



Circular construction

Vienna,
July 2022

Dear readers,

Vienna is one of the most successful metropolises in the world when it comes to innovations in the field of sustainability. Around 9,200 companies in Vienna focus on urban and environmental technology. Over 90,000 people generate annual sales of around €40 billion, which equates to 16% of the total sales from Viennese companies.

The city is doing particularly well in terms of innovative strength, comprehensive support for start-ups and a strong focus on sustainability. Vienna also comes top in a number of smart city rankings. The main goal of the Smart Climate City Strategy Vienna¹ is to keep on ensuring optimal quality of life while also conserving resources to the greatest extent possible. In order to achieve this goal, in November 2020, Vienna City Council concluded a coalition agreement to reduce greenhouse gas emissions to net zero by 2040. Vienna's going climate neutral!²

The city also boosts an environment conducive to research and technology, geographic and cultural proximity to growth markets further east, high-quality infrastructure and training systems and, last but not least, the highest quality of life in the world.

In the 'VIENNA 2030 – Economy and Innovation Strategy',³ the Austrian capital has defined six key areas in which it is looking to become a world leader over the next ten years, along with vigorous innovation ('Viennese solutions'). One of these key areas is the development of smart solutions for cities, i.e. innovations to combat climate change and bring about greater sustainability in the areas of energy production, mobility and urban planning. Vienna City Council is demonstrating its far-sighted vision by making planning and construction based on a circular economy the standard for new construction and renovation work from 2030 onwards, in order to maximise the conservation of resources. The DoTank Circular City Wien 2020–2030 programme led by the Municipal Directorate for Buildings and Technology provides important impetus for this and promotes the transition to a circular city.

DoTank Circular City Wien 2020–2030, a transdisciplinary programme, has been one of the leading projects in the VIENNA 2030 – Economy and Innovation Strategy since 2019. The Business Agency has provided DoTank Circular City Wien 2020–2030 with funding and support from the very outset. Among other things, this report has come out of that collaboration.

This Technology Report offers an overview of the various trends and developments in the field of circular construction, along with interesting case studies and a selection of companies and players who are active in this field in Vienna.

The Vienna Business Agency team



¹ [smartcity.wien.gv.at/wp-content/uploads/sites/3/2022/03/scwr_klima_2022_web-neu.pdf](https://www.smartcity.wien.gv.at/wp-content/uploads/sites/3/2022/03/scwr_klima_2022_web-neu.pdf)

² www.wien.gv.at/regierungsabkommen2020/files/Koalitionsabkommen_Master_FINAL.pdf

³ www.wien.gv.at/wirtschaft/standort/strategie.html

REACT-EU ALS TEIL DER
REAKTION DER UNION AUF DIE
COVID-19-PANDEMIE FINANZIERT.



p.6	1. Introduction	
p.6	1.1	Why are we committed to a circular economy?
p.6	1.2	What are the distinguishing features of the circular economy?
p.7	1.3	The circular economy and sustainability
p.9	1.4	Transition from a linear economic system to the circular economy
p.10	2. Initial situation	
p.10	2.1	Global level
p.13	2.2	Action at EU and national level
p.13	2.2.1	EU – Circular Economy Action Plan
p.13	2.2.2	The EU circular economy package
p.14	2.2.3	EU Taxonomy Regulation and the Non Financial Reporting Directive
p.14	2.2.4	Circular Economy Monitoring Framework
p.14	2.2.5	EU – Waste Framework Directive
p.14	2.2.6	Construction Products Regulation
p.14	2.2.7	Digital Building Passport
p.16	2.3	Federal level in Austria
p.16	2.3.1	National circular economy strategy
p.16	2.3.2	Waste Management Act and Federal Waste Management Plan
p.17	2.3.3	Construction Materials Recycling Ordinance
p.17	2.3.4	Landfill Ordinance
p.17	2.3.5	Standards documents
p.18	2.4	Municipal level – City of Vienna
p.18	2.4.1	Governmental Agreement
p.18	2.4.2	Vienna’s Smart Climate City Strategy
p.18	2.4.3	VIENNA 2030 – Economy & Innovation Strategy and the Digital Agenda Vienna 2025
p.19	2.4.4	The DoTank Circular City Vienna 2020–2030 transdisciplinary programme
p.19	2.5	Aspects of the circular economy in building certification systems
p.20	3. Implementation of the circular economy	
p.22	3.1	Real estate
p.22	3.2	Building operations
p.23	3.3	Construction – buildings
p.23	3.4	Construction – components
p.24	3.5	Construction – building materials and raw materials
p.24	3.6	Network

p.26	4. Model circular economy projects in Vienna	
p.27	①	Reviving vacancies through conversion – residences in the former post office headquarters at Nordbergstrasse 15
p.28	②	Preserving the essentials – soil upcycling in Biotope City
p.29	③	Using raw materials on site – earthwork balancing in Seestadt
p.30	④	Putting built structures back into circulation – urban mining in the Waldmühle Rodaun
p.31	⑤	Upcycling existing buildings – circular economy-based regeneration of a building on Adamsberggasse/ Miesbachgasse
p.32	⑥	Keeping building materials within the cycle for social purposes – organised material extraction on the Sophienspital site
p.33	⑦	Social urban mining documented – from the Vienna Energy Centre to the Medical University of Vienna’s Mariannengasse Campus
p.34	⑧	Generating multiple benefits – eco-social demolition of the Ferry Dusika stadium
p.35	⑨	Managing resources – urban expansion around the Zukunftshof in Rothneusiedl
p.36	⑩	Providing energy in a circular system – Vienna’s largest renewable geothermal probe field in the Viertel2 development
p.37	⑪	Recovering raw materials during operation – urea collection in the Adolf Blamauegasse building
p.38	⑫	Combining potential for reuse – grey water as a material and thermal resource
p.39	⑬	Getting recycling on track – demolition material in the Wiener Linien track system
p.40	5. Services of the Vienna Business Agency	
p.43	6. Companies in Vienna	
p.54	7. Imprint	

1.2 What are the distinguishing features of the circular economy?

The realignment of our economy in terms of cycles is still a work in progress, so no catch-all definition exists as yet. This means that descriptions of the circular economy tend to be based on lists of applicable principles, such as price consistency, lower consumption, regeneration, longevity and the like, and on positioning the circular economy model as an alternative to the existing linear economic model. For example, the European Parliament defines it as follows: 'The circular economy is a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. In this way, the life cycle of products is extended.'⁴

This description works at the level of materials and products, and in terms of processes. It is highly applicable to the building sector. In a consistently implemented circular economy, it follows that everything that is fed into the system cycle of the building sector comes from 'inexhaustible' sources, and is available without any limitations and/or can be produced sustainably. The phases of value creation, usage and value retention are cycled through repeatedly. Everything that leaves the system cycle of the building sector can be transferred to other system cycles or does not cause any significant damage through its departure.

Whether materials and products actually remain in a system cycle over the long term does not solely depend on their physical properties, but is also largely determined by the way in which they are handled.

The circular economy requires the involvement of a large number of players, so wholesale initiation and organisation of interactions between the participants is vital for closing and maintaining cycles.

Accordingly, a large number of circular economy business models and business cases have a bearing on cross-linking and product and process design.

1.1 Why are we committed to a circular economy?

Comprehensive transformation is required in order to tackle major challenges such as the worsening climate crisis, the scarcity of finite resources and the loss of biodiversity. This is also particularly pertinent to the economy. The aim of this process of transformation is to develop and establish an economic system that,

- within the ecological limits of our planet,
- enables us to strike a balance between different social interests over the long term and
- generates a vital basis for economic enterprise.

Alongside other significant changes, such as a reassessment of services pertaining to the 'caring economy' and the 'grey economy', and a refocusing from quantitative to qualitative growth as part of a broader 'steady state' approach, the introduction of the circular economy is fundamental to making such an economic system a reality. It is clear that the circular economy provides the greatest potential for success in resource-intensive industries, and is therefore an urgent priority for the construction and real estate sectors.

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www.europarl.europa.eu/news/en/headlines/economy/20151201STO05603/circular-economy-definition-importance-and-benefits (last accessed on 20/01/2022)

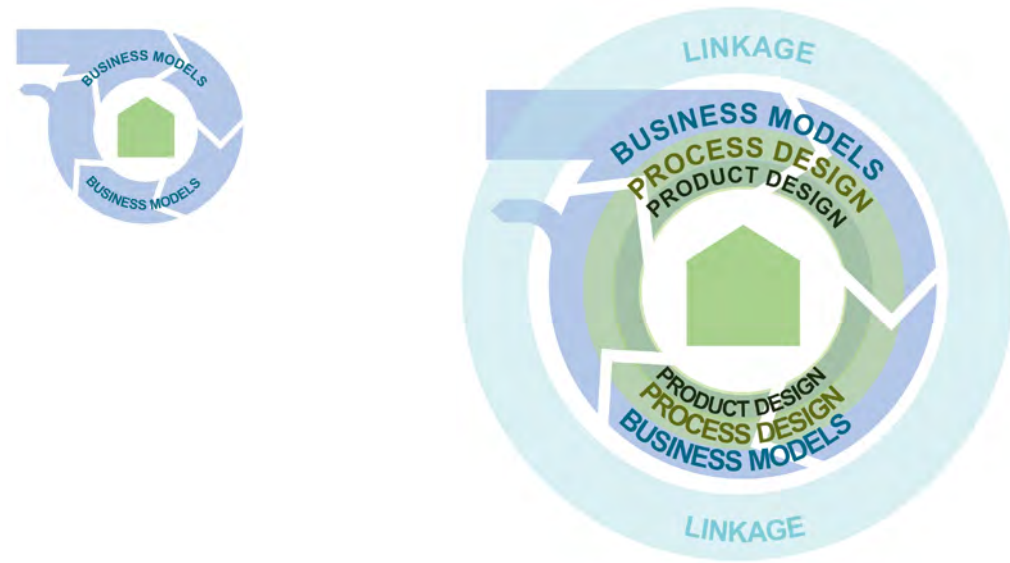


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1.3 The circular economy and sustainability

Many principles of sustainable action that are already well established in the construction sector, are rooted in the circular economy, in some cases with standard methods of assessment. These principles include the use of renewable raw materials, the generation of renewable energy on site, waste avoidance, life-cycle evaluation of material-related energy use, and a sparing approach to the use of soil, a finite resource. It is important to address these cycles in relation to one another and coordinate and consider them as an overall system.

The circular economy in the building sector – processes level



The circular economy in the building sector – integration of material and energy flows



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1.4 Transition from a linear economic system to the circular economy

The circular economy differs fundamentally from its linear counterpart. The European Parliament puts it as follows: 'The circular economy marks a departure from the traditional, linear economic model, which is based on a take-make-consume-throw away pattern. This model relies on large quantities of cheap, easily accessible materials and energy.'⁵

In the building sector, this is particularly evident when we look at life cycle. If, for instance, the useful life of a building is extended through renovation, or the need for new homes is met by making use of abandoned properties, this runs counter to linear economic systems, which demand the accumulation of value through constant new consumption.⁶ Alternatives to value realization through new consumption offer entrepreneurial principles such as price subsistence, sharing, local production, etc. or a true cost basis for business models of the circular economy. With true-cost pricing, it is no longer permissible to pass on secondary costs to future generations, such as for repairing the damage caused by climate change, nor is it acceptable to shift production steps to low-wage countries, thereby bypassing the expense of ensuring minimum social standards.

⁵ www.europarl.europa.eu/news/en/headlines/economy/20151201STO05603/circular-economy-definition-importance-and-benefits (last accessed on 20/01/2022)

⁶ See: Wilmsen F.; Je mehr, desto weniger? Das Verhältnis von Wachstumskritik und alternativen Wirtschaftskonzepten des Postwachstums zum kapitalistischen System; Universität Bremen, artec Forschungszentrum Nachhaltigkeit; artec-paper no. 206; December 2015; p.103.

