



Sustainable and circular construction

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for a greener Europe*

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Summary

The construction industry is one of the world's largest consumers of energy and raw materials. In the EU, it is responsible for almost 40% of emissions and nearly a third of all waste. When buildings are demolished, only around **40%** of construction waste is **recycled or reused**. In most cases, recycled construction material is used in second-grade construction, rather than new buildings. Adopting a circular approach in the building sector has great potential to deliver environmental, social and economic benefits. Circular construction requires rethinking how buildings are designed: reducing embedded carbon, using recycled or bio-based materials, designing for material and component reuse, and extending life of buildings through maintenance.

The EU [Circular Economy Action Plan](#) considers the construction sector one of the eight sectors with the highest potential for circularity, and outlines a set of actions to be taken. Similarly, the Waste Framework Directive sees construction and demolition waste as a priority waste stream.

Local and regional authorities have an excellent opportunity to drive the change in the construction sector. Local governments manage a vast portfolio of public buildings and have enough of a purchasing power to significantly impact the market conditions. They can adopt green public procurement practices, develop pilot projects, raise awareness, support data sharing, and stimulate collaboration among stakeholders.

The following pages provide an overview of EU initiatives to inspire local and regional authorities and showcase practical examples of stimulating the transition to a circular and sustainable building sector. These include instances of innovative policies, actions concerning the recycling and reuse of construction materials, and demonstrations of potential for using recycled and bio-based materials. Furthermore, there is a selection of Interreg Europe good practices from various projects, [KARMA](#), [INERTWASTE](#), [CONDEREFF](#), [POTeNT](#), [REPLACE](#) and [REDUCES](#), with a high degree of replicability in other municipal contexts.

The knowledge, solutions and good practices showcased in this policy brief come mainly from Interreg Europe projects.

Table of Contents

Summary	2
Sustainable construction: building a circular future	4
EU policies on sustainable construction	5
European financial support	6
Policy solutions for a circular built environment	7
Recycling and reuse of construction materials	8
Sustainable building materials	14
Policy recommendations	17
Interreg Europe resources	18

Interreg Europe good practices

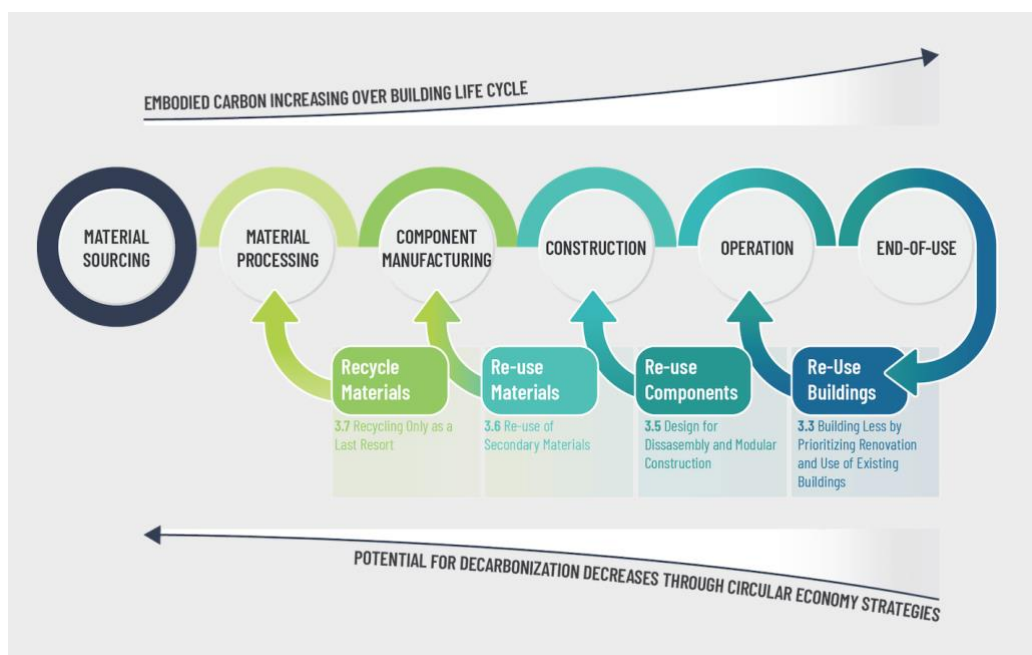
<i>GOOD PRACTICE 1: Recycling Building Material Ordinance (Austria)</i>	10
<i>GOOD PRACTICE 2: Mandatory GPP environmental criteria for buildings (Italy)</i>	10
<i>GOOD PRACTICE 3: Construction and Buildings Extended Producers Responsibility (France)</i>	11
<i>GOOD PRACTICE 4: Reuse centre for building materials (Sweden)</i>	11
<i>GOOD PRACTICE 5: Avoiding waste by extending the life of construction materials (France)</i>	12
<i>GOOD PRACTICE 6: Recycling materials from a residence deconstruction (France)</i>	12
<i>GOOD PRACTICE 7: Recyclable construction solutions from hemp (Finland)</i>	15
<i>GOOD PRACTICE 8: HafenCity Ecolabel for sustainable architecture (Germany)</i>	15

Sustainable construction: building a circular future

Governments around the world are consistently investing in the construction of new buildings and infrastructure to fulfil various societal needs. The built environment significantly impacts many sectors of the economy, on local jobs and quality of life. Globally, the built environment accounts for **39% of gross annual carbon emissions**. Under this figure fall both embodied carbon (all the carbon emitted during the life cycle of a given building/construction project, including production, transport, and disposal of construction materials), and operational carbon (emissions related to the building's day-to-day use).

Built environment is also one of the most resource intensive sectors of the economy, and according to [IEA](#) accounts for about 50% of all extracted material, 33% of water consumption, and for over **35% of the EU's total waste generation**. Greenhouse gas emissions from material extraction, construction product manufacturing, as well as the actual construction and renovation of buildings are estimated at **9.4% of total domestic carbon footprint**. According to UNEP, greater material efficiency and the move to a circular economy could prevent **80% of those emissions**. Consistent with the [Circularity Gap Report 2022](#), “[...] current estimates suggest that 255 billion square metres of buildings exist across the globe—a figure expected to almost double within the next four decades. This is equal to erecting cities the size of Paris every week”. The report also attributes the second largest emission footprint to housing. This is due to the vast extraction, transport and construction activities it entails, as well as the energy used in homes.

