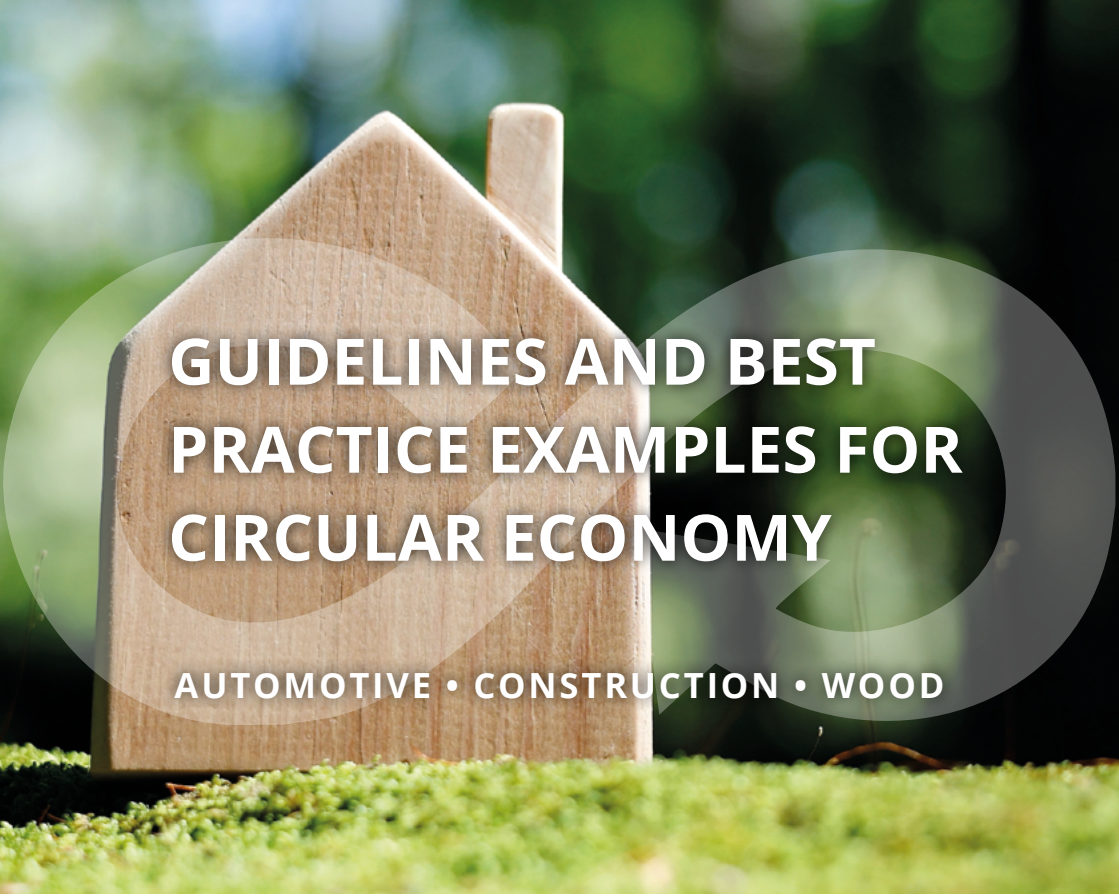


GUIDELINES AND BEST PRACTICE EXAMPLES FOR CIRCULAR ECONOMY

AUTOMOTIVE • CONSTRUCTION • WOOD

EDU-CIRC

Interreg Italia–Österreich

Co-funded by the European Union

INDEX

PROJECT EDU-CIRC

www.edu-circc.eu

The **EDU-CIRC** project is an awareness-raising / training measure to promote the **long-term potential of the circular economy** in manufacturing companies of the Alpine region.

The aim is to qualify young people from vocational and secondary schools, university students, teachers as well as specialists from industry and craftship in **principles, methods, instruments** and **best practice applications** and thus to **close the current educational gap** across borders and generations, accelerating the transformation towards a circular production.

The guidelines and best practice examples presented in these booklet are based on interviews with about 20 companies along **3 value chains** that are important for the Alpine region:

- **AUTOMOTIVE**
- **CONSTRUCTION**
- **WOOD PROCESSING**

EDU-CIRC CONSORTIUM

FREE UNIVERSITY OF BOZEN-BOLZANO

The Sustainable Manufacturing Lab of the Free University of Bozen-Bolzano is doing applied research on circular economy, decarbonization, resource efficiency and social sustainability in manufacturing with a focus on small and medium sized enterprises.

Link: https://sustainablemanufacturinglab.unibz.it/

TRASFERIMENTO TECNOLOGICO E INNOVAZIONE

T2i (trasferimento tecnologico e Innovazione) supports companies in making innovation a continuous process in the company as a key lever to regain competitiveness in the markets, accompanying them in defining and developing innovation paths through its services.

Link: https://www.t2i.it/

FACHHOCHSCHULE KÄRNTEN

The Smart Lab Carinthia of the Carinthia University of Applied Sciences in Villach offers a wide range of support in the areas of research, innovation and development as well as knowledge and technology transfer from academia to industry.

Link: https://www.fh-kaernten.at/studium/villach/smart-lab-carinthia

CIRCULAR ECONOMY

Materials
Minimal or targeted use of natural and fossil raw materials.

Design
Necessary change in awareness among product designers towards resource-saving materials and circular design.

Manufacturing
Sustainable manufacturing by reducing energy consumption and reprocessing materials during manufacturing.

