CIRCULAR ECONOMY

STOP TALKING - START ACTING!

Gender Disclaimer:

For the sole purpose of better readability, gender-specific spelling has not been used. All person-related terms in this brochure are therefore to be understood as gender-neutral.

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KEYWORDS

Digitization, EU taxonomy, flexible architecture, holistic architectural assessment, integral planning, circular economy, life cycle assessment, resource management, deconstruction, urban mining.

INTRODUCTION

In hardly any other sector is the consumption of energy and raw materials as high as in the construction industry. Around 40% of CO_2 emissions and almost a third of all waste in the EU are generated by the construction industry.
In Europe, the construction sector also accounts for more than one third of total energy consumption. Furthermore, only 40% of construction waste from buildings is reprocessed or recycled. Moreover, most recycled materials are not used for the construction of new buildings, but only as filling material in road construction[1]. In Austria, the situation is similar. Around 50% of the resources consumed and more than 70% of the waste generated can be attributed to the construction sector. Of course, excavated soil, which is almost completely deposited in landfills, plays a crucial role in this 70%[2]. The local use of excavated soil and construction waste would save landfill volume, protect extraction sites and additionally reduce heavy truck traffic significantly[3]. In addition, there are central issues such as climate change, scarcity of resources as well as dependencies on raw materials, which show us that things cannot go on like this.
A significant improvement in the ecological situation could be achieved by moving from a linear to a circular economy. The transformation of the economy and society is unavoidable in order to keep climate change and all its associated consequences within an economically, socially and ecologically acceptable framework. For this reason, as early as 2015, the member states of the European Union defined the circular economy as the means of choice for the transition to the world's first climate-neutral continent. Among other things, because an awareness arose that climate neutrality is not achievable without resource conservation - which, by honoring planetary boundaries, is a goal in its own right, on an equal footing with decarbonization.

The question is, how can this transformation to a circular economy work?

Let's approach this question by first identifying the two main guiding principles of a circular economy:

- The decoupling of value creation from the consumption of limited resources. This means maintaining the value of products and materials at the highest level for as long as possible for minimal resource consumption and waste. After a building or individual building elements have reached the end of their life, the resources used in the upstream phase will remain in the economy in the future and will be used again and again to continue generating value.

[1] Es wird Zeit für die Kreislaufwirtschaft in der Baubranche, Kai-Stefan Schober
[2] Beschäftigung und Kreislaufwirtschaft, Markus Meissner, BauKarussell
[3] Ökoeffizientes Bauen mit Ressourcen vor Ort, Thomas Matthias Romm, Thomas Kasper, 2018

- Integral consideration of all phases of the life cycle of products, components and building elements. This requires the establishment of the cycle concept from production and use or preparation for reuse, through preparation for up-, re- or downcycling, to the development of a market for secondary raw materials, elements or products for their reuse.

A circular economy is regenerative by design, contributes to climate neutrality and promotes a sustainable, high-quality industry. Digital innovation, climate protection, and the creation of regional jobs lead to an increase in the resilience of local economies and enable greater independence from global supply chains[4].
The construction industry is particularly affected by this due to a diverse and branched value chain, but at the same time has enormous potential as a result. The creation of a circular economy requires a broad network of partnerships and alliances between both new and established players in order to jointly create a completely new economic system. It requires a change in the business models of all actors involved in this value chain. Old-established methods and processes must be rethought, and innovative solutions found. This change, which has already begun, requires courage and the right framework conditions.

The framework and guidelines for action already exist.

The EU Commission presented the European Green Deal at the end of 2019, which contains an ambitious package of measures for sustainable ecological and economic change in Europe. The Green Deal as well as the EU Taxonomy Regulation pursue a transformation of production and consumption systems with the key objectives of making the EU climate neutral by 2050, decoupling growth from resource use and creating a sustainable transition[5]. In the EU Circular Economy Action Plan 2020, the "Construction and Buildings" sector is one of the areas where the most resources are consumed and where there is a high circularity potential. The planning and tendering phase in particular has a decisive influence here on the lifespan of buildings and the long-use, reuse or recyclability of the materials used. In addition, the construction method is determined in these life cycle phases of a building, which determines the sustainability of the construction elements, products and materials used later. Thus, the project is designed to be regenerative, or sustainable, e.g., by using renewable raw materials, employing variant planning for better repairability or reusability, or honoring the needs of the site beyond the next ten years. The circular economy is therefore affecting the industry as never before. From now on it is no longer enough to talk about it, because from 2022 the real estate industry is obliged by the EU taxonomy regulation to implement a circular economy, which requires rapid adaptation.
The planning and tendering phase is considered a major lever for the circular economy in construction. An indispensable premise for a functioning circular economy is that all those involved in construction work together from the very beginning in the course of integrated planning. In addition to the general planner, architects, building services planners, and waste and resource managers are needed from the beginning to implement a circular project throughout its life cycle and beyond. Only together can the course be set in the direction of a circular economy. In many aspects, this is still uncharted territory and must first become the building standard. For maximum practicability, it is not always necessary to aim for one hundred percent circularity immediately, every contribution helps to drive the transformation forward. This is one of the great benefits of an all-encompassing paradigm shift. The life cycle

[4] https://www.circulareconomyforum.at/regenerative-kreislaufwirtschaft/ - Circular Economy Forum Austria
[5] Die österr. Kreislaufwirtschaft, BMK Österreich, 2022

of a property consists of many different stages, which is a great area for continuous adjustments. For example, deciding in favor of a certain mono-materiality of the building structure in conjunction with rethought models of interior fit-out - the keyword use instead of own - or quite simply the decision to refurbish, raise the circularity factor of our built environment.

Appropriate conversion and after-use concepts must be included in the planning, attention must be paid to flexible floor plans and sufficient room heights, and interlocking connections are to be used in preference to gluing, plastering and other irreversible connection techniques. Attention should be paid to the use of secondary raw materials, and on-site processing of construction waste should be considered. For this purpose, a pollutant and hazardous substance investigation and removal is to be carried out. A building and material passport is to be created digitally. This opens up quantity, material and cost lists of the property at the push of a button. Possible additional costs for demolition and disposal logistics can also be calculated.
Prefabrication and modular construction are also practices that must soon become standard. In the course of this publication, these topics are described using best-practice examples that have already been implemented.[6]
A regenerative circular economy increases the value of material resources while minimizing overall resource consumption, greenhouse gas emissions, and waste volumes and pollution. Circular capability is not just about individual products or services. The transition to a circular economy requires product, business model and system innovation.[7]

In addition, questions of warranty and responsibility must also be clarified. Product manufacturers must guarantee that they will also take back their products and reuse them to the highest possible quality. The developer or owner should be aware of the fact that they define the framework conditions for a circular economy and a recycling-oriented deconstruction. Only adequate deconstruction planning enables high-quality deconstruction and recycling of the resources contained in buildings - only then can the city be regarded as a storehouse of raw materials. In all these points, the correct hierarchy must always be observed:
Extension of the use phase through regular maintenance and refurbishment, conversion and reuse measures, removal and equivalent further use and reuse of entire building components. Only then the process of recycling and material recovery in various forms begins. Landfilling and the transportation of waste is at the very end of this hierarchy and should be completely avoided as far as possible in the future. According to Eurostat, the utilization rate of recyclable materials in Austria was 12% in 2020. This means that only 12 % of the materials and resources used in the economy were obtained through a recycling-oriented return and reuse of materials. This value puts Austria below the EU average of 12.8%. So, there is a huge potential to significantly increase this value, be it through the requirements of taxonomy, the Green Deal or the identification of new business models. For this to succeed, what is needed above all is education and training on topics related to the circular economy, cooperation and alliances, the necessary standards and guidelines, knowledge of available materials through digitization and, one thing above all, - courage. Getting out of familiar patterns, away from already established methods, and toward new types of processes.[8]

[6] https://bigbuyers.eu/working-groups/past/circular-construction-materials - Big Buyers Initiative Lessons Learned Report 2020
[7] https://www.circulareconomyforum.at/regenerative-kreislaufwirtschaft/ - Circular Economy Forum Austria
[8] Die österr. Kreislaufwirtschaft, BMK Österreich, 2022

This working group with all its participants and the ÖGNI as a platform for all stakeholders in the construction and real estate industry are committed to ensure that this transformation towards a circular economy succeeds.

CIRCULAR ECONOMY

"The circular economy must be taken into account in the tender process"

"Good for the planet, good for people, and good for business"

"Satisfying the same need with less material - more sufficiency"

"Demolition projects must become urban mines"

"Making sourcing easy through material databases"

"Consider timing component in planning and tendering - Know when products are available, where."

"Thinking beyond the boundaries of personal responsibility".

DEFINITIONS OF TERMS

Waste is defined by the Federal Waste Management Act as movable material which the owner intends to dispose of or has disposed of, or whose collection, storage, transportation or treatment as waste is necessary so as not to adversely affect the public interest.

Waste treatment: any recovery or disposal operation, including preparation prior to recovery or disposal.

Waste prevention: includes actions taken before a product has become waste that reduce the following:

(a) the amount of waste generated, including through the reuse of products or the extension of their useful life

(b) the adverse environmental and human health impacts of subsequently generated waste; or

c) the pollutant content in products.

Disposal: Any process that does not constitute a legitimate recovery, even if the process has the secondary consequence that substances or energy are recovered.

Guarantee: The seller is legally obligated to fulfill promises at the time of sale.

Warranty: The seller voluntarily promises certain characteristics for a specified period of time.

Material passports are digital data sets that contain information about all materials included in a product. They describe defined properties and contain important information, especially regarding the deconstruction and reusability of products. In the future, material passports will be an important tool for more circularity in the construction industry, enabling transparent traceability of all components of a product and the emergence of an open market of used materials.[9]

Product liability: liability for damage caused by a defective product by the party responsible for the production defect.

Deconstruction expert, or person investigating pollutants and contaminants, authorized specialist or specialized institute: A deconstruction expert is a natural person within the meaning of the Recycling Building Materials Ordinance, Federal Law Gazette II 181, who is trained in construction engineering or chemistry and has knowledge of demolition work, waste and construction chemistry and waste law. For deconstruction projects up to 3,500 m^3 of enclosed space, they can carry out an orientational investigation of pollutants and hazardous substances, prepare deconstruction concepts and prepare release protocols for the client. The necessary knowledge is acquired, for example, in the BRV demolition course.[10]
For deconstruction projects larger than 3,500 m^3 of enclosed space, comprehensive hazardous substance and pollutant investigations, deconstruction concepts or release protocols must be

[9] https://concular.de/de/blog/materialpass/ - Concular
[10] https://brv.at/ruckbaukundige-personen/ - BRV Österreichischer Baustoff-Recycling Verband

carried out by authorized specialists or specialized institutions according to the Waste Management Act[11].

Material utilization means the ecologically appropriate treatment of waste to utilize the material properties of the source material with the main purpose of using the waste or the substances obtained from it directly for the substitution of raw materials or of products generated from primary raw materials. This does not apply if the waste or the materials obtained from it are sent for thermal recycling.

Recycling: any recovery process by which waste materials are reprocessed into products, things or substances either for the original purpose or for other purposes. It includes the reprocessing of organic materials, but does not include energy recovery and reprocessing into materials intended for use as fuel or for backfilling.[12]

Urban mining essentially refers to the exploration of settlements and infrastructures with regard to their material composition and their use. Accordingly, it is a kind of deposit exploration for so-called anthropogenic or secondary resources. Knowledge of the material composition of structures is used to make predictions about the quantitative and qualitative composition of the expected waste. This is intended to enable high-quality recycling in the construction industry.

Recovery: any process whose primary result is to return waste to a useful purpose within the site or economy in an environmentally responsible manner by replacing other materials that would otherwise have been used to perform a specific function, or (in the case of preparation for reuse) preparing the waste to perform that function. Recovery is defined as preparation for reuse, recycling, and any other recovery (e.g., energy recovery, preparation of materials for use as fuel, or backfilling), including pretreatment prior to these operations.

Preparation for reuse: any recovery process of testing, cleaning or repair in which products, as well as components of products that have become waste, are prepared so that they can be reused without further pretreatment.

Reuse: Any process by which products, as well as components that are not waste, are reused for the same purpose for which they were originally used and intended.

[11] https://brv.at/ruckbaukundige-personen/ - BRV Österreichischer Baustoff-Recycling Verband
[12] AWG 2002 - Österreichischer Nationalrat (2002): Bundesgesetz über eine nachhaltige Abfallwirtschaft, Abfallwirtschaftsgesetz 2002 - AWG 2002, vom 11.09.2019.

STANDARDS, REGULATIONS & CO.

The Recycling Building Materials Ordinance

This obligates the building owner:

- §4. (3) "Within the scope of the investigation of pollutants and hazardous substances ... also those building components which can be prepared for reuse are to be documented."
- § 5. (1) "... It shall be ensured that building components which can be prepared for reuse and which are in demand by third parties are dismantled and handed over in such a way that the subsequent reuse is not made difficult or impossible. (...).

ÖNORM B 3151 Deconstruction of structures as a standard demolition method

Regulates the organizational and technical scope for the dismantling of structures. Specifies, among other things:

- Investigation of pollutants and hazardous substances
- Deconstruction concept
- Clearance before deconstruction

THE AUSTRIAN CIRCULAR ECONOMY STRATEGY

Goal 1: Reduce domestic resource consumption.

- Reduce domestic material consumption by 25% by 2030
- Sustainable domestic material consumption of no more than 7 metric tons per capita per year by 2050

Goal 2: Increase the resource efficiency of the Austrian economy

- Increase resource efficiency of the Austrian economy by 50 % by 2030

Goal 3: Increase utilization rate of reusable materials by 35 % by 2030 (base year 2020)

Target 4: Reduce material consumption in private consumption by 10 % by 2030

BACKGROUND AND OBJECTIVES

What is the ÖGNI?

The ÖGNI - Austrian Society for Sustainable Real Estate, is an NGO (non-governmental organization) for the establishment of sustainability in the construction and real estate industry. The focus of ÖGNI's work is the certification of sustainable buildings and neighborhoods according to the European quality certificate of the DGNB (German Sustainable Building Council). In addition, the ÖGNI carries out verifications of real estate with regard to the EU Taxonomy Regulation.

What is the DGNB certificate?

The DGNB system of the ÖGNI serves to objectively describe and evaluate the sustainability of buildings and neighborhoods. The quality is evaluated on the basis of all aspects of sustainability throughout the entire life cycle of the building. The DGNB certification system is internationally applicable. Due to its flexibility, it can be precisely adapted to different building uses and country-specific requirements. The DGNB system considers all essential aspects of sustainable building. These include the six thematic fields of ecology, economy, sociocultural and functional aspects, technology, processes and the site. The first four topics are weighted equally in the assessment. This makes the DGNB system the only system that gives the same weighting to ecology as to the other factors that make a decisive contribution to the production of a sustainably successful building.

