswear brand adidas is utilizing Avery Dennison's cloud-based platform atma.io for circularity and unique consumer-product interactions. atma.io completely reimagines how supply chains operate, how brands connect with individual consumers, and how global organizations can achieve their sustainability and transparency goals. Currently, atma.io manages over 22 billion unique items and adds over 300 new connected products to the platform every second.

“adidas integrated atma.io's connected product cloud into our Infinite Play initiative to scale our ability to buy-back products and give them a second life. The program has been the first of many use cases we look to enable with atma.io and Avery Dennison to achieve our connected product vision and our sustainability goals.”

David Quass,  
former Global Director of Brand Sustainability, adidas



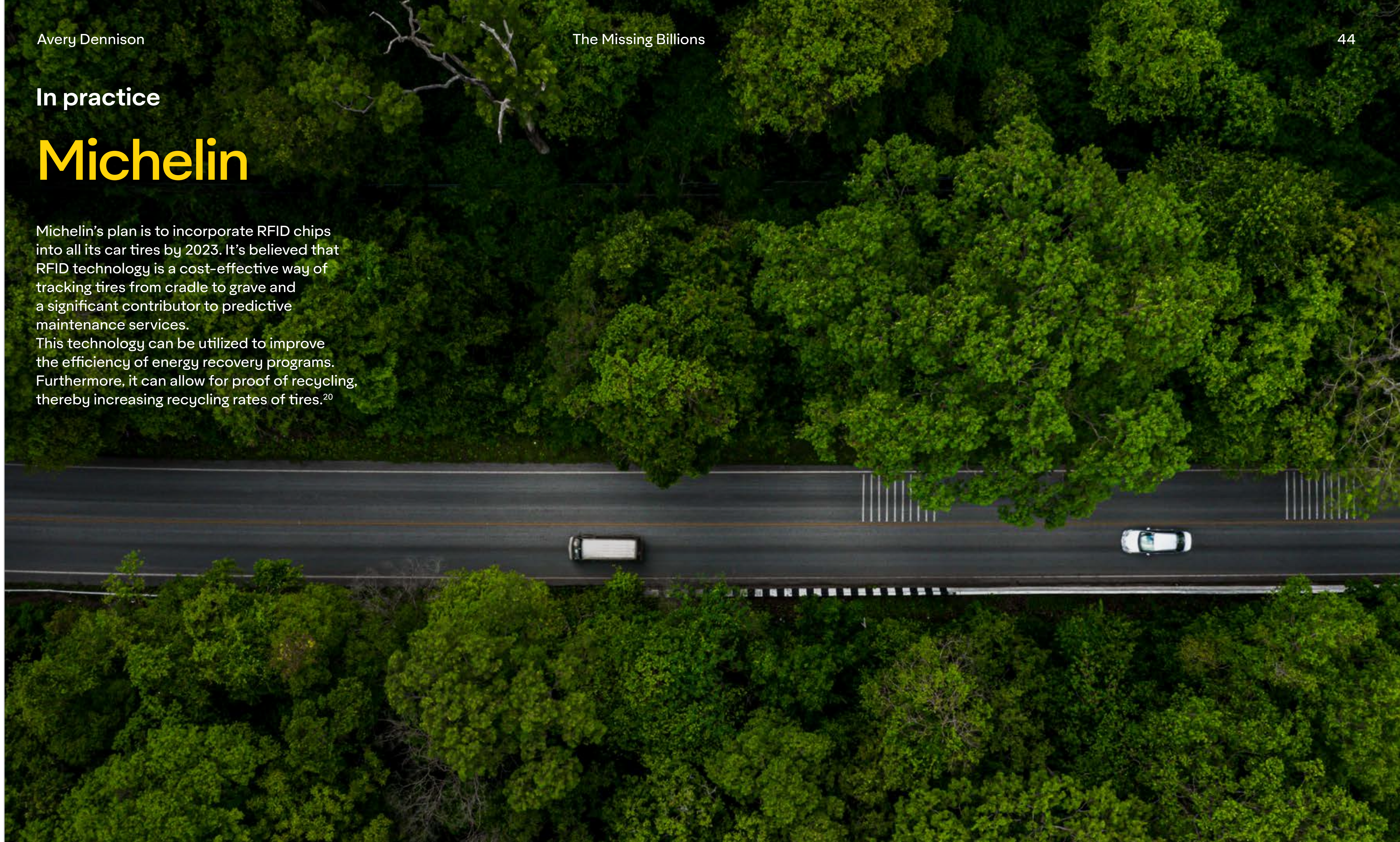


## In practice

# Michelin

Michelin's plan is to incorporate RFID chips into all its car tires by 2023. It's believed that RFID technology is a cost-effective way of tracking tires from cradle to grave and a significant contributor to predictive maintenance services.

This technology can be utilized to improve the efficiency of energy recovery programs. Furthermore, it can allow for proof of recycling, thereby increasing recycling rates of tires.<sup>20</sup>





# Key takeaways to minimize waste



## Durability connects consumer needs to the needs of the planet

With sustainability taking a back seat to cost concerns, brands can help eco-conscious consumers and those who are less concerned about the environment by clarifying the connection between durability and climate mitigation in product design, materials and ingredients choices.