At the same time, the construction industry is one of the most important to the EU economy. It drives economic growth, employs **25 million people**, and provides solutions for social, climate and energy challenges. It has played a crucial part in the economic recovery after the Covid-19 pandemic. The recent crisis related to the pandemic and the Russian invasion of Ukraine has exposed the risk of supply chain disruptions, and has shown the need for strengthening the internal market for construction products, as well as the resilience of the construction ecosystem.



Source: [Keena, Rondinel-Oviedo and Acevedo De los Ríos 2023](#)

EU policies on sustainable construction

Given the high percentage of CO₂ emissions associated with the construction and demolition sector, it is not surprising that the topic has been increasingly prominent in EU policies, and that the transition to a more circular building sector is integral to achieving the goals of the [European Green Deal](#). The European Union has implemented various policies to promote sustainable construction practices. These policies aim to reduce the environmental impact of the construction sector, improve resource efficiency, and promote the use of renewable energy sources.

Circular Economy Action Plan

The [Circular Economy Action Plan](#) considers the construction sector as one of the eight with the highest potential for circularity, and mentions several measures for construction and buildings. It foresees the launch of a new comprehensive **Strategy for a Sustainable Built Environment** (expected to come out in 2024), which should guarantee coherence across policy areas, such as construction and demolition waste, climate, energy efficiency, accessibility or digitalisation. It supports the promotion of circular economy measures, such as improved durability, adaptability of built assets, and development of digital logbooks for buildings, as well as integration of life-cycle assessment in public procurement. The document considers a possible revision of material recovery targets set in EU legislation for construction and demolition waste and its material-specific fractions. It also addresses brownfields rehabilitation, soil pollution reduction, and the circular use of excavated soils.

Waste Framework Directive (WFD)

According to the [Waste Framework Directive \(2008/98/EC\)](#) Member States were obliged to prepare for **reuse, recycle, and recover 70%** of non-hazardous construction and demolition waste by 2020, and minimise waste generation. While most countries have reportedly reached this target, many activities were reported under backfilling, which lacks proper definition. To this end, the European Commission shall consider new targets for construction and demolition waste by the end of 2024 and a harmonized guideline regarding definitions on waste, backfilling and treatment activities may be published in future. The WFD also includes the [Construction and Demolition Waste Management Protocol](#) (guidelines) and [guidelines on audits before demolitions](#).

Construction Product Regulation (CPR)

The CPR establishes harmonized rules for the marketing of construction products in the EU. It includes requirements for the declaration of performance and circular economy marking of construction products, ensuring that they meet essential performance criteria related to health, safety, and environmental aspects. The revision of the [Construction Product Regulation](#) should enhance sustainability of construction goods, with the possible introduction of recycled content requirements for certain products. It should also improve digital products information and enable easier delivery of harmonised standards.

New European Bauhaus (NEB)

The NEB specifically wants to inspire projects and initiatives that support **reconnection with nature** through the physical transformation of sites that show how new, renovated or regenerated built environment and public spaces may help protect, restore and/or regenerate natural eco-systems and biodiversity. These projects will **shape circular eco-systems**, transforming specific value chains, from the sourcing of raw materials, to the recycling of waste in various ecosystems such as the construction sector.

European financial support

Under the 2021–2027 [Multiannual Financial Framework](#) (MFF), funding will be available for various programs and projects related to sustainable construction. This includes investments in energy-efficient buildings, renewable energy infrastructure, and the development of sustainable urban areas. The EU aims to promote the use of environmentally friendly construction materials, energy-efficient technologies, and innovative building practices.

LIFE programme: During the [2014–2020](#) programming period, the [LIFE programme](#) supported the implementation of circular economy projects with over EUR [945 million](#). The [new regulation](#) governing the programme between 2021 and 2027 has allocated a budget of EUR 1,35 billion to the 'Circular Economy and Quality of Life' subprogramme, which is expected to help the dissemination of best practices and solutions. Worth mentioning is the [Waste2Build](#) project, aiming to develop new circular construction and public works streams, set up an innovative system to optimise resources, and recover waste from local construction. One of the expected results is to recycle 85% of construction waste across the Toulouse Metropole, reduce waste by more than 140,000 tonnes/year and save over 25,000 tonnes of CO₂/year starting in 2026, and have circular economy criteria included in 80% of building contracts in Toulouse.

The [CARBIP](#) project aims to demonstrate the industrial scale application of new, sustainably produced and circular composite aerogel-based insulation materials in the construction sector. The overarching goal of the [I-LOOP LIFE](#) project is to achieve a significant decrease of construction and demolition waste in landfill by implementing a new glass wool recycling technology.

Horizon Europe: With a [budget of EUR 95.5 billion](#), it is the EU's key funding programme for research and innovation. The topic of sustainable and circular construction falls directly under two Horizon Missions (Climate Neutral and Smart Cities and Adaptation to Climate Change). The [RECONMATIC](#) project will design new tools, solutions and techniques to connect prevention and management of construction and demolition waste with the European waste reduction goals. It will develop, test and demonstrate automated, digital and robotic solutions for the construction industry's stakeholder collaboration and waste traceability. [WOODCIRCLES](#) will develop innovative circular solutions for sustainable wood. Based on previously identified needs and market potential, the consortium will develop new value chains for upcycling wood waste materials and optimised design-for-disassembly building system solutions to increase recycling rates of wood in construction. Of interest can also be the results of the now closed [CIRCUIT](#) project, which showcases how circular construction approaches can be scaled and replicated across Europe.

The [EU Just Transition Fund](#) is a new programme running from 2021 to 2027, created to **support regions transitioning away from fossil fuel industries**. The Just Transition Fund has EUR 55 billion to facilitate the implementation of the European Green Deal, by supporting the transition to low-carbon technologies and economic diversification based on climate-resilient investments and jobs.