2.1 Global level

While the world population has almost doubled over the last 50 years, from 3.8 billion to 7.8 billion people, global consumption of primary raw materials such as minerals, ores, fossil fuels and biomass has increased almost fourfold over the same period, from around 28.6 gigatonnes to 101.4 gigatonnes.^{7,8} Only about 8.6% of this quantity currently remains in circulation. By contrast, the amount of brand-new material in use is increasing from year to year, to the extent that experts forecast global consumption of primary raw materials will rise to between 170 gigatonnes and 184 gigatonnes by 2050.^{9,10}

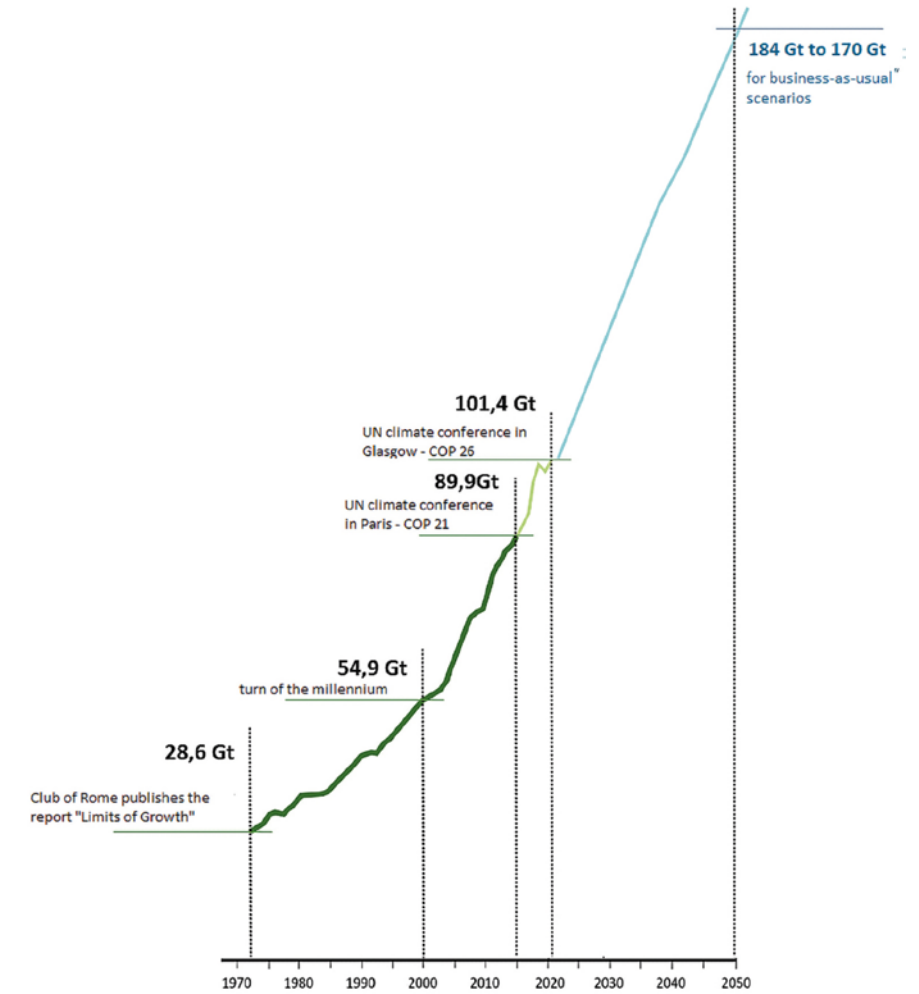
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UN Department of Economic and Social Affairs (UN DESA); World Population Prospects 2020; 2020

8
See: Circle Economy; Wit de M., Haigh L.; The Circularity Gap Report 2022; 2022; page 9.

9
International Resource Panel (IRP); Assessing global resource use: A systems approach to resource efficiency and pollution reduction; United Nations Environment Programme (UNEP); 2017

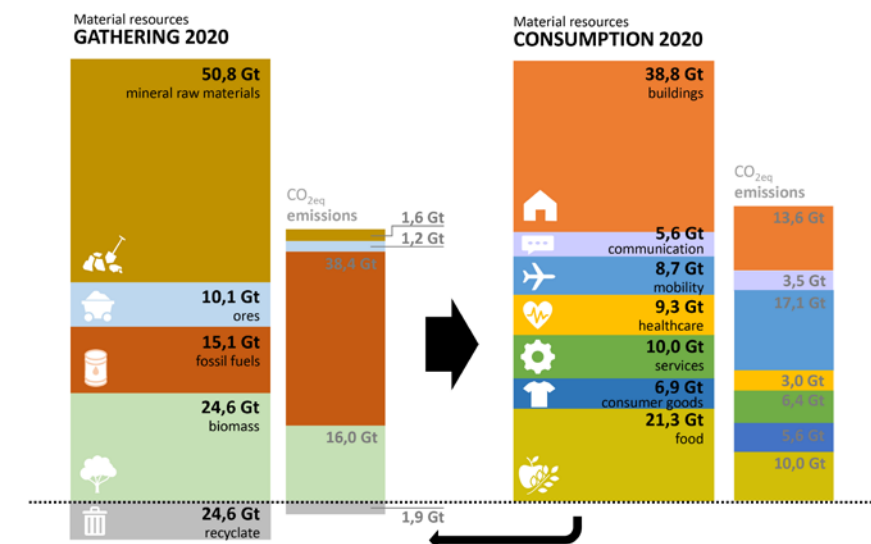
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See: Circle Economy; Wit de M., Haigh L.; The Circularity Gap Report 2022; 2022; page 9.

Trends in global primary raw material consumption between 1972 and 2050



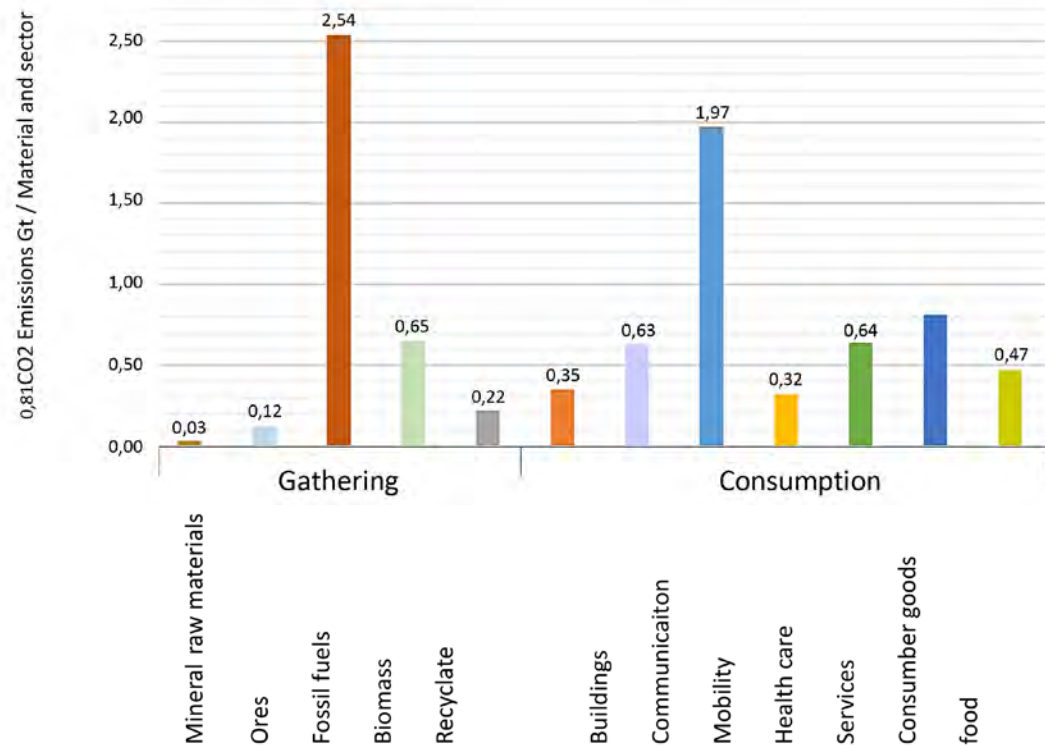
© Circularity Gap Report 2022, page 9

Supply and consumption of material resources with associated CO₂eq emissions in 2020



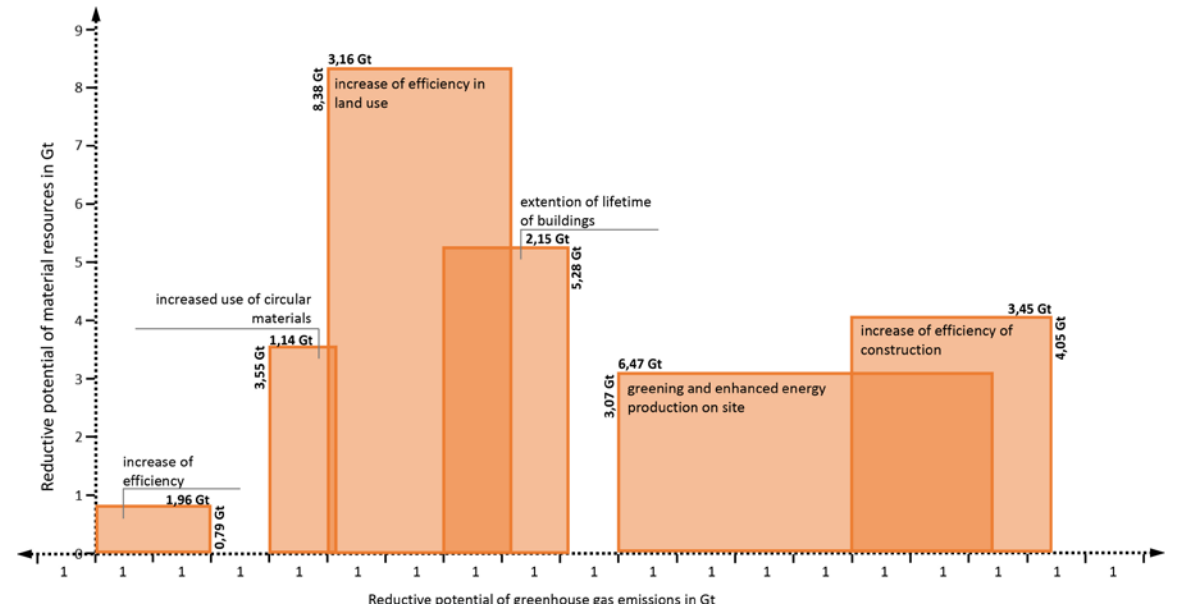
© IBR&I; source data: World Gap Report 2021

CO₂eq emissions per unit of material resources used in Gt/Gt



© IBR&I, source data: World Gap Report 2021

Effectiveness of different action strategies in the building sector in reducing the use of material resources and avoiding greenhouse gas emissions



© IBR&I, source data: World Gap Report 2021

In addition to this upward trend in the volume of primary raw material consumption, we can draw a distinction between the categories of material resources on the supply side and the sectors of use on the consumption side. In addition, the greenhouse gas emissions caused can also be allocated to the subsets reported in this way in the sense of a sustainable circular economy.^{11,12}

On the basis of this data, the contribution to climate change associated with the respective material resource application or consumption segment can be quantified and compared.