Distribution
Sustainable transport and distribution channels as well as sharing economy models.

Use / Reuse / Repair
Extension of product life cycle, repair and reuse of components and materials.

Waste Collection
Collection, separation, and sorting of waste.

Recycling / Recovery
Recycling waste for material or energy use.

Remaining Waste
As little as possible.

GENERAL GUIDELINES

Awareness building

Sustainability and Circular Economy should be seen as a **continuous transformation process** and an integral part of the **corporate mindset and culture**.
Through **role modeling and training**, employees are made aware and sensitized.
Employees can be sensitized through **simple pilot implementations** in the company like providing (electric) bicycles, charging stations for electric vehicles and reducing or avoiding paper usage.

Energy

Reduction of energy consumption through **small adjustments and behavioral changes:** reduction of room temperature, programmed lights with motion sensors, automatic closing of blinds in summer or automatic shutdown of PCs in the evening.
Reduction in energy consumption through **innovative building systems solutions** like surface heating/cooling, air-to-water cooling, heat circuits with heat recovery, river-water or groundwater cooling as well as heat pumps.
Purchase of local **green electricity** as well as purchase of heat from **local district heating.**
Own production of green energy to support self-consumption and income generation through grid feed-in by installing PV, combined heat and power plants (CHP) as well as energy storage with batteries.

Cooperation / Industrial Symbiosis

Collaboration between single companies and within industrial areas to conserve material resources, minimize waste and circulate waste material ("my waste could be your input material").
Joint use of river water by several companies for cooling or with heat pumps for heating.
Wood processing industries located next to district heating plants, which facilitate the direct use of bark residues and wood scrap for energy use.

Packaging

Avoidance or reduction of packaging wherever possible (e.g. reduced thickness of plastic film).
Reusable packaging instead of single-use packaging by introducing closed-loop systems where packaging materials are returned, cleaned, and reused multiple times.
Packaging that is **specifically designed or custom-cut** for the product or order helps reduce packaging waste and minimizes the need for additional filling materials, such as polystyrene.
Change towards alternative, more sustainable packaging materials such as recycled or renewables ones.

BEST PRACTICE – INDUSTRIAL SYMBIOSIS

In the industrial area of Bressanone, the companies **ALUPRESS, DUKA, AND MICROTEC** have jointly implemented an energy-efficient cooling and heating concept.
Alupress, a specialist in aluminum die-cast parts for the automotive sector, requires cooling energy for its production processes and buildings. In 2019, the company realized South Tyrol's first river-water cooling system, which uses the cold of the nearby Isarco River as a natural energy source via a heat exchanger. Compared to conventional industrial cooling systems, this solution is over 400 % more efficient.

The neighboring companies Duka, a shower enclosure manufacturer, and Microtec, a technology company in the wood processing industry, are connected to Alupress's river-water cooling system and make use of the energy according to their needs throughout the year:

Summer Operation

In summer, the three companies use the cooling energy for building cooling. For example, Microtec channels the coolant at around 18 °C through special ceiling panels and the existing underfloor heating system, creating an even, draft-free indoor climate. Thanks to the large-surface cooling, Microtec was able to reduce its energy demand for space cooling by 57 MWh per year, cutting its energy costs in half. Duka even covers 100 % of its cooling demand this way, saving 416 MWh of cooling energy annually.

Winter Operation

In winter, Alupress continues cooling its production processes. The resulting warmed water is transferred to Duka, where it is used with the help of a heat pump for space heating. Thanks to this innovative approach, Duka can already cover 60 % of its heating demand today.

www.alupress.com
www.duka.it
www.microtec.com

alupress duka MiCROTEC

BEST PRACTICE – KAB

www.kab.co.at

KAB (Kärntner Abfallbewirtschaftung) is one of Austria's leading producers of high-quality alternative fuels (RDF). In its modern processing facility, waste with a high calorific value is transformed into fuels that replace fossil energy sources, actively contributing to climate protection. Since 2011, KAB has produced around 500,000 tons of alternative fuels, saving approximately 0.5 million tons of CO_2 in the process.

These alternative fuels are primarily used in Austrian cement plants, where they substitute for fossil fuels.

Waste that can no longer be recycled materially is given a meaningful energy recovery, while valuable raw materials and resources are conserved.

Sustainability is at the Core of KAB's Mission

- CO_2 Reduction: Replacing fossil fuels with ~ 50,000 tons of RDF annually.
- Resource Conservation: Recovery of ferrous and non-ferrous metals.
- Regional Value Creation: Most of the RDF is used locally, reducing transport-related emissions.
- Renewable Energy: In 2024, a photovoltaic system with nearly 500 kWp was commissioned, covering a significant portion of the company's own energy needs.

AUTOMOTIVE

- Raw Materials
- Design
- Manufacturing
- Distribution
- Use / Reuse / Repair
- Waste Collection
- Recycling / Recovery
- Remaining Waste

RAW MATERIALS

Use of recycled / alternative materials

Recycled or alternative materials should be prioritized to reduce dependence on virgin resources. This can be done either completely or partially, by integrating **secondary metals** (e.g. aluminum, steel, copper...), as well as **secondary plastics**. Additionally, **natural fiber-reinforced composites** like wood-plastic composites (WPC) may offer a sustainable alternative. These materials contribute to a more circular use of resources and reduce the environmental impact.