Circular economy in the DGNB certificate

Promoting the conscious use of resources has been one of the DGNB core topics from the very beginning. This involves the forward-looking selection of products with regard to their materials in the context of the application as well as the consideration of possible structural changes during use. The subsequent deconstruction of the building should also be taken into account as a factor in product selection as early as the planning stage. With its certification system, the DGNB is thus committed to ensuring that material cycles are available for later reuse or further use in accordance with the cradle-to-cradle philosophy - via new business models and responsible and forward-looking product development. To promote new approaches here, these solutions are rewarded by means of corresponding bonuses that have a positive impact on the certification result.

Aim of this working group

There are already numerous models and definitions of the circular economy. This working group, composed of experts from architecture, development, waste management, digitization experts and environmental consultants, has set itself the goal of bringing the circular economy into practice. With demands, premises and already functioning best practice examples, it is to be shown that the circular economy offers an enormous potential of chances and possibilities.

PRINCIPLES OF A REGENERATIVE CIRCULATION ECONOMY

Minimization of the ecological effort – REDUCE

- Appropriate choice of materials and construction
- Reduction of material diversity
- Minimization of the amount of material in the planning
- Avoidance of nonstandard solutions
- Avoidance of residual materials in the construction of buildings
- Low transport distances / low transport costs
- Regional availability / regional recycling

Extending the lifespan – LONG USE

- High ideal value gain due to quality architectural concept
- Conversion flexibility
- Truth of materials
- Constructive protection of surfaces
- Use material that can age gracefully
- Design for ease of repair, cleaning and maintenance
- Provide for wear layers or parts
- Separate long-life and short-life structures
- Reduce susceptibility to design and construction errors
- Involvement of facility management

Assembly/disassembly options for later preparation for reuse – REUSE

- Critical selection of function integration or function separation
- Detachable connection systems and general ease of disassembly
- Separability of materials that cannot be recycled together
- Reuse of whole components
- Disassembly of wall elements into smaller units to ensure reassembly in other configurations

Good recyclability – RECYCLE

- Recyclability of materials in general
- Avoidance of composite materials
- Concentration of recycling efforts on mass-intensive or short-lived components
- Simple further processing methods
- Avoidance of additives that are problematic in the recycling process (through design measures or considered material selection)
- Labeling of valuable or harmful substances

CRITERIA FOR CIRCULAR BUILDING

(1) Resource conservation begins with using what already exists before creating something new. This is achieved by densifying urban spaces, minimizing vacancies, converting and reusing existing buildings, and reusing excavated and demolition materials - **in the sense of activating local potential.**

(2) The multiple occupancy of areas promises a more intensive use of the existing building stock and, as a consequence, a lower demand for new building volumes. In addition to ecological benefits, **increasing the intensity of use** also creates social added value by multiplying social contacts and enlivening neighborhoods through longer periods of use and greater diversity.

(3) By avoiding over-specification, reducing the use of unneeded materials, and eliminating resource-intensive building components, resource conservation is achieved in the most direct way, namely in the form of **resource optimization.**

(4) Long-term building utilization means direct resource conservation, i.e., it is a central goal of circular construction. Since at the time of the planning phase it is usually not foreseeable to what extent requirements or external conditions will change by the end of the building's life, it is essential to design buildings that are **flexible in their use.**

(5) The principles of **ease of maintenance and repair** make a significant contribution to ensuring that buildings retain their value and can be used for a long time - "as they are".

(6) The possibility of reusing utilized resources in a value-retaining way depends to a large extent on the **separability of the materials/components**. Consequently, buildings must not be designed as "unchangeable blocks", but in "separable layers" which differ in function and service life - because the total service life of a building component construction can only be as long as the shortest service life of the components sharing the common fate.

(7) For material recycling, the degree of **grade purity** is primarily decisive. Impurities impede or prevent the recycling process. This means that if the required degree of purity cannot be met, the material cannot be recycled after use.

(8) Even minor additions of hazardous substances can severely limit recyclability. Therefore, **pollutant-free materials** are a basic requirement for consistent cycles.

[13] Zirkuläres Wien! – Vorstellung des Maßnahmenpakets, Kathrin Gaal & Bernhard Jarolim, 2022

RELEVANT STAKEHOLDERS

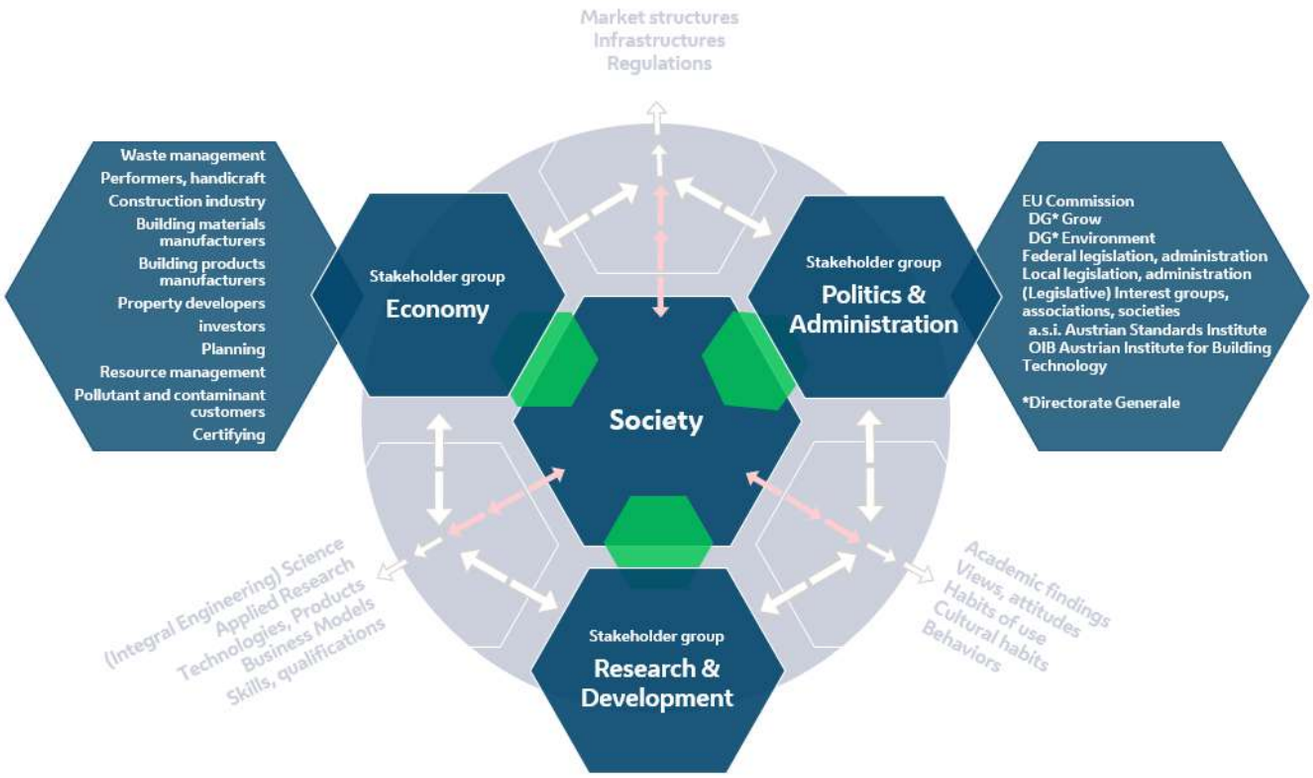


Figure 1: Quadruple-helix approach to socio-technical innovation in the circular economy of construction according to Carayannis and Campbell, and Schot and Steinmueller, respectively.

The creation of collaborations and transdisciplinarity requires the creation of a holistic possibility space with all influencing factors, limitations, direct and indirect effects, interrelationships and functions. This should enable concentrated, systematic problem solving.[14]

Since around 2010, this innovation paradigm has developed at the European level with the systematic application of the Quadruple Helix approach - where research and innovation strengthen the economy through effective knowledge and technology transfer, as well as creating the necessary regulatory framework.[15] For a rapid transition to a circular economy in the construction industry, a certain simultaneity of different developments is needed: Aspects of research and development must on the one hand be integrated into cultural-social habits and views, and on the other hand economic and regulatory possibilities for implementation are needed. This is the aforementioned possibility space which is defined by the non-taxative stakeholders in the graphic. A successful interplay between a holistic, overarching view of the construction industry system and detailed discussion and negotiation of relevant topics between directly affected stakeholders from business, science, politics and administration, transparent for society at all times, ensures the necessary efficiency for the rapid paradigm shift.

[14] http://www.zwicky-stiftung.ch/index.php?p=35%7C38%7C38&url=/Stichworte.htm - Zwicky Stiftung, Stichworte zur Morphologie

[15] Das Geschäftsmodell kollaborativer Innovation, eine empirische Analyse zu funktionalen Rollen in Quadrupel-Helix-Innovationsprozessen, M.A. Florian Schütz, 2020

CONTRIBUTION TO THE SUSTAINABLE DEVELOPMENT GOALS

With the Sustainable Development Goals (SDGs) as a central element of the 2030 Agenda, the United Nations defined concrete goals in 2016 to shape the further development of our world in a meaningful way and thus enable a rethink in the long term that will lead to a life in a sustainable world. A total of 17 goals with a large number of sub-goals were defined. The ÖGNI supports these goals and aims to make a concrete, positive contribution to achieving them by means of certification. Together with other European Green Building Councils, the initiative CPEA (Climate Positive Europe Alliance) was founded to promote solutions based on the SDGs to make the European building sector as sustainable as possible.

The topics of the working group also deal with the SDGs, as the building sector can and must make an important contribution to a sustainable future. If the European Commission's goals of a climate-neutral EU are to be achieved, action must be taken. In particular, Goal No. 12 "Responsible consumption and production structures" addresses the circular economy. This goal calls for waste generation to be significantly reduced by 2030 through prevention and reuse, and for waste to be recycled.
In addition, important aspects of the circular economy are directly or indirectly included in Goal No. 6 "Clean Water and Sanitation," Goal No. 8 "Decent Work and Economic Growth," Goal No. 9 "Industry, Innovation and Infrastructure," Goal No. 11 "Sustainable Cities and Communities," Goal No. 13 "Climate Action," and Goal No. 15 "Life on Land."

6 Clean water and sanitation
8 Decent work and economic growth
9 Industry, innovation and infrastructure
11 Sustainable cities and communities
12 Responsible consumption and production
13 Climate Action
15 Life on land [16]

[16] https://www.globalgoals.org/

KEY TOPICS

EU taxonomy and the circular economy

At present, the main contribution to the environmental goal "transition to a circular economy" has not yet been precisely formulated, even though the publication of the four remaining environmental goals in the form of the "Delegated Act", including the circular economy, was communicated by the EU in January 2022. So, things remain exciting in this regard. In the two already defined environmental goals "climate protection" and "adaptation to climate change", however, the point of the circular economy is formulated in the category of the avoidance of a significant impairment (Do-No-Significant-Harm (DNSH) criteria), whereby it should be mentioned that only the two building conditions of new construction and renovation are affected by this. For the building condition acquisition and ownership, the circular economy is not targeted, since no required measures can be taken in the existing building stock. The requirements are the same for both environmental objectives and for both building conditions and refer to Annexes 1 and 2 of Regulation (EU) 2020/852 of the European Parliament of 04.06.2021 (C (2021) 2800 final).[17] Two major areas are addressed.

The first area concerns the construction and demolition waste which is triggered by the planned/activated investment at the present time. This means that construction and demolition waste is generated by the demolition of existing buildings or parts thereof or by the construction of a new building. Of this mass (minus hazardous materials), at least 70% (as of April 2022) by weight must be demonstrably processed for reuse, recycling, or other material recovery, which includes backfilling as a substitute material. It is further required that best available technology and the use of selective demolition techniques be used to reduce the amount of waste. The use of available sorting systems for construction and demolition waste is required as a way to ensure reuse and high-quality recycling or safe handling when disposing of hazardous materials.

The second area looks to the future and calls for the design of buildings and construction technology to be planned in a way that supports the circular economy and makes it feasible at different stages of the building's life cycle. In doing so, the possibility of disassembly or adaptability must be demonstrated. Therefore, attention must be paid to the design of resource efficiency, adaptability, flexibility and dismantling capability, and these must be optimized.
As proof of compliance with the above points, the ÖGNI is currently calling for a summary of the waste footprint in accordance with the Waste Evidence Ordinance 2012 (ANV 2012), and for the calculation of the required quota of 70 mass percent in accordance with the Recycling Building Materials Ordinance (RBV). In addition, the tender text or the declaration of the construction company and a corresponding process description with recorded checks are required for the proof of the limitation of waste. The corresponding documentation is required for the planning, which facilitates the circular economy.

[17] https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:52019DC0640&from=DE

Why EU taxonomy? What are the benefits, who is affected and what does it mean for the construction industry? What is the contribution of the ÖGNI?

The more one deals with the topic of sustainability, the more one can get lost in the thicket of multilayeredness and complexity. And it is precisely these complex interrelationships and interconnections that make it easy to carry out actions, activities, statements and ultimately investments under a green cloak - also known as greenwashing. This is why the EU adopted the Green Deal in 2019. It's about creating a transition to a modern, resource-efficient and competitive economy that emits zero net greenhouse gases by 2050, decouples growth from resource use and does not leave anyone, neither people nor regions, behind. This is no easy task, given the diversity and differences between the 27 member states of the EU. The EU Taxonomy Regulation serves as an instrument to implement this goal. The EU Taxonomy Regulation is a technical classification system, which can be used to evaluate which investments flow into green, ecologically sustainable projects and which do not. It works with the means of transparency. There are (still) no legal or monetary consequences on the part of the EU if an investment does not meet the criteria of the Taxonomy Regulation.

However, due to the obligation to disclose the cash flows, there will very well be consequences from this assessment. The aim is to be able to identify an investment as sustainable on the basis of criteria that are identical at EU level, to prevent greenwashing and to make a reliable statement for investors, etc. The EU's taxonomy regulation will be published in the Official Journal of the European Union. A total of nine economic sectors are (currently) addressed in the EU Taxonomy Regulation. As of today, companies that already report non-financial information must now additionally report on whether and to what extent their economic activity complies with the EU Taxonomy Regulation (defined in the Non-Financial Reporting Directive-2013/34/EU). Similarly, financial market participants offering financial products in the EU, including investment funds, portfolio managers and occupational pension schemes, are subject to disclosure requirements. In addition, the EU and its member states must report on environmentally friendly financial products or environmentally friendly (corporate) bonds when establishing public policies, standards or labels. For the construction industry, this step by the EU represents another milestone in the direction of sustainable construction. No one is directly forced to build sustainably, but hope lies in market regulation and increased demand for green buildings. The recognition of the industry to take advantage of this opportunity and competitive advantage will make all the difference in how companies in this field will fare in the future.

The ÖGNI supports all parties involved in EU taxonomy. On the one hand, auditors who have already been trained can undergo additional training to become EU Taxonomy Advisors approved by ÖGNI. This means that these advisors can evaluate projects according to the specifications of the EU Taxonomy and subsequently submit them to the ÖGNI for an independent audit. After a successful, positive review, ÖGNI issues a verification, which identifies the project as taxonomy-compliant. On the other hand, the Technical and Certification Committee of the ÖGNI deals intensively with the topic of "translation" into national law. The taxonomy often formulates the requirements in headings, as these must be applicable throughout the EU area and thus no concrete benchmarks are defined. The task of the ÖGNI is to incorporate these headings into our requirements. In addition, the topics are discussed between the affiliated Green Building Councils.