The [European Regional Development Fund](#) (ERDF) has supported projects related to a sustainable and circular construction sector. One example is the [SeRaMCo project](#), focusing on the use of recycled demolition waste in cement production. To improve construction waste recycling, SeRaMCo analysed and improved sorting and treatment methods, before developing and testing concrete mixes made from recycled material. It then produced cement from recycled aggregates and used it to make concrete precast products which stand comparison with conventional products in terms of cost and quality.

European Territorial Cooperation also provides considerable support for regional and local authorities wishing to learn how other peer organisations across Europe implement sustainable construction measures in their policies. In the following chapters of this brief, several good practices selected from Interreg Europe's framework will be highlighted. [Interreg Europe](#) provides opportunities for exchanging experience on any policy objective, including the possibility to test out solutions through pilot actions.

Policy solutions for a circular built environment

Circular construction is an approach that aims to minimise waste, maximise resource efficiency, and promote the reuse, recycling, and recovery of materials throughout the building's entire life cycle. It aligns with the principles of circular economy, which seek to keep resources in use for as long as possible and extract maximum value from them. Following these principles, new construction should be avoided whenever possible. If a new construction is built, it should be designed for longevity, adaptability and disassembly. New buildings should be built efficiently and with the right materials (recycled, renewable, non-polluting). Main aspects of circular construction include:

1. **Design for Deconstruction:** Newly built development should be designed with the intention of easy disassembly and material recovery at the end of life. This involves using modular construction techniques, standardized components, and reversible connections that allow for efficient dismantling and reuse.

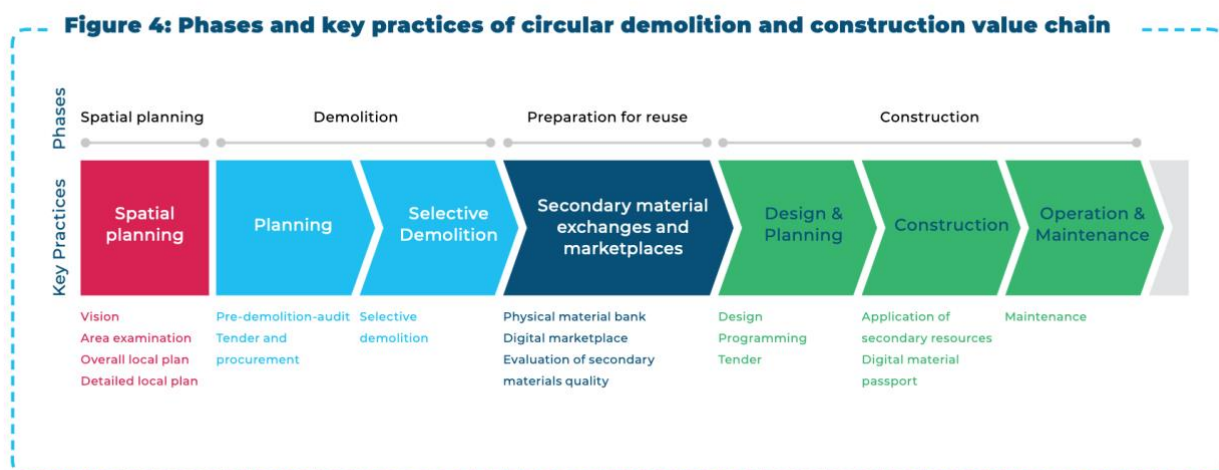


Image source: [City Loops](#)

2. **Material Reuse and Recycling:** Circular construction emphasises the reuse of building materials. This can involve salvaging materials from existing structures, repurposing materials within the same building or other projects, and utilizing recycled or upcycled materials. Materials that can be easily recycled at the end of their life cycle should be used.
3. **Resource Efficiency:** Reducing material consumption and optimizing resource use is essential. It can be achieved by choosing efficient design that minimizes material waste, adopting prefabrication techniques, and implementing lean construction practices.
4. **Circular Business Models:** Circular construction involves exploring new business models that support circular economy principles. This may include leasing or renting building components, implementing take-back schemes for materials, and fostering collaboration between stakeholders to promote the sharing of resources.
5. **Digitalisation and Data Management:** Digital technologies, such as Building Information Modeling (BIM) and the Internet of Things (IoT), can play a significant role in making the construction sector circular. These tools enable better tracking and management of materials, facilitate the identification of reusable components, and support decision-making for material selection and disassembly planning.

Circular construction practices are gaining momentum as a means to reduce the environmental impacts of the construction sector and contribute to EU-wide reduction of greenhouse gas emissions. Various organisations, research institutions, and industry initiatives are working towards developing guidelines, standards, and best practices for circular construction.

As illustrated by the examples of good practices from the Interreg Europe community on the pages below, policymakers have begun to embed circular economy principles in city strategies, roadmaps and public procurement. However, there are still obstacles to overcome. Policy makers interviewed for a [study](#) conducted by ARUP and Ellen McArthur Foundation stated that an important first step is “*identifying policy changes to support transition to a circular economy*”. This can include the development of national, regional and municipal policy frameworks, introduction of economic incentives, or circular principles in public procurement.

Recycling and reuse of construction materials

Recycling and reuse of construction materials is a key component of circular construction. Given the high demand for resources, the European Union strives to make the building sector more circular. Nevertheless, the uptake of more circular approaches is slow. Around [70% of the recycled construction material](#) is used in low value applications, e.g. for backfilling or as a road base.

Reusing building materials should always be prioritised over recycling, following the EU Waste hierarchy. **Deconstruction would be prioritised over demolition.** Deconstruction involves the careful disassembly of buildings in order to maximize recovered materials reuse and recycling. Although it can take longer than demolition, it benefits the environment more than demolition and recycling.

Better management of construction and demolition waste

Construction and demolition waste is generated in construction, renovation and demolition of existing buildings and makes for the Europe’s largest waste stream (around one third of all waste). It can include cuttings of new materials or damaged stock, and materials such as metals, wood, concrete, bricks, plastic, glass, asphalt, and hazardous materials such as asbestos. About [400 million tonnes](#) of construction and demolition waste are generated annually, with concrete making at least one third.

