

resources **SAVED** by recycling.

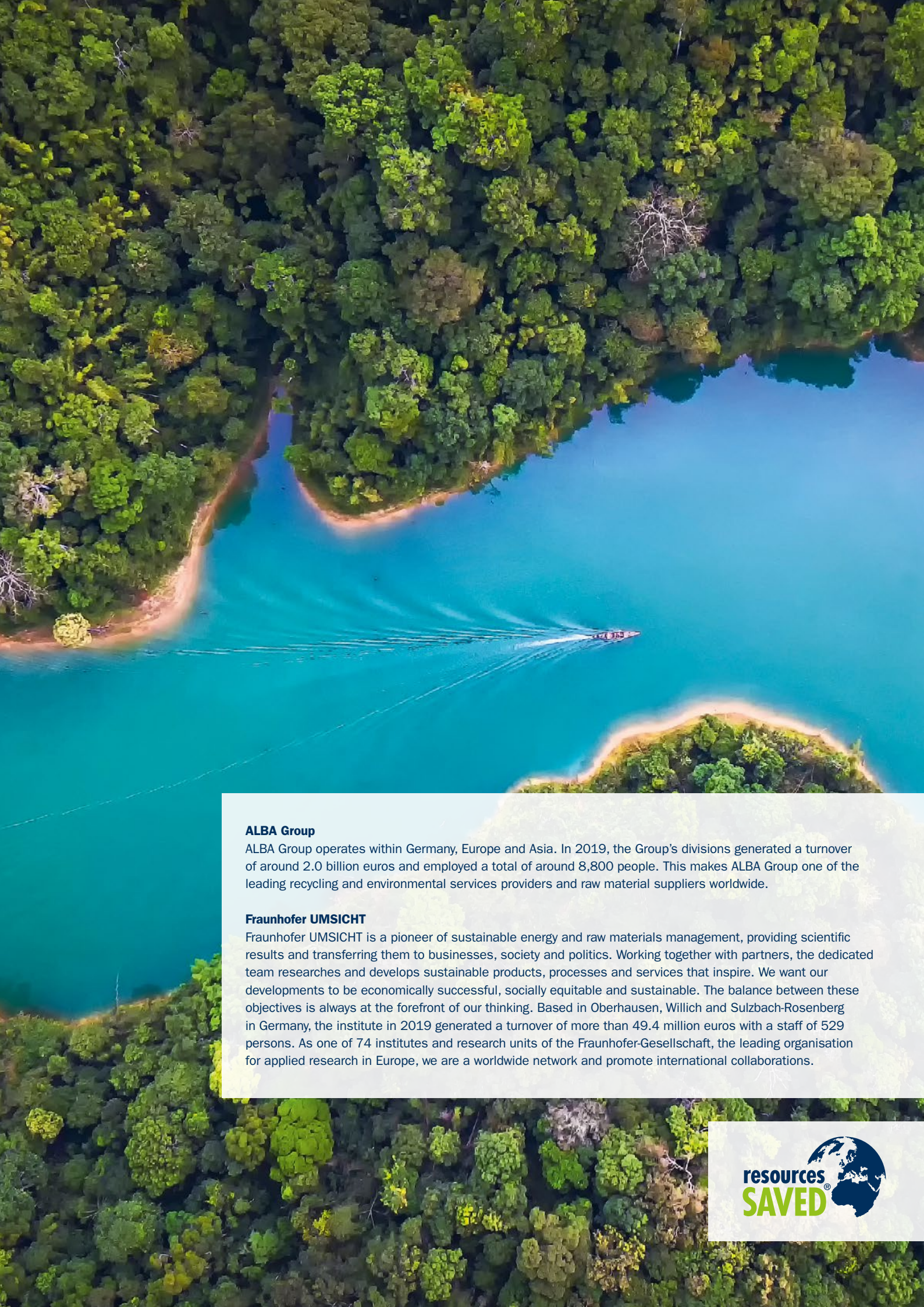
Successful work along the value chain:

With its closed-loop management of 6 million tonnes of materials, the ALBA Group saved 32.3 million tonnes of primary resources and 4.2 million tonnes of greenhouse gases in 2019.*



* Source: Fraunhofer UMSICHT





ALBA Group

ALBA Group operates within Germany, Europe and Asia. In 2019, the Group's divisions generated a turnover of around 2.0 billion euros and employed a total of around 8,800 people. This makes ALBA Group one of the leading recycling and environmental services providers and raw material suppliers worldwide.

Fraunhofer UMSICHT

Fraunhofer UMSICHT is a pioneer of sustainable energy and raw materials management, providing scientific results and transferring them to businesses, society and politics. Working together with partners, the dedicated team researches and develops sustainable products, processes and services that inspire. We want our developments to be economically successful, socially equitable and sustainable. The balance between these objectives is always at the forefront of our thinking. Based in Oberhausen, Willich and Sulzbach-Rosenberg in Germany, the institute in 2019 generated a turnover of more than 49.4 million euros with a staff of 529 persons. As one of 74 institutes and research units of the Fraunhofer-Gesellschaft, the leading organisation for applied research in Europe, we are a worldwide network and promote international collaborations.