DESIGN

Appropriate use of materials

Maximize the efficiency and functionality in automotive design by **selecting** and utilizing both primary and secondary **materials according to their specific properties** and **suitability**. Material choice must also **take into account boundary conditions** such as stability and safety requirements. By using materials efficiently and economically, offcuts and residual waste can be minimized, contributing to resource conservation and cost reduction.

DESIGN

Promoting circular economy through sustainable design

Circular economy principles should guide the design process by **emphasizing durability, reparability, and separability** of components. High product quality supports **extended service life**. Additionally, conducting product **life cycle assessments (LCA)** helps to evaluate and optimize environmental impact. This approach reduces resource consumption, facilitates reuse and recycling, and supports long-term sustainability of products.

MANUFACTURING

Just-in-time production

Just-in-time production aims to **align manufacturing** closely **with actual demand**. This is achieved by avoiding overproduction and producing only what is needed, when it is needed.
As a result, inventory costs are reduced, storage resources are saved, and material use becomes more efficient.

MANUFACTURING

Innovative and sustainable production strategies

Innovative and sustainable production strategies increase efficiency and support circularity by reducing waste and conserving resources. This includes **standardized and automated workflows, 3D printing** for customized components, and **advanced manufacturing techniques**. Transitioning to **cleaner energy sources** and **replacing resource-intensive systems** further enhance efficiency. **Real-time monitoring** of operational and environmental data enables continuous optimization, reducing environmental impact and improving adaptability and resilience.

Circular economy in the manufacturing process

Internal circular economy practices can be implemented by **reprocessing and reusing materials** — such as fiber-reinforced plastics — for parts with **lower performance requirements** and **remelting unmixed metallic discards** for reuse. In addition, **operational resources** like cooling emulsions, lubricants, heat, process water, or grinding oils are kept in **internal cycles**. These measures conserve resources, lower emissions, and support a more sustainable production process.

DISTRIBUTION

Reusable packaging and reverse / shared logistics

Reusable packaging systems, such as standardized containers, crates, and metal racks, enable closed-loop logistics and reduce packaging waste. **Reverse logistics** processes facilitate the return of components, tools, and transport packaging for refurbishment, reuse, or remanufacturing. **Digital tracking technologies like RFID and IoT** support the efficient management of reusable assets. **Shared logistics** networks can further reduce empty runs and promote resource-sharing.

USE

Extend service life of products

Extending the service life of automotive products is a key strategy for enabling circularity and sustainability. This is achieved by **designing for durability** and **ensuring long-term functionality**, especially in cases where replacing individual components is not feasible. **Providing spare parts** further supports repair and continued use. A longer product lifetime reduces the need for new production, conserves resources, and lowers environmental impact over the product's life cycle.

USE

Extend service life of production machines / systems

Maximizing the service life of machines and systems through **flexible and reconfigurable production machines and lines** is key to sustainability. **Reusing old machinery parts** as spares and relocating equipment to other factory sites supports resource efficiency. Additionally, **3D printing** enables timely, on-demand production of spare parts, reducing downtime and new resource consumption.

COLLECTION

Proper waste collection

Strict separation of waste streams — such as metals and plastics — should be practiced to reduce disposal costs and improve recycling efficiency. **Careful sorting** enhances the quality of secondary metals, increasing their economic value and supporting circular material flows. On-site **waste potential analysis** assessing types, volumes, and sources of waste to uncover materials that can be reduced, reused, recycled, or valorized.

RECYCLING

Material recovery

Material recovery focuses on **reclaiming and reprocessing materials** to keep them in circulation and reduce the need for virgin resources. Hence, **metal scraps** must be recycled and processed to ensure high-quality reuse, which also offers economic benefits. Where possible, (fiber-reinforced) **plastics** should likewise be recovered for high-quality reuse within the production cycle. If direct reuse is not feasible, they can still be **repurposed for less demanding applications** — eather internally or externally by other industries.

BEST PRACTICE – INTERCABLE AUTOMOTIVE SOLUTIONS

INTERCABLE AUTOMOTIVE SOLUTIONS is an international supplier of high-voltage technology for electromobility, with a focus on busbars. The company develops customized system solutions from various materials for leading automotive manufacturers. Sustainability plays a key role, as the products contribute to vehicle efficiency and the reduction of traffic emissions. In addition, the company promotes sustainable innovations such as the use of renewable energy, intelligent logistics solutions, and the reuse of plastic waste.

Direct Reuse of Runners

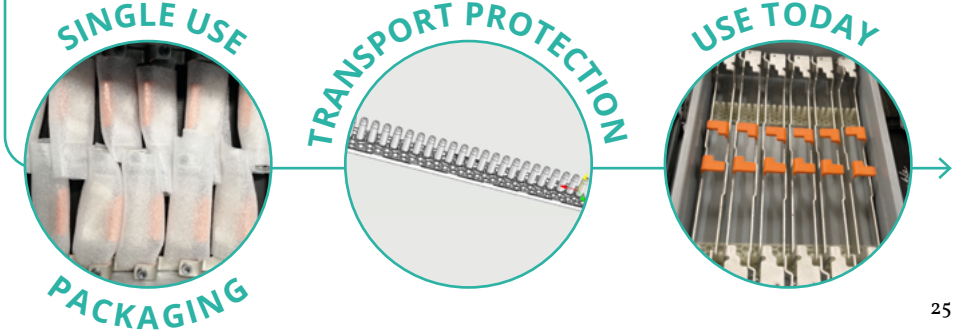
Where technical requirements are met, runners are ground and reintroduced into the injection molding process in selected projects. According to current standards, this material is not classified as recycled, but it significantly reduces the need for virgin material by 5-15 % and represents a particularly efficient form of circular economy in injection molding.