Recycling rates vary greatly across the EU, from less than 10% to over 90%. Many EU countries have succeeded in establishing markets for recovered construction and demolition materials. However, as a result of past building practices and the lack of high-purity materials recovered during demolition, the material streams arising from demolition and renovation works are currently not suitable for reuse or closed-loop recycling.

Some of the barriers to greater circularity within the sector include high prices of secondary materials compared to virgin ones, low confidence in the quality of secondary materials, polluted materials, and insufficient data on the kinds of materials used in the buildings. The picture on the following page shows examples of measures that would improve the management of construction and demolition waste.

Examples of circular actions that improve the management of construction and demolition waste

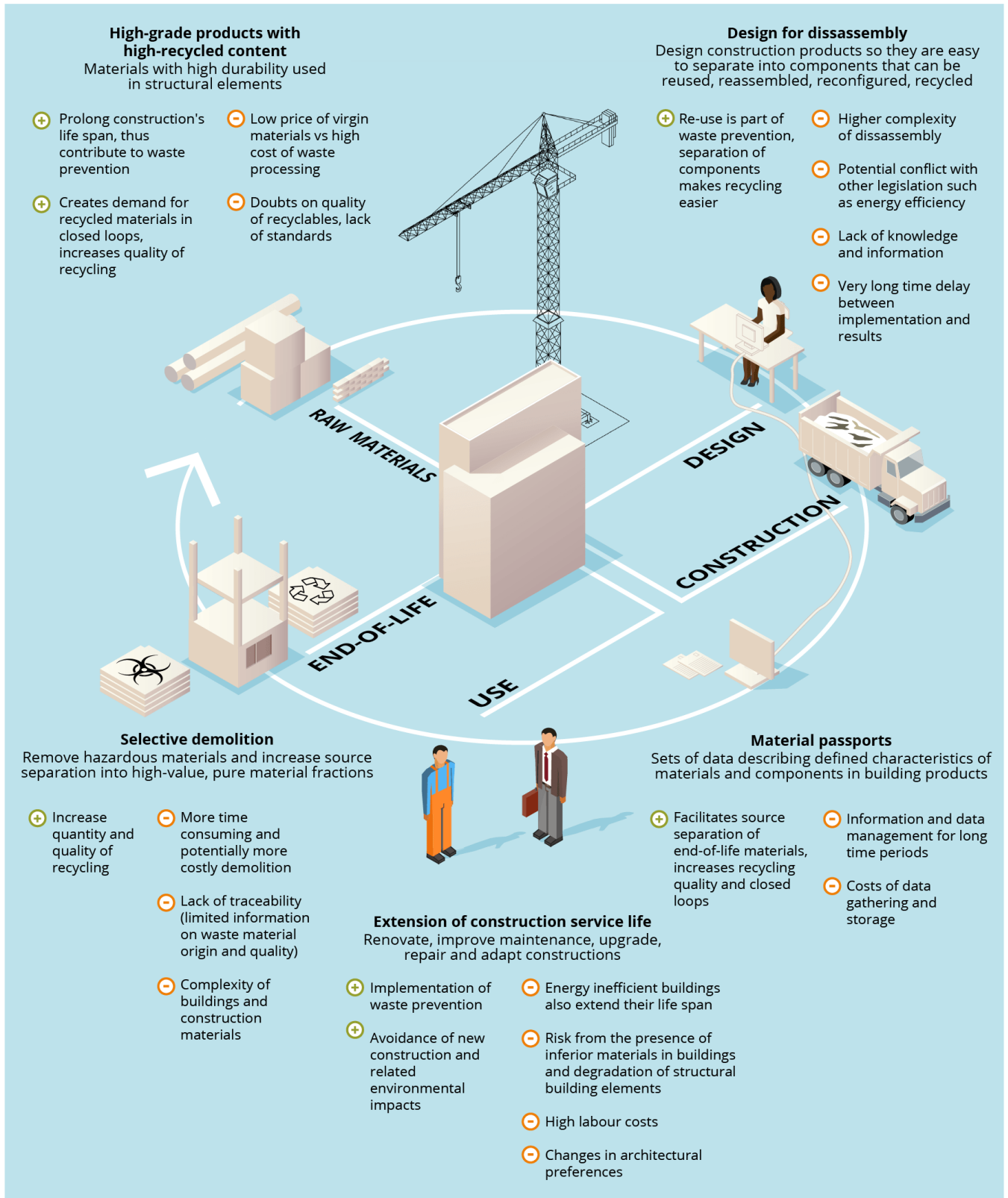


Image source: [European Environmental Agency](https://www.eea.europa.eu/en)

Making policies for circularity

A policy environment that incentivises and facilitates more circular behaviour is essential for driving the change in the sector. Existing regulatory policies, such as overly prescriptive waste regulations, often stand as barriers to the adoption of circular economy initiatives. Policymakers are currently presented with a great opportunity to support waste prevention, reuse and recycling of construction materials, e.g. through economic incentives or public procurement. Collaboration between the private, public, and non-governmental sectors will also help promoting the holistic system change needed to achieve circularity in construction. Furthermore, the industry can provide important data, and implement the circularity principles in commercial scale projects, for instance through the formation of public–private partnerships.

GOOD PRACTICE 1: Recycling Building Material Ordinance (Austria)



The main objective of the Austrian Recycling Building Materials Ordinance is to promote the recycling of construction and demolition waste by ensuring that the waste generated during construction and demolition activities is of high quality. It will contribute to increased material efficiency and circular economy. Specifically, the ordinance applies to construction and demolition activities, the production and use of recycled materials.



Image source: [CONDEREFF project](#)

Broadly speaking, the ordinance determines requirements to be fulfilled during the construction and demolition procedure. Prior to demolition, an audit of on-site conditions, including the presence of reusable components, pollutants and contaminants, has to be carried out. According to the Recycling Building Materials Ordinance, the evaluation must be based on the Austrian Standard ÖNORM B 3151, “Dismantling of buildings as a standard method for demolition”. It contains the appropriate process chart, which spans from the pre-demolition audit to mechanical deconstruction.