Dear Reader,

We stand at a crossroads. The standstill of entire industry sectors during the Covid-19 pandemic has led to a dramatic slump in the demand for recycled raw materials. In light of the current situation, there is a real risk of the environment being put on the back burner and the economy failing to meet EU-wide recycling targets. At the same time, there is now an opportunity to take decisive action towards safeguarding lifestyles and business practices that protect our climate and resources.

The European Green Deal strengthens our hand here, with its clearly stated objective of remaking the EU economy into a working circular economy. This is the only way to decouple production and consumption from the utilisation of natural resources – and still achieve the Paris climate goals.

As before, our economy continues to be largely linear in design, with only 15 percent of recycled raw materials in Germany being returned to manufacturers for reuse. And yet: the reprocessing/reuse of raw materials has a carbon footprint roughly half the size of the one for primary raw materials. As a result, simply doubling the volume of recycled material used in Germany would save an additional 60 million tonnes of CO₂ equivalent every year. To stimulate demand and create market pull for the production of recyclates, we now need instruments such as minimum use quotas, together with binding quality standards for the use of recycled raw materials.

Lawmakers now need to step up and create the right policy framework. Ultimately, however, proper change can only happen with broad engagement throughout our society. Producers and retailers must use recycled materials and place reusable packaging on the market, consumers need to separate their waste properly and environmental services providers have to meet recycling targets.

The time to decide is now. Let's make the right decision.

Sincerely,

Dr Axel Schweitzer

Dr Eric Schweitzer

Chairmen of ALBA Group plc & Co. KG

Hoisting the flag for a Green Revolution

It's an ambitious goal: by 2050, Europe aims to be the world's first climate-neutral continent. At the heart of the EU's Green Deal are plans to convert linear value chains into value loops for greater resource efficiency. A project that the ALBA Group is also working on with its customers and partners. The contribution made by the ALBA Group to protect the climate and resources is calculated on an annual basis by the Fraunhofer Institute for Environmental, Safety and Energy Technology UMSICHT in its 'resources SAVED by recycling' study.

As neatly summed up by the German Council of Environmental Advisers (SRU) in its latest key opinion paper: Germany continues to use too many resources and also manages too few of them in the loop. Statistically speaking, each person in Germany consumes 22.8 tonnes of raw materials every year – almost double the global average. Which has devastating consequences for our climate and environment. According to the United Nations' International Resource Panel 2019, the harvesting/mining and processing of raw materials is responsible for half of greenhouse gas emissions worldwide, and as much as 90 percent of biodiversity loss. Continuing with 'business as usual' is no longer an option. In the SRU's opinion, only a comprehensively organised circular economy that implements a lifecycle approach to resources and products, and manages these in the loop to avoid almost all waste and emissions, is truly sustainable. Signalling its agreement with this viewpoint, the EU Commission adopted its new Circular Economy Action Plan in March 2020.

Achieving the goal of climate neutrality by 2050 is only possible by implementing a closed-loop economy and conserving our natural environment,

commented Frans Timmermans, the EU Commission Vice-President responsible for the EU's Green Deal.

Driving innovation along the value chain

Transforming our economy from a linear to a circular model will require participation from all stakeholders in the value chain – from raw material producers to manufacturers, and from retail companies and consumers to providers of environmental services. The ALBA Group sees itself as a key driver for this

process. With services tailored to the market and its customers, the recycling and environmental services provider helps manufacturers and retailers alike set up durable, effective circular models. Product design is a key aspect of this process, for example, since this design crucially affects environmental impacts during a product's lifetime and how well a product can be managed in the loop. With this in mind, the scientific assessment method 'Made for Recycling' was developed within the ALBA Group specifically for producers of packaging and consumer goods. This method is deployed to analyse the recyclability of packaging and to then derive concrete steps to improve the packaging design with this aim in mind. The smooth integration of recycled raw materials in the production process also needs the close involvement of customers and partners. With the aid of sorting, processing and recycling processes that are considerably more advanced than current industry best practice, the ALBA Group can already produce quality-assured plastic recomponds to meet exact customer specifications – and in one, single production step. High-quality plastics recycling not only reduces the removal of finite resources from the natural world but also sidesteps the energy-intensive processes of crude oil extraction, distillation and polymerisation.