## Consumers are prioritizing durability to ease cost concerns

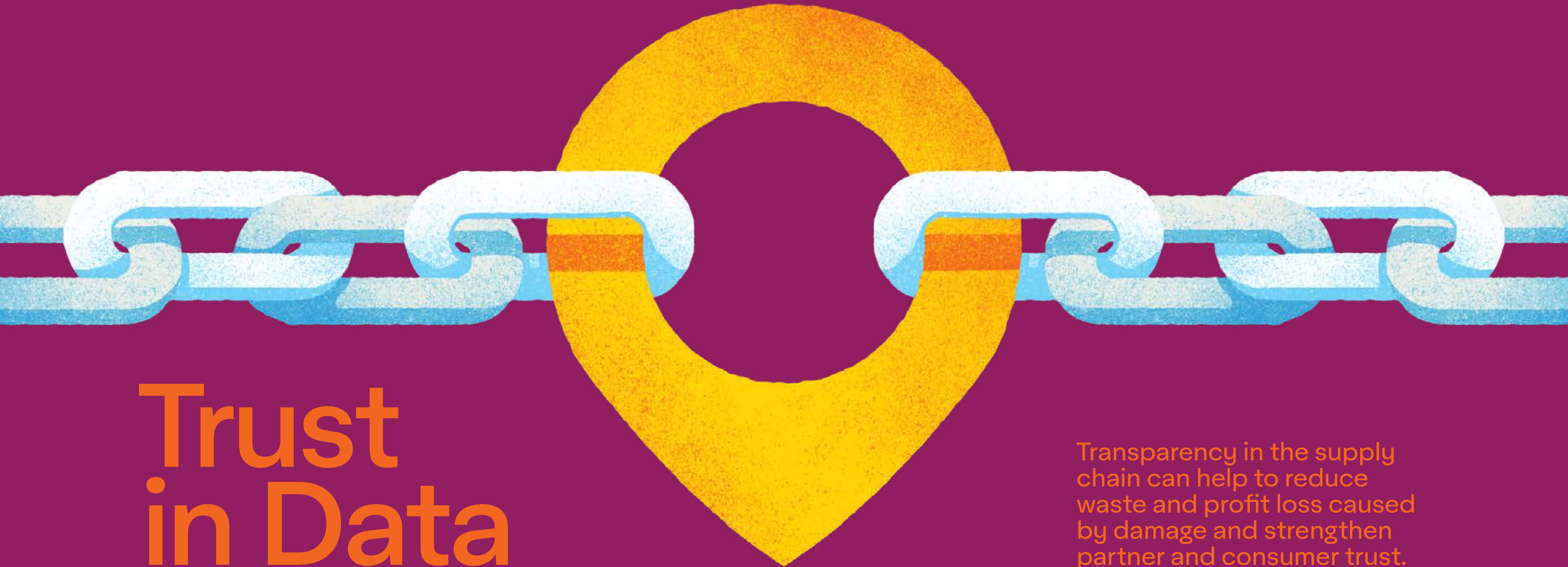
Consumers are increasingly placing value on high-quality, long-lasting goods. Focusing on durable products, and highlighting the connection between durability and long-term savings in marketing campaigns, can reassure consumers, who, rightly, have a keen eye on their budgets.



## The circular economy is driving how people think about the durability of goods

The circular economy is of increasing interest to consumers and is becoming a larger part of government legislation. Incorporating messaging about products' second lives, repair schemes and upcycling opportunities could be key to unlocking consumer interest in durable products.





# Trust in Data

Transparency in the supply chain can help to reduce waste and profit loss caused by damage and strengthen partner and consumer trust.



👉 How can leveraging data **create greater transparency and build stronger partnerships** along the supply chain?

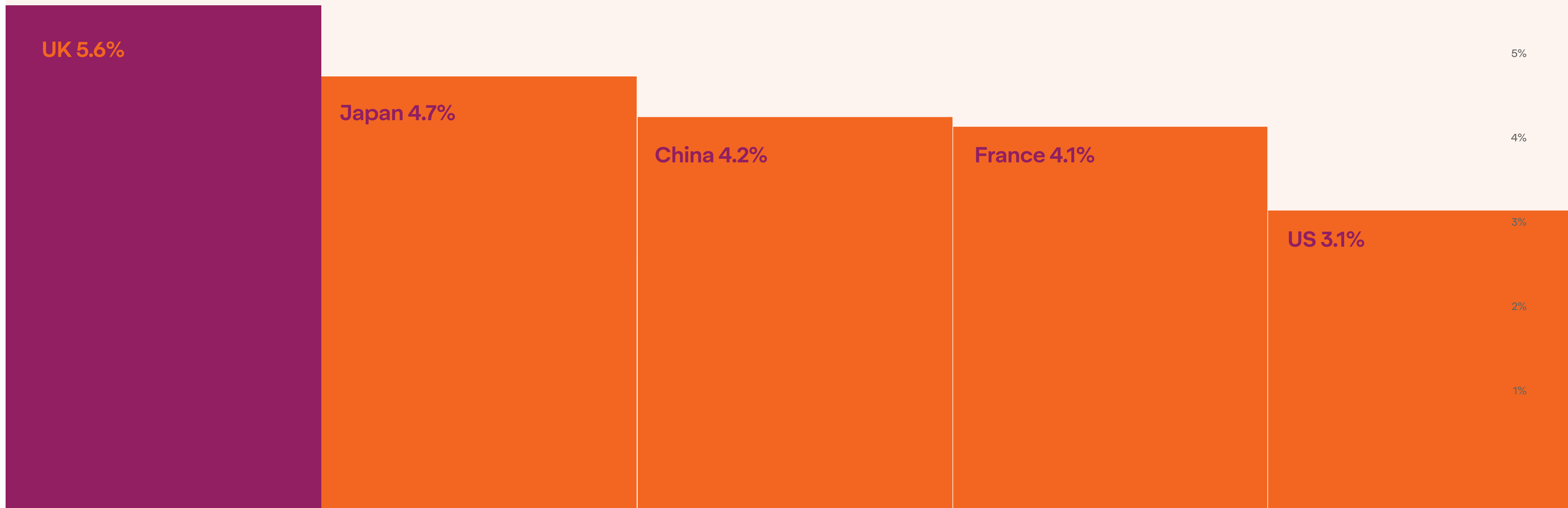


# On average, businesses report that **4.3%** of inventory is wasted due to items perishing or being damaged each year.

[AD Global Supply Chain Research, 2022]

The UK is facing the largest hardships due to damage related waste.

% of inventory wasted due to items perishing or being damaged each year





## What's happening?

# Damage is fuelling inventory waste and triggering friction along the supply chain

Across markets, supply chain managers are facing a very specific waste challenge: the damage or destruction of goods. The research found that 4.3% of inventory is going to waste globally due to the accidental damage or destruction of goods, across apparel, beauty, food, pharmaceuticals and automotive. While the percentage seems small, the actual value is huge. Globally, inventory across the five sectors is valued at USD \$1.9 trillion, making the total of this waste USD \$81.6 billion. In the automotive industry alone, this figure jumps to 4.7%, caused by specific components, such as tires having a finite shelf life, parts being shipped to the wrong locations and suppliers diverging from stipulated transport standards. That's USD

\$13.9 billion wasted in an industry with a total inventory value of \$296.2 billion. Even higher is the food industry at 7% (equal to USD \$53.9 billion), a figure fuelled by products spending too long on shelves, being stored outside of optimal conditions or damaged in transit. In the US alone, \$16 billion lost in potential profits due to wasted food every year.<sup>21</sup> On top of this, there is colossal damage to the environment, with wasted food contributing 24% of landfill inputs, 18% of US cropland use, 14% of fresh water use and 4% of US greenhouse gas emissions.<sup>22</sup>

What makes these figures hard to accept is that supply chain managers can't be certain if reported damage is genuine or a "concealed

shortage". This occurs when damage is reported excessively by distribution to improve margins, and interviews suggest that an increasing number of organizations are encountering it across all sectors. This generates additional and unnecessary complications for supply chain managers, who already do not have the time and resources to verify the damage claims. Despite legislation coming into play to prevent irregularities, such as the Cosmetic Supply Chain Transparency Act of 2021 (USA), this is still a huge challenge for businesses. On top of significant profit loss, this ambiguity and lack of visibility of damage creates distrust between business partners along the chain and can make building relationships difficult.