[Click here to find out more about this practice.](#)

GOOD PRACTICE 2: Mandatory GPP environmental criteria for buildings (Italy)



In 2017, Italy has become the first European country to introduce mandatory Green Public Procurement Minimum Environmental Criteria (MEC) for 100% of public building contracts. It applies to new constructions and renovation projects alike. Such approach significantly incentivizes the market to improve the quality of products, increase traceability of recycled content, and favour the adoption of certifications for recycled products. These GPP Criteria include several important measures related to circular economy: minimum recycled content in all major construction materials and products; mandatory implementation of pre-demolition audits; mandatory compliance with the 70% recovery threshold for construction and demolition waste, as required by the European Waste Directive; obligation to implement selective demolition processes, as well as design for disassembly/deconstruction for 50% of all materials used.

Though the implementation rate of GPP Minimum Environmental Criteria for public buildings had a slow uptake (around 18% on average for big towns in 2020), the policy is extremely important for raising awareness among the producers and users of recycled materials in the building sector. In fact, the market has quickly adapted by increasing supply of GPP–compliant construction products.

[Click here to find out more about this practice.](#)

GOOD PRACTICE 3: Construction and Buildings Extended Producers Responsibility (France)

Extended Producer Responsibility (EPR) is a principle according to which those who put products on the market need to ensure proper management of the products' end of life. The French law on circular economy and fight against waste, adopted in 2020, established the creation of an EPR scheme for Building Products and Materials (PMCB). The law says that PMCBs will be covered by EPR as of January 2022, and that construction waste will be taken back free of charge when collected separately, to ensure traceability of this waste. The law's aim is to divert construction and demolition waste from landfill, prevent illegal dumping, and increase recycling and reuse of these materials.

Each producer makes contributions to Valobat (EPR organisation) in the form of annual declaration of tonnage of waste produced and four quarterly instalments. Valobat handles the waste management and provides its members with various services. Individuals, craftsmen, and construction companies can deposit their waste at dedicated sites free of charge, providing the waste is sorted. Deposit sites include public and private waste collection centres, general or specialised distributors, construction companies' warehouses, direct points at construction sites (where waste production exceeds 50m³). Mandatory streams include rubble, metal, wood, rigid plastics, plaster, and dangerous waste. Among optional streams are glass and mineral wools, or bituminous membranes.

[Click here to find out more about this practice.](#)

Reuse of building materials

Many materials currently ending up as construction and demolition waste can be reused or recycled. On-site reuse in particular can significantly reduce project costs, according to Zero Waste Scotland's Zero Waste strategy guide for '[Maximising reuse in construction](#)'. Policy incentives can encourage both the re-use marketplace, as well as widespread adoption of secondary materials and selective deconstruction practices. Policies are needed to develop and regulate the government approval process for materials before they enter the marketplace. Municipalities can also lead by example. The Danish partner in the [INERTWASTE](#) project, Municipality of Guldborgsund, applied a [selective demolition](#) process to a house in Horbelev, basically taking it apart brick by brick. The bricks have been cleaned and tested, they are good enough to last another 50 to 100 years. The following good practices from various European regions show how reuse of construction materials can be implemented at a local or regional level.

GOOD PRACTICE 4: Reuse centre for building materials (Sweden)

The Municipality of Lessebo, together with a neighbouring municipality, have established a public company to operate a building material reuse centre. This initiative has successfully created a local market for the reuse of these materials. Their prices are 30 % of that of a new product. To make full use of the marketplace's potential, better collaboration with local construction companies is needed. Individuals and companies can deposit their building material directly at the centre or at a recycling station in a nearby city. The recycling station has a drop off point where materials are collected and later sent to the reuse centre. Following the drop-off point is a separation station sorting different materials according to type, e.g. plastics, metal, etc. that are later sent for recycling or to waste-to-energy plants.

An advisor at the station informs customers about the materials' reusability. The reuse centre is staffed by unemployed people participating in a labour market project. Employees try their hand at different tasks, learning new skills that are in-demand in the job market. Many of the participants have subsequently been offered jobs by private enterprises.

[Click here to find out more about this good practice.](#)

GOOD PRACTICE 5: Avoiding waste by extending the life of construction materials (France)

The ENFIN! RÉEMPLOI collective (FINALLY! REUSE), supported by five associations, companies and public institutions, aims to create a professional sector around the reuse of construction materials in the Savoie region around the city of Chambéry. The goal is to reduce the amount of waste and consumption generated by the construction sector. Apart from being circular, the project is also anchored in social and solidarity economy, since it contributes to job creation and the local economy. The services developed are as follows:

- Extraction and collection of material at the end of its first life, including materials from demolition sites, scrap, unsold goods, construction site surplus or production offcuts.
- Storage/repackaging/distribution of materials in a brick-and-mortar store.
- Resource diagnostics, project management, design studies to help professionals with the reuse process and accompany the material towards second life.
- In the future, it is expected that a centre for the transformation and standardisation of reused professional wood products will be created.



The physical space called Material Library covers almost 1000m² of material storage, offices, the Design Lab, and a wood workshop. In 2023, 88 tonnes of material were sold on the platform, with almost 1400 transactions. The collective had three full-time employees, three interns and six volunteers. Numerous visits for the public and professionals were realised.

[Click here to find out more about this practice.](#)

GOOD PRACTICE 6: Recycling materials from a residence deconstruction (France)

The deconstruction of 144 vacant social housing units in the Herbert Spencer residential building was the first operational project implemented as part of the "Nouvo Lorizon" project, driven by the city of Le Port, Réunion Island. One of the objectives of this urban renewal project was a revitalisation of the territory through supporting associative projects that promote circular economy, relying on local dynamics, implementing professional integration and contributing to social cohesion. The deconstruction project was an opportunity to create links between local stakeholders. The demolition work was supervised by SEMADER, the social landlord, in collaboration with the Technical Design Office, Envirotech, for the implementation of the deconstruction, and with the ITAC association, for salvage and reuse building materials.