If we talk about resource management in the future, a complete rethink must take place. There must be an economy and economic growth that is decoupled from resource extraction. As described above, there is a clear hierarchy that must be adhered to.

REDUCE – LONG USE – REUSE – RECYCLE

In the future, society's needs must be met through optimized and efficient use of resources. This will result in fewer resources and materials being used and recycled, as well as a reduction in greenhouse gases, pollution and waste.

In the real estate sector, mainly in existing buildings, the following premises apply: Materials and components that can be reused with the same application are to be identified by means of pollutants and hazardous substances investigations. From an economic point of view, removal and high-quality reuse must take place. Recycling is not the primary objective here, but the equivalent reuse of components. In terms of resource management, the aim is to use the materials for as long as possible - see also Value Hill Model on the next page (Figure 2). If the building substance is contaminated with the corresponding pollutants, a mandatory deconstruction concept, in which the technological implementation of the redevelopment and the recycling-oriented deconstruction are recorded, must be drawn up.

Landfill bans and CO2 tax will influence truck transport on the construction site and are further topics that will initiate a rethinking. Here, the topic of industrial prefabrication will also become increasingly important in order to reduce transport emissions, enable more efficient production and allow shorter construction times on site.

It is a matter of preserving the value of products and materials for as long and as high a quality as possible.
Furthermore, the following aspects must be considered before demolition:

- is it possible to extend the utilization phase
- is there a possibility to convert the building to a new use

If this is not possible, a qualified pollutants and hazardous substances investigation must be carried out as described and an appropriate deconstruction concept must be developed. The aim is to increase the utilization rate of reusable materials, which was 12% in 2020. This means that 12% of the materials and resources used in the economy were saved through a cycle-oriented return and reuse and recycling of materials.

Figure 2 shows that there is still a lot to be done in Austria, compared to the rest of Europe.[18]

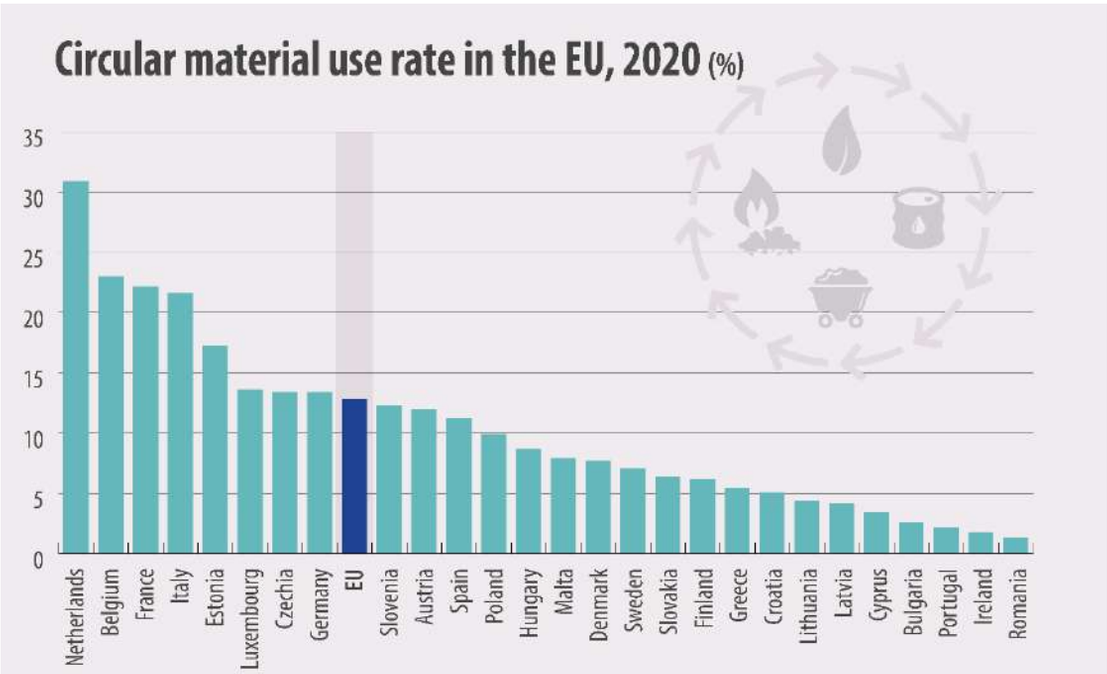


Figure 2: Utilization rate of recyclable materials in European comparison 2020. Source: Eurostat, 25.11.2021 [19].

In new construction, a digital building passport is a prerequisite for continued use beyond the life cycle. When a building is demolished, the life cycle of a new building begins. For this to succeed, comprehensive digitization is necessary, which is also kept up to date during operation. A rethink in architecture and planning is required - currently the consumption of primary raw materials and the associated greenhouse gas emissions generated during production are far too high. Fewer materials, modular and deconstructable constructions, conversion and reuse concepts, integral planning and the use of secondary materials must determine new buildings in the future.

Detailed component documentation is also required, showing the materials used as well as their assembly/installation. In the case of windows, for example, it is not only necessary to specify the manufacturer, but also its suppliers (e.g., glass, hardware, glazing, sealing material manufacturers as well as their upstream suppliers). This must be carried out consistently for all building and building services products used in order to enable a continuous warranty.

One thing must also be clear: if the climate targets and the Green Deal's ambition to make Europe the first climate-neutral continent by 2050 are to be achieved, this will not work without a regenerative circular economy. One premise of the Green Deal is energy- and resource-efficient construction and refurbishment - both in new and existing buildings.
The following pages present examples to show how it is already working.

[18] Die österreichische Kreislaufwirtschaft, BMK Österreich, 2022
[19] https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20211125-1

Comparison of a linear and circular economy using the example of the "Value Hill".

The linear model

All over the world, methods have been developed to design, manufacture, distribute and sell goods. By extracting resources from the earth, through the refining process to the finished product, value is added at each step. However, after the consumer uses the product, its value declines. Since most business models are revenue-driven and revenue is based on selling as many products as possible, this creates the incentive to develop products that have the shortest possible lifespan so that new ones can be constantly sold. Old products are landfilled or perhaps thermally recycled. Figure 3, left side, shows that value is constantly added and after a relatively short lifetime the product value is very quickly destroyed.

The circular model

The idea of a circular economy, on the other hand, is inspired by ecosystems in which the waste from one system is the source material for another[20]. Circular economy-oriented companies seek to preserve the added value of a product for as long as possible, if not forever. In the context of the value hill, value is added as the product moves "uphill" and circular strategies keep the product at its highest value (top of the hill) for as long as possible (Figure 3, right side). Products are designed to be durable and suitable for maintenance and repair, slowing resource loops[21]. This extends the product's use phase. When a product is ready to begin its downhill journey, it does so as slowly as possible so that its useful resources can still be of use to other products.

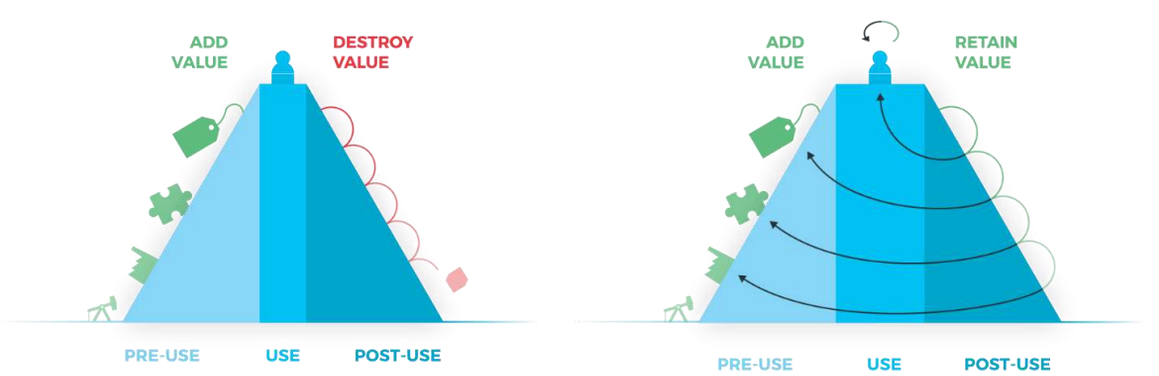


Figure 3: Representation of a linear and circular economy using the Value Hill model. Source: https://www.circle-economy.com/news/master-circular-business-with-the-value-hill

linear model circular model

[20] Towards the circular economy, Ellen MacArthur Foundation, 2013
[21] Product design and business model strategies for a circular economy, Journal of Industrial and Production Engineering, Bocken et al., 2016

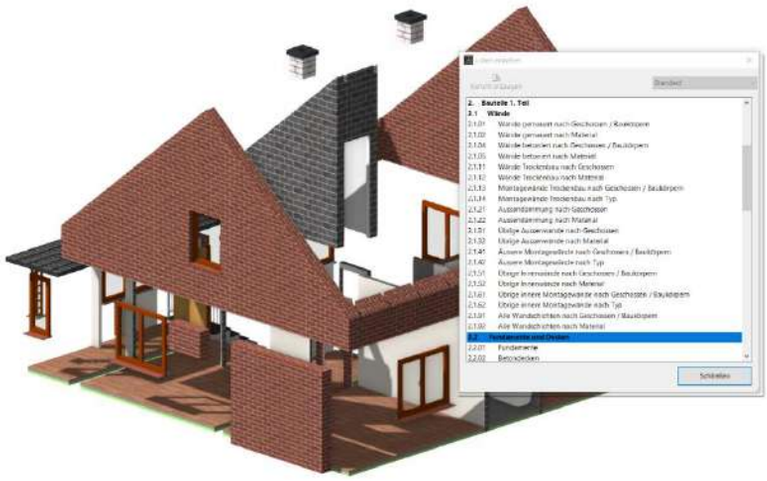
Digitalization in the circular economy

Intelligent BIM models as the basis for a circular construction industry

In the course of the EU Green Deal, the EU Taxonomy Regulation was issued, which requires proof of the degree of environmental sustainability of investments. This will be mandatory from 2022 and will affect the construction industry in particular. The declared aim is to promote the reuse of building materials. As a basis for this, a taxonomy compliance report must be prepared for buildings in the future, which provides information on such aspects as the recyclability of the materials and building materials used. The vision for the future is a digital register with information on available building materials in the surrounding area - so today's buildings will become tomorrow's material storehouses.

The determination of the material quantities of existing buildings alone presents the construction industry with a major challenge. Companies that have already made the transition to the openBIM process have a clear advantage here. Users of leading openBIM software such as ELITECAD, for example, have been determining the quantities of materials used at the push of a button for years. Intelligent digital building models are therefore the basis for evaluating the recyclability of a building.
However, the great added value only arises when the digital model is maintained over the entire life cycle. This starts in the planning phase and does not end with the as-built model, but includes every conversion, extension and deconstruction. Thus, the available and waste materials can be easily determined at any time. For this purpose, ELITECAD has been offering the practical functions of the rebuild planning "Time-Machine" for years, where each component receives its own rebuild status. The big advantage: All information on existing structures, demolition and new construction, including quantities, is available in an intelligent BIM model.

Another important aspect when it comes to circular construction is the material and component properties. For example, how are the walls of a building constructed? How well can the individual layers be separated from one another? What is the carbon footprint of a particular building material and what is the expected service life? In BIM models, this information is already defined as component properties during the planning phase. As a result, forecasts for the entire life cycle can already be made in the planning phase. ELITECAD offers the practical functions of attribution for this purpose. Numerous data sets and attributes of the sustainability criteria are already pre-installed and can be easily assigned to components. Attribute visualization and attribute stamps are used to clearly display the properties in both the 3D representation and the plans.



Surveying of existing buildings as a basis for a circular economy

Those who own digital twins of their buildings have a clear advantage. But what about old existing buildings? In the 1960s, no BIM models were created, let alone CAD plans - how can these now be easily digitized?

A lot has also happened in the field of as-built surveying in recent years. Nowadays, buildings can be captured using smartphones and their integrated LIDAR sensors and transferred into digital models. ELITECAD offers numerous practical tools for processing point clouds. In just a few steps, intelligent mass models are created from point clouds by tapping the corner points and heights, which serve as a basis for refurbishment, reconstruction or as a source of information for the evaluation for recyclability.

Urban Mining – The city as a resource storehouse

Once the technical and legal prerequisites have been created by politics and industry so that BIM can be used across the entire value chain, a digital material passport should be created for every building in the future and included in a digital resource register. This will enable recyclable building materials to be offered on a material exchange and recycled by construction projects in the surrounding area. Information on the service life of buildings and building materials can also be used to make advance forecasts for future material flows.

Problems and challenges regarding BIM and closed circular capability

The approach of BIM in connection with the circular economy offers great potentials and nevertheless involves some challenges. In order to make a building circular, it must be well documented so that it can be operated, maintained or even refurbished in an optimized manner. It is therefore necessary to provide a sound data basis along the individual construction phases in order to enable an analysis and evaluation of the use of resources. Among other things, the level of detail in the individual planning and construction phases is therefore becoming more complex for clients and users, since the necessary definitions must already be made in the client information requirements (AIA). This is associated with frequent knowledge gaps regarding the planning process and the associated Level of Detail (LOD), i.e. the relevant data depth required for the individual trades. Accordingly, there is a lack of standardized templates for AIAs and BIM execution plans (BAP) to ensure a consistent approach across different construction projects. The increased complexity is accompanied not only by increased time expenditure but also by a shift in the resulting costs from the construction phase to the planning phase, which must be ensured by appropriate remuneration. The strict division into service phases and the associated division of remuneration currently make the early creation of a comprehensive digital model less attractive for planners, despite the advantage of integrating circular economy criteria.
In the execution of cycle-capable BIM projects, workflows, including adaptations and adjustments, as well as associated responsibilities, must be defined, especially with regard to the model contents and qualities to be delivered, and aspects relating to the cycle capability of a building must be included from the outset. This represents an obstacle, since relevant data along the building life cycle is sometimes not provided in the appropriate quality, depth or in a timely manner. In addition, it must be clarified who owns the BIM model after project completion and how long-term availability and security of the data can be guaranteed, since the concept of the circular economy extends over several decades or the entire building life cycle and will thus prevent the loss of relevant data.

Opportunities and added value regarding BIM and circular capability

The use of sustainable BIM working methods represents a considerable added value over the entire building life cycle due to the complete availability of data and information. Essential findings regarding resource-conserving, sustainable operation up to refurbishment and recycling can thus be easily derived. For users and occupants, this leads on the one hand to increased transparency and acceptance of forward-looking circular economy concepts and on the other hand contributes to quality assurance throughout the entire construction process. Therefore, already in the early design phases, circular economy criteria are incorporated into the design process with the coupling of BIM-based approaches. This enables the client to evaluate the initial design with regard to circular economy criteria such as the expected energy demand, recycling and deconstruction options, the ecological footprint and CO2 savings potentials by means of models or model variants including approximate simulations as early as the preliminary design phase.
Decision-making and coordination processes are thus facilitated, actively controlled and made more valid. Ideally, the information flows in BIM come from all disciplines involved and represent all dimensions and perspectives of the lifecycle phases. A large amount of information can be taken directly from the model with connected calculation and simulation programs and used for subsequent analyses such as LCA. With the combination of BIM in both the planning and operating phases as a digital twin, numerous life cycle related data are also

stored in attributes that enable optimized management of a building. Digitization will therefore also gain in importance in the construction sector in the future and, due to the required documentation, is also necessary in order to design a building in a way that allows it to be recycled and to be managed in a sustainable and value-adding manner.