Benchmarking climate and resource protection: 'resources SAVED by recycling'

Effective closed-cycle management, recyclable-friendly design and innovative technologies all have measurable effects on the climate/resource balance sheet. But to what extent do the recycling activities within the ALBA Group actually help protect the environment? The answers can be found in the 'resources SAVED by recycling' study conducted annually by the Fraunhofer

Institute for Environmental, Safety and Energy Technology UMSICHT. In this study, the researchers calculate the volume of greenhouse gases plus biotic and abiotic raw materials saved compared with primary production. These 'abiotic' raw materials include non-renewable primary resources such as ores, coal or sand, which are mined from the earth to produce a valuable material. Biotic raw materials include renewable primary resources such as wood. The methodology, developed by Fraunhofer UMSICHT specially to meet the ALBA Group's requirements, comprises four steps. First, the researchers map out the primary and recycling processes in detail for the material flows in question. In a second step, consumption data for resources and energy are collected for each individual part of the process and fed into Sphera's life-cycle analysis system GaBi. Data are of course surveyed for both options: production using primary raw materials or using recycled raw materials. Taking the data input,

the software works out the amounts of raw materials involved, and the greenhouse gas emissions created by the primary and recycling processes. The last step is to compare the two values obtained: the difference is the specific environmental saving per material flow.

Compared with other kinds of studies, this life-cycle analysis has the advantage of putting a precise figure on the resource/greenhouse gas emission savings for each flow.

The 2019 study covers the material streams of plastics, metals, waste electrical/electronic equipment, wood, paper/paperboard/cardboard and glass.



Overall findings:

Thanks to the ALBA Group's closed-loop management of 6 million tonnes of materials*, some

32.3 million tonnes of primary raw materials were conserved in 2019 and did not need to be extracted from the environment, transported or processed.

At the same time, the ALBA Group saved **4.2 million tonnes of greenhouse gas emissions.**

This corresponds to the average annual mileage of almost 2 million cars in Germany. The overall report findings are based on data from the ALBA Group recycling activities in Austria, Germany, Poland and Slovenia. Individual figures given for specific material streams are based only on data from Germany.

* Evaluated volume in the study

‘Recycling boosts the resilience of the economy’

From the European Green Deal to the Circular Economy Action Plan: the essential role played by recycling for climate and resource protection has seldom been so crystal clear. As is the opinion of Dr Markus Hiebel from the Fraunhofer Institute for Environmental, Safety and Energy Technology UMSICHT, who believes closed-loop systems make the economy better able to weather crises like Covid-19: “Stakeholders are already working more closely together to accelerate improvements to product recyclability or recycle use, for example.”

Dr Hiebel, a permanent changeover from a linear to a circular economy depends on a great many actors: government, consumers, manufacturing, trade and recycling companies. What part does research have to play here?

Essentially, research drives innovation: both in terms of technological developments in sorting machinery or processing and for entirely new business models such as the refurbishment of used IT equipment.

Reliable life-cycle analyses – like the present resource study, for example – form an important basis for the planning and communication of sustainable action. Last but not least, research also oils the wheels of the value chain, so to speak: as a neutral broker who is able to get all of the stakeholders on the same page. Ultimately, making the change to a climate- and resource-friendly closed-loop economy requires a concerted effort.

In your ‘resources SAVED by recycling’ study, you measure the degree to which recycling materials help the environment down to the very last kilogramme. Which factors have the greatest impact in this climate and resource report?

Energy use is certainly an important factor. While simply cutting electricity consumption achieves a lot on its own, a high proportion of renewable energy also works to cut greenhouse gas emissions. One example of the positive effects of technical innovation is the COREMA® cascade extrusion system, which Interseroh is using to produce the next generation of the recycled plastic Procyclen. Since production involves just a single step while consuming less energy, using Procyclen today cuts greenhouse gas emissions by over 50 percent compared to new goods made from crude oil.

What trends are you seeing in product design – in plastic packaging, for example?

Most industry players are now well aware of the need to think about recycling at the outset. If a piece of packaging cannot be separated into its various parts, for example, or its colours or coatings make it hard to scan for sorting, this will make material recycling all the more difficult. While sorting is improving all the time – one example being the use of near-infrared to detect black plastics – this is a downstream strategy to solve an upstream problem. Producers must focus on selling packaging that not only fulfils product protection and hygiene requirements while conveying the brand image but is also recycling-friendly. This requires a joint effort by retailers, manufacturers and research. Consumers also have a role to play. The more accurately households sort their waste, the simpler it will be to recycle this waste. The ‘Waste Separation Works’ campaign run by the dual systems in Germany is really helping to raise awareness here.

Another approach is to improve recycle take-up in manufacturing. How are stakeholders in the value chain working together here to promote the usage of recycled raw materials?