Several local associations got involved in upcycling of the deconstructed materials: specifically in furniture making, building of an aquaponic greenhouse, refurbishment of interior housing doors and the deconstruction and removal of materials. Integration clauses in the work contract have enabled hiring four people from the local neighbourhood. The ITAC association was in charge of dispatching the materials and monitoring the progress of their reuse. 30 tons of various materials were collected and reused (doors, windows, etc.) in this collaborative circular economy project. These materials were given to five associations, e.g. 275 glass doors (seven tons) were used to manufacture a 160 m² aquaponic greenhouse; 40 doors were painted by local artists. 99% (19,691 tons) of the inert and non-hazardous waste was recovered. Most of all, the project constituted an example of participative governance, involving different stakeholders in a community-building project.

[Click here to find out more about this practice.](#)



Navarra policy context and challenges to foster recirculation of inert and inorganic waste

Interview with Raúl Salanueva Murguialday, Government of Navarra (INERTWASTE project)

How would you describe the national and regional policies that directly influence the transition to a circular economy in the construction and demolition sector?

There are several regulations: National ([Royal Decree 105/2008](#)) and regional ([Regional Decree 23/2011](#)), concerning the production and management of construction and demolition waste (CDW) and Excavated Natural Materials (ENM) that set obligations for producers, owners and managers. Moreover, the [Regional law 14/2018](#) on waste introduced taxes on landfill disposal, and created a Waste Fund to promote the first steps in the waste hierarchy and to optimise and improve the recycling and recovery systems through subsidies for companies and local entities. [National Law 7/2022](#) on waste and contaminated soil for a Circular Economy sets valorisation objectives for CDW (70%) and simplifies the administrative procedure of waste valorisation by shifting management to regional authorities, including articles for new by-product concepts, the end-of-waste status, self-sufficiency, proximity, and exemptions of permit requirements. The [Navarra Waste Plan 2017-2027](#) published in December 2016 and reviewed in January 2024, includes a specific working group for CDW and ENM and a strategic line in the waste prevention programme to promote more sustainable construction and deconstruction. In addition, ENM to restore degraded spaces includes a database of degraded spaces (BBDD SPADE), ENM land exchange to share the availability of excavation lands and the existing destinations for their valorisation. Finally, the [Agenda for Circular Economy in Navarra 2030](#), published in 2019, includes actions to work on the higher steps of the waste management hierarchy (from prevention and reuse to proper management).

What activities were implemented by the region so far, supporting a more circular and sustainable building sector?

Needless to say, Navarra participates in European projects, such as [RCdiGREEN](#) or [LCA4Regions](#), to allow for the exchange of experience on a European level. Furthermore, 2023 saw the creation of a [Circular Economy Chair in “Transfer and Innovation in Circular Economy”](#), signed between GAN-NIK and the Public University of Navarra, to broaden knowledge in the area of circular economy. The Circular Economy Chair will focus on the use of secondary raw materials in the construction sector, and the implementation of more sustainable construction techniques, based on the use of construction materials with a reduced environmental footprint. Other initiatives include [Navarra Zirkular](#), a public-private initiative presented in October 2022 to boost the circular economy among companies, including collaboration between construction and built environment companies; the [Construction cluster](#), advocating for public-private collaboration, as part of Navarra's commitment to leading the industrialisation processes in the construction sector at a national level, with the aim of positioning itself at a European level; as well as the [National Centre for the industrialisation of construction](#), which will be set up in Navarra, to enhance capacity building and applied research for companies.

Can you share some good practices of prevention, reuse and recycling of industrial/construction and demolition waste?

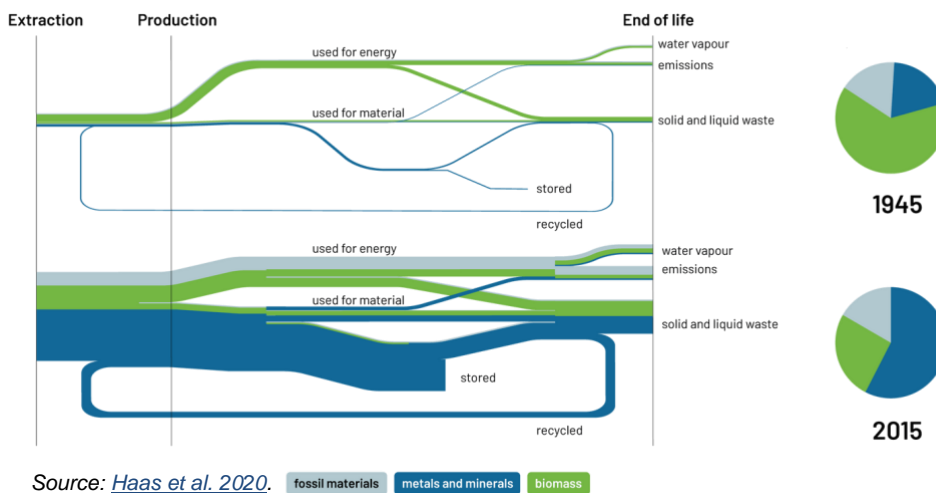
A good practice worth mentioning is the declaration of [ROCKWOOL Peninsular](#) stone wool scraps as a “by-product” in 2023. The declaration is the first one approved by the regional Government of Navarra for inert or inorganic waste under the recent [Law 7/2022](#). Stone wool scraps are used as insulation in construction, and the reclassification from “waste” to “by-product” elevates the status of this material within the waste hierarchy. It also promotes the reuse of stone wool scraps, minimises raw material extraction and landfill disposal, whilst at the same time cutting red tape and costs. Another example is the [regional Waste Fund of Navarra](#) that offers financial support to projects aimed at reducing waste, improving efficiency, and promoting the valorisation of industrial and construction waste. The fund is financed through taxes, penalties, and donations, and is distributed through annual calls to various entities. Since 2020, more than €15 million have been allocated in numerous waste flows. The fund has assigned over €740,000 for CDW and industrial waste among 17 private entities and one public body.

Sustainable building materials

The extraction, manufacturing, transport, and disposal of virgin building materials pollutes air and water, depletes resources and damages natural habitats. Therefore, it is always desirable to incorporate reusable, recyclable, recycled or biodegradable materials in construction projects. Building materials composed of one substance (wood, concrete) are generally the easiest to recycle or reuse. On the other hand, materials composed of many ingredients, such as wood chipboard, are not readily reusable or recyclable.