As the building consumption segment is responsible for the greatest use of material resources, it follows that this segment has the greatest potential for cutting back on the use of primary raw materials and achieving sweeping reductions in greenhouse gas emissions. The effectiveness of different action strategies relating to this has been estimated for the respective consumption segments. It is important to note, however, that the overall effect that might be expected cannot be determined simply by adding up all the potential savings; it will be significantly lower due to interrelated effects and areas of overlap. This is illustrated by the bar chart below, which shows how the areas of effectiveness overlap. The savings in material resources are indicated by the height of the bars and the reduction in greenhouse gas emissions by their width. Measures relating to the building consumption segment have been grouped into six action strategies. The period between 2021 and 2032 is considered here.^{13,14}

Increasing the efficiency of land use has proven to be a particularly effective strategy for reducing the use of material resources, followed by extending the life of the building. The action strategy for greening and increasing the building's

own energy production has the greatest leverage for avoiding greenhouse gas emissions. The action strategy for increasing efficiency in design has a clear impact both on reducing the use of material resources and on avoiding greenhouse gas emissions.

At the level of the United Nations, the concept of the circular economy is embedded within the global Sustainable Development Goals, which were adopted in 2015. Among the 17 goals, which are based on over 150 sub-goals, Goal 12 calls for the implementation of sustainable consumption and sustainable production patterns.¹⁵

¹¹ See: Circle Economy; Wit de M., Haigh L.; The Circularity Gap Report 2022; 2022; page 9.

¹² See: Circle Economy; Haigh L., Wit de M., Daniels von C., Collorichio A., Hoogzaad J.; The Circularity Gap Report 2021; 2021; page 23.

¹³ See: Circle Economy; Wit de M., Haigh L.; The Circularity Gap Report 2022; 2022; pages 30–33.

¹⁴ See: Circle Economy; Wit de M., Haigh L.; The Circularity Gap Report 2022; 2022; pages 30–33.

¹⁵ See: sdgs.un.org/goals

2.2 Action at EU and national level

2.2.1 EU – Circular Economy Action Plan

At European Union level, an action plan for the circular economy was first adopted by the Commission in 2015 with the aim of supporting European companies and consumers in the transition to a more circular economy in which resources are used more sustainably. Socio-economic aspects such as employment, local value creation, innovation, competitiveness and growth are all integral parts of this document.¹⁶

The second edition of the EU Circular Economy Action Plan – For a cleaner and more competitive Europe, was published by the EU Commission in 2020 as a central element of the European Green Deal. It lists the construction industry as one of seven product areas of key importance. The action plan is not legally binding, but is presented as a policy agenda.¹⁷

2.2.2 The EU circular economy package

As part of the circular economy package passed by the European Parliament in 2018, the EU action plan has been made binding in new legislation.¹⁸ This set out targets for eliminating and recycling municipal and packaging waste and outlined the gradual phase-out of landfilling practices. On the basis of the new EU Landfill Directive, for instance, the Member States are obliged to take measures to deal with waste and shift from landfill and incineration to avoidance, reuse and recycling.¹⁹ The circular economy package was updated in 2020 and 2022. Looking ahead, the European Commission is considering setting targets for preliminary work towards the re-use and recycling of construction and demolition waste and material-specific sub-areas by the end of 2024.

¹⁶ Closing the loop – An EU action plan for the Circular Economy; COM(2015) 614 final; 2015

¹⁷ A new Circular Economy Action Plan – For a cleaner and more competitive Europe; COM(2020) 98 final; 2020

¹⁸ ec.europa.eu/commission/presscorner/detail/de/IP_18_3846

¹⁹ Directive (EU) 2018/850 of the European Parliament and of the Council of 30 May 2018 amending Directive 1999/31/EC on the landfill of waste (text relevant for the EEA)

2.2.3 EU Taxonomy Regulation and the Non Financial Reporting Directive

The EU Taxonomy is legally binding and contains criteria for a total of six environmental goals, which can be used to determine whether an economic activity can be considered environmentally sustainable.²⁰ It assesses whether the economic activity makes a significant contribution towards achieving at least one environmental goal, and that it is not detrimental to the other goals in any significant way. As a tool, the EU Taxonomy enables participants in the financial market to declare the status of their products in terms of the Green Deal. The EU Green Bond, a previously introduced market standard, was integrated into the EU Taxonomy.

Criteria for the construction and real estate sector were formulated for environmental goal four – the transition to a circular economy. To avoid any significant adverse effects, the following must be observed for new construction and renovation work:

- At least 70% of (...) construction site waste must be recycled.
- The design of the building and the construction technology must support the circular economy. This means
 - increasing resource efficiency, adaptability, flexibility and ease of dismantling.
 - Reuse and recycling must be facilitated.
 - Relevant proof of these efforts must be collated in accordance with ISO 20887:2020.

At present, no specific requirements have been formulated for new construction, renovation or the acquisition and ownership of buildings. A corresponding delegated regulation can be expected from 1 January 2023 at the earliest.

In addition, since 2022, the Non-Financial Reporting Directive has required companies of a certain size and public interest to disclose what percentage of their investment products are taxonomy-compliant.²¹ In Vienna, for instance, this also applies to companies and enterprises based in the city, such as Wiener Wohnen or Wien Holding.

2.2.4 Circular Economy Monitoring Framework

In order to get an insight into trends and patterns in the transition to a more circular economy, the Commission adopted the Circular Economy Monitoring Framework in 2018.²² This is intended to identify success factors and indicate whether the measures being taken by the Member States are sufficient. It takes ten indicators into consideration, some of which are of particular relevance for the construction industry, such as the extent of self-sufficiency in relation to raw materials, the amount of waste, the proportion of recycled materials among the raw materials purchased, trade in recyclable raw materials, the recycling rate and the reutilisation of certain waste streams.

Based on the data from the Monitoring Framework, Eurostat has issued two evaluations relating to the circular economy: a Sankey diagram showing material flows in the European Union and a diagram showing the circular material utilisation rate as a proportion of the material recycled and returned to the economy. Austria comes out just below the European average.^{23, 24}

2.2.5 EU – Waste Framework Directive

Since 2008, the EU Waste Framework Directive has specified how waste is to be handled. It prescribes a five-step waste hierarchy – prevention, reuse, recycling, recovery and disposal – and introduces the concept of greater producer responsibility and the precautionary principle whereby the costs of waste management are to be borne by the original waste producer.²⁵

2.2.6 Construction Products Regulation

The Construction Products Regulation, which has been in force since 2013, provides a concrete basis under EU law for the implementation of the circular economy in the construction industry. It stipulates seven basic requirements for buildings, thus setting out uniform conditions for the marketing of building products within the European Union. Aspects of the circular economy are depicted in the seventh basic requirement for the sustainable use of natural resources. The text states that a building must be designed, erected and demolished in such a way that natural resources are used sustainably.

The structure must be long-lasting and recyclable after demolition, and the construction work must use environmentally compatible and secondary building materials.²⁶

20

Regulation (EU) 2020/852 of the European Parliament and of the Council of June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088

21

Directive 2014/95/EU – also known as the Non-Financial Reporting Directive (NFRD)

22

Circular Economy Monitoring Framework; COM(2018) 29 final; 2018

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See: ec.europa.eu/eurostat/statistics-explained/index.php?title=Circular_economy_-_material_flows

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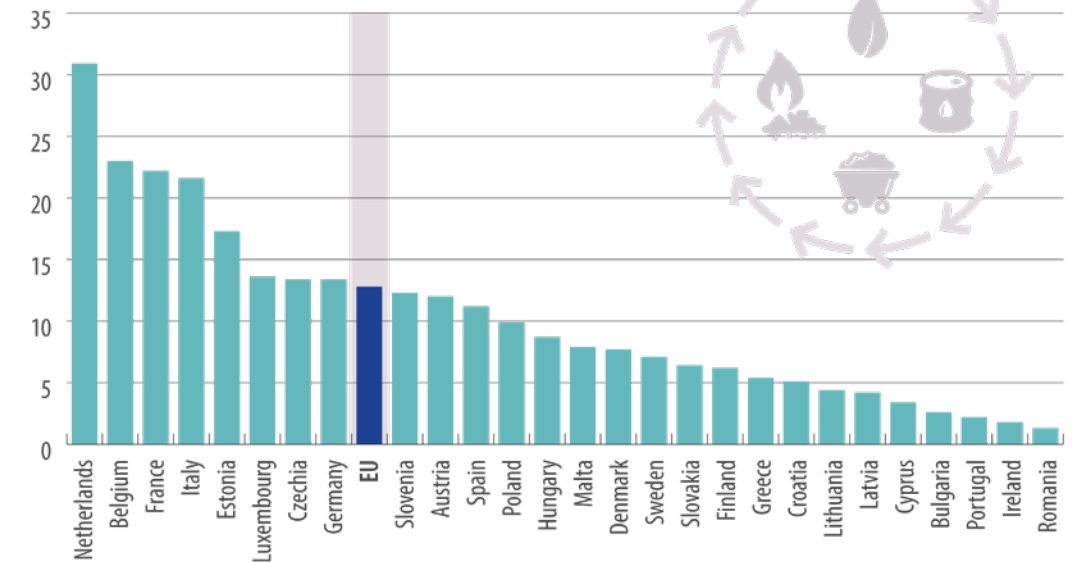
ec.europa.eu/eurostat/documents/4187653/11581532/Circular+material+flows.png

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Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives; 2008

Rate of circular usage of material in the EU Member States in 2020 (%)

Circular material use rate in the EU, 2020 (%)



© Eurostat

Basic requirements 1–6 were implemented in Austrian law by implementing the OIB Guidelines in building regulations. Basic requirement 7, which relates to the circular economy, has not yet been mapped in national legislation.

2.2.7 Digital Building Passport

Finally, it should also be pointed out that the European Commission is currently devising concepts for a Digital Building Passport that manages data, information and documents throughout the life cycle of a building. This can provide information to a wide variety of stakeholders as needed, especially in relation to the circular economy.²⁷

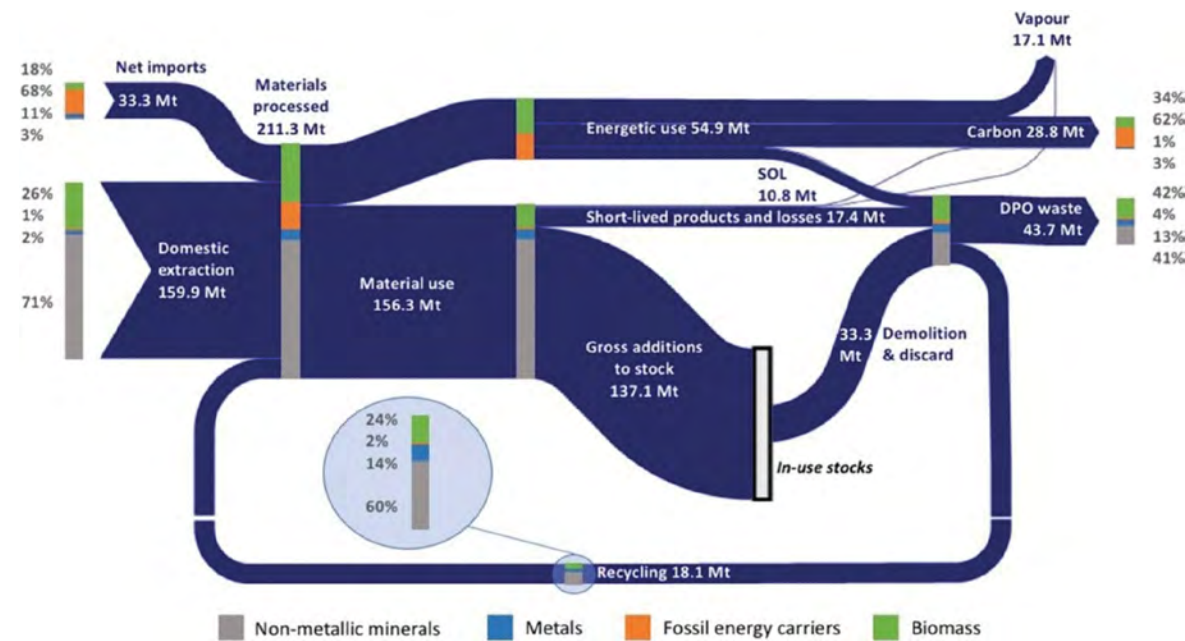
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Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC; 2011

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See: Europe's Digital Decade: Commission sets the course towards a digitally empowered Europe by 2030; ec.europa.eu/commission/presscorner/detail/en/IP_21_983

Material flow diagram showing aggregated flows in millions of tonnes annually in Austria in 2014



© Jacobi et al.