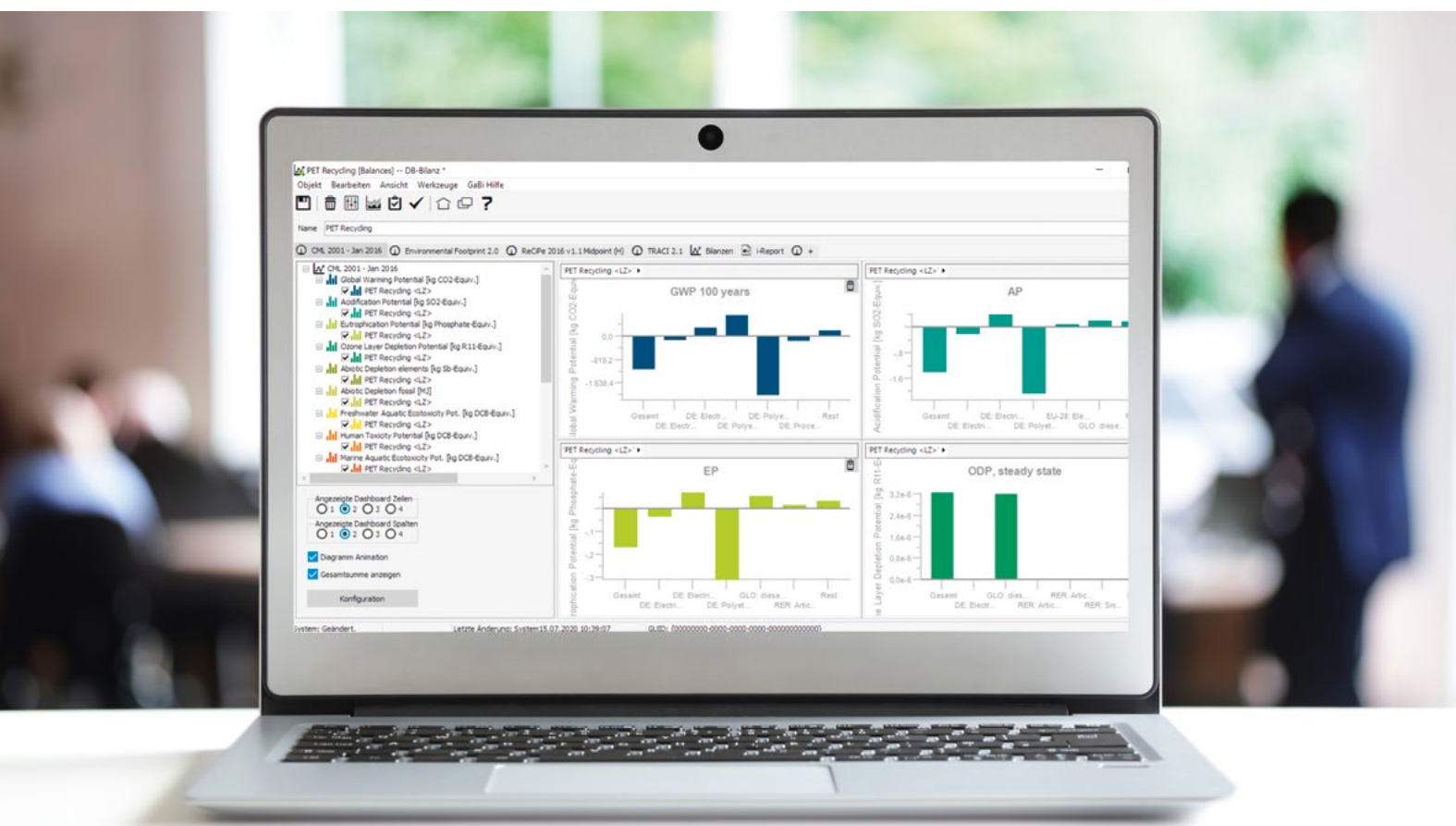
Many companies have already committed voluntarily to using a certain proportion of recycled raw materials in their products. To do so, however, they need access to these materials and dependable partnerships with recycling companies. We are now seeing the producer and recycler markets becoming more closely intertwined. Overall, we need greater incentives to increase the proportion of recycle usage. When this proportion becomes a purchasing criterion for product procurement, this will in turn have positive effects on the demand side.



Dr-Ing Markus Hiebel, Head of Department Sustainability and Participation at Fraunhofer Institute for Environmental, Safety, and Energy Technology UMSICHT

In early 2020, the German National Academy of Sciences Leopoldina warned against letting sustainability measures slide as a result of the coronavirus pandemic. In fact, the Academy said, any economic stimulus package needed to be aligned with the goals of the Green Deal. What opportunities do you see here to set the agenda for a circular economy?

A key concept here is the resilience of a national economy. In many places, Covid-19 is teaching us to think again about where we can close our resource loops. Such action would let the waste management sector generate higher quantities of recycled raw materials, secure the required quantities at the right quality, and reduce dependencies on fossil resources and external sources of supply. Simultaneously, the recycling would also cut greenhouse gas emissions. In the future, damage to the climate and environment – and the external costs of the current linear economy – need to figure more prominently in strategic planning. New ideas and business models in relation to reuse, sharing, leasing or the digitalisation of products have the power to create jobs, manage products and materials in the loop for longer, and boost the economy’s ‘immune response’ to external influences.