# Legislative forces

## US

The Cosmetic Supply Chain Transparency Act of 2021 (USA) requires beauty suppliers to prove that their products do not contain banned substances or chemicals. A measure that endeavors to eliminate the need to verify if a company is acting ethically.

→ [Read more](#)

## China/Japan

Regional Comprehensive Economic Partnership (RCEP) legislation came into action in January 2022, the policy is predicted to support economic partnerships and relationships in East Asia, particularly in China, Japan and South Korea through more integrated supply chains.

→ [Read more](#)

“Concealed shortages cost us a lot of money in lost sales and in cost of goods sold. It happens every day and we have no idea if the claims are legitimate, and no way to check them. We can’t fight concealed shortages unless we have RFID.”

US clothing company [anonymous]





## Why it matters

# Data is building hyper-connectivity and putting trust back into the supply chain.

To address the loss of profit caused by damage-related waste and the lack of transparency, companies are turning to data-led tech solutions to boost visibility and flag irregularities and anomalies. Avery Dennison's real-time waste elimination tool enabled by atma.io is a key example of a solution that caters to these needs, its anomaly callout feature generates alerts regarding suspicious activities happening within inventory, this can include possible counterfeit items in the supply chain, or items that have traversed along the supply chain in unexpected ways.<sup>23</sup> Armed with this information, businesses are able to modify processes and monitor changes much more effectively.

This item-level transparency has the added benefit of instilling more trust, a key component of relationship building with external partners, and the basis of a functional and harmonious supply chain ecosystem. If used ethically and effectively, data can facilitate transparent communication, ease potential areas of tension and increase worker satisfaction, which consumers also care about.

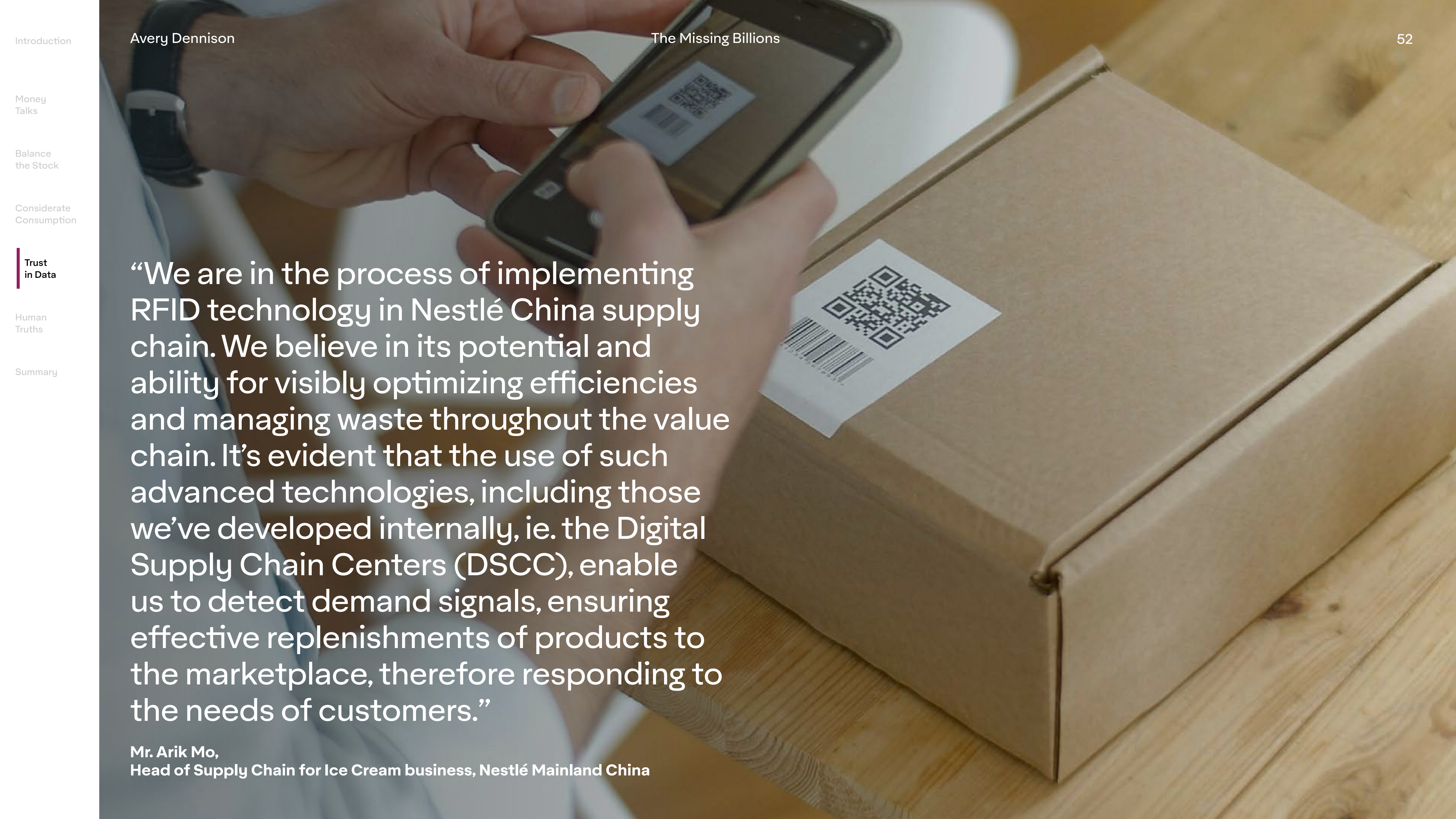
Every year, **56%** of global businesses see more than **3%** of inventory go to waste due to items perishing, spoiling or goods being damaged

[AD Global Supply Chain Research, 2022]

“We are using IT solutions that provide visibility along the supply chain to reduce waste. From the time an order is placed until it ships, we have technologies that track expiration dates and how many pallets a retailer should be expecting to receive in the coming weeks. This gives us a safeguard because retailers cannot then tell us that they only received two pallets out of five, and if that happens, we can go directly back to the carrier for the missing three pallets.”