2.3 Federal level in Austria

A material flow diagram was modelled as part of a research project to monitor changes in material flows and stocks in the course of transition to a circular economy. This represents aggregated flows in million tonnes per year for a total Austrian population of 8.5 million people in 2014.²⁸ The bars at the sides show the material breakdown of the different flows. The diagram clearly shows that the low material flow of recycling, at 18 million tonnes, is in stark contrast to the two far greater input flows of net imports and extractions in Austria, which total 193 million tonnes.^{29, 30} The flow diagram thus shows a predominantly linear economic model.

2.3.1 National circular economy strategy

Up until now, the circular economy has been considered from the point of view of waste management in the Austrian construction sector. However, circular construction affects the entire life cycle, with demolition only a comparatively short phase that comes late in the overall process. The draft national circular economy strategy from 2021 takes this into account and sets comprehensive system boundaries for the construction industry.³¹ For example, the measures under discussion include the introduction of an Austria-wide permit requirement for the demolition of buildings, the tightening of waste law measures regarding landfill bans and recycling requirements, as well as a general expansion of the decision-making framework of the authorities, including environmental practicality.

Against a backdrop of the target to increase resource efficiency in the Austrian economy by 50% by 2030,³² it is clear that the construction and real estate industry needs to undergo a comparative reassessment of the alternatives to demolition and new construction, including renovation or conversion.

2.3.2 Waste Management Act and Federal Waste Management Plan

According to the Austrian Waste Management Act of 2002, which sets out the targets and principles for waste prevention, provisions for reuse, recycling, repurposing and waste disposal, a federal waste management plan must be drawn up at least every six years.^{33, 34} This should outline the situation, detail any implemented or planned measures, and describe the treatment principles and waste prevention programme. As an example, the category breakdown of the total amount of waste is shown below for 2019.³⁵

If you look at how things have changed since 2015, it is obvious that excavated materials, in particular, have increased from 32.77 million tonnes to 42.02 million tonnes in 2019 – a 28% rise. The generation of waste from construction increased by 15% between 2015 and 2019. A comparatively smaller increase can be seen in municipal waste from households and similar facilities, with an 8% increase. The diagram also shows how the accumulated waste was treated. In 2019, around 41% of waste was recycled, 7% percent was thermally recovered, 46% sent to landfill, and 6% treated in some other way.³⁶

2.3.3 Construction Materials Recycling Ordinance

In 2016, the Construction Materials Recycling Ordinance newly regulated the treatment of construction and demolition waste, the separation of waste on construction sites and the production and use of recyclable building materials. Material efficiency and the circular economy are to be promoted, especially by laying the groundwork for the reuse of components and ensuring that recyclable building materials are of high quality.³⁷

2.3.4 Landfill Ordinance

An amendment to the Landfill Ordinance was issued in 2016. The requirements of this will gradually come into force by 2026 as part of the implementation of the EU Circular Economy Package 2018. The aim is to create a circular economy in which waste that is suitable for recycling or other forms of use may no longer be dumped in landfill. For the construction sector, this will mean a landfill ban on key building material groups such as concrete, brick or mineral fibre products containing gypsum. From 2024 onwards, uncontaminated concrete rubble and road rubble may no longer be sent to landfill; it must be recycled instead.

2.3.5 Standards documents

The various standards according to the definition given in ÖV/ÖNORM EN 45020 are listed here. According to this definition, standards are documents that have been prepared with general consent and adopted by a recognised standardisation body.³⁸ The standards define the rules, guidelines or characteristics of activities or their results for general and repeated application. In and of themselves, standards are recommendations that can be applied voluntarily, but mandatory application can be contractually agreed. It is also possible for legislators to give standards the status of ordinances and thus declare them to be generally binding. A large number of standards in Austria deal aspects of the circular economy in the construction sector, either in a direct sense or in a broader context. As such, the instances mentioned here are merely by way of example.

ÖNORM EN 15978:2012 10 01:

Sustainability of construction works – Assessment of environmental performance of buildings – Calculation method

ÖNORM EN 17680: 2021 07 15:

Sustainability of construction works – Evaluation of the potential for sustainable refurbishment of buildings

ÖNORM EN 17666: 2021 07 15:

Maintenance – Maintenance engineering – Requirements

ÖNORM B 3151: 2022 05 15:

Dismantling of buildings as a standard method of demolition

ÖNORM B 2251:2020 09 01:

Demolition work – Contract to provide services

ÖNORM B 3140:2020 11 01:

Recycled aggregates for unbound and hydraulically bound applications as well as for concrete

28

MISO – A model of material stocks and flows in the global metabolic transition Monitoring progress towards a sustainable circular economy; aus: Jacobi N., Haas W., Wiedenhofer D., Mayer A.; Providing an economy-wide monitoring framework for the circular economy in Austria: Status quo and challenges; Resources Conservation and Recycling 137; 06/2018

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Revised based on www.ibo.at/meldungen/detail/data/circular-economy-jetzt#-&qid=lightbox-group&pid=0; source data: Jacobi N., Haas W., Wiedenhofer D., Mayer A.; Providing an economy-wide monitoring framework for the circular economy in Austria: Status quo and challenges; Resources Conservation and Recycling 137; 06/2018

30

Note: The atmospheric oxygen required for combustion processes is not taken into account.

31

Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation, and Technology (ed.); Die österreichische Kreislaufwirtschaft, Österreich auf dem Weg zu einer nachhaltigen und zirkulären Gesellschaft; draft: 2021;

32

Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation, and Technology (ed.); Die österreichische Kreislaufwirtschaft, Österreich auf dem Weg zu einer nachhaltigen und zirkulären Gesellschaft; draft: 2021; here: Chapter 4.1

33

Federal Waste Management Act (Abfallwirtschaftsgesetz 2002 – AWG 2002); 2002

34/35/36

Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (ed.); Die Bestandsaufnahme der Abfallwirtschaft in Österreich – 2021 status report, reference year 2019; overall implementation: Department V/3: Waste Management Planning, Waste Treatment and Remediation of Contaminated Sites; 2021

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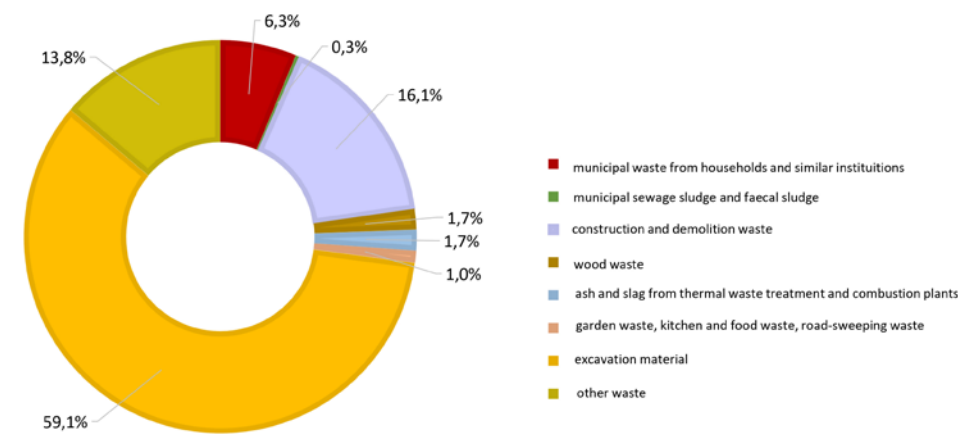
Ordinance of the Federal Minister for Agriculture, Forestry, Environment and Water Management on obligations during construction or demolition activities, the separation and treatment of waste generated during construction or demolition activities, the production and disposal of recyclable building materials (Construction Materials Recycling Ordinance – Recycling Baustoffverordnung, RBV); original version: Federal Law Gazette II No. 181/2015

38

See: ÖVE/ÖNORM EN 45020 Standardization and related activities – General terms and definitions (ISO/IEC Guide 2:2004) (multilingual version: de/en/fr); 01/02/2007

Breakdown of the total amount of waste in 2019 by waste category

total waste production 2019 in waste groups



© IBR&I Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie (Hrsg.): Die Bestandsaufnahme der Abfallwirtschaft in Österreich - Statusbericht 2021, Referenzjahr 2019; Gesamtumsetzung: Abteilung V/3: Abfallwirtschaftsplanung, Abfallbehandlung und Altlastensanierung, 2021

2.4 Municipal level – City of Vienna

If you contextualize the material flow diagram of Austria with the energy flow diagram for Vienna, it can be concluded that a linear economic system also prevails in the capital city. The energy flow diagram shows that in 2020, 4,018 GWh or around 10% of the city's gross consumption came from renewable sources. At 2,782 GWh, around 60% of this goes into energy conversion processes, while the remaining 40% or 1,236 GWh is used directly for final energy consumption.³⁹ These proportions have only fluctuated slightly over the last decade, without any clear trend in a different direction. Various instruments are being deployed and measures taken in the construction sector with a view to making progress in implementing the circular economy.

2.4.1 Governmental Agreement

The Vienna Governmental Agreement of 2020 stipulates that the principle of the circular economy should be reinforced. It specifies that material self-sufficiency is to be promoted and landfills kept to a minimum through reuse and recycling. One of the measures outlined is the introduction of a 'building passport' that records the materials and recyclables used. New tendering and contract-awarding approaches must be developed, with the aim of reducing CO₂ emissions by cutting down on truck journeys.⁴⁰

2.4.2 Vienna's Smart Climate City Strategy

The Smart City Vienna Framework Strategy has been in place since 2014. It is a long-term umbrella strategy that runs up to 2050. In 2020, the goal of climate neutrality by 2040 was enshrined in the Vienna Governmental Agreement. In 2022, the Framework Strategy was reviewed in terms of the climate targets, and was adjusted and re-presented as the Smart Climate City Strategy Vienna. Targets for resource conservation are anchored in the strategy, so as to promote the circular economy in the construction sector. After their service life, buildings should form important sources of raw materials ('urban mining'). From 2030, circular economy-based planning and construction will be standard in new construction and renovation to ensure maximum conservation of resources, while from 2040, the reusability of at least 70% of the materials used in major conversions and buildings slated for demolition must be guaranteed.

2.4.3 VIENNA 2030 – Economy & Innovation Strategy and the Digital Agenda Vienna 2025

The goal of conserving resources is anchored in the economic and innovation strategy adopted by the Vienna City Council in 2019, so that regulatory and qualitative standards are to be adopted with regard to life cycle and recycling-oriented planning and building.⁴¹

The Digital Agenda Vienna 2025 is a strategy for the digitalisation of all areas of life in the city in line with the Smart City goals.⁴² For example, in the context of the circular economy within the construction sector, digitalisation should facilitate sustainable procurement, the environmentally friendly use of raw materials, resource-saving operations and the effective use of sharing options. Since June 2019, for instance, it has

been possible to submit building applications online to the Vienna building authorities. This enables the ongoing digitalisation of construction processes and the introduction of a physical 'building passport' for recording the use of materials and recyclables.