Transport Protection Made from Plastic Waste (Pilot Project)

Previously, internal transport of sensitive busbars to the plant in Krivan (Slovakia) was secured with bubble wrap. To eliminate this single-use packaging, Intercable Automotive Solutions developed a reusable transport protection system made from its own plastic waste. Inserted into load carriers, it prevents parts from touching and thus minimizes the risk of damage.

Runners

Transport Protection



BEST PRACTICE – LUCCHESE INDUSTRIA

www.luccheseindustria.com

LUCCHESE INDUSTRIA

LUCCHESE INDUSTRIA is a highly specialized company with expertise in the Automotive sector, designing and manufacturing thermoplastic components and aesthetic parts — bi-component and tri-component — for car interiors.

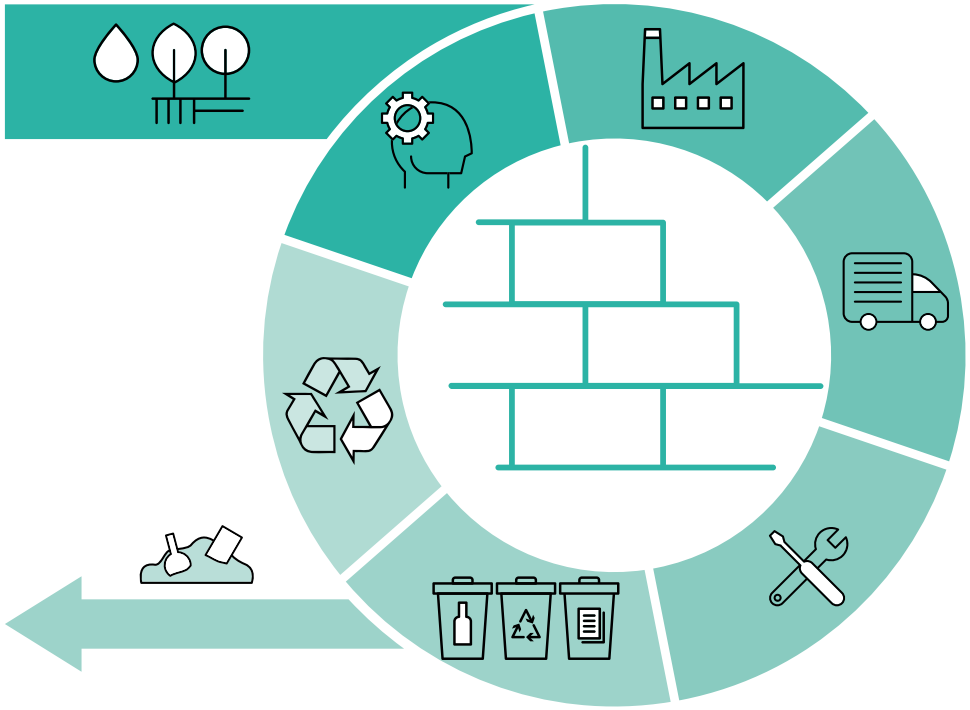
Increased Energy Efficiency

Energy efficiency measures are adopted, such as the use of injection molding machines with ECO pumps that operate only when needed. In addition, technological upgrades (revamping) are carried out to extend the service life of the equipment and improve its performance.

Resource Conservation

Additive manufacturing techniques, compared to traditional subtractive methods, enable the realization of complex geometries that facilitate lightweight designs and thus reduce material usage.

CONSTRUCTION



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- Remaining Waste

RAW MATERIALS

Use of local resources

Using **local resources** in construction means relying on regionally available materials to reduce environmental and economic costs. This can be achieved by sourcing **local raw materials** such as regional limestone for concrete production and making use of **existing materials on-site,** like earth or gravel. These practices minimize transportation needs, lower emissions, support the local economy, and contribute to more sustainable and efficient construction processes.

Use of recycled / alternative materials and components

Using **recycled or alternative materials and components** in construction supports circular practices by conserving natural resources. This can include the integration of **excavated or demolition materials** into structural layers, such as for backfilling or road bases. **Recycled materials** like asphalt, concrete, or plastics can replace / reduce virgin materials in new mixtures. In addition, **reusing building components** or **reclaimed wood** helps conserve resources. These approaches reduce the demand for virgin materials, decrease waste, and lower the overall environmental footprint of construction projects.

DESIGN

Appropriate use of materials

Materials are used optimally by **leveraging their inherent properties** such as strength, durability, and dimensions. This involves carefully considering **the required boundary conditions and functional requirements of the application**. Through this targeted approach, building products and structures can be designed with **minimal material use without compromising performance**. This conserves resources, lowers costs, and reduces environmental impact while ensuring performance.

Accuracy in design

Accurate design and planning ensure efficient use of resources and smooth project execution. This is achieved through **precise coordination between different trades, careful material calculation** to minimize offcuts and waste, and the **avoidance of overengineering** by tailoring designs exactly to functional requirements. Additionally, it is important to support **automated processes**, for example in the ancillary building trade industry or in the production of construction components and materials.

DESIGN

Design with separable connections

Designs should enable easy disassembly through **separable connections** such as screws, nails, positive-fit connections, plug-in systems, or click joints, while **adhesive bonding or welding should be avoided** whenever possible, as it complicates repair, recycling, and the reuse of components.