BIMaterial - the BIM-based material building passport.

A large proportion of building materials end up in landfills at the end of their life cycle. To avoid this, the subsequent recycling or reuse strategy should be taken into account in the early planning stages. In order to optimize the entire life cycle of buildings in terms of resource efficiency, but also to predict environmental impacts, design-centric tools are necessary. A suitable tool is the material building passport (MGP), which maps the materials installed in the building. The "standard" MGP is a documentation of the installed materials in a building and indicates which materials and elements occur and in what quantity. A special, BIM-based MGP was developed at the Vienna University of Technology as part of the BIMaterial research project and the dissertation of Dr. Meliha Honic. This serves as both an optimization and documentation tool (inventory) over the entire life cycle of a building. The developed BIM-based MGP also integrates a life cycle assessment (OI3 index of the IBO) and can thus also make statements about the ecological footprint of buildings. Furthermore, the BIM-based MGP calculates the waste masses and the recyclable masses that would be generated at the end of the life cycle already in the planning phase and thus enables the optimization of the end-of-life phase of buildings. In addition, the BIMstocks research project is currently working on an MGP for existing buildings.

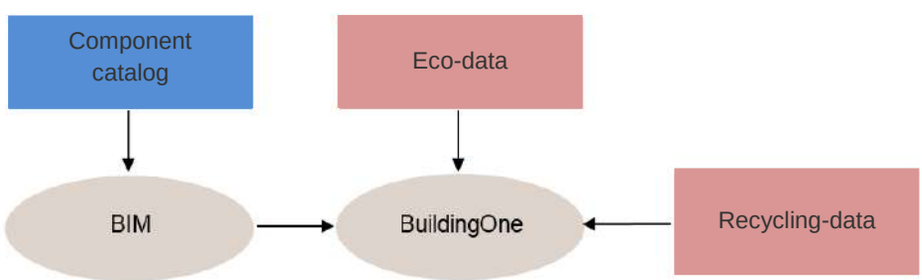


Abbildung 4: BIM-based Workflow, ©Honic-BIMaterial

- **More information on the projects mentioned can be found here:**
- **BIMaterial:** https://nachhaltigwirtschaften.at/de/sdz/publikationen/schriftenreihe-2019-08-bimmaterial-prozess.php
- **BIMstocks:** https://www.industriebau.tuwien.ac.at/forschung/forschungsprojekte/bimstocks/

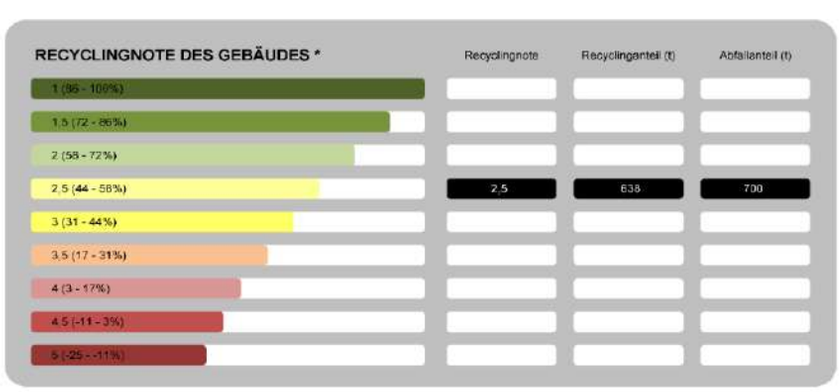
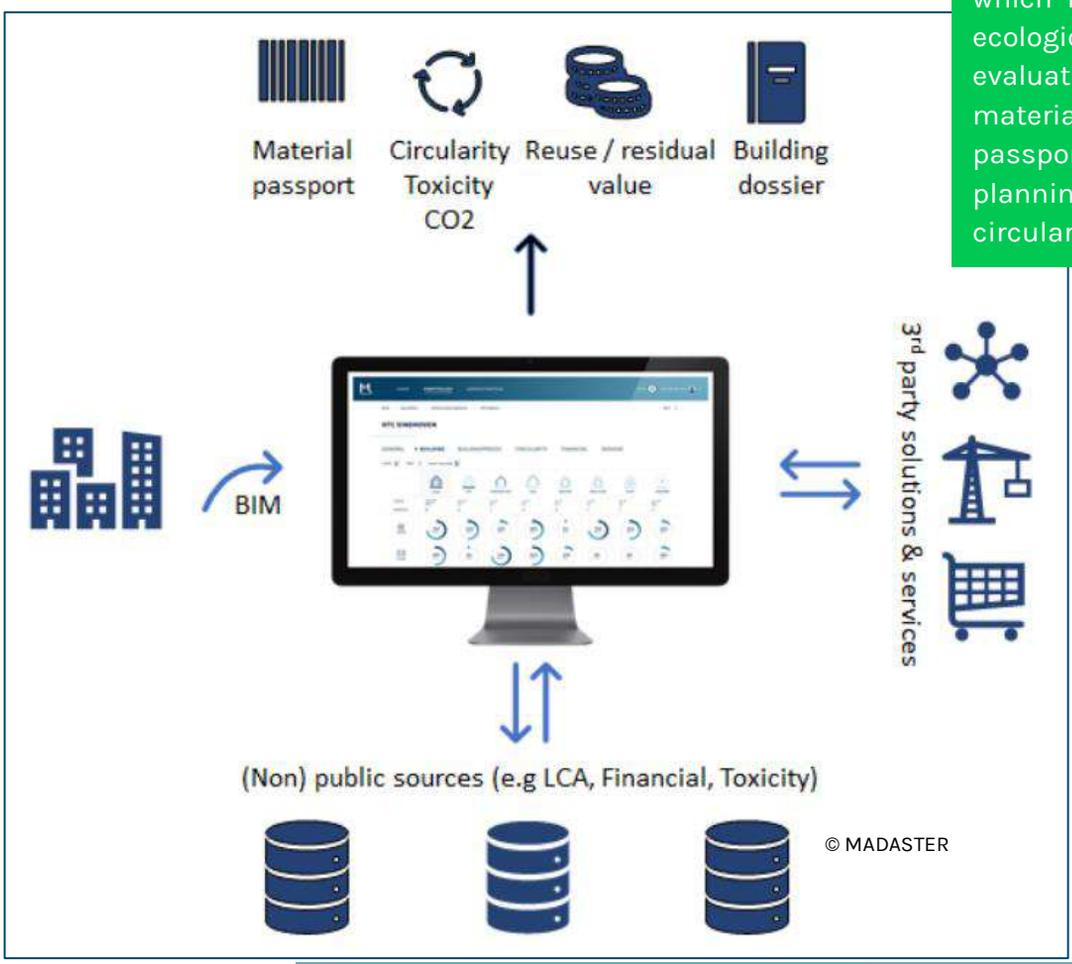


Figure 5: MGP of an example building, © BIMaterial

MADASTER – the digital building material passport

The mission of MADASTER is to eliminate waste by giving materials an identity. For this purpose, MADASTER offers a digital, web-based tool that generates a digital building material passport and, for example, accesses the BIM model of the building. It pulls the information of all installed materials and products into the material passport via interfaces and supplements these with ecological key figures from external databases (e.g. Ökobaudat). As a result, the user receives a transparent overview of all materials, their quantity/mass, their ecological key figures (CO2 footprint, toxicity) and, among other things, information about the recyclability of the building. The "Circularity Index" shows, for example, to what percentage the building is recyclable and can thus serve **various ESG or EU taxonomy reporting requirements** at the push of a button. In addition, the tool offers the possibility of valuing the "Urban Mine" in monetary terms or forecasting the value of the raw materials in the future.

For this purpose, the tool also makes use of external databases which it accesses. Through the ecological and economic evaluation of the existing materials, the digital material passport supports more circular planning and contributes to the circular economy.



INITIATIVES

BauKarussell

BauKarussell is a collaborative initiative that specializes in the reuse and high-quality recycling of building parts and building components in large-scale construction projects, while at the same time striving for social impact. The highly collaborative network consists of architects, repair networks and social economy businesses and aims to establish new value creation models for the real estate industry that incorporate environmental and social aspects into the circular economy.

BauKarussell is the first provider of Social Urban Mining (SUM) - recovery-oriented deconstruction with social added value and a special focus on the reuse of building elements. The BauKarussell team has been accompanying building owners through the deconstruction planning and implementation since 2016 and increases the added value before mechanical demolition: In the sense of the circular economy, reusable building elements are brokered and recyclable building materials are fed into the recycling process.
The operational work is refinanced by recyclable materials available in the building. Through cooperation with partner companies in the social economy, people who are disadvantaged in the labor market receive job training, qualification and new opportunities for re-entry into the primary labor market.

BauKarussell

The overall results of Bau-Karussell testify to the tireless efforts of the team and its partners: A total of 1,277,000 kg of material had been recovered from buildings by the end of 2021. Of this, 579,000 kg was sent for direct reuse, which corresponds to a reuse rate of over 45%. This result was achieved by means of 26,100 hours of work in the social economy; to date, around 160 people have been engaged in the dismantling teams.

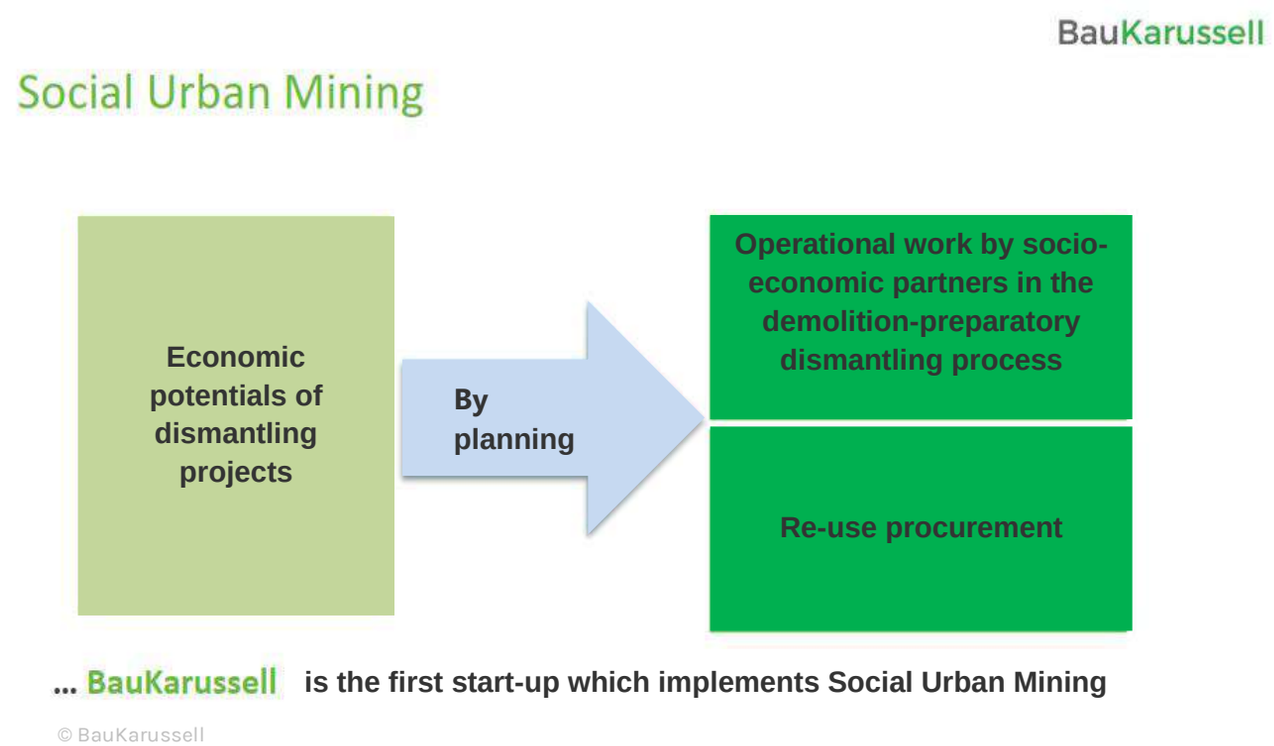
BauKarussell develops the concept of Social Urban Mining further with each project and works by means of raising awareness and interdisciplinary exchange to make it a common practice in the construction sector and to integrate it into standard procedures. This requires openness on the part of the building owner to go beyond the resource-intensive standard and to realign historically evolved working methods.

In order to advance the topic of the circular economy in construction, it is necessary to raise awareness at all levels and to create a new planning culture that recognizes the value of existing resources and makes use of them accordingly.

The clients of BauKarussell

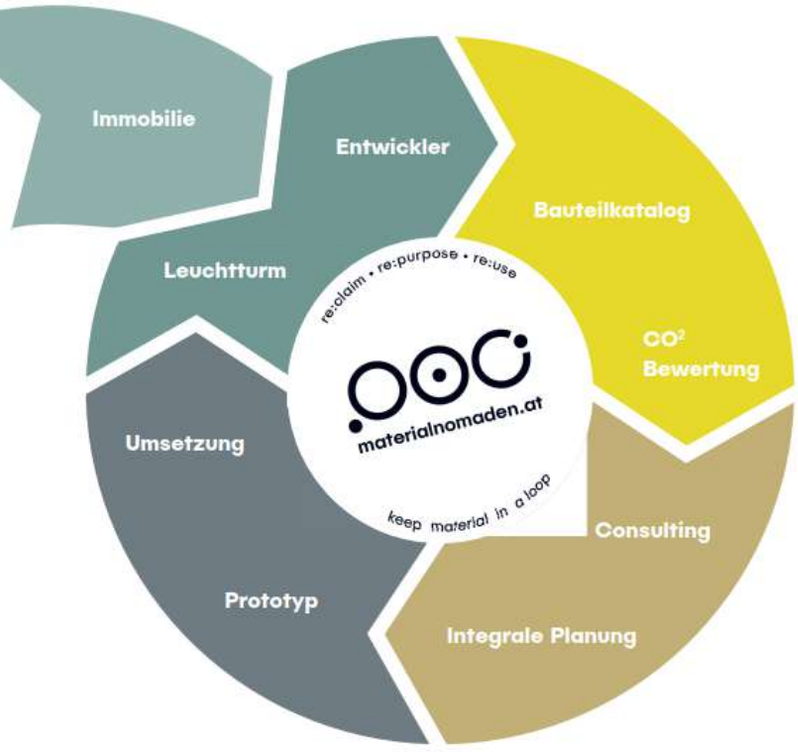
The clients of BauKarussell include BUWOG, BIG and its subsidiary ARE Austrian Real Estate, LINZ AG, Energie AG OÖ, SOZIALBAU AG and the City of Vienna.