A total of 4.2 million tonnes of greenhouse gases saved



Metals

A long-running loop: steel and non-ferrous metals such as aluminium, lead and copper can be endlessly recycled. In 2019 the ALBA Group saved 2.1 million tonnes of greenhouse gas emissions and over 15 million tonnes of primary raw materials with metal recycling.

2,105,546 t
of greenhouse gases saved



Waste electrical equipment

From old mobile phones to TV sets, LCD monitors and refrigerators: with the closed-loop management of waste electrical equipment the ALBA Group saved around 2.2 million tonnes of primary raw materials and more than 70,000 tonnes of greenhouse gases in 2019.

71,993 t
of greenhouse gases saved



Plastics

Waste as a source of raw materials: with the closed-loop management of nearly a million tonnes of lightweight packaging and other plastics, the ALBA Group saved over 3.8 million tonnes of primary raw materials and almost 500,000 tonnes of greenhouse gases in 2019.

484,422 t
of greenhouse gases saved



Wood, paper/paperboard/cardboard

Waste paper is an essential resource and its recycling helps protect our climate. In 2019 alone, the ALBA Group saved over 600,000 tonnes of greenhouse gases plus more than 4.6 million tonnes of primary raw materials with the closed-loop management of wood, paper, paperboard and cardboard.

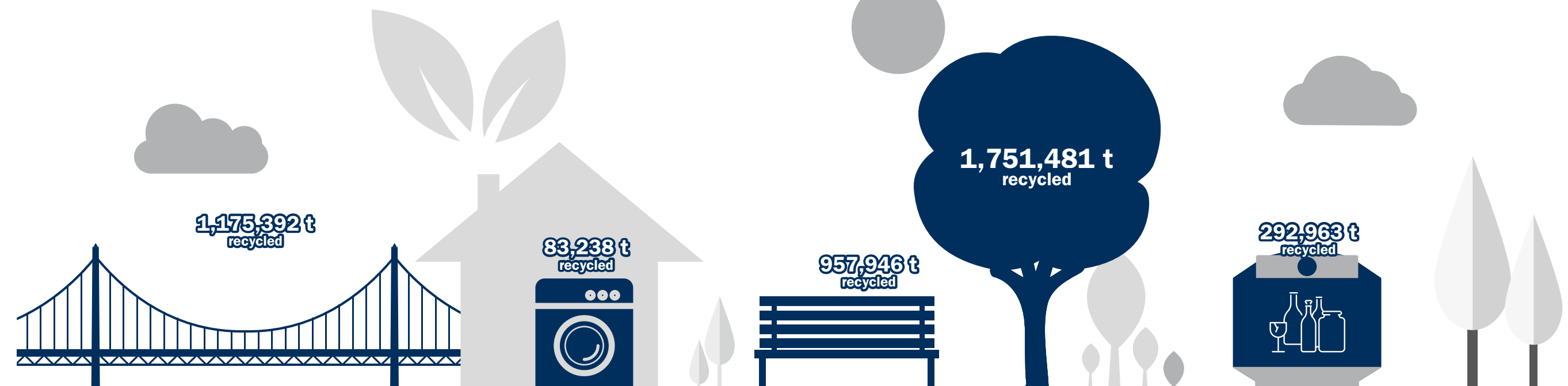
626,562 t
of greenhouse gases saved



Glass

A clear environmental benefit: glass can be broken up and melted down for reuse any number of times. Thanks to the closed-loop management of glass, the ALBA Group saved nearly 80,000 tonnes of greenhouse gases and more than 600,000 tonnes of primary raw materials in 2019.