Promoting circular economy through sustainable design

Create durable, high-quality building products and structures by carefully **considering** the specific **application area, selecting appropriate materials, avoiding composites** for material purity, and **eliminating hazardous substances. Stress tests** ensure quality, while certifications like KlimaHaus Nature address also environmental and health impacts, as well as the well-being of occupants. **Good architectural integration** completes the approach. This extends service life, reduces waste, and supports both environmental and human well-being.

DESIGN

Design based on the C2C concept

Use Products that are designed in accordance with the Cradle-to-Cradle (C2C) concept to be fully reintegrated **at the end of their life** into either the **biological or technical cycle**. Accordingly, a **modular design** is required to enable future dismantling and easy separation of materials. The Cradle to Cradle Certified® Product Standard provides a framework that addresses the following categories: **material health, product circularity, social fairness, water & soil stewardship, clean air & climate protection**. By adhering to these criteria, products, buildings and infrastructure, support sustainable resource use, minimize environmental impact, and promote social responsibility throughout their lifecycle.

MANUFACTURING

In-house material production

In-house production of materials such as plastics, (recycled) concrete, and bituminous mixtures allows for **rapid development and adjustment** of material formulations. Through **internal recycling loops**, production residues can be reused, while independent **quality inspections** ensure consistent standards. The use of renewable energy further reduces environmental impact.

MANUFACTURING

Just-in-time production

Just-in-time production in the construction sector primarily relates to the building materials and supply industry or the prefabrication of construction components. It aims to **align manufacturing closely with actual on-site demand**. By avoiding overproduction and producing only what is needed, when it is needed, inventory costs are reduced, storage resources are saved, and material usage becomes more efficient.

Circular economy in manufacturing processes

In construction, examples of internal circular economy include **processing and reusing offcuts, remnants, and nonconforming products**, as well as **salvaging intact parts** from complaints whenever possible. **Wood waste** can be **repurposed for formwork** or used as an **energy source** within the company. Additionally, when companies renovate or modify their own buildings, they can improve resource efficiency by selectively dismantling and **reusing parts of the existing structures** in the new construction.

DISTRIBUTION

Sustainable logistics

In construction, logistics plays a crucial role since companies and construction sites are often located at different places. Sustainable logistics focuses i.a. on **minimizing transportation needs** while maintaining operational efficiency. This is achieved through **efficient planning of personnel and machinery, optimizing their deployment** to reduce unnecessary travel. **Partnering with local suppliers and contractors**, further shortens transport routes. Additionally, switching to **HVO (Hydrotreated Vegetable Oil) biodiesel** and adopting **electric vehicles and machinery** (e.g. trucks, dumpers, forklifts) may help significantly cut CO_2 emissions, especially when combined with renewable energy sources.

USE

Extend service life of buildings

Extending the service life of buildings is essential for sustainable and circular construction. This is achieved by using **high-quality materials and craftsmanship**, ensuring durability from the outset. **Regular inspections and proper maintenance** help detect and address potential issues early. For wooden components in particular, effective **protection against water** is crucial. **Educating users** on proper handling and care further supports the long-term preservation of structures. These measures reduce the need for replacements, conserve resources, and minimize environmental impact over the building's lifetime.

Extend service life of machines / vehicles

Use **modern, durable equipment** to support the longevity of machines and vehicles. **Preventive maintenance** — carried out e.g. by in-house mechanics and possibly through internal **reuse of components** — keeps equipment in optimal condition and extends its operational lifespan. As a result, resource consumption, replacement costs, and waste generation are significantly reduced.

COLLECTION

Proper waste collection

Strict waste separation should be implemented both **within the company and** directly on **construction sites** separating waste streams such as wood, concrete, metals, plastics, and insulation. This practice reduces disposal costs, improves recycling efficiency, and supports environmental protection by preventing contamination and enabling better resource recovery. Especially on construction sites, the **culture of sorting waste as potential valuable materials** holds great potential.

RECYCLING

Thermal recovery

In the construction sector, thermal recovery primarily involves the material wood. Depending on the quantity and available options, this can be carried out either internally, by using wood chips and sawdust **for heating** and **production** processes, or **externally**, by supplying surplus materials such as bark mulch or wood chips **to local district heating plants**.

RECYCLING

Material recovery

Material recovery in construction varies depending on the specific trade and focus of the construction or ancillary industries. In some cases, demolition materials such as asphalt, metals, plastics, and glass can be **directly reused**, especially if the company produces its own materials and can ensure quality. Otherwise, particularly plastics and glass are often **downcycled into lower-value applications**. Demolition waste, after sorting and crushing, can be processed into recycled gravel (RC gravel) for various uses. If enough space is available on-site, excavation or demolition material can be **directly processed and reused** for substructures or road construction, **reducing transportation needs**. Old wood from demolition can, depending on its condition, be reused as construction elements or for formwork. Additionally, surplus auxiliary materials should be **collected and returned to the manufacturer** when possible, further contributing to resource efficiency and waste reduction. However, the best form of recycling in construction is the **reuse of entire buildings or parts** thereof, preserving their original function and greatly reducing the need for new materials.

BEST PRACTICE – ERDBAU

Since 1959, **ERDBAU** has been active in earthmoving, and since the early 1990s in recycling various types of waste from the construction sector.