BauKarussell invites project developers to realize Social Urban Mining in their projects - together with local social economy enterprises, a potential analysis is used to work out how the project development can increase resource efficiency in a cost-neutral way, promote a circular economy and at the same time create important jobs for disadvantaged people.



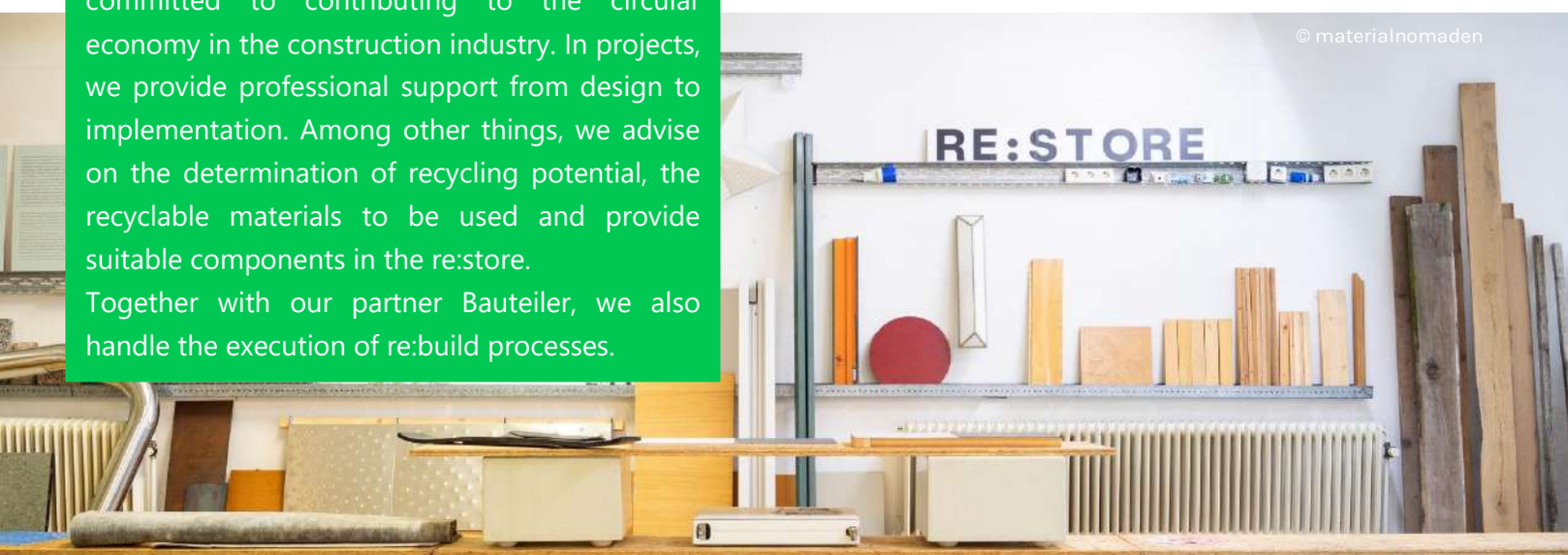
materialnomaden

Each material in its use is an expression of its time and as such an inspiration for new interpretations. This leads to the first task: cataloging components in the built environment. With its database, materialnomaden can now draw on experience in cataloging over 60,000 components. A digital notepad for integration into ERP systems of industrial companies is being developed so that the planning of resources can be precisely coordinated even in larger production processes.
In the **re:store**, **re:use** components and materials from deconstruction buildings are made visible and communicated. The conveyance takes place via integration into new construction projects, product development or prototype development for industrial products using reused components.



In addition, materialnomaden offer the creation of building material cycle concepts which, in addition to the deconstruction concept, guarantee the greatest possible yield of components that can be reused. By means of concrete implementation projects, consulting activities, the creation of prototypes and the conveyance of re:use components, materialnomaden demonstrate the constructional, architectural and artistic added value of projects in which the found material is at the center. The economic added value becomes apparent when taking a closer look at life cycle costs. Assuming that large parts of the costs of manufacturing components from primary raw materials and using primary energy were externalized (environmental follow-up costs, ...), it is precisely these externalized costs that can be saved through reuse BEFORE material recycling. The reuse-oriented deconstruction also saves direct costs such as landfilling and removal of pollutants.

Our collective, comprising experts in architecture, urban planning, construction execution and restoration, art and design, as well as structural engineering and guided self-construction, is committed to contributing to the circular economy in the construction industry. In projects, we provide professional support from design to implementation. Among other things, we advise on the determination of recycling potential, the recyclable materials to be used and provide suitable components in the re:store.
Together with our partner Bauteiler, we also handle the execution of re:build processes.



alchemia nova

alchemia-nova is a Vienna (and Greece) based innovation organization deeply rooted in the application of circular economy principles. It was founded in Vienna in 2000 and became an official Cradle to Cradle® partner in 2006. alchemia-nova has steadily grown over the years into a 30-member organization with an international profile. Their expertise ranges from natural resource recovery, plant technology and circular buildings, to systems thinking and circular process design. In the last 20 years, alchemia-nova has developed several services to advise companies, regional authorities and research or educational institutions focusing on circular economy innovations of resource flows. They are Leadership Group Partner of the European Circular Economy Stakeholder Platform on circular construction and have published several brochures and guides on the topic.

alchemia-nova works with biological and technical cycles. Biological cycles allow the cascading use of bio-based resources, the recovery of nutrients and the return to the field. In the technical cycle, the aim is to circulate the substances taken from nature as efficiently as possible in order to limit the amount of primary raw materials.

For the building sector, alchemia-nova uses construction elements that are either deconstructible and reconstructible, renewable, degradable or fully recyclable. This basic principle of renewability and eco-efficiency also applies to energy supply and water treatment.

One example of recirculating water treatment is LooPi®, a near-natural toilet. It is based on an integrated vertical constructed wetland that treats the water used for flushing a public unisex urinal. The water can be treated in continuous loops and reused for flushing. The prototype was put into operation in Vienna in spring 2021. This and similar green walls are also applied on buildings for integration of ecosystem services. The benefits of these technologies are: Closing the water cycle, sustainable reduction of water consumption, no chemicals or consumables, no grid connection required, aesthetically pleasing with multiple design options.

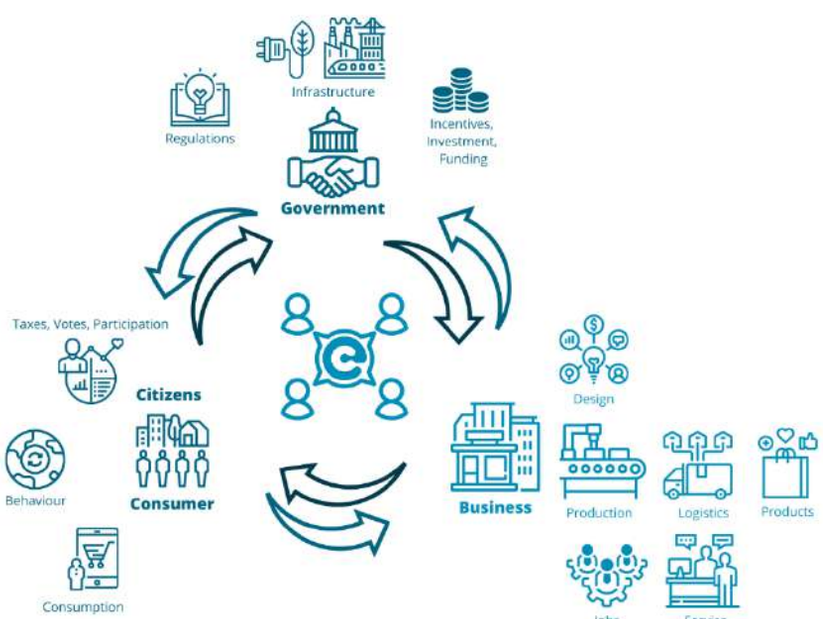
Circular Economy Forum Austria

Founded in 2020 as a multi-stakeholder initiative, the Circular Economy Forum Austria is working on the creation of a digital mapping and matching platform that will visualize the development of Austrian elements of a circular economy from a map to an innovation ecosystem.

The Circular Economy Forum Austria is a privately funded multi-stakeholder initiative that aims to provide politically independent and content competent support to companies on their way to a circular economy and to connect key stakeholders between companies, politics, science, research and design to establish a circular innovation ecosystem. The Forum is also part of the European Circular Economy Stakeholder Platform and promotes international cooperation and exchange of experiences.
A core part of the work of the Circular Economy Forum Austria is the monitoring and visualization of a Circular Innovation Eco-System. For this purpose, the experts of the Forum are currently working on the creation of a transparent, interactive "Map of the Austrian Circular Economy". This will make relevant stakeholders, initiatives, business models and projects visible as components of an Austrian Circular Innovation Eco-System to be developed in the coming years, so that organizations of all kinds can find innovation partners along the value chains and develop joint cross-industry and cross-sector cycles.

In an environment of rapid global change, hardly any company will be able to handle all innovation achievements on its own. Systemic challenges such as climate change and the depletion of natural resources are multidimensional challenges that cannot be solved collectively by innovation processes of a single actor or a few actors. The time of the lone wolf seems to be over. The circular economy reinforces these requirements all the more. We already see that success models are always cross-industry and cross-sector, and circular value creation must go beyond individual company boundaries. Companies can leverage ecosystem relationships for greater value creation by exploiting the synergies and network effects that arise from the complementarity of the players.

Achieving and sustaining development outcomes depends on the ability of a wide range of interconnected actors including governments, civil society, the private sector, universities, individual companies, and others to work together effectively. Any group of interconnected actors whose collective actions produce a particular development outcome is a local ecosystem. The effectiveness of each part of the innovation ecosystem is influenced by other parts of the system. These ecosystems can create processes that enable more innovators and entrepreneurs to more quickly develop and introduce solutions to real-world problems.

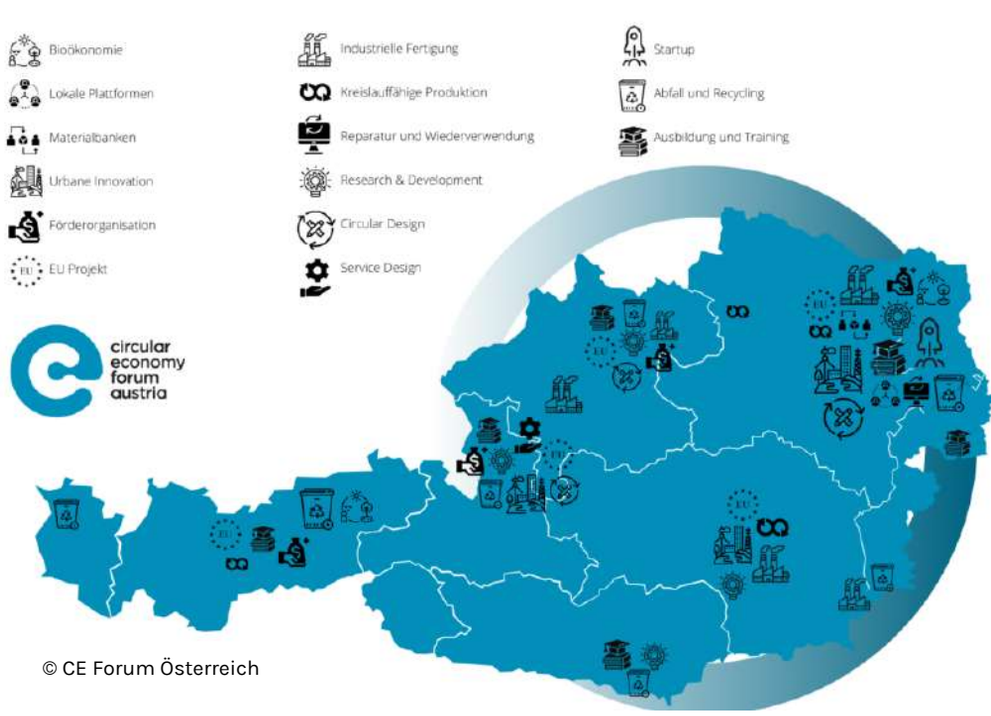


Building an innovation ecosystem takes time - and that's why it's important to focus on the long-term goal. The first step is to continually take stock of the innovation activity in a region. Where are there current impulses for the transformation towards a circular economy? Who is leading these implementations? Which industries are affected by these transformational innovations? How are new developments being supported? Who are the connecting organizations? Understanding these factors lets us see the current landscape, and also for individual organizations, their place and role.
Through networks and cooperation partners as well as in numerous information and knowledge exchange meetings of the Circular Economy Forum Austria, this inventory is continuously expanded. Names and contact persons of companies, organizations, initiatives, research institutes, as well as their geographical locations are collected.

At the time of writing, there are just under 100 organizations and elements of different types and sizes on the map, and more are being added almost daily. These are divided into different sectors and can in turn be filtered by specific characteristics, such as bioeconomy, local platforms, material banks, urban innovation, funding organizations, EU projects, industrial manufacturing, circular products, repair and reuse, research and development, circular design, service design, startups, waste and recycling, and education and training. All relevant initiatives, business models and projects that are part of the Austrian Circular Innovation Eco-System can thus be made visible.

Understanding the dynamics of the system is the goal. Subsequently, therefore, the interest, needs, and goals of public and private partners must be understood in a mutually dependent manner. Local, state, and federal entities play an important role in developing the enabling environment in ecosystems.
Knowing about the actors and their contributions is not enough. An innovation ecosystem is not just a list of actors and places. It is based on the interactions between them, the exchange of information and resources that form a sustainable system. A working map must show these relationships. Digital mapping should be openly accessible to all interested parties and can in the future also underpin the setting of targets, evaluations and control measures by political decision-makers.

The key players need to be brought together from the outset to jointly develop strategies and translate ideas into activities. The Circular Economy Forum is dedicated to this task through a variety of offers, from Circular Innovation Journeys, expert roundtables, online seminars, education and training offers in cooperation with universities of applied sciences and universities. Through knowledge building, exchange and curation of different actors, the Forum supports the development of the Circular Innovation Eco-System in Austria.



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The eco consultants

Engineering services for environmental protection with added value.