Global pharma organization  
[anonymous]

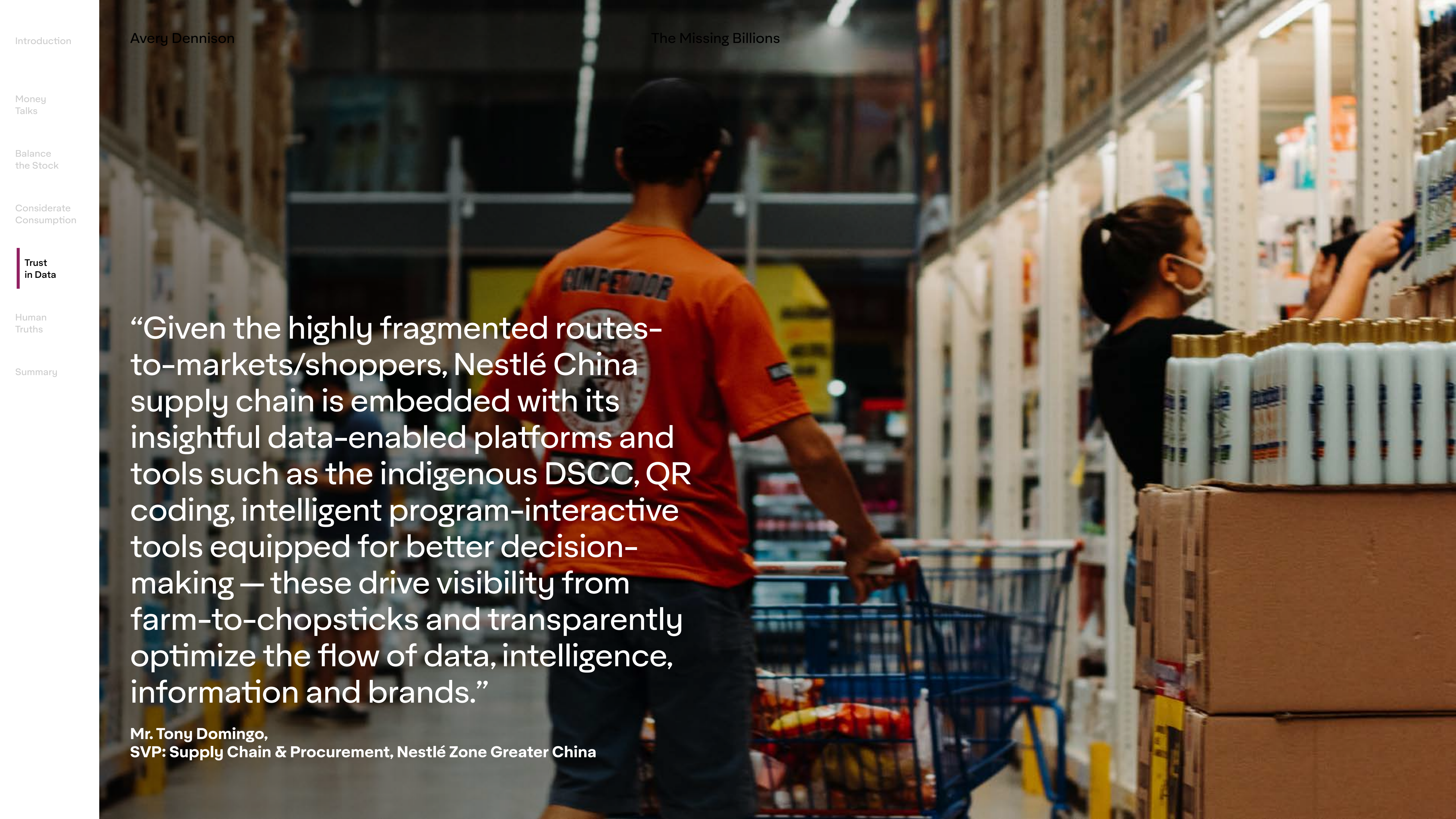


A close-up photograph of a person's hands holding a smartphone, scanning a QR code on a cardboard box. The box is resting on a wooden surface. The background is slightly blurred, showing a white cup and a wooden table. The text is overlaid on the left side of the image.

“We are in the process of implementing RFID technology in Nestlé China supply chain. We believe in its potential and ability for visibly optimizing efficiencies and managing waste throughout the value chain. It’s evident that the use of such advanced technologies, including those we’ve developed internally, ie. the Digital Supply Chain Centers (DSCC), enable us to detect demand signals, ensuring effective replenishments of products to the marketplace, therefore responding to the needs of customers.”

**Mr. Arik Mo,**  
Head of Supply Chain for Ice Cream business, Nestlé Mainland China





“Given the highly fragmented routes-to-markets/shoppers, Nestlé China supply chain is embedded with its insightful data-enabled platforms and tools such as the indigenous DSCC, QR coding, intelligent program-interactive tools equipped for better decision-making — these drive visibility from farm-to-chopsticks and transparently optimize the flow of data, intelligence, information and brands.”

**Mr. Tony Domingo,**  
SVP: Supply Chain & Procurement, Nestlé Zone Greater China



## In practice

## Chipotle

[→ Read more](#)

To enhance its traceability and inventory systems at its Chicago distribution center and approximately 200 restaurants in the greater Chicago area, Chipotle is one of the first major quick service restaurants to leverage RFID case labels to track ingredients from suppliers to restaurants via serialization.

Participating suppliers have invested in RFID technology using Chipotle specifications, which is anticipated to save suppliers time on inventory management and stock rotation, mitigate human error and increase expiration date visibility and accountability.

“Chipotle is attempting to close the bleeding edge for the restaurant industry. If we can pull it off, this will be a huge breakthrough for Chipotle logistics, for the restaurant teams and for ordering. There are a lot of companies [around the industry] looking at us to implement this successfully.”

Jordan Roth,  
Director of Planning, Chipotle





## In practice

# Hanmi Pharmaceutical Co.

→ [Read more](#)

Pharmaceutical and medical goods are one of the most sensitive and supervised product groups worldwide, which means that any product tracking and management system must be completely reliable and provide proof against theft, fraud or counterfeiting.