79,393 t
of greenhouse gases saved



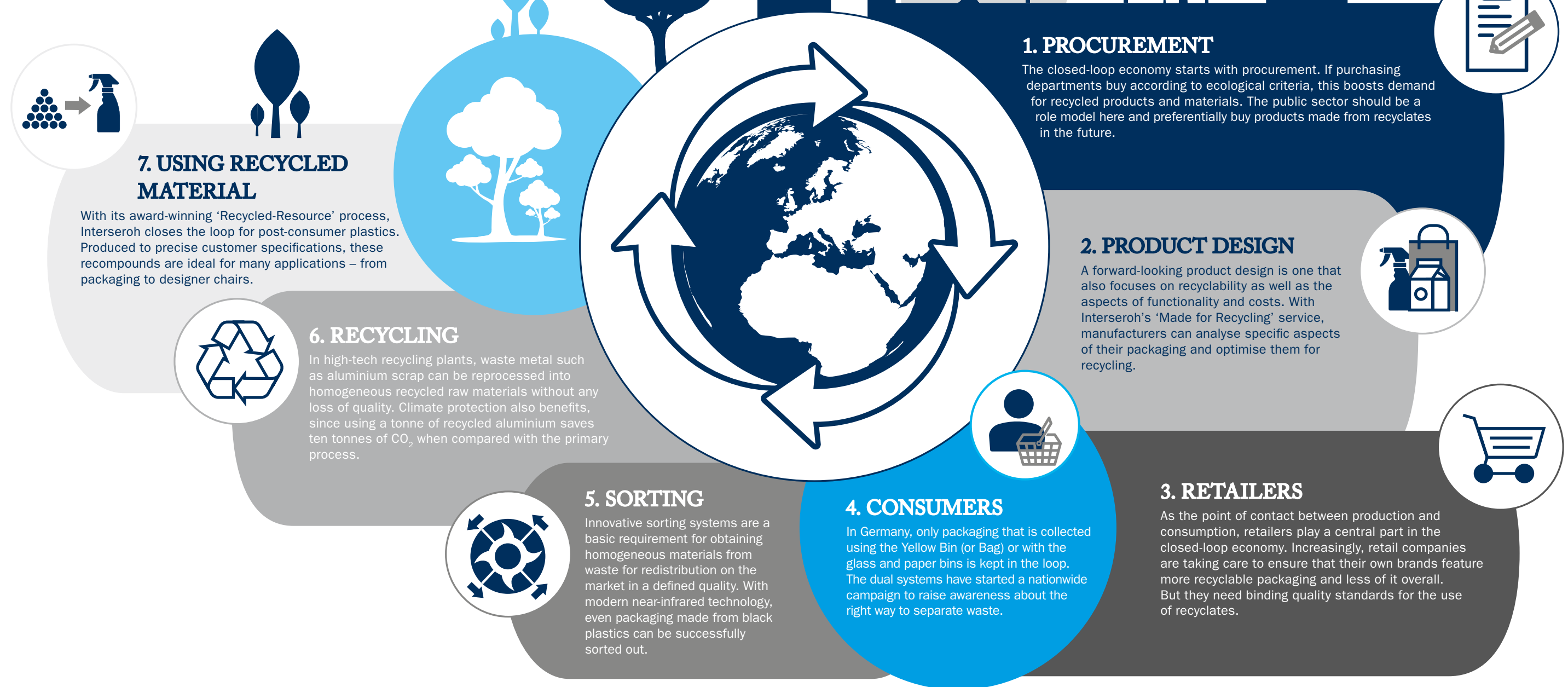
A total of 6,043,390 tonnes recycled

A total of 32.3 million tonnes of primary resources saved



A healthy 'circulatory system'

To ensure products and materials can be managed in the loop while retaining their value, all of the stakeholders in the value chain must work together like clockwork. From procurement and product design to marketing, consumption and recycling, the quality of this teamwork in each phase of the product lifecycle is directly proportional to the quality – and quantity – of recycled raw materials obtained.



Effective interaction



1. Procurement

Environmentally friendly procurement is an important step towards circular economy. Once the use of recycled raw materials becomes a key criterion for product procurement, this helps develop the market for high-quality recycled materials. The public sector can also lead by example here, with 'Green Public Procurement' being just one such initiative. The topic has also now become part of mainstream politics, with the EU's Circular Economy Action Plan envisaging introducing legislation to establish minimum criteria for sustainable procurement and the proportion of recycled materials in packaging and other products. In a recent amendment to its Circular Economy Act, Germany is also seeking to provide federal procurement departments with workable tools for sustainable procurement and the simultaneous prioritisation of recycled raw materials.

The city of Berlin has also demonstrated the enormous ecological and economic potential offered by the responsible purchasing of recycled products, after explicitly anchoring sustainability in the Senate's administrative policy. Thanks to its systematic approach to environmentally friendly procurement, the Senate's own figures reveal annual greenhouse gas savings of around 50 percent, equal to 350,000 tonnes of CO₂ equivalent. Berlin is also saving over two million tonnes of primary raw materials every year and cutting its annual procurement costs by about four percent – which works out to the tidy sum of EUR 40 million.

2. Product design

This is a key factor, since product recyclability always starts with the design. To support companies wanting to optimise their packaging for sustainability, ALBA Group subsidiary Interseroh worked with the bifa environmental institute to develop its 'Made for Recycling' service. The method was also reviewed by the Fraunhofer Institute for Process Engineering and Packaging (IVV). This three-stage assessment process determines whether a piece of packaging can be disposed of in the correct collection system, easily sorted and mechanically recycled. Packaging scoring at least 19 points on the 20-point scale is considered to have 'very good recyclability' and may bear the 'Made for Recycling' quality seal. A key purchasing criterion for shoppers – and one that also guarantees that minimum standards set by the Central Agency Packaging Register have been met.