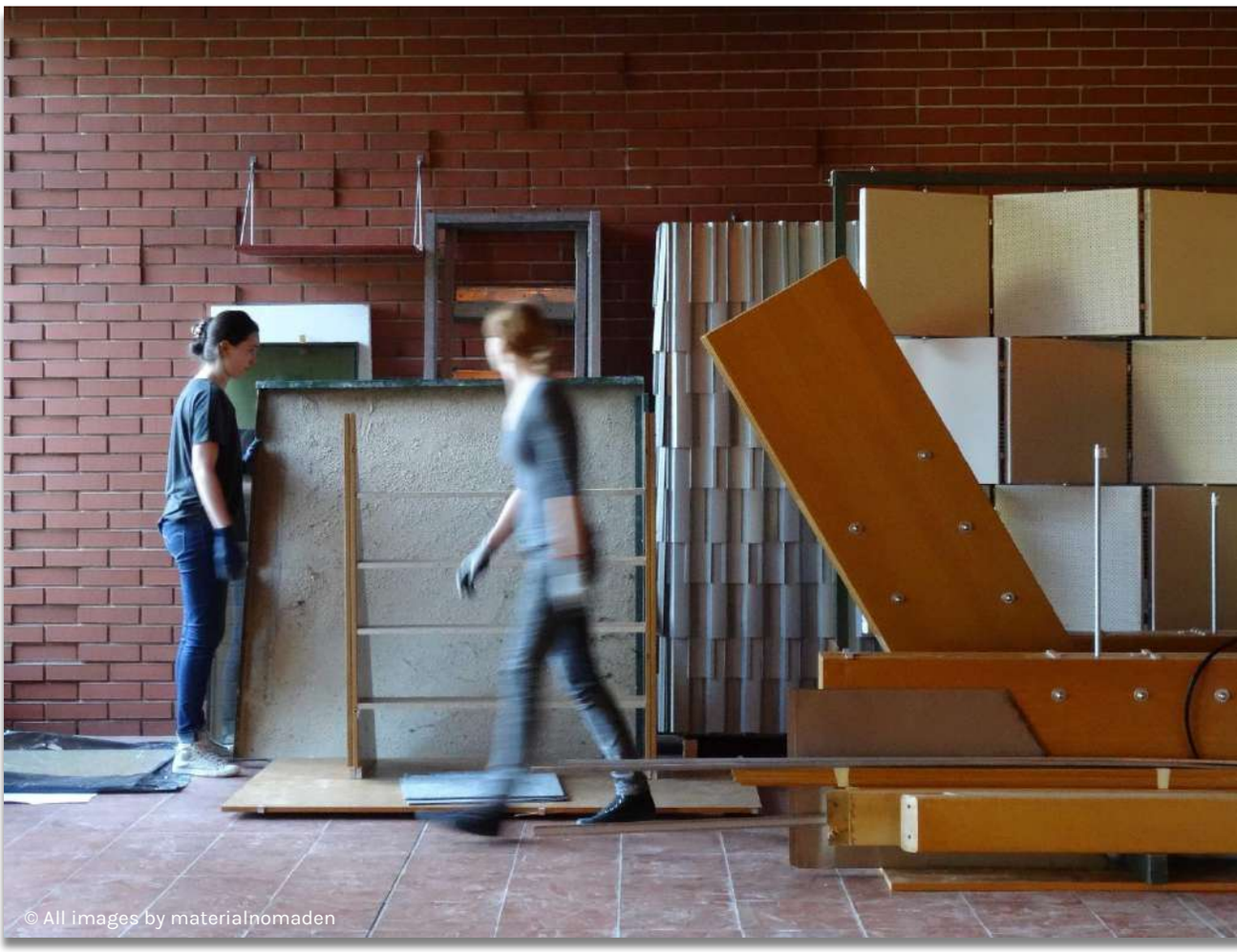
The eco consultants have been supporting the construction industry for more than 20 years with regard to both soil chemistry issues from civil engineering as well as recycling-oriented deconstruction, both topics that can make great contributions to increasing the sustainability of the construction sector. In addition to contamination assessments and, if necessary, remediation of properties and waste assessment of excavated soil in accordance with the requirements of the Landfill Ordinance and the Federal Waste Management Plan, the eco consultants also carry out waste management monitoring of excavated soil on behalf of clients in the civil engineering sector in order to minimize disposal costs for excavated material.

Even if planning for and building on greenfield sites is comparatively easier, less risky and less expensive for the developer than planning, clearing and using existing building sites, land recycling and thus the use of already historically used building sites often also offers the advantage of lower infrastructure costs in addition to the aspects of avoided additional land consumption and less surface sealing. In the field of recycling-oriented deconstruction, these are preparatory engineering services such as pollutant and hazardous substance investigations for deconstruction projects in accordance with ÖNORM EN ISO 16000-32 and ÖNORM B3151, as well as disposal and deconstruction concepts or assistance in the context of recycling-oriented tendering and awarding. In addition, the eco consultants provide deconstruction-accompanying engineering services such as waste management supervision, remediation monitoring as well as approvals for demolition and quality assurance of recycled building materials.

The aforementioned engineering services are the basis for the sustainable use of land and resources such as excavated soil and other (mineral) construction and demolition waste, and thus form an important prerequisite for sustainability in the construction industry.

Against the backdrop of EU taxonomy, a growing awareness of sustainability on the part of building owners, and growing efforts with regard to sustainable procurement in the construction sector as well, it can in any case be assumed that the careful handling of land resources and recycling-oriented deconstruction will become increasingly important.

PRACTICAL EXAMPLES FROM THE FIELD



Reuse of an old railroad station building – Gare Maritime

From industrial freight station to energy-neutral urban hub. The Gare Maritime in the heart of Brussels was once the largest freight station in Europe. But from the 1990s, the imposing station halls stood empty. After extensive renovations, the complex is now one of the highlights of a city tour in Brussels.

The traditional spirit of the station halls has been retained. But the design is decidedly modern. This bustling indoor village is the ideal place for both emerging and established brands and businesses. The oak pavilions form a covered network of boulevards, streets, squares and gardens. They are perfect for use as offices, stores, showrooms and production areas. The first-floor shop windows form the balconies of the offices above. The pavilions are connected by sculptural wooden staircases that cross and intersect. The architectural focal point is the monumental central atrium, flooded with natural light. Ideal for events of any size. The food hall is the natural meeting place for residents, visitors and employees alike. It houses lively bars, hip restaurants, enticing terraces and delightful eateries. The green pedestrian boulevards on either side of the central atrium are lined with 10 themed gardens and numerous tall trees. It is as if the adjacent park flows into the building.

Impressive facts

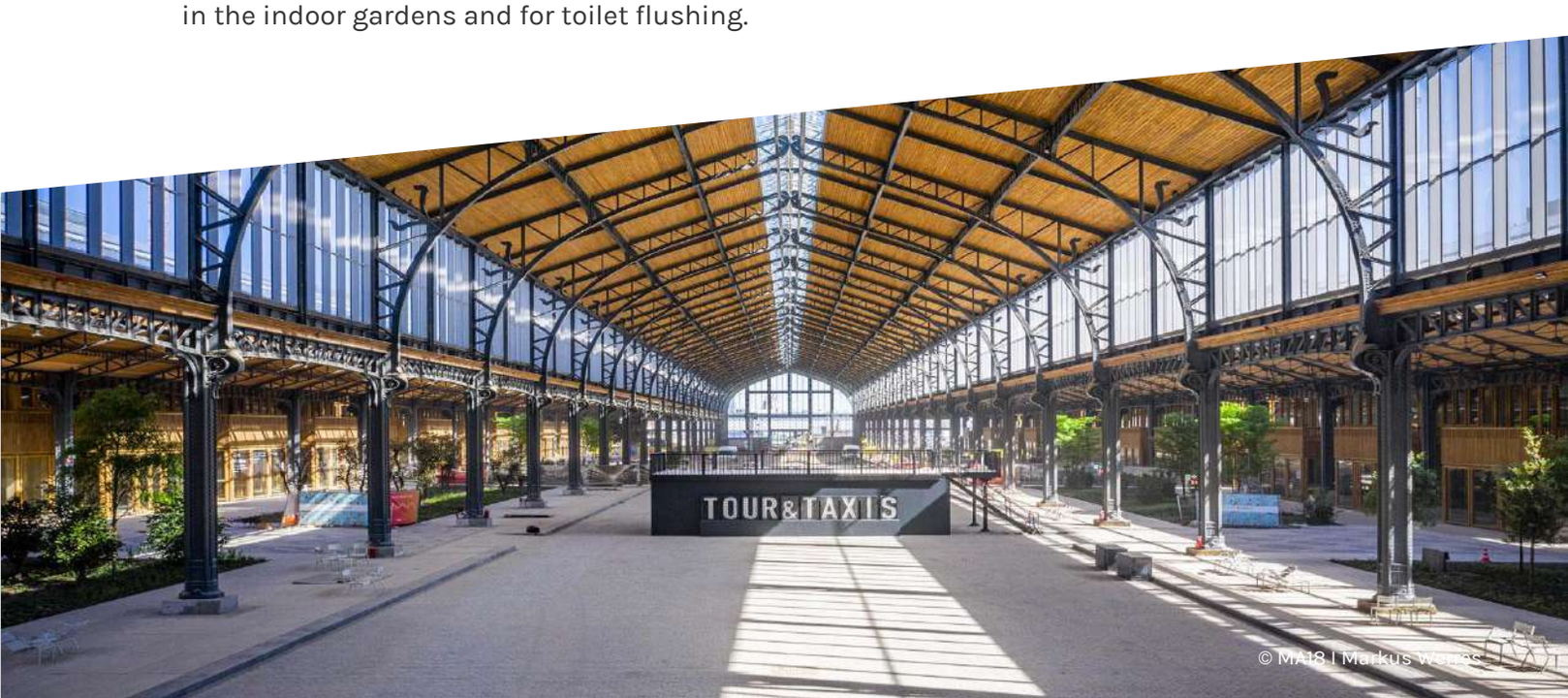
- 9,700 m^2 of retail space: 30 unique spaces of various shapes and sizes, including 10 kiosks overlooking landscaped pedestrian boulevards
- 7,500 m^2 of public space
- A 2,500 m^2 food hall
- 10 themed gardens with many tall trees
- 8 squares, each with an impressive mosaic floor inspired by regional Belgian products.

Circular economy

The industrial station halls were retained but completely renovated. The imposing steel structure was reinforced where necessary. The steel columns were given a fire-resistant coating, and the historic wooden roofs were sandblasted and restored on site. The original cobblestones of the station were salvaged and smoothed for use in the building. Sustainability was a constant consideration during the renovation. Rotterdam-based Neutelings Riedijk Architects focused on the principles of a circular economy. They opted for cross-laminated timber with (FSC) oak cladding for the pavilions in the station halls. This saved 3,500 tons of CO_2 emissions during construction. With around 10,000 m^3 of timber used, the Gare Maritime is the largest timber construction project in Europe.

- Reuse and integration of 7,500 m^2 of historic cobblestone and 350 m^2 of bluestone from the original platforms.
- 10,000 m^3 of timber for 12 units that can be used as office or retail space

Gare Maritime produces more renewable energy than it consumes and is therefore CO2 positive. This directly benefits the complex's neighbors in Molenbeek, who are allowed to consume the surplus energy. The glass facades on Rue Picard are equipped with solar panels, and there are enough solar panels on the highest roofs to generate 3,000 MWh of electricity per year. That's enough to supply 850 households. The wooden pavilions are heated and cooled with geothermal heat pumps. The station halls are equipped with natural ventilation. Some windows are equipped with innovative Halio Smart Glass technology, which regulates light penetration and temperature in the building. In addition, rainwater is collected in two large tanks and used in the indoor gardens and for toilet flushing.



CO_2 savings through conversion in the FRANCIS

In Vienna's ninth district, directly above the Franz-Josefs train station, a modern urban quarter is being created in the form of the Althan Quarter on an area of around 2.4 hectares. The combination of revitalized, historic buildings and ultra-modern properties not only preserves what already exists, but also creates a contemporary, sustainable and versatile mix of uses through targeted transformation. With a gross floor area of around 130,000 square meters, the Althan Quarter also provides a showcase example of sustainable construction and neighborhood development. In addition to economic and ecological aspects, it also provides important impetus for social coexistence in the neighborhood. Three of the four independent buildings are connected by the "Plaza", which was also conceived as a space for relaxation and a place for people to meet.

The heart of the Althan Quarter, however, is the FRANCIS. This building on Julius-Tandler-Platz, directly above the former Franz-Josefs train station, was originally planned by architect Karl Schwanzer and developed in the 1970s. Recently, however, it had fallen into disrepair and was no longer suitable for modern office use. Nevertheless, the location is ideal for a mixed-use urban commercial property. Therefore, 6B47 is redeveloping the building near the city center. On eight floors, modern space for large-scale offices and coworking spaces as well as a food cosmos, a fitness center and a wide variety of shopping possibilities are being created on approximately 40,000 square meters of floor space. The direct proximity of the Franz-Josefs train station to the city center also re-establishes ideal transport links. The parking garage in the neighboring building with around 660 parking spaces provides space for tenants as well as visitors.

Conversion instead of demolition and new construction
Practiced circular economy through CO_2 savings & reuse of building fabric

A conversion, i.e. a deconstruction to a reinforced concrete skeleton and a subsequent new construction, enables a saving of more than two thirds of the CO_2 emissions and thus makes **FRANCIS** a lighthouse project of modern and especially sustainable urban development. As a result, **FRANCIS** will be one of the most sustainable commercial properties in all of Vienna.

On the one hand, the extensive preservation of the building fabric will save resources and gray energy to a large extent and additionally eliminate vacancies and "wounds in the cityscape". On the other hand, unique projects like this one contribute to the decisive further development of cities like Vienna as well as to the coexistence in the neighborhood and even to reinventing it in part.

Since sealing of the site already took place a long time ago, there is no additional environmentally harmful land consumption, and at the same time all building elements that emitted a lot of CO_2 40 years ago remain in place.

A case study by Werner Sobek AG in cooperation with 6B47 shows just how enormous the potential savings through conversion in this project and thus the contribution to climate protection actually are. According to this study, the conversion approach enabled a saving of 18,625 tons of CO_2 equivalents compared to demolition and new construction. This corresponds to a difference of 67%. In addition, more than 10,000 truck trips that would have been required to remove the rubble can be saved in this way. In other words, an entire small town would have to switch its supply to green electricity to generate the same effect after one year.
The Werner Sobek AG case study also shows that conversion can significantly reduce CO_2 equivalent emissions - in the case of the FRANCIS project, by the emission load of 12,000 cars per year. Steel and concrete in the supporting structure and building framework respectively underline the long-lasting use and can continue to be used very well.

Circular economy of concrete

Production of concrete with recycled aggregate

Reuse is the use of concrete or other mineral building materials in the same function. At present, most of these materials from demolition are broken up and used as unbound fill or backfill. This corresponds to a "downcycling" as the material is used in another, subordinate function. Thus, there is a high potential to use the demolition materials from the remaining below ground and building construction, after appropriate processing, as aggregate material in concrete in the production of ready-mix concrete or even precast elements. According to the assessment of waste management in Austria Status 2021 (reference year 2019), approximately 3.5 million tons of concrete demolition waste and 4 million tons of construction waste are processed. Of this, a low single-digit percentage goes into concrete production as an aggregate and thus over 90% into "downcycling". There is therefore great potential for higher-value recycling.

Demolished concrete and construction waste can be 100% reused in the production of concrete. Mixed construction waste, after appropriate processing, can replace natural aggregate in the concrete formulation, thus conserving primary resources and avoiding landfills. The type of reuse of this demolition material depends on several factors. The higher the quality of the extracted demolished concrete, e.g. the more sorted with few to no impurities, the higher the reusability. The corresponding requirements and methods are described in ÖNORM B 3140 and ÖNORM B 4710-1.[15]

[22] ÖNORM B 3410. 2016-06-01. Rezyklierte Gesteinskörnungen für ungebundene und hydraulisch gebundene Anwendungen sowie für Beton.