Hanmi Pharmaceutical Co., one of Korea's largest pharmaceutical companies, employs RFID to increase efficiency, monitor product movements, and to help it carry out government regulated quality management.

Hanmi's Pedigree system, which is used to manage the distribution of individual drugs between their production by pharmaceutical companies and their dispatch to hospitals and pharmacies where they are sold to patients, is not just an efficient distribution management system. It can also prevent the circulation of health-threatening fake medicines and solve the problem of unlicensed medicine being distributed in the pharmaceutical supply chain.





# Key takeaways to minimize waste



## Data can pinpoint where damage occurs

By ascertaining the type, frequency and validity of damage, supply chain managers are able to take the necessary prevention measures, and in turn, reduce waste.



## Transparency is facilitating stronger partnerships

By knowing exactly where and how damage occurs, supply chain managers can work with suppliers to solve issues and build more trusting partnerships.



## Data prolongs the life of products

By using data to educate partners along the supply chain, products with a shelf life or specific storage conditions can be kept for longer and in optimal conditions.



# Human Truths



Helping consumers make waste conscious purchasing choices through education and transparency.



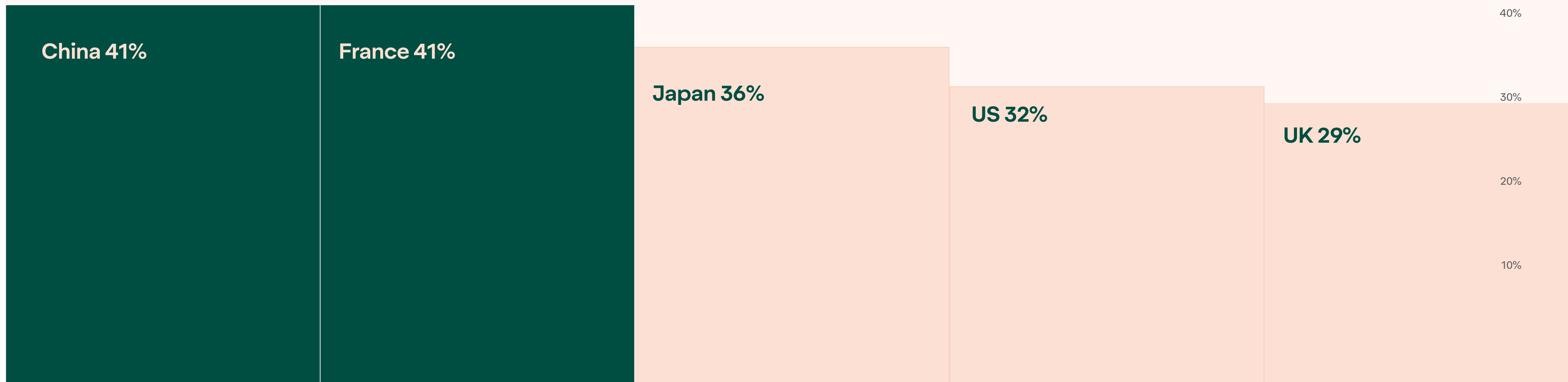
👉 **How can educating consumers on the human and environmental impact of the supply chain lead to less waste?**



# Consumers rank increased transparency about materials and ingredients as the **top** way brands can help them make more sustainable purchases around apparel, beauty and food.

[AD Global Consumer Insights Research, 2022]

% of apparel, beauty and food consumers ranking transparency about materials or ingredients as a top driver for sustainable purchases





## What's happening?

# People need trustworthy information to make informed purchase decisions

With almost a third of consumers placing sustainability in their top five priority list of factors affecting purchases, and 85% of people globally saying they have switched to more sustainable shopping habits in the past five years, there is a significant and growing number of consumers striving to reduce their environmental impact through purchases.<sup>24</sup> Despite being willing on an individual level, consumers want brands to shoulder most of the responsibility when it comes to tackling environmental and societal issues, and brands are using ESG goals to signal their action on these expectations. The research found that

the opportunity to promote CSR was cited by businesses as the top motivator for supply chain sustainability investments, sitting at 49%.

Despite good intentions, most consumers know very little about what it takes for a product to end up in their hands. The consumer survey data found that over half of global consumers (54%) mistakenly believe fast fashion is made entirely by machines. To overcome this gap in consumer knowledge, the research shows that consumers are looking for more information before making a purchase — whether for food, apparel or beauty, over a third of consumers say

that if brands are transparent about ingredients or materials it would encourage them to make more sustainable purchases (37% for food, 36% for apparel and 36% for beauty). It's perhaps not surprising that reducing packaging is the most pressing concern for both businesses and consumers, with a focus on single use plastics, unnecessary packaging and non-recyclable materials. Looking into the near future, consumer desires for information will be coupled with legislative pressure to make this kind of information available as lawmakers aim to help conscious consumers make informed decisions about what they buy.



# Legislative forces

## US

The New York Fashion Sustainability and Social Accountability Act, which was unveiled to a legislative committee for the first time in January 2022, will attempt to compel all fashion companies that sell products in New York State and generate more than \$100 million in global revenue, to map at least 50% of their supply chains and disclose greenhouse gas emissions, water footprint, chemical use and median wages. Fines levied against companies failing to comply will contribute to a community climate justice fund. This legislation could reshape behavior of fashion brands — reorienting business goals toward people and the planet.

→ [Read more](#)

## EU


The European Commission has proposed a new Ecodesign for Sustainable Products Regulation, which would see the introduction of digital product passports (DPP). These will make data on products and their supply chains readily available so that consumers can make informed purchase decisions and businesses can recycle and repair items more easily. By 2030, the new framework expects results in 132 mtoe of primary energy savings, which corresponds approximately to 150 bcm of natural gas, almost equivalent to EU's import of Russian gas.

→ [Read more](#)



**Over half** of global consumers **(54%)** mistakenly believe fast fashion is made entirely by machines

[AD Global Consumer Insights Research, 2022]



“Consumers want to know where produce is coming from, they want to connect with the specific location. They want to see who is growing a particular product, how sustainable they are, what kind of practices they are using, whether the produce is coming from an organic farm, or are there sustainable harvesting practices?”