Historically, building materials were extracted predominantly from local, renewable and biological sources. Buildings were also designed with climate conditions in mind. As of the second half of 20th century, the majority of building materials came from extractive non-renewable processes. Globally, just three materials (steel, concrete and aluminium) are responsible for [23% of global emissions](#). In Europe, cement, steel, aluminium and plastic amount to [15% of EU carbon emissions](#).

Biomass materials dominated in buildings until the latter half of the 20th century



Renewable bio-based materials

If managed responsibly, renewable bio-based materials can have a lower carbon footprint compared to traditional materials and function as important carbon sinks. However, there are issues to be considered. Timber is the most commonly used renewable material for construction projects, and therefore the demand for wood has led to a level of harvesting and deforestation in natural forests that is [higher than the overall regrowth](#). The greatest impact is observed in tropical forests, particularly due to the limited financial and infrastructural resources available in many tropical countries to implement sustainable forest management practices. Purchasing countries can support sustainable sourcing practices by demanding products that are certified as environmentally friendly, such as those certified by the [Forest Stewardship Council](#) (FSC).

At the same time, it is important to develop products from other resources, such as reconstituted wood products from non-timber lignocellulosic forestry residues or fast-growing crops, such as bamboo, hay, straw, hemp etc. For example, straw biomass can replace high-carbon petrochemical-based insulation. Compared with conventional insulation materials – including polystyrene, mineral wool, cellulose fibres and rock wool – straw bale insulation exhibits much [lower CO² emissions](#).

GOOD PRACTICE 7: Recyclable construction solutions from hemp (Finland)

Hemp is a traditional annual crop that has been grown in Finland since at least the Iron Age. Finland has favourable growing conditions for hemp: suitable soil types and bright summer, cold winter and dry spring. Hemp has many benefits: it improves the soil's structure, increasing the amount of organic matter, is naturally immune to pests, has high yield and a wide range of applications.

The Hemp Construction project aimed to explore the potential of domestically grown hemp as a sustainable material for the construction industry. The long-term goal was to develop an alternative, resource efficient and carbon neutral building material. Working with a number of stakeholders, various mixtures were investigated and tests performed.

Subsequently, the resulting hemp-based material was used in construction with success. The material's circular potential has been examined also. The Tuorla Agricultural School has tested it for recyclability and found the material both degradable and beneficial for the soil.



Image source: [Rakennetaan Hampusta](#)

Thanks to a high amount of material being amassed during the project, an opportunity arose to test the material and structures in a real-world scenario, leading to the construction of a pilot house. The house is currently fully furnished and serves as a hemp house exhibition space, as well as a remote working space for the staff and students of TUAS.

[Click here to find out more about this practice.](#)

GOOD PRACTICE 8: HafenCity Ecolabel for sustainable architecture (Germany)

The HafenCity Ecolabel has been launched in 2007 as Germany's first green building certification system. In 2010, certification became a prerequisite for obtaining building plot planning options, emphasising commitment to sustainability. Since 2017, with the introduction of Version 3.0 of the Ecolabel, adherence to the highest platinum standard has become obligatory for all new buildings in HafenCity.

HafenCity Hamburg's Zero emissions building



Image source: [Ubm Development](#)

for the materials of the new buildings themselves to be recycled and reused later. The buildings also use green façades, have solar and geothermal power installed, and utilise grey and rainwater.

Over the years, HafenCity has become a test bed for sustainable building. From a timber-built high-rise to the zero-emission house (completely carbon neutral and dismantlable, see picture on the left), many forward-looking projects are bringing new methods and materials into construction practice, thus generating important impetus to the real estate sector. The use of regenerative raw materials, such as timber and clay, carbon-reduced steel, recycled building materials, and modular or reduced-concrete construction methods, all contribute to reducing emissions.

Documentation of the materials used and their separability during deconstruction make it easier

[Click here to find out more about this practice.](#)

Building Balance is a Dutch national program with the aim of accelerating the adoption of bio-based raw materials in building and construction. The project makes an active contribution to the agricultural and raw material transition. The focus is on creating **local value chains from ‘farmers to builders’**, involving all relevant stakeholders, using crops and residual flows from Dutch soil to produce biobased construction products. These products have the potential to contribute on a large scale to different governmental goals related to climate, circular economy and the transition to thereof in rural areas. For instance, there is a collaboration with housing associations in the province of Noord-Brabant, which committed to utilise solely biobased isolation materials in both new and renovation projects from 2027 onwards. This creates guaranteed demand for agricultural entrepreneurs and gives them the confidence to grow the respective crops.



Image source : [Building Balance](#)

Fibre crops, such as hemp, flax, miscanthus and cup plants, are grown in the in the region’s most suitable fields. These fibre crops are not very labour, fertilizer, and capital intensive, relative to the land area being farmed. Therefore, they are of special interest for agricultural areas that are bound by restrictions to protect the quality of water and soil.

Recycled materials

Another option to lower the construction industry’s emissions and amount of waste is the use of recycled materials in renovations and new buildings alike. As highlighted at the beginning of this document, recycling should always come after prevention and reuse, as it often results in a product of a lesser value. Even though different recycling techniques have been well developed globally, many regions have not implemented recycling methods for construction, renovation and demolition waste due to limitations, such as the lack of confidence in recycled products, cultural resistance, lack of certainty around the economic feasibility and viability of investing in advanced recycling methods, poor communication and insufficient policies.

Policy makers can implement policies with ‘**recycled content requirements**’, meaning that newly built constructions (or new products) must contain a certain percentage of recycled material. In the Netherlands, for instance, the construction industry is responsible for 50% of the country’s raw material use, 40% of waste generation and over one third of greenhouse gas emissions. To address these challenges, the government has set ambitious targets to halve the use of primary materials in construction by 2030 and to create a circular economy with net-zero carbon emissions for the sector by 2050. They have [commissioned a study](#) to examine the potential benefits of urban mining in the Netherlands between 2020 and 2050. Urban mining involves extracting valuable materials from existing buildings and infrastructure, contributing to a more sustainable approach to resource management.