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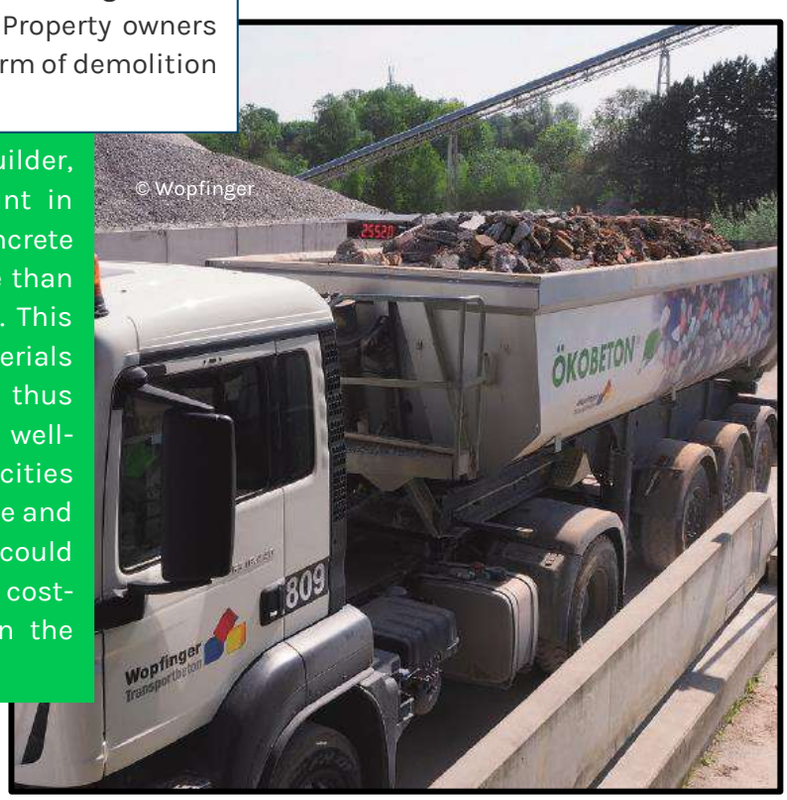
The substitution of recycled aggregates in the production of concrete enables valuable natural raw materials to be saved. Land consumption in the course of gravel extraction and landfilling of construction waste can thus be avoided.

Approximately 20 million tons of sand and gravel are required annually in Austria for ready-mix concrete. With an average excavation depth of 8 m in a gravel pit, the extraction of 100,000 tons of natural gravel causes land consumption the size of a soccer field. At the same time, vast quantities of construction waste are generated, especially in large cities, which are mainly put to lower-grade use or sent to landfills.

The city of Vienna, for example, has an annual demand for 4.5 million tons of construction material per year. At the same time, about 1.7 million tons of demolition material are produced in the city. If these construction waste materials were completely recycled, this would result in a savings potential in land consumption of about 17 soccer fields per year. In the course of the circular economy, large cities thus take on a new significance as a growing reservoir of raw materials for the future. The city of Vienna currently has a steadily growing building stock amounting to approximately 420 million tons. Property owners thus have future raw material resources in the form of demolition materials in their very own hands.

From the point of view of the planner and the builder, economic aspects must be taken into account in addition to sustainable aspects. Today, eco-concrete with recycled aggregates already costs no more than conventional concrete with natural aggregates. This will not change in the future, as natural raw materials are becoming increasingly scarce and thus correspondingly more expensive. In addition, a well-positioned recycling plant in or near major cities allows short distances to the raw material source and to the construction site. These developments could even lead to ECOCONCRETE becoming a more cost-effective option than conventional concrete in the future.



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[23] ÖNORM 4710-1. 2018-01-01. Beton — Festlegung, Eigenschaften, Herstellung, Verwendung und Konformität, Teil 1: Regeln zur Umsetzung der ÖNORM EN 206 für Normal- und Schwerbeton

[24] Lederer, J.; Gassner, A.; Kleemann, F.; Fellner, J. (2020). Potentials for a circular economy of mineral construction materials and demolition waste in urban areas: a case study from Vienna. Resources, Conservation and Recycling, Volume 161 (2020), 104942.

Possible treatment paths of selected wastes

Non-contaminated soils and other naturally occurring materials excavated in the course of construction work are not considered waste (pursuant to Section 3(1)(8) AWG 2002) if it is ensured that they are reused in their natural state and on the same construction site for construction purposes. If excavated soil is contaminated or used on another construction site, it falls under the definition of waste.
Common recycling methods for excavated soil material include use as a recultivation layer, subsoil backfilling, terrain correction, agricultural soil improvement, dam construction or disposal by landfilling.

Construction and demolition waste: The purer a waste stream is, the easier it is to process and the more cost-effective it is to accept it at treatment plants.

In contrast to general construction waste, concrete demolition waste is a waste stream that is purer by type (primarily concrete). Concrete demolition results, for example, from road demolition, bridge construction or industrial dismantling. It is processed by various mechanical treatment steps to produce defined particle sizes. Depending on the quality and particle size, recycled concrete is used, for example, as an unbound upper and lower base course / cement-bound base course, for agricultural road construction, as an aggregate for concrete production, as a high-grade coulter filling material or as a drainage layer.

Recycled building materials in accordance with the Recycling Building Materials Ordinance may only be produced from certain types of waste, such as broken concrete, asphalt and building rubble, and may not be contaminated with pollutants and impurities. For this reason, a pollutant and hazardous substance investigation is mandatory for 750 t or more of construction and demolition waste (excluding excavated soil) during demolition, as well as an obligation to separate the main components produced in the course of demolition. In addition, there is an obligation to separate hazardous and non-hazardous waste types at the construction site. A total of approximately 8.6 million tons of recycled building materials were produced in Austria in 2019 in accordance with the Recycling Building Materials Ordinance.

In 2019, approximately 3.8 million t of concrete demolition waste was generated. 3.6 million t of concrete demolition waste were processed in treatment plants for mineral construction and demolition waste. Only about 150,000 t were landfilled. Even though part of this processed quantity could result from previous year's stocks, it is evident that concrete demolition waste is processed to a very large extent into recycled construction materials.

- Acceptance prices for concrete demolition waste in construction waste recycling plants: concrete sorted by type approx. 10-15 €/t, concrete unsorted approx. 20 €/t
- Acceptance prices for concrete demolition for landfilling: Depending on the quality from approx. 45 € (BRM quality)/t
- Prices for recycling granulate: concrete recycling U-A quality approx. 10-15 €. In 2019, approximately 4 million t of construction waste was generated. Approximately three quarters of this waste was processed in treatment plants and about one quarter was landfilled.

Mineral construction waste is composed of mixed materials, e.g. brick masonry, concrete components, glass concrete blocks, roof tiles or tiles, glass concrete blocks, roof tiles or tiles. After treatment, this waste can be recycled if it complies with a quality class in accordance with the Recycling Building Materials Ordinance.

Excessive contamination (e.g. with gypsum, insulating materials, etc.) or possible contamination (e.g. chimney masonry) can make recycling difficult or even prevent it.

Brick rubble, for example, which is sorted from construction waste and then processed in a construction waste recycling plant to become recycled crushed brick, can be used for such purposes as green roofs, as an aggregate for masonry bricks/concrete and for filling.

- Acceptance prices in construction waste recycling plants: brick rubble pure approx. 10.00 €/t, brick rubble max. 30% fine particles approx. 16.00 €/t
- Acceptance prices for landfill: Depending on the quality from approx. 45 € (BRM quality)/t

Generally, gypsum does not occur on demolition sites as a single type, but is mixed with other construction waste. In Austria, there is currently no processing plant for gypsum board from demolition. Therefore, it is currently deposited in landfills for construction waste. As things stand today, a ban on the landfilling of gypsum board, gypsum wallboard and fiber-reinforced gypsum board is to be introduced from January 1, 2026, with a number of exceptions mentioned.
The price for landfilling is about 50.00 €/t (incl. ALSAG), this is delivered as construction waste with construction waste landfill quality according to DVO.

Insulation waste: EPS and XPS boards are used for building insulation. They used to contain the flame retardant HBCDD.
In the meantime, there has been a switch to the polymeric flame retardant PolyFR. XPS used to be partially foamed with CFCs/HCFCs and can therefore be hazardous waste. Today, the foaming agent CO_2 is used for XPS. Recycling of such materials is not currently common practice in Austria, and the material that accumulates during deconstruction is usually sent for thermal disposal or recycling.

Mineral wool is primarily used as a non-combustible insulation material due to its physical properties. Depending on its fiber geometry and solubility, this material is classified as hazardous waste. In Austria, it is classified either as a hazardous waste or as a non-hazardous waste according to the Recycling Building Materials Ordinance. At present, there are no recycling options for mineral wool waste from demolition, which means that it is exclusively sent to landfills. The new Landfill Ordinance of 2021 stipulates an Austria-wide ban on landfilling from 2027. Should this deadline remain in place, a recycling option will have to be created in the next few years.
Due to these difficulties to dispose of the material, the cost has increased from 250€/t to over 1300€/t.

Building Center Blaue Lagune

The new construction center in the Blauen Lagune is a unique exhibition, information, consulting and event platform covering all areas of the construction and real estate industry. At the same time, the five exhibition buildings themselves are a showcase for the construction of the future. A key objective here is to implement the criteria for a functioning circular economy in as many areas as possible. This ranges from the correct handling of the demolition materials of the old existing buildings and the reuse of the excavated material, to the new buildings, whose circularity is based in particular on sustainable planning and digital construction documentation. The following are some examples of a practiced circular economy within the scope of the project:

Dismantling of show homes and reconstruction as privately used single-family houses
Months before construction of the new construction center began, individual show homes were sold to private builders in order to create sufficient space for the new project. The houses were professionally dismantled and rebuilt on their new sites. This is the special advantage of prefabricated houses in timber frame construction, as these houses can be rebuilt at another location without any loss of quality.

Demolition of existing show home
One of the show homes could not be dismantled and rebuilt for structural reasons, which made it necessary to demolish the building. Special attention was paid to components that could still be used, such as entrance doors or windows, so that they could be put to possible further use. All other building materials were separated by type, specially processed and could thus be recycled for other purposes.

Planning and construction
The five almost identical buildings were designed in the spirit of sustainability and circular economy. The same grid and height dimensions, the type of construction in terms of structure and the type of material were always chosen. The basement and floor walls are constructed using precast hollow walls, which can be dismantled and reused due to the always identical dimensions. Due to the structural requirements of the live loads, all ceilings are made of in-situ concrete, but in terms of recycling management, the raw materials used can be recycled after appropriate processing. This is done by demolition, reduction by means of crushers and separation of concrete and steel.

Due to the requirement for highly flexible use and the associated possible changes in an exhibition center, all possible types of use were planned through in advance in the ten 2 to 3-storey exhibition spaces. This is achieved by means of girder systems consisting of reinforced concrete columns and girders as well as pure steel girders. A peripheral walkway made of the steel beams, which can be assembled and disassembled again, provides the flexibility to reuse them easily and cost-effectively. The underfloor convectors for heating and cooling the building are installed in this walkway, which allows for a change of use. In the area of the facade elements, consideration was also given to the possible change of use by always using the same grid elements.

Building services

With the sustainable ecological footprint of the building in mind, a combination of district heating, surface collectors and geothermal ground probes were used for the energy supply. With the combination of an approx. 2,500 m2 PV system, this results in an excellent energy system, since electricity storage is also planned. The entire concept is supplemented with a service water utilization system to enable optimal water use for sanitary facilities and garden irrigation as well. In order to illustrate the energy consumption and production, a monitoring system will be installed to enable the FM to optimally control the system. In addition to the PV systems, parts of the buildings will be constructed with a green roof, with an emphasis on "urban farming".

Outdoor facilities

The existing buildings were taken into account as much as possible in the design of the outdoor areas. The new walkways that will be created in the area of the pergolas and roof paths will be constructed using concrete paving stones. Here, the reuse of these materials can be easily achieved.

In summary, simplicity of construction in terms of assembly and possible disassembly was taken into account in all trades. This makes it possible to return elements of the building back into the material cycle by reusing them in other buildings, or to return them to the raw material cycle. The used materials are continuously recorded and documented as part of the construction documentation. This means that the raw materials used can be replicated at any time and retrieved as needed. This provides the corresponding CO2 footprint for the purpose of the circular economy. A possible change of use was already taken into consideration during the design planning.

Raising awareness of the circular economy in the construction of single-family houses and apartments

The Life-Cycle Oriented Building theme center in the new Building Center is an example of how the topic of the circular economy is being taken into account in private house construction. Using a fully equipped house model on a scale of 1:1, it shows how forward-looking planning can help people to live in their own homes for as long as possible. Subsequent retrofits or the simplest possible conversion of rooms for changed requirements are included in the concept.

Long-Use – Lasting and flexible architecture

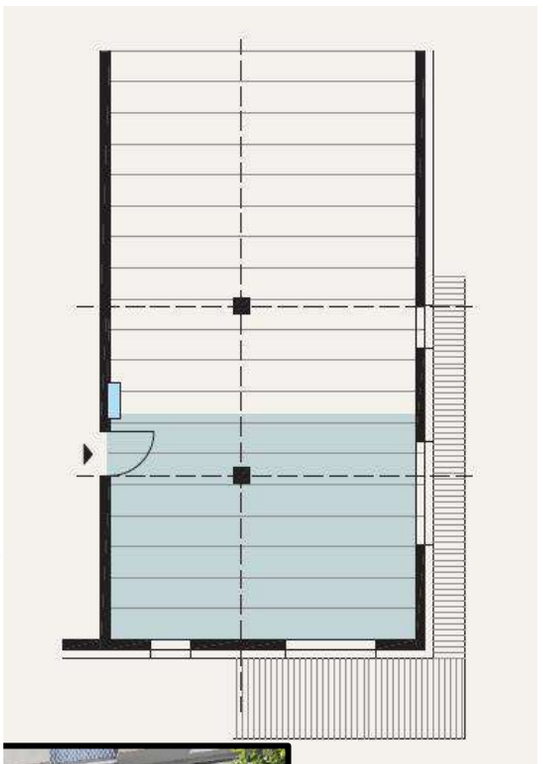
Two projects are to demonstrate the principles of a cycle-oriented architecture. **SEEPARQ** and **JAspern.**