US food company  
[anonymous]



## Why it matters

# Framing waste reduction to align with causes people care about can help build brand loyalty

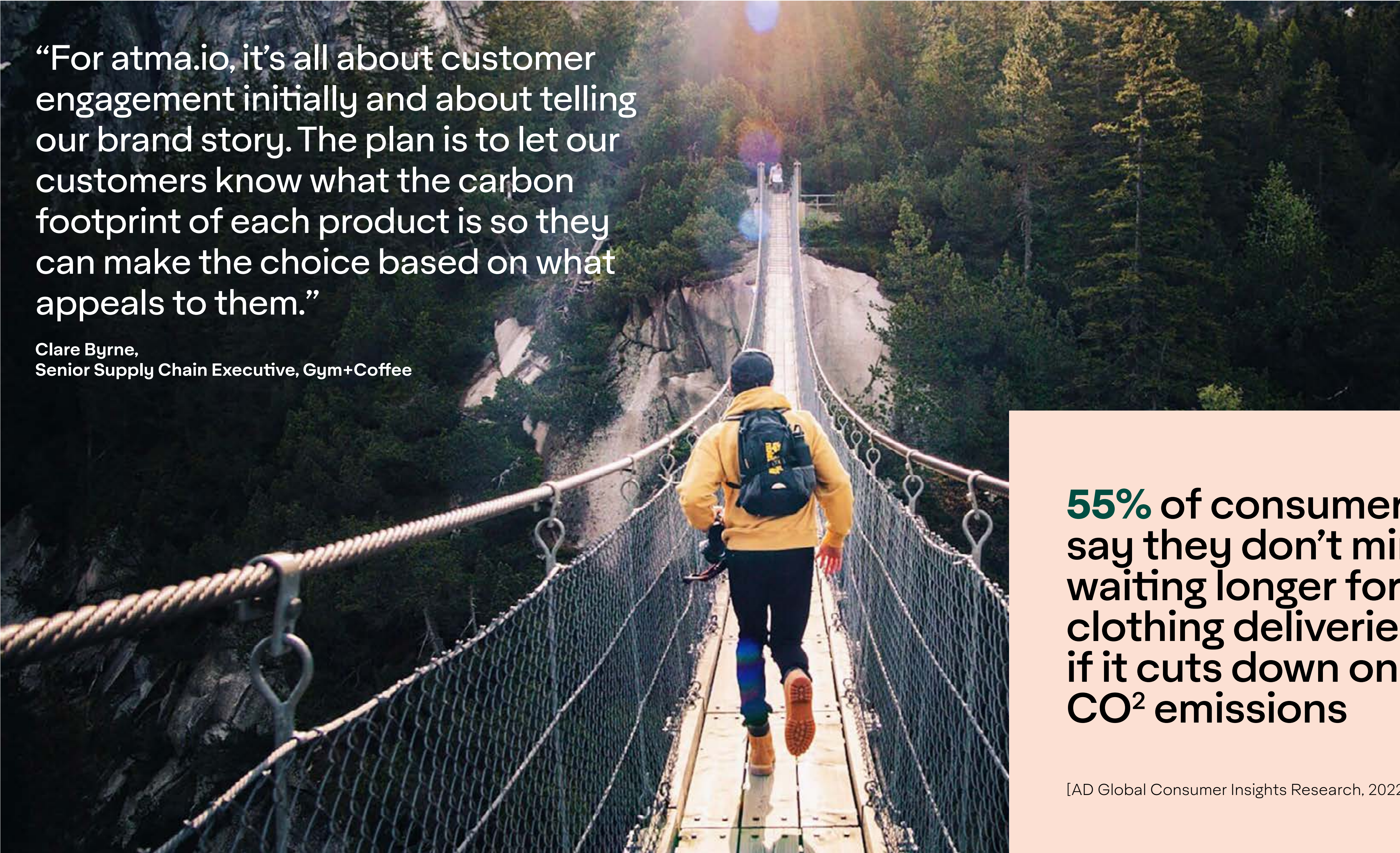
While consumers believe the responsibility to cut waste should primarily lie with businesses, concerns about convenience, cost and a lack of information mean that they are also looking to companies to help them make sustainable choices in everyday life.<sup>25</sup> And there are multiple points along the purchase journey that consumers need guidance. From pivoting their regular purchases to those with less packaging, or choosing the recyclable option, to opting for a slower delivery that wastes less CO<sup>2</sup>, or picking a product that's traveled fewer miles — brands have a number of opportunities to help consumers learn about how they can produce less waste when they make a purchase. The consumer data suggests people are open to making these everyday changes to benefit the environment, with 55% saying they don't mind

waiting longer for clothing deliveries if it cuts down on CO<sup>2</sup> emissions.

Packaging waste is particularly salient for consumers, and to a large extent this can be attributed to it having seen more press.<sup>26</sup> While this presents short-term opportunities to reduce waste, the research shows that a growing number of consumers want easily accessible information on the lifecycle of their products, where they have been and the conditions under which they were made. Whether it's for food, apparel or beauty, 43% of consumers say transparency about a product's origins and journey is important to them (44%, 43% and 43%, respectively). Providing this level of information has a number of benefits for brands too. Education and transparency will boost

consumer awareness of initiatives that reduce supply chain waste and reinforce brand trust when there may be little faith in businesses' existing attempts to combat climate change.<sup>27</sup> In addition, brands and consumers will be obliged to align their goals when it comes to reducing waste, and this increased transparency will reduce friction for consumers who rely on this information to make the best decisions for them.



A person wearing a bright yellow jacket, a dark backpack, and a dark cap is walking away from the camera across a suspension bridge. The bridge has a wooden deck and metal railings. The background is a dense forest of tall trees, and the sky is bright with some lens flare effects.

“For atma.io, it’s all about customer engagement initially and about telling our brand story. The plan is to let our customers know what the carbon footprint of each product is so they can make the choice based on what appeals to them.”