High-Quality Recycling of Building Materials

The company's core business is the recycling of construction waste such as concrete, bricks and rubble into high-quality secondary material. The materials are:

- carefully sorted (magnets, washing) and crushed;
- tested by internal and external bodies for safety, freedom from pollutants, and technical suitability;
- subsequently returned to the economic cycle as certified building materials, as products or in innovative mixtures such as green roof substrates. In this process, brick components are separated from rubble using a technical method and added to the substrate.

Over 90 % of the processed waste can thus be reused. Industrial waste and other construction waste are also manually sorted for recyclable materials, with only the residual fraction being disposed of.

Treatment of Contaminated Soils and Hazardous Waste

ERDBAU draws on the expertise of specialized sister companies for the proper treatment of contaminated soil and hazardous waste. These companies specialize in the analysis, classification, and decontamination of such materials, ensuring legally compliant and environmentally responsible handling.

www.erdbau.it

Power Team
ERDBAU

Resource Conservation through Mobile Processing On-Site

Mobile plants enable the processing of excavated material and recycling directly on-site, saving time, costs, and transport, while reducing CO_2 emissions.

BEST PRACTICE – FINSTRAL

FINSTRAL is a South Tyrolean company that specializes in the manufacturing of plastic windows and doors. The company deliberately chooses PVC as it's material of choice.
On the one hand because of its outstanding properties such as thermal and sound insulation, weather resistance, durability and individual mouldability, and on the other hand because of the resulting high purity of the products, which enables efficient recycling:

1. Production waste, offcuts, and defective parts are collected at the respective sites and then transported to the production facility in Cortaccia.

2. Coarse sorting, in which foreign materials such as metals or wood are removed.

3. Shredding of the plastic parts first to < 10 mm, then to 0.8 mm.

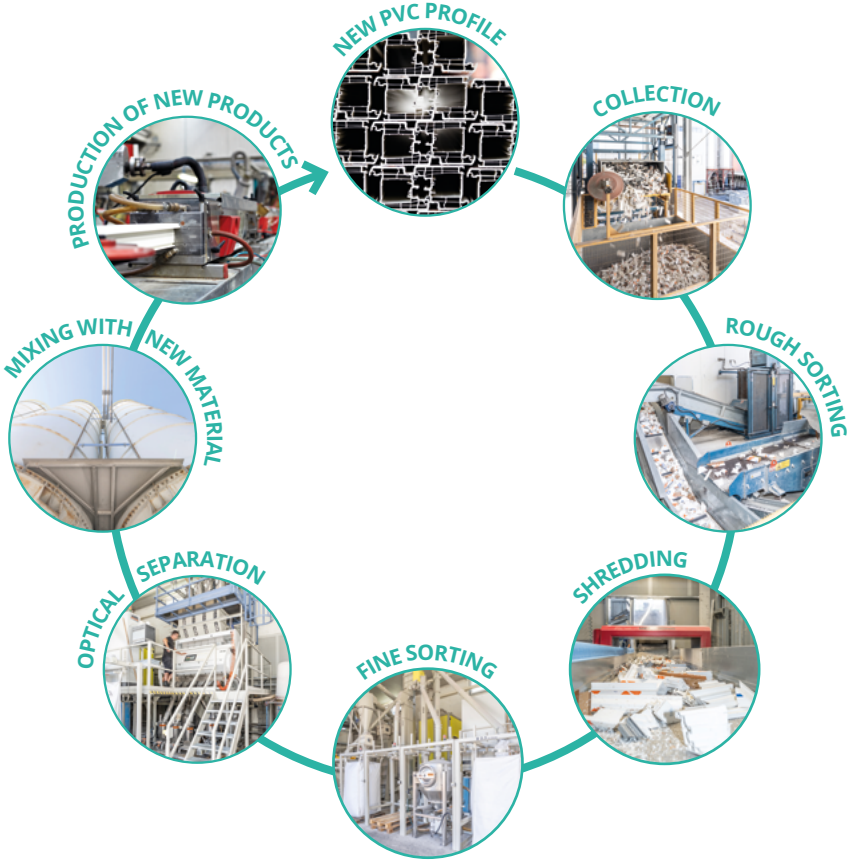
4. Fine sorting into light fraction, rigid PVC, and gaskets.

5. Optical separation of rigid PVC by color.

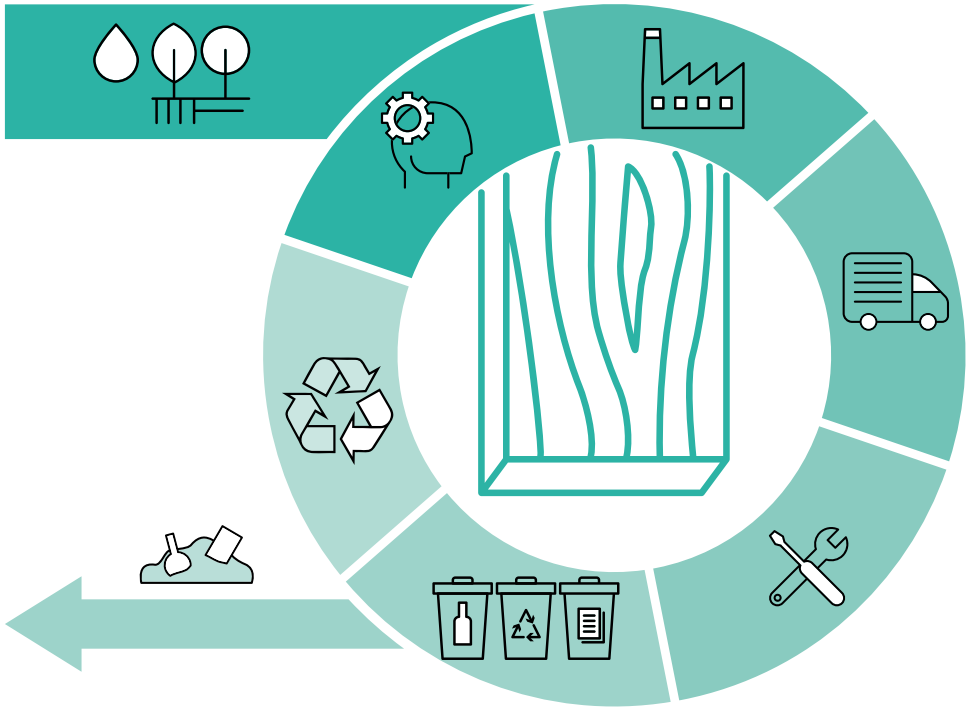
6. The recycled material is then mixed with new material, making up an average content of 20 %.