2.4.4 The DoTank Circular City Vienna 2020–2030 transdisciplinary programme

The DoTank Circular City Vienna 2020–2030 sees itself as an interdepartmental hub for all things circular economy in the built environment. As a key project in the VIENNA 2030 Economy & Innovation Strategy, the transdisciplinary programme promotes the transformation of Vienna into a circular city. The core team consists of representatives of the municipal authorities and companies from the city of Vienna. The DoTank helps to raise awareness of the need for circular, regenerative construction, sets out operational principles for scaling and is in continuous exchange with national and international partners to exchange knowledge and build up expertise.

The Vienna Business Agency has supported the DoTank as a programme partner since the start of the project and is represented by one member of the core team. As a service centre for Viennese companies, the Vienna Business Agency primarily deals with socio-economic issues and connecting companies, research and administration.

2.5 Aspects of the circular economy in building certification systems

Building certification systems that largely use sustainability criteria for their assessments have now become established both globally and locally. Despite a fundamental orientation towards the specifications of the international standard ISO 15392:2008-05 Sustainable construction – general principles, the individual systems proceed differently. The US LEED rating system and the British BREEAM certification system are particularly prominent on an international level. In German-speaking countries, certification by the quality seal of the German Sustainable Building Council (DGNB) is often used, which in Austria is carried out by the Austrian Society for Sustainable Real Estate Management (ÖGNI). The 'klimaaktiv' building certificate issued by the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, and the TQB rating system, which is adopted by the Austrian Sustainable Building Council (ÖGNB), are particularly important in this country. The latter prescribes further criteria in addition to those in klimaaktiv. So far, criteria relating to the circular economy have not been given much consideration or are included in the various systems in a primarily descriptive way. Nevertheless, there is evidence that further steps are being taken to do justice to the growing importance of this approach. In 2018, for instance, circular economy bonuses were integrated into the DGNB certification system.

39

Energy flow diagram of the City of Vienna; ma20.23degrees.io/#/sankey/00

40

See Governmental agreement, Die Fortschrittskoalition für Wien; 2020; page 63, 80, 136. www.wien.gv.at/regierungsabkommen2020/files/Koalitionsabkommen_Master_FINAL.pdf

41

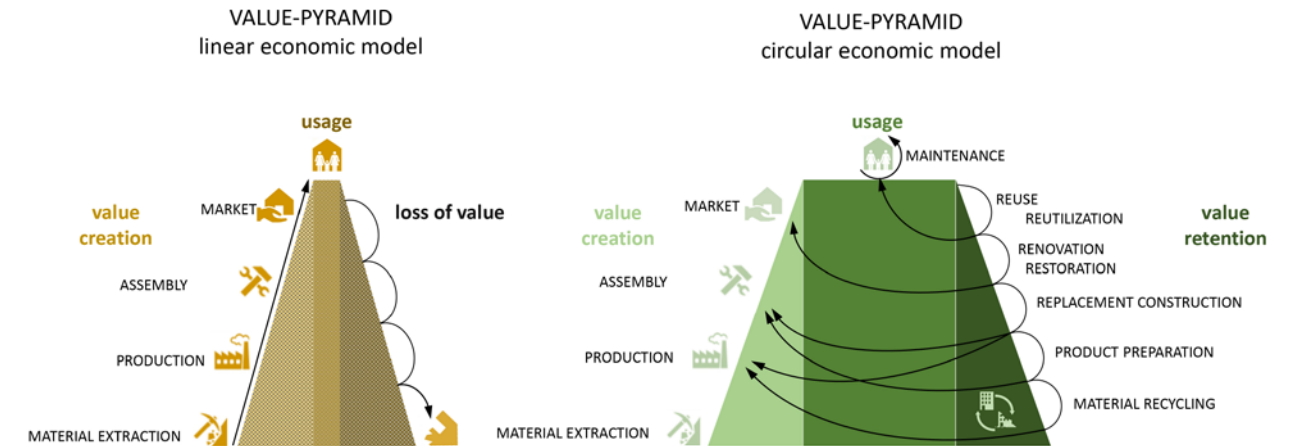
www.wien.gv.at/wirtschaft/standort/strategie.html

42

City of Vienna; Wirtschaft, Arbeit und Statistik – MA 23 (ed.); WIEN 2030, Wirtschaft & Innovation; 2019; page 13. digitales.wien.gv.at/digitale-agenda

3. Implementation of the circular economy

Value pyramids in different economic models



© IBR&I; source data: Achterberg

Conversion of the value pyramids into a table for circular economy-based business models

Making the transition from a linear to a circular economy means implementing complex and fundamental changes. In the light of this, it makes sense to propose a structure that companies can use to position themselves and use as a guide for taking specific steps. The value pyramid has proven to be particularly good at representing this structure.^{43,44} The contrast between the shapes of the value pyramids for a linear economic model and for the circular economy clearly illustrates the fundamental differences between the two systems and thus the extent and nature of the necessary transformation.⁴⁵

The circular economy value pyramid is broken down here in tabular form, along with business models, to show how measures can be implemented as part of specific projects.⁴⁶ In the following diagram, areas of activity relating to real estate, operations, buildings, components, building materials and cross-linking are entered into the rows, and the life-cycle phases of value creation, usage and value retention are entered into the columns.

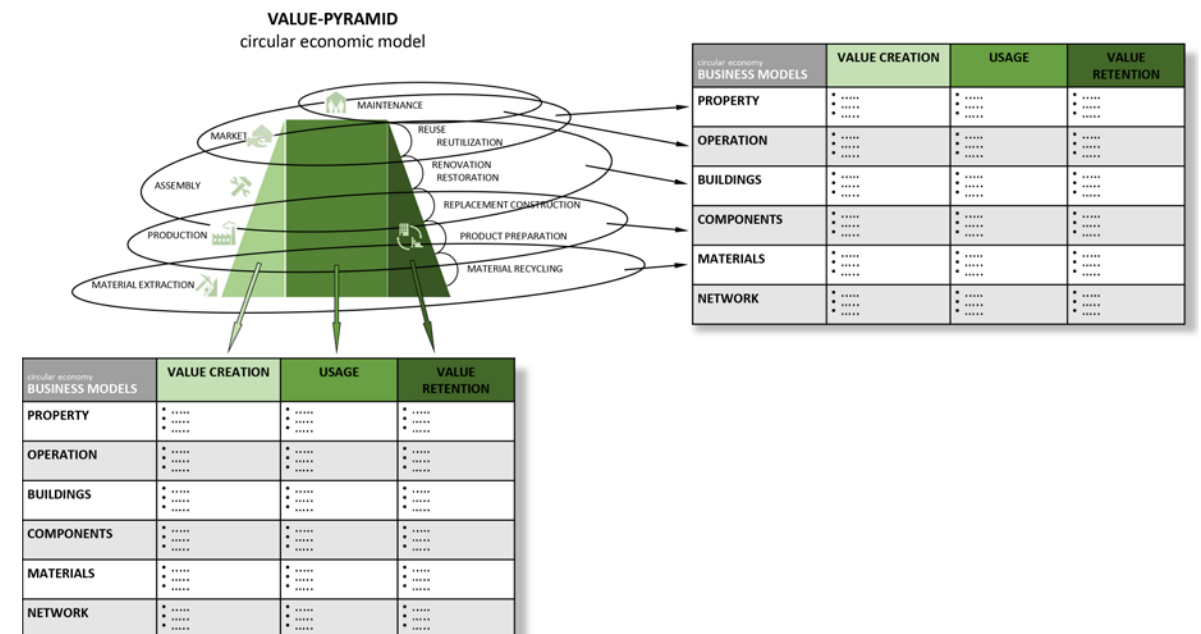
The following tables provide key examples of circular economy-based business models and business cases. While not claiming to be exhaustive, this is intended to give an idea of potential specific measures in different fields of action and provide inspiration for further developments.

43
Representation of Achterberg's 'value hill' adapted to the construction and real estate sector

44
Achterberg E., Hinfelaar J., Bocken N.; Master circular business with the Value Hill; 09/2016, hetgroenebrein.nl/wp-content/uploads/2017/08/finance-white-paper-20160923.pdf (last accessed on 20/01/2022)

45
Own representation of the Achterberg's value hill model adapted and specified in detail for the construction and real estate sector ©IBR&I

46
See Achterberg E., Hinfelaar J., Bocken N.; Master circular business with the Value Hill; 09/2016, hetgroenebrein.nl/wp-content/uploads/2017/08/finance-white-paper-20160923.pdf (last accessed on 20/01/2022)



© IBR&I; source data: Achterberg

3.1 Real estate

REAL ESTATE	VALUE CREATION	USAGE	VALUE RETENTION
	<ul style="list-style-type: none"> ● Optimising the portfolio ○ Identifying areas of wasteland and acquiring ... ○ or using ... ○ ... or dismantling ○ Identifying abandoned properties and putting them into use ○ Optimising the utilisation mix ○ through acquisition ... ○ or appropriate sale ○ Analysing property ownership ○ through contractual land use planning ... ○ or renaturation ... 	<ul style="list-style-type: none"> ● Optimising usage ○ Avoiding abandoned properties by orienting them towards needs ○ Making usage more flexible in a socially responsible way ● Maintaining and developing building stock ○ Creating reserve funds for upgrading ○ densifying areas if necessary ● Creating value by facilitating production within the plant ○ Energy generation ○ Horticultural use ○ Letting to start-ups 	<ul style="list-style-type: none"> ● Repurposing where appropriate ● Redimensioning where appropriate ● Dismantling where appropriate ● Constructing replacement buildings where appropriate

3.2 Building operations

OPERATION	VALUE CREATION	USAGE	VALUE RETENTION
	<ul style="list-style-type: none"> ● Commissioning monitors 	<ul style="list-style-type: none"> ● Planning in line with consumption ● Linking up the building and mobility sectors ● Optimise technical maintenance ● Maintain tree populations 	<ul style="list-style-type: none"> ● Offer optimised waste separation ● On-site recycling ○ Composting ○ Second hand systems ● if necessary, obtained from grid-related infrastructure

3.3 Construction – buildings

BUILDINGS	VALUE CREATION	USAGE	VALUE RETENTION
	<ul style="list-style-type: none"> ● Low-emission construction ● Holding soil in place ● Conserving existing trees 	<ul style="list-style-type: none"> ● Carrying out maintenance work ● Facilitating structural conversion ● Interconnecting sectors ○ Building/mobility ○ Building/heat ○ Building/electric power 	<ul style="list-style-type: none"> ● Unsealing sites ● Renaturation

3.4 Construction – components

COMPONENTS	VALUE CREATION	USAGE	VALUE RETENTION
	<ul style="list-style-type: none"> ● Optimising construction ○ Ensuring flexibility ○ Avoiding oversizing ○ Selecting functional materials ○ Ensuring maintenance, reparability, possibility of replacement ● Optimising building technology ○ Selecting systems for climate-neutral energy sources ○ Avoiding oversizing ○ Avoiding system duplication ○ Ensuring longevity ● Using real climate data sets ● Implementing BIM-based component records 	<ul style="list-style-type: none"> ● Maintaining components ● Optimising: <ul style="list-style-type: none"> ○ care ○ maintenance ○ repair ● Maintaining building technology components over the long term ● Designing in a way that is sufficient for consumption ● Keeping BIM-based component records up to date ● Maintaining tree populations 	<ul style="list-style-type: none"> ● Offering optimised waste separation ● On-site recycling ○ Composting ○ Second-hand systems ● Retaining grid-related infrastructure where appropriate