Clare Byrne,  
Senior Supply Chain Executive, Gym+Coffee

**55%** of consumers say they don’t mind waiting longer for clothing deliveries if it cuts down on CO<sup>2</sup> emissions

[AD Global Consumer Insights Research, 2022]



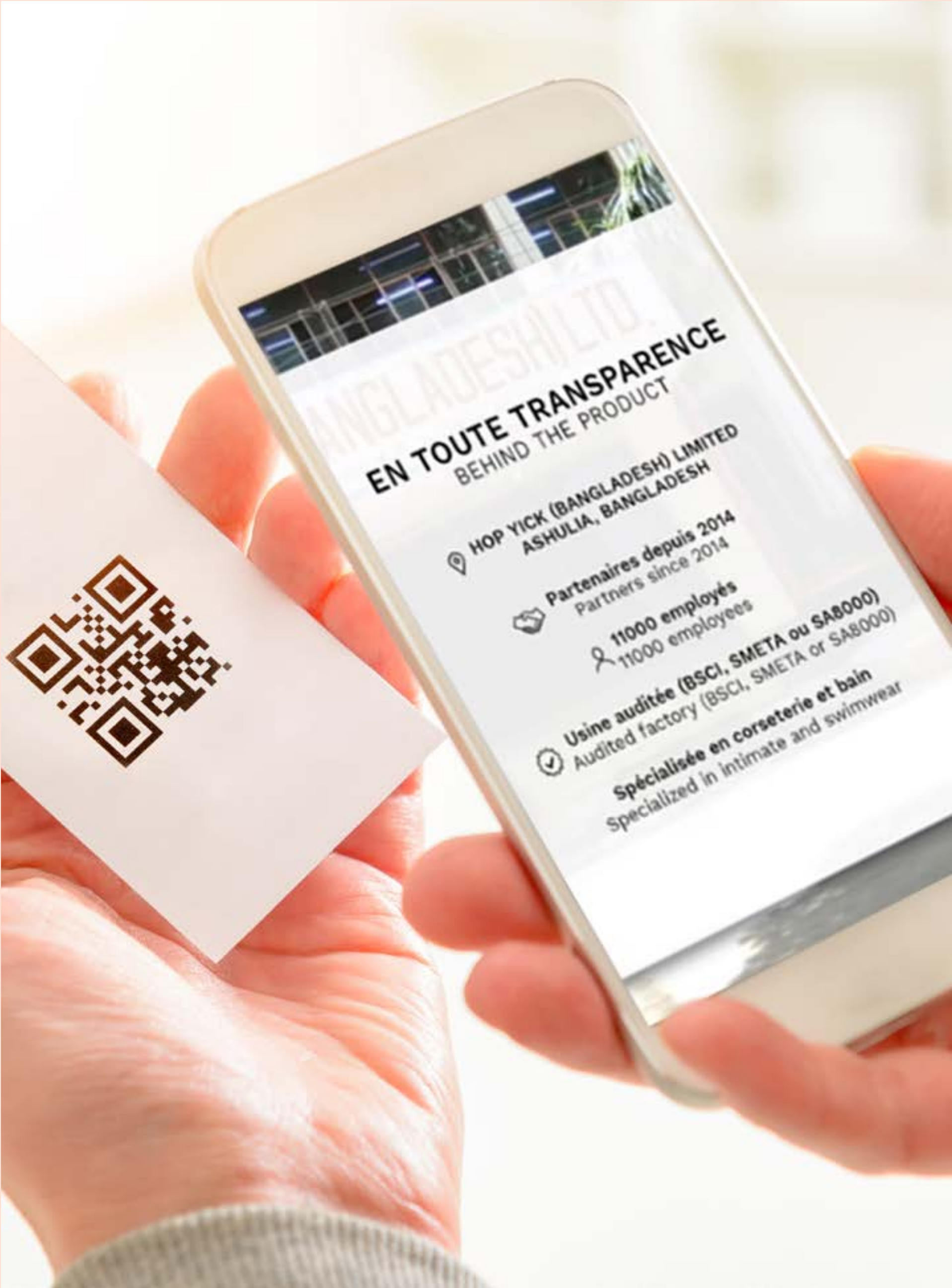
### In practice

# Etam Group

→ [Read more](#)

Today, the ultimate goal of this business approach is to offer what Etam refers to as “the best-in-class retail and omnichannel experience in the lingerie segment”. In order to achieve this, Etam is exclusively deploying digital identification technology from Avery Dennison. This includes RFID and QR coded hang tags to digitize the whole value chain and processes, along with vendor shipments, store inventory accuracy, self check-outs, returns or reverse logistics, e-commerce and the retailer’s game-changing Try@home initiative.

Clients can scan a product label by means of a QR code with their smartphone to get instant access to short videos that provide insights into the actual factory where the item was produced. This further supports Etam’s sustainability efforts, but also broadens the consumer experience well beyond what many of its competitors can offer, including even big global brands.





# Key takeaways to minimize waste



## Reducing packaging waste will resonate with consumers

Supply chain transparency will be required by consumers and lawmakers in the long term, but reducing packaging waste is a quick and effective solution to consumer concerns and environmental damage now.



## Lifecycle information will help consumers make more sustainable purchases

Consumers desire transparency from businesses, but also have very little understanding of how products are made. Providing easy access to sustainability information will help consumers bust myths about supply chain waste and make more informed purchase decisions.



## Transparency helps bolster trust in brands' ESG goals

At a point in time where people have little confidence in businesses to do the right thing by the environment, and are well attuned to greenwashing, supply chain transparency is helping businesses evidence their commitments to ESG.



# Summary

To recap,  
our opportunities

## 1 Money Talks

Matching up environmental, social and governance (ESG) goals with supply chain investment can help reduce waste and improve margins.

## 2 Balance the Stock

Boosting the visibility of supply and demand can lead to less waste and more contented consumers.

## 3 Considerate Consumption

Offering more durable products to consumers not only reduces waste but also addresses their need for affordability and quality.

## 4 Trust in Data

Transparency in the supply chain can help to reduce waste and profit loss caused by damage and strengthen partner and consumer trust.

## 5 Human Truths

Helping consumers make waste-free purchasing choices through education and transparency.





## Francisco Melo

Senior Vice President and General Manager,  
Avery Dennison Smartrac

**Francisco is a global leader in digital technologies with over 20 years' experience in enterprise strategy and new technology adoption. He is a firm believer in using technology as a force for good in society and in the power of digital identities to tackle some of the world's toughest challenges such as climate change.**

# Analyst perspective

“When we’re talking to customers about how they can improve their supply chain for sustainability, everything starts with reliable data”, says Francisco Melo, SVP and General Manager at Avery Dennison Smartrac:

“What’s encouraging to see from this research is the recognition from organizations that visibility and traceability across their supply chain operations needs improving. That’s why a substantial 61% of organizations surveyed have already deployed solutions to track unique items and this will rise to over 95% in future.

You cannot avoid problems you can’t foresee — visibility of your inventory is crucial and to do this successfully, businesses need to invest in digital Identification solutions to give them accurate near real-time data across their supply chain. This transparency will lead to systemic change

and help to reduce waste and profit loss as well as strengthen partner and consumer trust.