The study’s results showed only a limited contribution of recycled materials, especially due to increasing urban population. The main sources of waste materials included **concrete** (60%) and **clay bricks** (24%). Many secondary materials can only contain up to a certain maximum level of recycled content. With concrete, for instance, the collected amounts can exceed the requirements. Still, there is often a discrepancy between available materials and those in demand for new constructions. Overall, the study concluded that the combination of accelerated decarbonisation and urban mining could lead to a **40% reduction** in greenhouse gas emissions by 2050.

The Interreg Europe [INERTWASTE](#) project has highlighted a Danish product which was the first one in Europe to receive a DS 206 certification for [concrete made with 100% recycled aggregates](#). Their recycled material performs as well as ordinary concrete, but all stone and gravel is replaced with aggregates from recycled resources, such as crushed concrete gravel and concrete stone, crushed sanitation, aerated concrete, plaster, or broken wind turbine blades.

Policy recommendations

Examples from Interreg Europe projects and the wider Interreg community can be a source of inspiration for many and can provide real benefits for those who wish to transform the construction sector at local and regional level.

Policy and finance

- Provide economic support (such as green taxes) to secondary materials. Create demand, e.g through green public procurement. Get inspired by the [mandatory green public procurement](#) from Italy ([CONDEREFF](#)).
- Advocate for the development of standardisation for secondary law materials at national and EU levels.
- Implement more ambitious waste management policy objectives focused on management quality. For example, the introduction of requirements for the re-use of construction and demolition waste would reorient current waste management practices toward a more circular approach. Similarly, implementation of recycled content requirements for construction products would be an optional policy. Get inspired by the [Austrian Building Material Ordinance](#) ([CONDEREFF](#)).
- Develop an [Ecolabel for sustainable architecture](#), such as in HafenCity, Germany ([KARMA](#)).
- Aspire to have construction and demolition waste under the [extended producer responsibility scheme](#), like in France ([INERTWASTE](#)).

New products and bio-based materials

- Dedicate research funding to technological development solutions with a focus on developing circular construction products with the potential to increase the re-use of construction components and waste prevention.
- Support research and development of biobased products, as well as their implementation. Get inspired by the Finnish example of [hemp-based recyclable construction solutions](#) ([REDUCES](#)).
- Encourage the use of bio-based materials such as straw, following the example of Building Balance in the Netherlands.

Actions on the ground

- Maximise use of existing buildings.
- Establish reuse centres and online platforms to boost reuse of construction materials as in [Sweden](#) ([POTEnT](#)) and [France](#) ([CONDEREFF](#)).
- Pilot and then standardise circular construction approaches in public renovation and new construction to lead by example and prove viability.
- Deconstruct buildings instead of demolishing them and reuse the materials in other projects, as in France ([REPLACE](#)).

Empowering and cooperating with stakeholders

- Educate and raise awareness to alleviate the lack of credibility of recycled, bio-based materials.
- Facilitate communication among stakeholders, share information about selective demolition, renovation and retrofitting.
- Engage in public private partnerships to develop projects such as Hamburg's [zero emissions building](#).

Interreg Europe resources

The Interreg Europe Policy Learning Platform experts provide a tailored set of resources, contacts, or in-depth analyses to help you find the answers you are looking for. Explore our services that can help you solve regional policy challenges.

Interreg Europe Policy Learning Platform information

- Webinar recording on [collection and recycling of construction and demolition waste](#)
- Policy brief on [leading the way towards waste prevention](#)
- Story on [Wood as a sustainable construction material](#)
- Story on [Improving resource efficiency in the construction sector](#)
- Matchmaking on [Reducing the carbon footprint of buildings](#)
- Webinar recording on [district approaches to sustainable energy](#)
- Virtual study visit from Hamburg '[Sustainable construction materials for climate protection](#)'

Other resources

- [The European Green Deal](#)
- [Circular Buildings Toolkit by Arup](#)
- [Circular construction in Europe: handbook for local and regional governments](#) – City Loops
- World Green Building Council: [EU Policy Whole Life Carbon Roadmap](#)
- [Building Materials and the Climate](#) – UN, Global Alliance for Buildings and Construction & Yale
- [From Principles to Practices: First steps towards a circular built environment](#) – Ellen McArthur Foundation & ARUP

Interreg Europe Programme

Interreg Europe is an interregional cooperation programme co-financed by the European Union. With a budget of 379 million euros for 2021-2027, Interreg Europe helps local, regional and national governments across Europe to develop and deliver better policies through interregional cooperation projects and its Policy Learning Platform services. The programme promotes good practice sharing and policy learning among European regions in 29 countries – the EU27, Norway and Switzerland. Interreg Europe contributes to the EU cohesion policy together with the other European Territorial Cooperation programmes known as Interreg.

Interreg Europe Policy Learning Platform

The Policy Learning Platform is the second action of the Interreg Europe programme. It aims to boost EU-wide policy learning and builds on good practices related to regional development policies.

The Platform is a space where the European policy-making community can tap into the know-how of regional policy experts and peers. It offers information on a variety of topics via thematic publications, online and onsite events, and direct communication with a team of experts.

Interreg Europe Policy Learning Platform expert services

Our team of experts provide a set of services that can help you with regional policy challenges. Get in contact with our experts to discuss the possibilities:



Via the [policy helpdesk](#), policymakers may submit their questions to receive a set of resources ranging from inspiring good practices from across Europe, policy briefs, webinar recordings, information about upcoming events, available European support and contacts of relevant people, as well as matchmaking recommendations and peer review opportunities.



A [matchmaking session](#) is a thematic discussion hosted and moderated by the Policy Learning Platform, designed around the policy needs and questions put forward by the requesting public authority or agency. It brings together peers from other European regions to present their experience and successes, to provide inspiration for overcoming regional challenges.



[Peer reviews](#) are the deepest and most intensive of the on-demand services, bringing together peers from a number of regions for a two-day work session, to examine the specific territorial and thematic context of the requesting region, discuss with stakeholders, and devise recommendations.

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