Since 2004, Finstral processes lead-free PVC. As a result, Finstral PVC window frames are free of pollutants and 100 % recyclable.

FINSTRAL



WOOD PROCESSING



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RAW MATERIALS

Use of sustainable timber

Prioritize sourcing timber **certified by sustainable forestry standards** such as FSC or PEFC. Using certified timber ensures responsible forest management, promotes environmental conservation, and supports long-term resource availability.

Use of local resources

Prioritize the use of **regional timber species** such as spruce or larch. Source materials preferably from **local farmers, merchants**, or, if available, directly from the client. This helps to reduce transportation distances and supports the local economy.

DESIGN

Appropriate use of materials

Materials are used optimally by **leveraging their inherent properties** such as strength, durability, and dimensions. This involves carefully **considering the required boundary conditions** and, where necessary, combining materials — like concrete or plastics — to achieve the best performance (composite materials). By doing so, designs ensure resource efficiency, enhanced functionality, and longer product lifespans.

DESIGN

Accuracy in design

Accurate planning is essential to support automated processes, ensuring smooth production and **reducing errors, waste and offcuts**. By considering both **assembly and disassembly**, products become easier to maintain and recycle.

Design with separable connections

Designs should enable easy disassembly through **separable connections** such as screws, nails, positive-fit connections, plug-in systems, or click joints, while **adhesive bonding should be avoided** whenever possible, as it complicates repair, recycling, and the reuse of components.

Design based on the C2C concept

Products are designed in accordance with the Cradle-to-Cradle (C2C) concept to be fully reintegrated **at the end of their life** into either the **biological or technical cycle**. The Cradle to Cradle Certified® Product Standard provides a framework that addresses the following categories: **material health, product circularity, social fairness, water & soil stewardship, clean air & climate protection**.
By adhering to these criteria, products support sustainable resource use, minimize environmental impact, and promote social responsibility throughout their lifecycle.

Low-energy wood drying

Improvements in the energy requirements of wood drying can be achieved by using **low-energy technologies**, integrating **renewable energy sources**, and applying **smart drying** methods. Whenever possible, **natural wood drying** is preferred to maintain the wood's natural aroma (such as stone pine) and uphold traditional practices. This approach reduces environmental impact and enhances product value.

Just-in-time production

Just-in-time production aims to **align manufacturing closely with actual demand**. This is achieved by avoiding overproduction and producing only what is needed, when it is needed. As a result, inventory costs are reduced, storage resources are saved, and material use becomes more efficient.

Avoidance of wood treatment

Using **untreated wood** and avoiding substances like varnish, glue, and paint enhances both reusability and health safety.

Targeted use of adhesives

If adhesive use is unavoidable, manufacturing processes should focus on **minimizing** the **amount applied** and ensuring accurate, **targeted application**. This helps to reduce hazardous waste and limits the need for frequent plant cleaning.

Use natural / alternative auxiliary materials

It is recommended to use **natural or alternative auxiliary materials** wherever possible for e.g. adhesives, wood lubricants, packaging, insulation. Choosing these materials helps reduce environmental impact and promotes better health and safety during manufacturing, use, and disposal.

Circular economy in the manufacturing process

The manufacturing process in woodworking often involves multiple in-house processing steps, ranging from raw logs to finished products. Within these steps, circular economy principles can be applied — e.g. by using **lower-quality wood for parts where high quality is not required** (such as non-visible components) and by **energetically utilizing co-products** to support operating processes. Implementing these strategies increases resource efficiency, minimizes waste, and enhances the overall sustainability of production.

DISTRIBUTION

Market differentiation

Market differentiation focuses on **setting products apart through sustainable characteristics**. This can be achieved by marketing recycled products, reused goods, or circular materials. Such an approach not only appeals to environmentally conscious consumers but also opens up access to new markets and supports the growth of **circular business models**.

USE

Extend service life of products

Extending the service life of wood products is a key principle of sustainable and circular design. This is achieved through **constructive wood protection** — particularly **against water** — combined with **regular inspections and proper maintenance**. **Educating consumers** on correct use also plays an important role in ensuring safety, functionality, and long-term preservation of materials.
A longer product lifespan reduces the need for replacements, conserves resources, and significantly lowers environmental impact over time.

COLLECTION

Proper waste collection

Strict separation of waste streams is necessary to reduce disposal costs and improve recycling efficiency. **Treated and untreated wood** must be **collected separately to prevent contamination** and **allow appropriate processing**, supporting environmental protection and closed-loop material cycles.