To date, Interseroh has tested the recyclability of over 1,250 pieces of packaging. These include the packaging for Unilever's Cremissimo ice cream: made from 100 percent polyolefins, it manages to offer full product protection without recycling-unfriendly barriers. Bio-Zentrale Naturprodukte GmbH opted to have all the packaging materials in its product portfolio tested simultaneously for optimisation in the recyclable loop. And Interseroh's work with packaging manufacturer KHS Corpoplast has created a true product innovation: the first PET juice bottle made from 100 percent recycled materials, which is itself fully recyclable.

3. Retail

With footfall of around 50 million customers every day, retail in Germany is a significant factor here. By actively prioritising the products it stocks, the sector can help to change the nature of our economy from resource-intensive to circular. Many retail chains are trying to reduce the packaging placed on the market and make more of it recyclable by reducing packaging weight, replacing disposable plastic bags with reusable net bags and taking plastic wrap off fruit and vegetables.

Take ALDI, for example: by 2025, the discount supermarket chain is aiming to cut packaging weights on its own brands by 30 percent compared with 2015 and make all of its own-brand packaging recycling-friendly by 2022. ALDI is also using Interseroh's new 'Check for Recycling' service to do so. With this free online tool, customers of the Dual System Interseroh can have the recyclability of their packaging evaluated by entering just a few pieces of data.

To establish a truly end-to-end closed-loop economy, it is also important that the recycled materials recovered by the recycling process are then reused for new products and packaging.

The German Retail Association (HDE) advocates higher proportions of recyclates in plastic packaging to reduce the use of new material made from crude oil and therefore to contribute directly to climate protection. While increasing amounts of recycled materials are now being used in plastic pallets and plant pots, major obstacles still remain in the food sector. Along with binding quality standards, the HDE is calling for quick, straightforward approval procedures for recyclates for food contact materials. The vision is of a European market for recycled raw materials where plastic recyclates are traded as primary resources.

4. Consumers

Every little helps: a recycling system that truly protects our planet can only succeed if consumers also play their part and ensure that packaging waste is properly sorted at home.

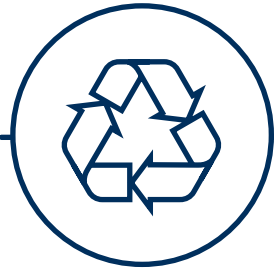
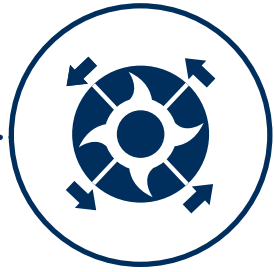
Taking Yellow Bags and Bins as an example, these should only be used for lightweight packaging made from plastic, metals and composites: but 30 percent of the content emptied out of these bags/bins later is still residual waste, on average. These so called "impurities" make the sorting process difficult – and at the end valuable raw materials are never recycled at all.

To motivate German households to do their part, Interseroh teamed up with the other dual systems in the country to launch the nationwide public awareness campaign 'Waste Separation Works'. The campaign uses TV and radio spots, digital media platforms and posts on social networks to show how easy waste separation is while also communicating a very important message: all of us are also consumers who have a

central role to play in recycling and can therefore actively help protect the climate and our resources by properly sorting our waste. The dual systems do collect some 6.2 million tonnes of packaging waste every year. Recycling this amount of waste saves several million tonnes of primary raw materials and greenhouse

gas emissions.

A successful pilot phase for the campaign in the county of Euskirchen in 2019 resulted in a significant reduction to the percentage of residual waste mistakenly thrown into the Yellow Bins, showing that this concerted effort by the dual systems really can get the message across to the public.



5. Sorting

Upcycling needs first-class sorting: to ensure waste packaging can be turned into high-quality recycled raw materials that meet market requirements, the ALBA Group has been investing in technological development. Thus it is getting increasingly better to separate lightweight packaging from Yellow Bags or Bins, for example, which helps to meet the demanding recycling targets set by the German Packaging Act.

Take black plastic, for example: “For a long time, the automatic sorting of black plant pots or cosmetic packaging was seen as a really difficult challenge,” recalls Dipl.-Ing. Hendrik Beel, Managing Director of STEINERT UniSort GmbH. “Many black plastics are coloured with soot and reflect only very little light. Conventional near-infrared systems that scan individual points at high speed simply fail to register the dark objects on the conveyor belt. But we have solved this problem.” Together with ALBA the manufacturer launched a novel kind of camera technology: “Our photo scanning technique captures a complete section of the belt at a time,” Beel explains. “Thanks to ultra-high resolution in the specific spectral band, the computer is able to process considerably more data about the reflected light – and even successfully separate out black shampoo bottles.”