According to Auburn University, without RFID, apparel retailers currently have 65% inventory accuracy but with RFID, the rate improves up to 99%. Consultancy McKinsey has identified ‘more than’ a 25% improvement in inventory accuracy by using RFID in retail with 1.0–3.5% increases in full-price sell-through tied to better management and lower stockouts.

These findings demonstrate the importance of taking action now and those that do will see their supply chains become a competitive advantage. Making these incremental improvements can help us collectively strive for a zero waste future, which is crucial for the bottom line as well as the future of our planet.”



# Methodology

It is Avery Dennison's goal to enable businesses in their ambition for more efficient, sustainable and zero waste supply chain solutions.

Supporting this ambition, in collaboration with our research partners Canvas8 and VDC, we conducted global business and consumer studies to better understand the problem of waste in the supply chain and the solutions in practice.

Thank you to all of our customers and research participants who contributed their valued time and insights to this report.

## Our process

We commissioned a global supply chain waste and operations survey to 318 businesses across five markets (UK, US, France, China and Japan) and five industries (food, beauty, apparel, automotive, pharma/healthcare).

To complement the survey, qualitative interviews were conducted with 16 global business leaders to better understand the impact of waste in the supply chain and how it is (and in some cases isn't) being addressed.

To capture consumer sentiment and priorities, we also conducted a quantitative survey targeted at 7500+ consumers across five markets (UK, US, France, China and Japan) across the three key retail segments (food, beauty, apparel).

Quantitative and qualitative research was coded to identify the most prevalent themes and insights across markets.

Finally, a secondary data and literature review was conducted to elaborate the themes, providing additional theory and context for the readers.



<sup>1</sup> Based on ‘inventory lost or wasted’ feedback from research respondents calculated against inventory carrying costs gleaned from balance sheets of Fortune 500 companies. This has then been extrapolated to the global market size of each sector estimated by Statista.

<sup>2</sup> Raconteur, “[The Future of Supply Chain & Procurement](#)”, 2022

<sup>3</sup> World Economic Forum, “[An overwhelming majority of people want real change after Covid-19](#)”, 2020

<sup>4</sup> World Economic Forum, “[The Climate Progress Survey: Business & Consumer Worries & Hopes](#)”, 2021

<sup>5</sup> World Economic Forum, “[The Climate Progress Survey: Business & Consumer Worries & Hopes](#)”, 2021; YouGov, “[Global supply chain: In which sectors are consumers noting shortages?](#)”, 2022

<sup>6</sup> Deloitte, [Deloitte 2022 CxO Sustainability Report](#), 2022

<sup>7</sup> European Commission, “[Corporate Sustainability Due Diligence Directive](#)” 2022

<sup>8</sup> World Economic Forum, “[9 charts that show how inflation and the Ukraine war are impacting European consumers](#)”, 2022

<sup>9</sup> PharmTech, “[The digital supply chain: seizing pharma’s untapped opportunity](#)”, 2017

<sup>10</sup> Outsourcing-Pharma, [Supply chain woes can lead to billion-dollar problems: Cloudleaf](#), 2020

<sup>11</sup> FDA, “[Drug Supply Chain Security Act](#)” (2013)

<sup>12</sup> IHLservices, [Retail’s Biggest Threat – An Erosion of Trust](#), 2022

<sup>13</sup> Deloitte, “[Global State of the Consumer Tracker](#)” (2022); Deloitte, “[Global Automotive Consumer Study](#)”, (2022)

<sup>14</sup> Other factors affecting purchase decisions included durability, convenience, availability, design, sustainability, brand reputation, brand familiarity, ethical origins/sourcing, ethical working conditions, ‘makes me feel good’, ‘makes me look good’; and the opinion of friends/others

<sup>15</sup> Deloitte, “[How consumers are embracing sustainability](#)” (2021)

<sup>16</sup> Deloitte, “[How consumers are embracing sustainability](#)” (2021)

<sup>17</sup> Nasa, “[Extreme Makeover: Human Activities Are Making Some Extreme Events More Frequent or Intense](#)”, (2021)

<sup>18</sup> European Commission, [Circular economy action plan](#), 2020; China Briefing, “[China’s Circular Economy: Understanding the New Five Year Plan](#)”, 2021; UK Parliament, “[Regulating product sustainability](#)”, 2021

<sup>19</sup> [TexTrace Connected Textiles - Integrated RFID Solutions](#)

<sup>20</sup> [Michelin to incorporate RFID to all its car tyres by 2023](#)

<sup>21</sup> Coresight, “[Overcoming the Food-Waste Challenge: Improving Profit While Doing Good](#)”, 2022

<sup>22</sup> Coresight, “[Overcoming the Food-Waste Challenge: Improving Profit While Doing Good](#)”, 2022

<sup>23</sup> atma.io

<sup>24</sup> Simon-Kucher and Partners, “[Global Sustainability Study: What Role do Consumers Play in a Sustainable Future?](#)”, 2021

<sup>25</sup> Deloitte, “[Sustainability & Consumer Behavior](#)”, 2022

<sup>26</sup> The Guardian, “[Britons dispose of nearly 100bn pieces of plastic packaging a year, survey finds](#)”, 2022

<sup>27</sup> Edelman “[Edelman Trust Barometer](#)”, 2022

# References



### Interviews and surveys were conducted between July 2022 and August 2022.

As a global leader in materials science and digital identification solutions, Avery Dennison partners with the world's biggest and most progressive organizations to create new value throughout the supply chain. Our solutions equip companies across a diverse range of industries (from food and apparel to beauty, aviation, automotive, and healthcare) to optimize their supply chains and create richer consumer experiences.

Our suite of technologies, including RFID, enables individual physical items to be assigned with a unique digital identity, helping businesses and brands to track inventory and trace products and their constituent parts back to every point of origin.

Digital identification technologies are proven to improve transparency thus helping to reduce waste, increase brand protection and provide consumers with product authentication and open up a myriad of customer experiences from brand storytelling to direct to consumer (D2C) sales to recycling and circularity.

The latest addition to the Avery Dennison digital identification technology portfolio is atma.io, connected product cloud, a product

data management and analytics platform that helps unlock the end-to-end value of connected products, driving savings and sustainability through traceability.

### Canvas8

Canvas8 is an award-winning strategic insights practice operating out of London, LA, New York and Singapore. Its focus is on enabling organizations to be better, by understanding changes in human culture and behavior.

### VDC Research

VDC Research is a technology market intelligence and consulting firm, delivering in-depth insights to vendors, end users, and investors across the globe since 1971.

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