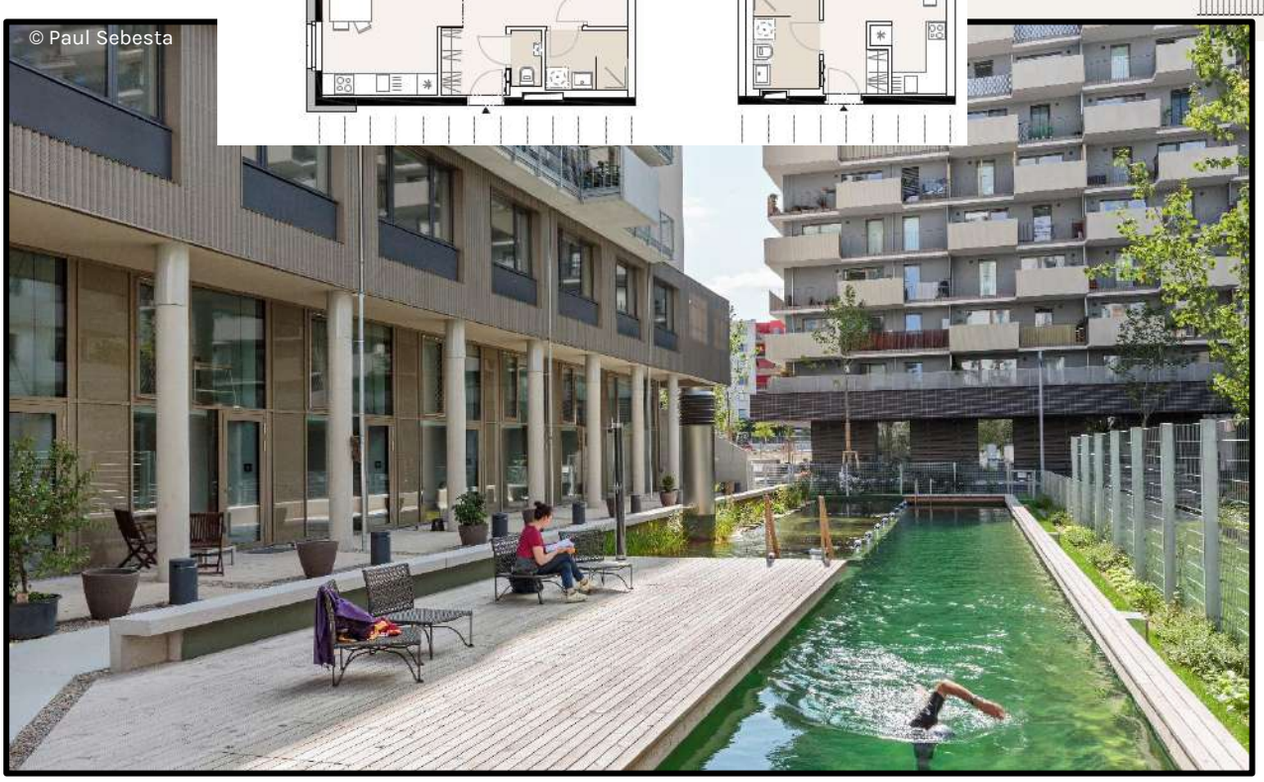
The maxim of POS architects was: to use the most advanced technical products, means that they will remain contemporary for a long time. Maintaining the products from the beginning (windows, roof, doors, building services) means extending their life cycle. The facade is divided into load-bearing columns every 4.5m with minimum-reinforced, demountable infill panels in between. As a result, the building shell can be retained for a very long time. The room height of 2.8m allows different uses. Great importance was attached to the use of separable products such as wood-aluminum 3-pane windows, mullion glazing, gypsum plasterboard stud walls and products that are not hazardous when disposed of.

FLEXIBILITY

Special attention was paid to durability and flexibility. Seeparq has only a few load-bearing exterior wall columns and a few load-bearing interior columns. The entire building is based on a grid of 75 cm. This allows flexible expansion in 75 cm increments, which can be freely designed within. Thus, different floor plan configurations are possible on each floor.

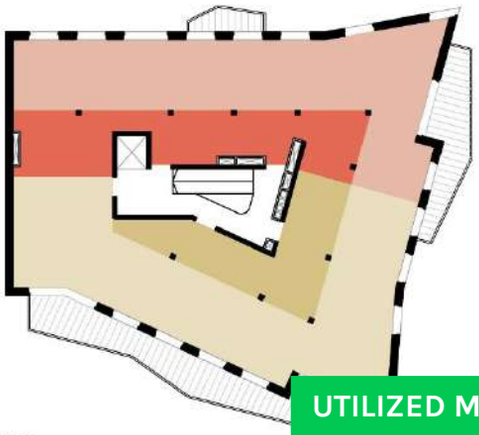
SEEPARQ





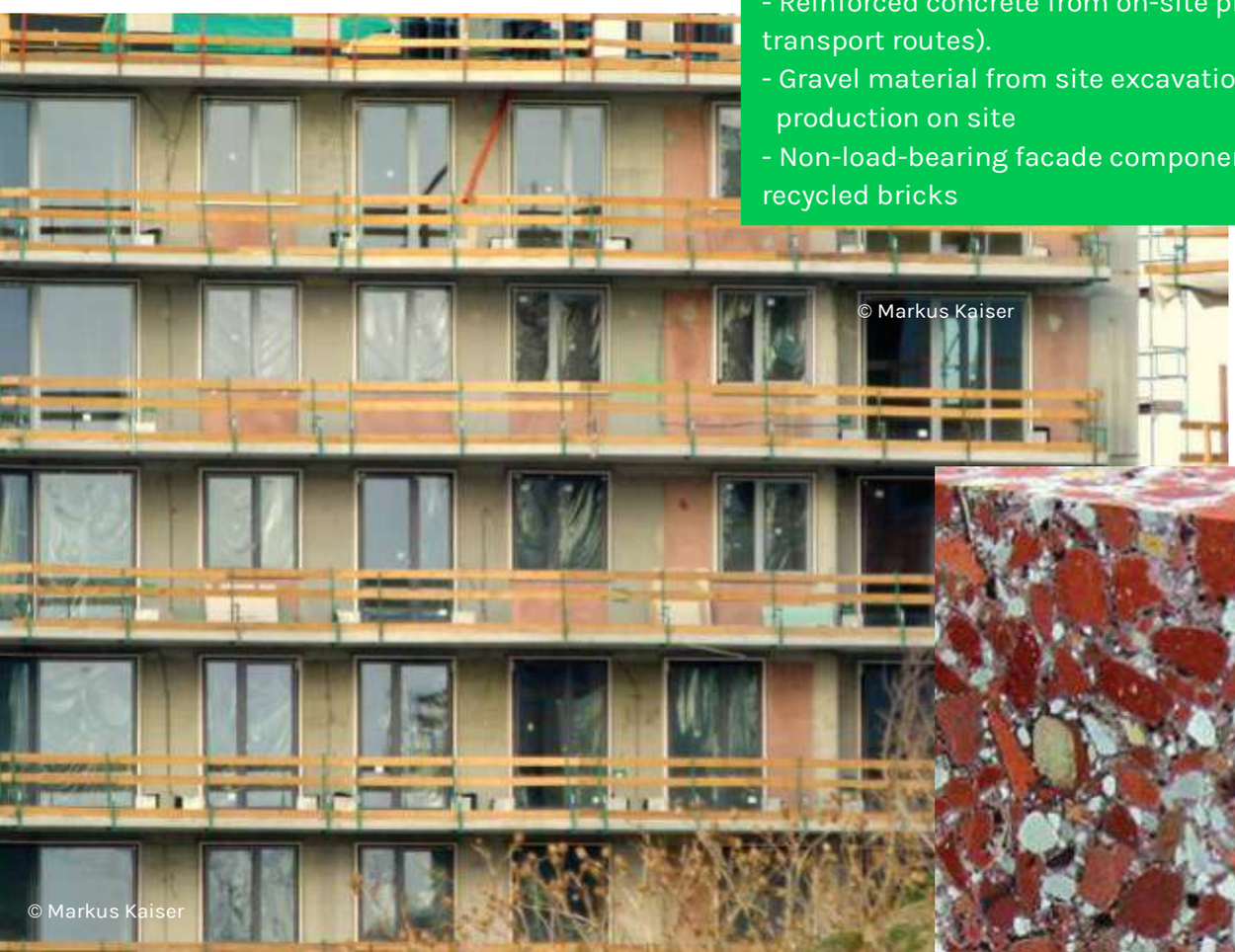
Flexibility
Special attention was paid to durability and flexibility: JAspern features only a few exterior load-bearing wall columns and interior load-bearing columns, and the remaining walls can be modified on each floor with little extra effort.

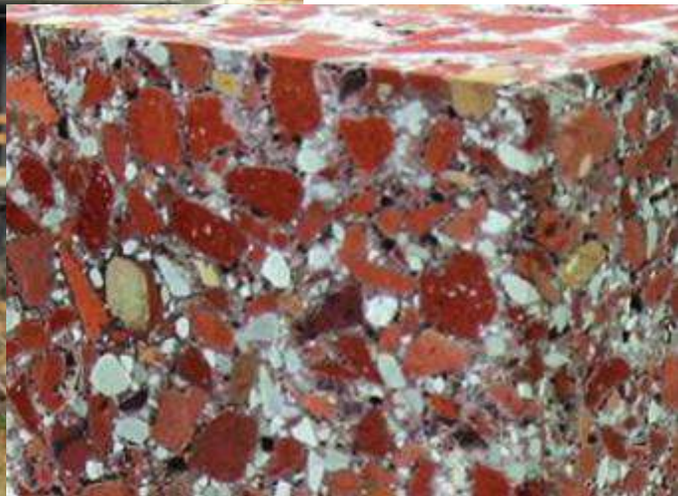
JAspern



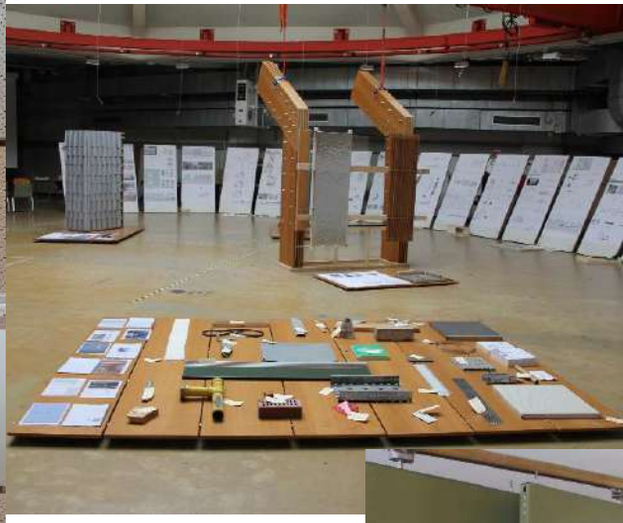
Use together, share and be in contact: The heart of the building is the rooftop terrace with a meeting lounge, a laundry room and areas for urban gardening. Gardening, barbecuing, sitting and celebrating go hand in hand every day.

UTILIZED MATERIALS
- Non-load-bearing walls made of Ziegelit allow future modifications with comparably low expenditure
- Reinforced concrete from on-site production (no transport routes).
- Gravel material from site excavation for concrete production on site
- Non-load-bearing facade components made of recycled bricks



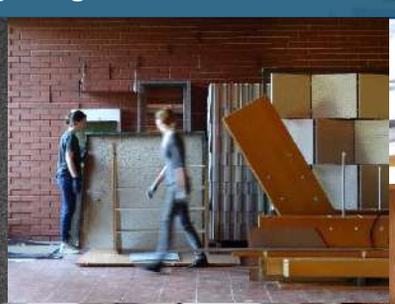


REBEAUTY



materialnomaden

Cooperation TU Vienna and materialnomaden
Under the title "Rebeauty - design for disassembly and reuse" materialnomaden developed a program together with the Department of Interior Design and Sustainable Design of the TU, which uses found materials as a starting point and source of inspiration for designs. Materialnomaden was able to provide the material source "Grellgasse" as well as methods and experiences for design processes with re:use. The found material was analyzed by the students, expanded under guidance and transferred into a new context. New spatial uses and applications were developed on the basis of 1:1 prototypes and building designs.



Rebeauty is the creation of something new from used, repurposed materials.

It is about breathing new life into building components that at first glance may appear to be waste. Many materials develop their own character, appearance and texture over their lifetime and these properties can be used to create furniture, interior fittings and much more. It is about proposing new solutions where materials are reused in a high-quality way on another level.

DEMANDS

Availability time of reusable materials as a new dimension to enable the plannability of use.

Harmonization of building codes that ensure maximum flexibility in reuse.

Mandatory deconstruction planning with a focus on reuse and recycling that exceeds the regulatory standard.

Introduction of an Austria-wide permit requirement for the demolition of buildings and expansion of the authorities' decision-making framework to include ecological appropriateness (demolition and new construction versus renovation or conversion).

Flexibility in building configuration and adaptable floor plans to increase pre-fabrication levels and promote repurposing.

Mandatory further training measures on the subject of circular economy for all professions in the planning, construction and building services sector.

Facilitate reuse by providing adequate room heights.

Mandatory multifunctional (post-) use concepts in the construction of service buildings.

CONCLUSION

The transformation from a linear to a circular economic model: the challenge of the hour. As the results of the working group show - not impossible. Individual companies and initiatives are already successfully demonstrating how it can work.

Flagship projects and initiatives are important, but the real challenge is to understand the mindset and associated process design in network, or circular, terms as well. In this case, a first step towards reducing complexity would not be to add circular elements to the current, linear system, but to comprehensively connect all phases in the life cycle of a building.

The circular economy should be understood first and foremost as a transformation - recognizing that not only new things are good is also a task for our society and an insight that has shaped our economic activities for centuries. Learning and applying the meaning and benefits through education and training and raising awareness already in schools are measures that can pave our way to the circular economy.

Furthermore, cross-functional cooperation is crucial. Cooperation within the sector, between building owners, planners, service providers and industry, as well as alliances are necessary to drive the transformation forward. Alliances and networks are there to jointly develop strategies, exchange ideas and learn from each other. More regional thinking is needed again. Long supply routes must be avoided. Comprehensive knowledge and easily retrievable availability data of materials must be the goal. Digitization will be the key here. Digital building passports, material platforms and interactive maps with all players in the real estate industry are the tools of the future. To ensure the utilization of reuse materials, the availability time of the corresponding building components must be added as a new dimension in the material databases. This is the only way to ensure precise planning can take place in compliance with time schedules.

In addition to the involvement of the individual players along the entire value chain, new regulations from politics and administration will also be required. Demolition without prior inspection to assess reusable components will no longer be permitted in the future. Only when we begin to see the built environment as a resource mine, with materials of a guaranteed quality available, can we succeed in breaking the dependence on resources while simultaneously achieving economic growth. This venture cannot be realized without the participation of the industry.

In conclusion, however, it takes one thing above all to break out of familiar patterns: Courage. Courage to cooperate with "new" partners and new players along the value chain. Courage in the use of new materials and in the implementation of new utilization concepts.

With this in mind – Stop talking – Start acting!

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THE FOLLOWING COMPANIES AND ORGANIZATIONS HAVE CONTRIBUTED TO THE PRODUCTION OF THE BROCHURE

Austrian Society for Sustainable Real Estate Industry – ÖGNI

The ÖGNI - Austrian Society for Sustainable Real Estate, is an NGO (non-governmental organization) for the establishment of sustainability in the construction and real estate industry. The aim of the ÖGNI is to demonstrate the added value of building certifications in order to create environmentally and resource friendly buildings, with high economic and social efficiency, which can be used flexibly over generations and have a positive impact on the health, well-being and performance of the users.

The ÖGNI was founded in 2009 and is a cooperation partner of the DGNB (German Sustainable Building Council), whose certification system was adopted, adapted to Austria and has been continuously developed since then. The ÖGNI is the only Austrian council that is an "established member" of the WorldGBC (World Green Building Councils) and strives to strengthen the European quality certificate on an international level.

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