The precision achieved at this stage in the value chain truly pays its way in the long term. High yields for homogeneously separated plastics improve not only the efficiency of the recycling process but also the marketability of the recyclates – whose quality is continuously inspected and optimised in Interseroh’s Centre of Competence for Recycled Plastics in Maribor, Slovenia. Since its official accreditation in March 2020, the laboratory is currently the only accredited EU research institution that specialises in the development and analysis of recycled plastics.

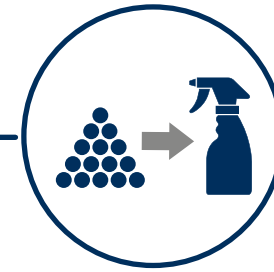
6. Recycling

Metal recycling is extremely well established and sets a truly shining example: the German steel industry alone contributes more than 20 million tonnes of scrap every year to be turned into new products. Non-ferrous metals such as aluminium can also be endlessly melted down for subsequent reuse. Around 75 percent of the total volume of aluminium ever produced is still in circulation today.

Specialised know-how and modern recycling technologies are essential to ensuring the successful closed-cycle management of aluminium. At ALBA Metall Nord in Wilhelmshaven, for example, old window profiles and composite profile scrap is turned back into semi-finished raw material for the industry. This multi-stage process first involves sending the material through a shredder, which strips out plastic residues and shreds the material into various grain sizes. Other steps in the process then separate out ferrous metals and remove organic residues by using a range of electrostatic techniques. As a last step, an X-ray machine scans the resulting aluminium parts to determine their basic composition. This makes it possible to detect undesirable material inclusions and alloys, and filter these out according to pre-programmed limit values. The separation is carried out by an array of compressed-air nozzles. Aluminium of a specific quality is left over – ready for its next cycle of life as a new product.

Aluminium is truly a poster child for the essential contribution made by recycling to securing raw material supplies in Germany – and the huge ecological benefits of the circular economy.

Recycling aluminium utilises just 5 percent of the energy that is otherwise required to mine primary aluminium from bauxite. Similarly, each tonne of recycled aluminium saves around 10 tonnes of CO₂ emissions compared with new material. All of which makes aluminium a frontrunner in climate protection.



7. Using recycled material

This is where the loop is closed. Thanks to intensive research and its Recycled Resource process, Interseroh has succeeded in converting post-consumer plastics into recomponds that possess properties identical to virgin material. This achievement was selected to receive the Initiative Mittelstand industry award for outstanding innovative industrial solutions. Most of the primary materials used in this process are sourced from domestic recycling collections. They are processed into recycled plastics under the brand names Recythen and Procyclen at the company’s state-of-the-art plastics processing plant in Eisenhüttenstadt.

Due to their robust physical characteristics, the recycled plastics are ideally suited to the production of cable drums, pipes and films. Procyclen is a customisable recompond which, like crude oil based virgin material, can be produced to application-specific formulations and is therefore very versatile. Fluidity, stability, UV and heat resistance, and colouring can be precisely adjusted to meet product and customer specifications.

Another advantage offered by Procyclen is that it saves around 890 kg of greenhouse gases and 21,000 kWh of primary energy when substituted for one tonne of crude oil based primary raw materials. The latest generation offers an even greater reduction in greenhouse gas emissions of more than 50 percent compared with new granulate. This is made possible by a pioneering process developed by technology partner EREMA, who worked with Interseroh to adapt the process to meet the requirements of recycled plastics. The COREMA® cascade extrusion system cuts the

Procyclen production process from two to a single process step, reducing energy and resource consumption still further. Interseroh and EREMA received a category award at the Plastics Recycling Awards Europe 2019 for their innovative achievement.

In its quest for high-quality recycled raw materials, Danish furniture manufacturer HOUE also became aware of Procyclen in 2019. In its sustainability agenda, the specialist indoor and outdoor furniture design house has set itself the task of closing material loops and minimising the consumption of resources. This has meant considering waste as a resource rather than a problem. This approach gave rise to the idea of creating a designer chair with a seat made from post-consumer waste. The concept was implemented with the help of Procyclen. The recycled raw material was customised to meet the requirements of the product designers and complies with all furniture industry standards for stability, safety and strength. The recompond is simply liquefied and poured into the chair seat mould during the production process.

Upcycling in the best sense of the word: the FALK Chair combines functionality, modern design and a sustainable profile. For example, producing 100 chairs with Procyclen rather than with primary raw materials saves approximately 7,300 kWh of energy. The chair, which carries the European Ecolabel, also received the German Design Award in 2020. HOUE has shown the furniture industry the way forward and the chairs are now available in many European countries and the USA.

Contact

ALBA Group plc & Co. KG
Knesebeckstr. 56–58
10719 Berlin
Germany

INTERSEROH Dienstleistungs GmbH
Stollwerckstr. 9a
51149 Cologne
Germany

info@resources-saved.com
www.albagroup.de



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