3.5 Construction – building materials and raw materials

CONSTRUCTION MATERIALS	VALUE CREATION	USAGE	VALUE RETENTION
NATURAL RESOURCES ENERGY SOURCES	<ul style="list-style-type: none"> ● Requiring as few new building materials as possible ○ through optimised design ... ○ choice of suitable materials ○ intelligent layouts ● Giving preference to building materials that ... ○ consist of upcycled materials ○ consist of recycled materials ○ are available locally ○ are sustainably produced using renewable energy ○ are produced in an energy-optimised way ○ are long-lasting ○ can be repaired ○ are fully recyclable ● Space-saving construction ● Adequate pricing 	<ul style="list-style-type: none"> ● Generating of energy at the building ● Generating energy on the property ● Utilising waste heat ● Generating energy in ongoing operation ○ Horticultural use ○ Urea production 	<ul style="list-style-type: none"> ● Separating materials by type ● Separating pollutants and disposing of them correctly

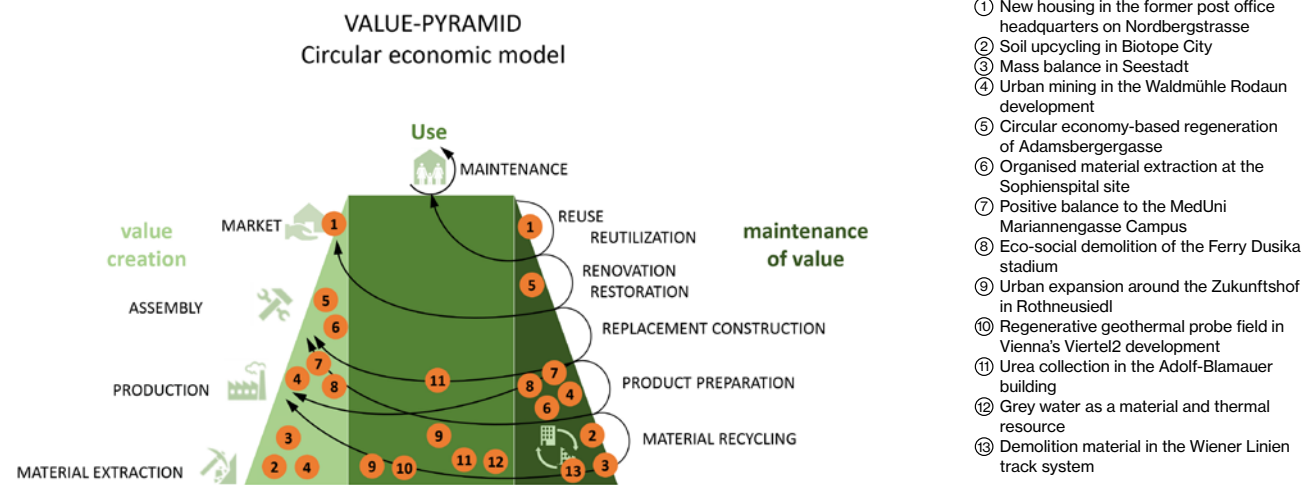
3.6 Network

NETWORK	VALUE CREATION	USAGE	VALUE RETENTION
	<ul style="list-style-type: none"> ● Integrated planning ○ Assessing long-term needs or 'do-not-needs' ○ Acknowledging third-party needs (community) ○ Planning according to needs ● Incorporating spatial planning ○ Internal development and densification before new development ○ Considering energy space planning ○ Making use of transport planning (local public transport development, ...) ● Making use of material 	<ul style="list-style-type: none"> ● Reinforcing mobility networks ○ Carsharing ○ Organising shared rides ● Integrating into local energy production systems ○ Energy collectives ○ Energy networks, etc. ● Organising services ○ Building technology ○ Repair ● Implementing or using vacant property management services 	<ul style="list-style-type: none"> ● Collaborating with material exchanges ○ Keeping BIM-based component records up to date ○ Reporting conservation projects in good time

In the following chapter, selected projects are presented that illustrate the exemplary implementation of recycling management in Vienna's construction activities. The characteristic approaches in the examples are located in the value pyramid, whereby multiple entries are possible.

Location of the selected Viennese projects in the value pyramid*

*Multiple mentions are possible



Althanpark residential development; © HD Architekten ZT GmbH



① Reviving vacancies through conversion – residences in the former post office headquarters at Nordbergstrasse 15

used and the lifespan of the building has been significantly extended.

Key players
6B47 Real Estate Investors AG; HD architects

Sources
6b47.com/de/projekte/althan-park/;
hd-architekten.at/projekte/althanpark

A building originally erected in 1986 as the post office headquarters in Vienna's 9th district had fallen derelict and accordingly represented a large, vacant office space in the middle of a dense, well-developed district. In the course of a comprehensive renovation, 237 new apartments were integrated into the existing building fabric by 2018. The supporting structure and the structurally essential parts of the building shell were largely retained, including the star-shaped, four-winged floor plan. A lightweight construction was added on top to give the building a total of 21,870 m² of usable space. Through meticulous architectural planning, apartment types of various sizes and layouts were fitted into the existing building outline. Open spaces were enhanced in line with the change in use, so that each apartment now has a balcony, a recessed loggia or a garden terrace. A fitness room, bicycle parking areas, children's playroom and a day nursery were created in the common areas, while shops and restaurants were set up on the ground floor. The parking spaces on the lower ground floor are now available to residents. Due to the change of use, extensive material resources, especially the existing reinforced concrete structure, could continue to be



Open spaces rich in species diversity at Biotope City in Wienerberg © Knollconsult | Heinz Wind

② Preserving the essentials – soil upcycling in Biotope City

Special soil protection and resource conservation measures were implemented during the construction of Biotope City on the site of a former Coca Cola plant by recirculating the excavated soil, in line with the 'circular soil' concept devised as part of an accompanying research project. Soil accumulated during the excavation of the construction site was temporarily stored and used as an organic component in the mixing and preparation of substrates for planting. This significantly reduced the need to purchase industrially manufactured substrates, leading to lower raw material consumption and cost savings. The excavated material is also being used for construction purposes. This reduces the amount of material that needs to be disposed of and eliminates the issue of pollutants and noise emissions during transportation from the site. Experts have shown that local resources can be quantified with sufficient accuracy, so that it is possible to obtain the information necessary for the use of the excavated soil from the comparison of waste law and geotechnical reports. A correspondingly timely commissioning of the data collection proves to be particularly important.

Key player

Forschungskonsortium Biotope City – Bauanleitung für die grüne Stadt der Zukunft (Biotope City Research Consortium – building guidance for green cities of the future)

Sources

Biotope City is smart, FINAL REPORT FOR PUBLICATION: www.iba-wien.at/fileadmin/user_upload/documents/003_IBA_Projekte_u_Gebiete/02_Quartiere/Biotope_City/Publizierbarer_Endbericht_Biotope_City.pdf; boku.ac.at/fileadmin/data/H03000/H85000/H85400/Projekte/BCB/Biotope_City_Bauanleitung_Heft_2.pdf



Gravel from the excavation of the lakeside area is used for in-situ concrete production © Christian Fürther | MA 18

③ Using raw materials on site – earthwork balancing in Seestadt

The use of local raw materials is a key point of leverage for the circular economy. The principle of mass balancing was comprehensively implemented in the construction of the residential quarter in Seestadt Aspern Süd. Almost the entire quantity of excavated earth, amounting to around 1 million tonnes of material from the company's own construction work could be used and recycled on site. The specially built in-situ concrete plant processed the gravel from the lake excavation and the excavation pits. The civil engineering team used local sand gravel from advance excavations for road embankments, frost walls and paved areas. This material extraction also shortens the construction time of a residential building. A track was specially laid in the new construction logistics centre for cement delivery by rail. Thanks to this environmentally friendly construction process, the construction of the residential buildings saved over 100,000 journeys by heavy lorries. All measures could be implemented through contractual agreements between the 20 applicants with cross-site tenders and orders for construction work.

Key players

Wien 3420 Aspern Development AG; architecture office Romm – research, plan, build

Source

www.romm.at/projekte/forschen/detail/seestadt-aspern



Construction of the Waldmühle Rodaun housing development © Ailura, upload.wikimedia.org/wikipedia/commons/9/90/20150705_Wohnanlage_Waldmühle_Rodaun_133035127.jpg

④ Putting built structures back into circulation – urban mining in the Waldmühle Rodaun

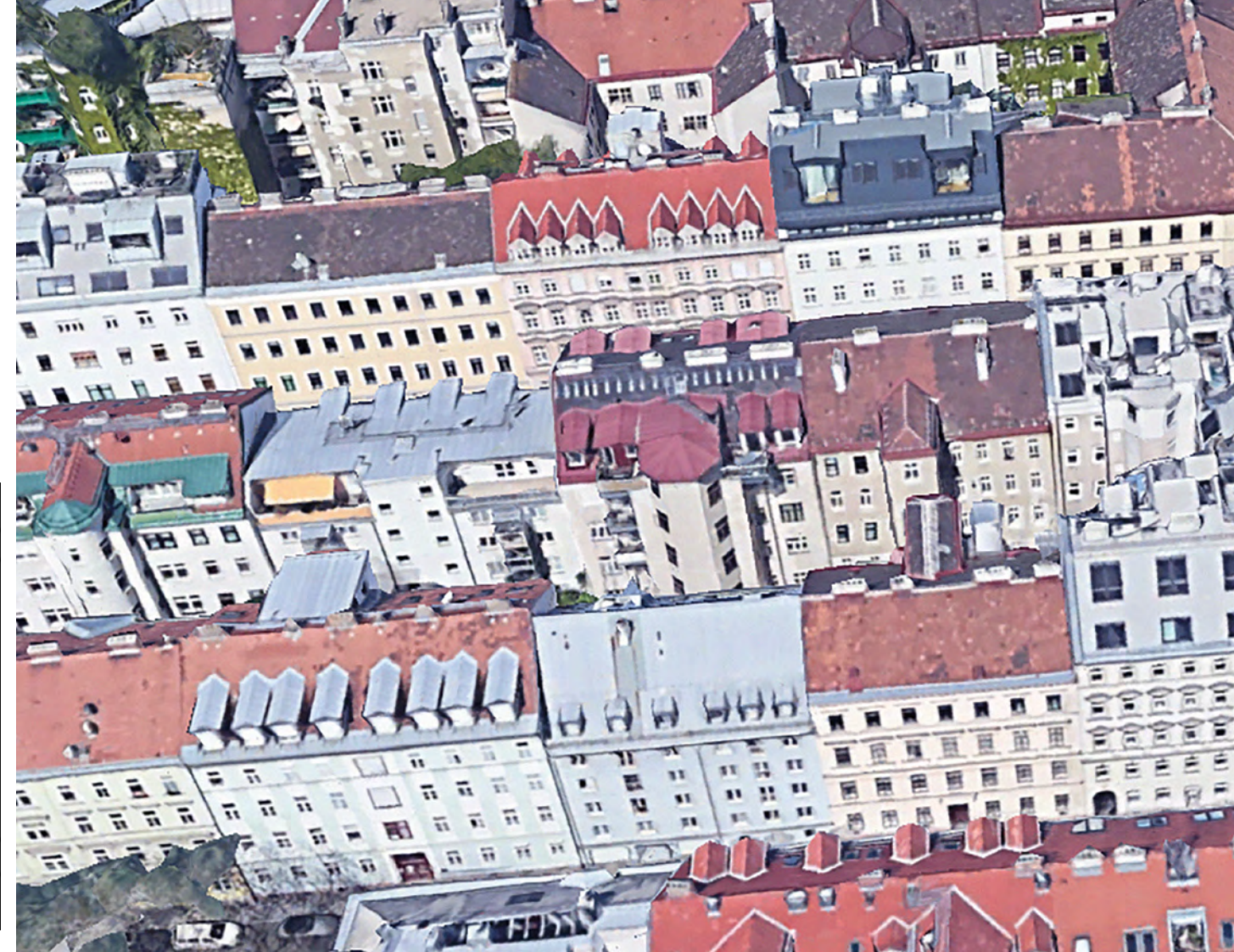
The Waldmühle residential complex with 450 apartments on the site of a former cement works on Kaltenleutgebner Strasse in Vienna's 23rd district was handed over in 2016. Existing resources from the former factory premises and the industrial buildings located on site, which had been vacant since 1995, were mainly used for the residential project with a total usable area of 46,000m². Specific methods of material recovery were deployed here. Modern crushing systems were used to process 200,000 tonnes of concrete for use as recyclable building material. For this purpose, the material was analysed to ensure that the concrete would be of sufficient quality for use in road construction or building construction. Extensive reuse helped to minimise traffic congestion and reduce transportation costs. In the specific case of the Waldmühle, it was possible to reduce costs for the production of the base layer in accordance with the guidelines and regulations for the road system for the 6,400 square meters of outdoor facilities to 25 euros/m². This alone saved around €160,000 in total. Avoiding the need to remove 180,000 tonnes of used material resulted in cost savings of around €1 million.