RECYCLING

Material recovery

Material recovery focuses on **returning wood** and auxiliary materials to the production cycle **at the highest possible value**. This is most feasible with **untreated or only minimally treated wood**. Depending on quality and condition, materials should be **reused whenever possible** — e.g. for non-structural purposes such as decorative elements. **Lower-grade wood** can be **processed** into bark mulch for gardening or recycled into pallets, boxes, fences, or roof shingles. Offcuts may also be recycled in chipboard or fiberboard production. Additionally, **surplus auxiliary materials** should be **collected** and, if possible, **returned to the manufacturer**. These practices help conserve resources, reduce waste, and support a functioning circular economy in woodworking.

RECYCLING

Thermal recovery

Thermal recovery uses wood by-products to **generate energy**, supporting a circular approach in woodworking. This is done **internally** by using wood chips and sawdust **for heating and production** processes.
Externally, surplus materials like bark mulch or wood chips can be **supplied to local district heating plants**, and by-products can be processed into pellets and **sold to regional customers**.
These measures reduce fossil fuel dependence, lower disposal needs, and increase the overall resource efficiency of the production system.

BEST PRACTICE – HOLZIUS

Building and living in harmony with nature, health, and sustainability: This is the principle by which **HOLZIUS**, based in South Tyrol's Vinschgau valley, produces glue- and metal-free solid wood elements. These meet the highest technical and building biology standards of modern architecture and are used in the construction of customized holzius buildings.

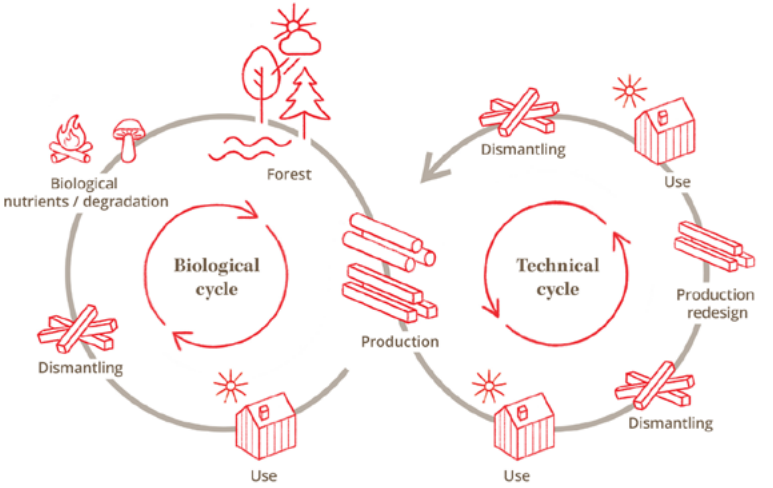
The high-quality solid wood components for walls, roofs, and ceilings are made from 100 % untreated wood. In doing so, holzius relies on well-tried joinery techniques from traditional craftsmanship:

- Use of PEFC-certified timber from the Alpine region
- All building elements are completely free of glue and metal
- Designed for disassembly and fully recyclable in closed loops
- Cradle to Cradle® Certified Gold for all solid wood elements

For holzius, sustainability does not end with the product. It is actively practiced throughout the company — from the sustainably designed headquarters to targeted training and awareness programs for employees. holzius sees itself as a pioneer of a construction method that unites ecological responsibility with entrepreneurial action.

www.holzius.com

holzius
VOLLHOLZHAUS



BEST PRACTICE – ITLAS

www.itlas.com

ITLAS

ITLAS is a company specialized in the production and marketing of two- and three-layer prefinished wooden flooring, which has also expanded its business to furniture and bathroom furnishings. The entire supply chain — from raw material to finished product, including storage, sawmill, production, finishing, and packaging — is managed internally, ensuring full process control.

Sustainable Raw Material

Only wood from certified forests (PEFC and FSC) is used, promoting responsible forest management. Through the "Assi del Cansiglio" project, the company enhances the local supply chain and, after the Vaia storm in 2018, joined the PEFC Solidarity Chain by purchasing fallen beech trees at a price higher than the market value. This turned a destructive event into an opportunity to support the local economy and territory.

Recycling

Production waste is recovered and reused either to create new boards or to fuel thermal energy generators that heat the production facilities.

Low-Emission Materials

Water-based paints, vinyl glues, and natural oils are used to minimize indoor pollution and reduce the environmental impact of production, ensuring products with extremely low formaldehyde emission levels.

IMPRINT

Project Coordinator:
Prof. Erwin Rauch, Chair for Sustainable Manufacturing and Head of Sustainable Manufacturing Lab in Bruneck, Faculty of Engineering, Free University of Bozen-Bolzano.

Edited and illustrated by:
Johanna Kargruber (unibz)
Roland Walch (unibz)
Chiara Remundos (t2i)
Fabio Favero (t2i)
Alexander Berndt (FHK)
Elisabeth Fugatti

Best Practice texts and images from:
Alupress AG *(picture: Jürgen Eheim)*
Duka AG
Erdbau GmbH
Finstral AG
holzius GmbH *(illustration: Helios; picture: Tobias Kaser)*
Intercable Automotive Solutions GmbH
ITLAS Srl Società Benefit
KAB Kärntner Abfallbewirtschaftung GmbH
Lucchese Industria Srl
MiCROTEC SpA

PUBBLISHED IN OCTOBER 2025

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TRASFERIMENTO TECNOLOGICO
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