Key players

Waldmühle Rodaun Betreuungsgesellschaft mbH, supported by four non-profit housing developers: Wohnbauvereinigung für Privatangestellte Gemeinnützige GesmbH – WBV-GPA; Österreichisches Siedlungswerk Gemeinnützige Wohnungsaktiengesellschaft; Gemeinnützige Bau- u. Wohnungsgenossenschaft „Wien-Süd“ eingetragene Genossenschaft m.b.H. and Familienwohnbau gemeinnützige Bau- und Siedlungsgesellschaft m.b.H.; architecture office Romm – research, plan, build

Source

urbanmining.at/aus-zementwerk-werden-neue-wohnungen-waldmuehle-rodaun/6674; www.romm.at/en/projects/build/detail/waldmuehle-rodaun



A typical Viennese block perimeter development between Adamsberggasse and Miesbachgasse © earth.google.com/web/search/Adamsberggasse

⑤ Upcycling existing buildings – circular economy-based regeneration of a building on Adamsberggasse/ Miesbachgasse

Two houses in a perimeter block development between Adamsberggasse and Miesbachgasse in Vienna's 2nd district are prime examples of the many residential buildings that are to be renovated under the aggravating conditions of largely vertical use. In this respect, worthy of note are the efforts of the Austrian Settlement Agency (Österreichisches Siedlungswerk) to develop and as far as possible apply circular economy-based guidelines for precisely this type of project involving the renovation of these residential buildings occupied by tenants. The construction measures planned under these specifications should not only improve the residents' living environment, but should also be communicated and understood as a contribution to the conservation of resources. The aim was to come up with an innovative social process to identify and develop procedures to achieve widespread acceptance for extensive circular economy-based renovations of inhabited buildings. Österreichisches Siedlungswerk uses the co-creation lab method, which is a modified workshop format devised by the Vienna Business Agency.

Key player

Österreichisches Siedlungswerk

Source

www.oesw.at/presse/presseaussendungen/news/detail/News/die-oesw-ag-der-groesste-gemeinnuetzige-wohnbaukonzern-feiert-sein-70-jaehriges-bestehen.html



The Sophienspital site development by 2024 © SCHREINERKASTLER

⑥ Keeping building materials within the cycle for social purposes – organised material extraction on the Sophienspital site

Key players

Sozialbau AG; Wohnbauvereinigung für Privatangestellte Gemeinnützige GesmbH – WBV-GPA; BauKarussell, comprising the partners pulswerk ltd., architecture office Romm – research, plan, build and RepaNet – Re-Use- and repair network Austria

Source

www.baukarussell.at/social-urban-miner-ausbildung-boost-er-fuer-beschaeftigung-und-kreislaufwirtschaft-am-bau

By the end of 2024, a diverse urban district with 180 subsidised apartments, including 21 council apartments, and a wide range of educational, work and cultural facilities will be created on the site of a former hospital, the Sophienspital. A high level of commitment to sustainability through a circular approach was a prerequisite in the multi-stage open competition process for overall project, comprising renovation and new construction. For that reason, the project management agency Bauträger Sozialbau AG and the housing associated Wohnbauvereinigung für Privatangestellte Gemeinnützige GesmbH – WBV-GPA appointed BauKarussell to implement its 'social urban mining' concept. The historic Europa and Kenyon city pavilions were repurposed in line with the circular economy approach, together with the removal of pollutants. The complex, labour-intensive removal of high-quality materials such as tiles, wooden parts and non-ferrous metals for reuse allows socially beneficial employment models to be implemented. Job seekers who have been disadvantaged in the labour market can find work on circular economy-related demolition projects.

Separated material and component removal at the former Vienna Energy Centre © Harald A. Jahn



⑦ Social urban mining documented – from the Vienna Energy Centre to the Medical University of Vienna's Mariannengasse Campus

Covid-19-related price fluctuations in the raw material markets, the social urban mining carried out by BauKarussell on behalf of the Bundesimmobiliengesellschaft in conjunction with partner companies Demontage- und Recycling-Zentrum DRZ and Die KÜMMEREI, culminated in a positive financial result.

Key players

Bundesimmobiliengesellschaft m.b.H.; Medical University of Vienna; BauKarussell with DRZ – Demontage- und Recycling-Zentrum der Wiener Volkshochschulen GmbH and DIE KÜMMEREI – Job-TransFair gemeinnützige GmbH

Source

www.big.at/projekte/meduni-campus-mariannengasse; www.baukarussell.at/meduni-campus-mariannengasse-wien

Extensive social urban mining was carried out on existing buildings before the Medical University of Vienna and the Bundesimmobiliengesellschaft, a quasi-governmental company managing publicly owned real estate in Austria, began construction work on the new MedUni Mariannengasse Campus. The new campus will provide 35,000m² of usable space on the site of the former Vienna Energy Centre in the city's 9th district. Besides conserving resources and reducing CO₂ emissions, there was a focus on the social aspect of employment as a key dimension of the circular economy.

The clear documentation of the project makes it possible to analyse various aspects of the work and devise an economic balance sheet. Some 81,170 kg of the 140,000 kg of materials removed, including non-ferrous metals, wooden components and glass ceilings, were recovered by 20 labourers who had previously been among the long-term unemployed. Over the course of ten months, they put 5,000 socioeconomic working hours ensuring the skilled extraction and clean separation of materials for the removal of pollutants or further use. Despite



Demolition of the Ferry Dusika stadium © Jakob Gramm/MA 51-Sport Wien

⑧ Generating multiple benefits – eco-social demolition of the Ferry Dusika stadium

A new arena with several multipurpose areas is set to replace the Ferry Dusika Stadium, built in 1977 in Vienna's Leopoldstadt district. The project is being implemented by the construction project management team at WSE Wiener Standortentwicklung, a Wien Holding company, on behalf the Department for Sport at Vienna City Council (MA 51 – Sport Wien). BauKarussell and its partners are ensuring that the old sports facilities are demolished in an environmentally and socially sustainable manner. In around 3,300 hours, 80,000kg of material was removed, around a quarter of which was reused for components. Fittings such as the 5,500 seats for spectators, were also removed from the building before the demolition and sold to buyers.

Key players

The Building Project Management team at WSE Wiener Standortentwicklung; BauKarussell, comprising the partners: pulswerk ltd., architecture office Romm – research, plan, build and RepaNet – Re-Use- and repair network Austria

Source

www.baukarussell.at/ferry-dusika-stadion-wien



Zukunfts Hof Rothneusiedl: a nucleus of urban farming © Andreas Gugumuck, Zukunfts Hof

⑨ Managing resources – urban expansion around the Zukunfts Hof in Rothneusiedl

The Zukunfts Hof cooperative emerged from an informal interest group that held a two-stage ideas competition in 2019 for the repurposing of the former Haschahof on Rosiwahlgasse in Vienna's 10th district. Since then, it has been exploring the potential for the Zukunfts Hof to become the nucleus of a sustainable energy and resource cycle-based system within Vienna's Rothneusiedl urban development area. As part of a research project, possible input and output flows have been extensively analysed with the aim of establishing material cycles and implementing innovative urban farming. The multi-criteria optimisation and evaluation models that enable assessments of environmental and energy indicators and take the prevailing economic conditions into account. The aim is to implement a local circular economy based on the resource flows of biomass, nutrients, food and water, as well as the energy flows of heat, cold and electricity. Any conflicting goals that arise are discussed with the stakeholders as part of planning and coordination processes.

Key players

Eingetragenen Genossenschaft Zukunfts Hof; Austrian Institute of Technology GmbH AIT; University of Natural Resources and Life Sciences, institute of Spatial Planning, Environmental Planning and Land Rearrangement (BOKU-IRUB); alchemia-nova research & innovation gemeinnützige GmbH

Sources

projekte.ffg.at/projekt/4123875;
www.zukunfts.hof.at/ueber-den-zukunfts.hof



Generating green energy, storing it counter-cyclically and distributing it intelligently in the Viertel2 development © Value One / Office Le Nomade

⑩ Providing energy in a circular system – Vienna’s largest renewable geothermal probe field in the Viertel2 development

A coupled heating and cooling system was set up to supply energy to planning areas 1 and 2 in the Viertel2 development, which feature mixed use comprising offices, apartments, student lodgings, a fitness studio and a hotel. The system is supplied by various green energy sources, first and foremost renewable geothermal probes, as well as groundwater wells, air-glycol heat exchangers, sprinkler tanks and waste water heat exchangers. This provides sustainable technology that uses green energy on site in a circular approach, with the heat storage capacity of the ground on site used counter-cyclically to the seasons of the year. Around 124,000 m² of gross floor area can be supplied with heating and cooling with the help of what is currently the largest energy network in Austria.

Key players

BCE Beyond Carbon Energy Holding GmbH; engineering firm P. Jung GmbH, Vienna branch

Source

klimaaktiv Evaluierung Example: Viertel2, www.beyondcarbon.energy/projekte/?tx_bauconsult_projekte%5Bprojekt%5D=220&cHash=f7186c46cd5a4f6c555aff56abc7052c

Obtaining plant fertiliser from waste water: a model of on-site raw material recovery © MAK | Georg Mayer | EOOS NEXT



⑪ Recovering raw materials during operation – urea collection in the Adolf Blamauergasse building

In a pilot project, the urine produced by the residents of a building in Vienna’s 3rd district is being used to produce fertiliser that is then deployed in the building’s greening system. This is the first time that such a scheme has been implemented in Austria. This type of green/blue infrastructure can be promoted in a targeted way to make residential areas more climate-resilient. However, plants in urban locations still need to receive an adequate supply of water and nutrients or fertilisers. Human urine contains the valuable raw material phosphorus, which is produced on site and can be used right there. The save! urine separation toilet separates out the various waste water streams, allowing urine to be upcycled in a sustainable closed loop model. The long-term goal is to take the pressure off sewage treatment plants in the cities of tomorrow, reduce CO₂ emissions by eliminating the need for transport, and process the collected wastewater more efficiently on site into valuable raw materials.

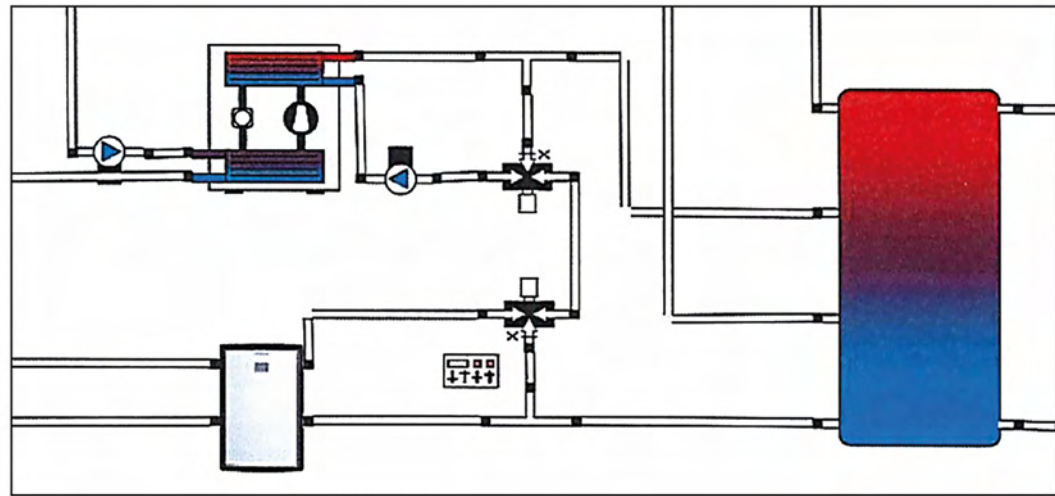
Key players

ARWAG Bauträger GmbH; EOOS NEXT GmbH; Laufen Austria AG; Institute of Building Research & Innovation ZT GmbH – IBF&I; GRÜNSTATTTGRAU Forschungs- und Innovations GmbH GSG

Source

projekte.ffg.at/projekt/4227295

Development of a system diagram for the thermal and material use of grey water



© Institute of Building Research & Innovation ZT GmbH

12 Combining potential for reuse – grey water as a material and thermal resource

Material and thermal grey water utilisation processes can be combined to irrigate building and façade greening systems and reduce energy consumption in heating water. This represents an innovative synergistic coupling of energy optimisation, microclimate improvements and circular resource use on site. While energy consumption for heating water supply now has the greatest potential for increasing efficiency in the building sector, the greening of buildings used to improve the urban microclimate can also lead to bottlenecks due to the water required for irrigation, especially during dry periods. This makes it all the more important to integrate water into cycles as extensively as possible. A pilot system developed and set up in Vienna harnesses the thermal and material potentials of grey water as a resource and combines them into a profitable overall solution. The prototype of the grey water recycling system is manufactured, adjusted and tested here. The findings will contribute towards the dissemination of domestic technology expertise and product solutions in future markets for building greening, energy efficiency and the circular economy.

Key players

Institute of Building Research & Innovation ZT GmbH;
OeAD-Wohnraumverwaltungs GmbH; Schöberl & Pöll GmbH;
University of Natural Resources and Life Sciences,
Institute of Sanitary Engineering and Water Pollution control
(BOKU-SIG)

Source

nachhaltigwirtschaften.at/de/sdz/projekte/green-water-recycling.php



Wiener Linien tram tracks © Manfred Helmer

13 Getting recycling on track – demolition material in the Wiener Linien track system

Public transport company Wiener Linien estimates that around 4.6 million tonnes of additional material resources will be needed by 2035. A number of strategic measures are being taken in the light of this prediction, including the use of climate-neutral, recycling-based steel from local sources and implementing recycling-based and carbon-neutral construction sites when renewing tram tracks. Tram tracks require around 1.3 m³ concrete per linear metre of double track. Given this outlay, alternative set-ups are being developed for new recycled concrete that is resistant to frost and de-icing salts, together with low-CO₂ cement binding. The recycled concrete is to be produced in the local region, ideally within the city limits of Vienna.

Key players

Wiener Linien; Bautechnikum Camillo Sitte; MA 39 Prüfung von Beton und Betonerzeugnissen – Bautechniklabor; Ressourcen Management Agentur GmbH

Sources

zukunftfindetstadt.blog/tag/recycling/;
www.wienerlinien.at/netz-modernisierung

The objective of the Vienna Business Agency is the continuous development of international competitiveness by supporting both Vienna-based companies and their innovative strengths, and the sustainable modernization of the city as a business location. To achieve this, the Agency provides free consultations to all entrepreneurs in Vienna on the topics of business creation, business location or expansion, business support and financing. Furthermore, networking contacts in the Viennese economy are also made available.

The Vienna Business Agency supports and helps businesses complete their research and development projects with both individual consulting and monetary funding. Depending on requirements, they will receive information about sponsorships, financing opportunities, possible development partners, research service providers, or research infrastructure, according to their needs.

The Vienna Business Agency sees itself as a network of the Viennese Green Tech & Social Tech industry and supports businesses with consultations, as well with distribution and networking among themselves. Events and workshops on topics from the sustainability sector are held regularly.

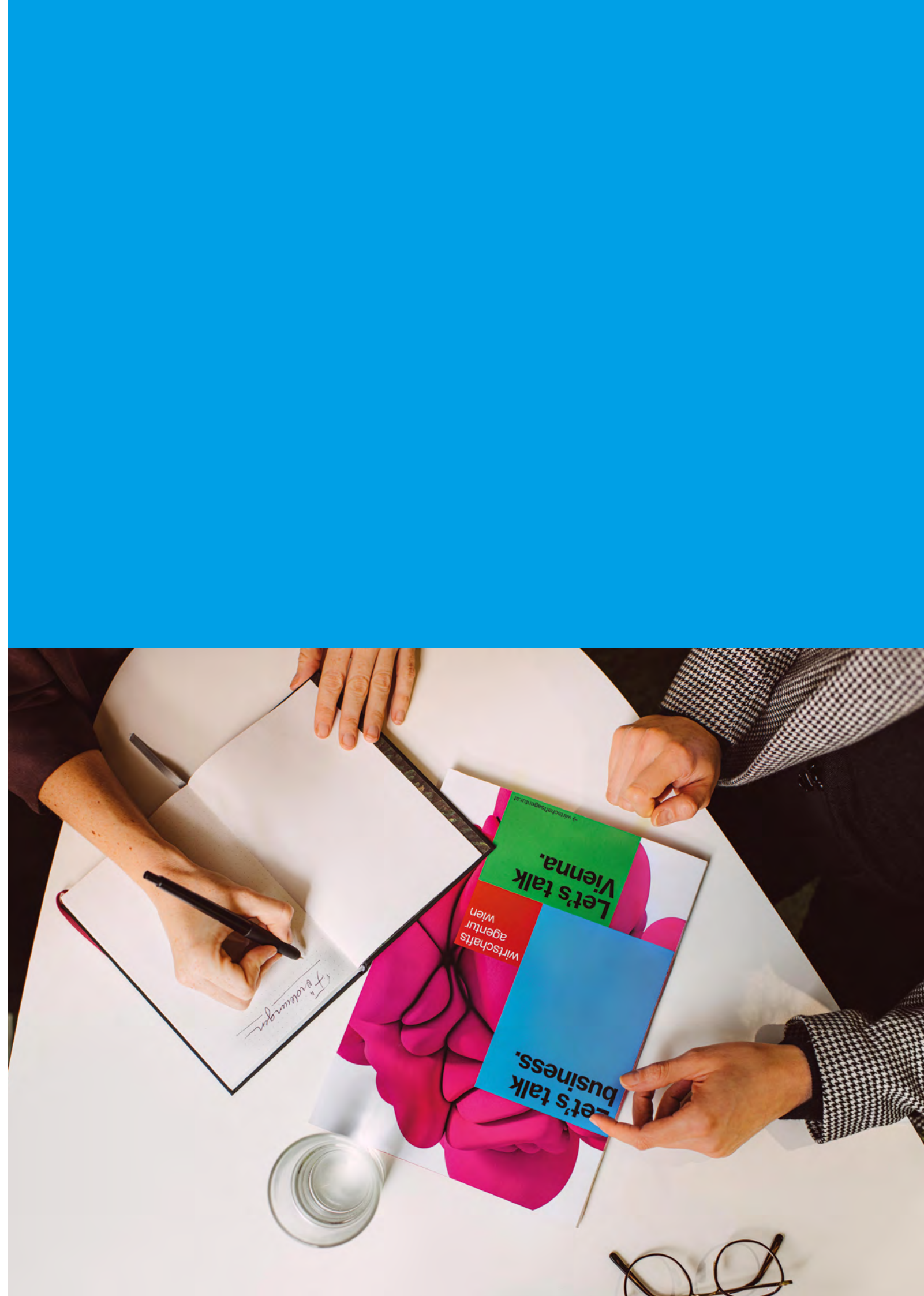
Additionally, the Vienna Business Agency helps with company relocations or internationalization services. Assistance is provided to business founders and young entrepreneurs in the start-up area. Free workshops and training sessions on topics of everyday business are offered as well as small, affordable office spaces.

Founders Labs⁴⁷ support aspiring entrepreneurs and founders with a two-month, part-time program to help them get started.

All funding programs of the Vienna Business Agency can be found here: viennabusinessagency.at/funding/programs

47

viennabusinessagency.at/startup-and-grow/lets-talk-founding-1/founders-labs





We provide with the alphabetical listing⁴⁸ on the following pages an overview of selected companies and players from Vienna that offer services in the field of recyclable construction.

Companies in the field of circular construction

COMPANIES	DESCRIPTION	WEBSITE
ARE – AUSTRIAN REAL ESTATE GMBH	Implementation of urban mining and social urban mining concepts in residential construction projects	www.aren.at
6B47 – REAL ESTATE INVESTORS AG	Real estate developers with comprehensive project experience in conversions	6b47.com
AIT – AUSTRIAN INSTITUTE OF TECHNOLOGY GMBH	Objective qualitative and quantitative analysis and development of environmentally friendly, competitive circular pathways	www.ait.ac.at/loesungen/kreislaufwirtschaft
ALCHEMIA-NOVA – RESEARCH & INNOVATION GEMEINNÜTZIGE GMBH	Process and project management for implementing a circular economy	www.alchemia-nova.net/de/legal-notice
ALLPLAN GMBH	Planning and consulting on sustainable building technology for renovations; waste heat recovery	www.allplan.at
ARCHITEKTURBÜRO ROMM – FORSCHEN PLANEN BAUEN	Development of value-added concepts for future-oriented alternatives in construction; decontamination	www.romm.at
ARWAG BAUTRÄGER GMBH UND HOLDING AG	Project-based experience with circular economy capability in operation through material and thermal wastewater use	www.arwag.at
ATP – SUSTAIN GMBH	Sustainability-oriented integral planning and certification	www.atp-sustain.ag
ATTENSAM – HAUSBETREUUNG ATTENSAM GMBH	Ongoing support, maintenance and standard-compliant control of building services systems	www.attensam.at/service/haustechnik-wartung

48

This list is not intended to be exhaustive.

COMPANIES	DESCRIPTION	WEBSITE
BAUKARUSSELL	Social urban mining as a concept for circular economy-oriented demolition with social added value and a special focus on reusing components from large properties	www.baukarussell.at
BCE BEYOND CARBON ENERGY HOLDING GMBH	Construction and operation of energy networks with regeneraative geothermal probe fields	www.beyondcarbon.energy
BUNDES-IMMOBILIENGESELLSCHAFT M.B.H	Implementation of urban mining and social urban mining in projects in the non-residential sector	www.big.at
CARITAS SÖB – CARITAS DER ERZ-DIÖZESE WIEN	Employment project for people far from the labour market, for example in removing pollutants from buildings	www.caritas-wien.at/hilfe-an-gebote/arbeit-beschaeftigung/beschaefigungsprojekte/caritas-soeb
CON.SENS VERKEHRSPPLANUNG ZT GEMBH	Mobility planning through workshops with citizens	www.cvp.at/stadtquartier-muthgasse
DELTA – GREEN LINE	Sustainability-focused building optimisation	www.delta.at/green-line/architektur
DIE KÜMMEREI – JOB-TRANSFAIR GEMEINNÜTZIGE GMBH	Support for sustainable (re-)entry into professional life through on-the-job training	www.die-kuemmerei.at/leistungen/bauen-renovieren
DIGITAL FINDET STADT GMBH – DIE PLATTFORM FÜR DIGITALE INNOVATIONEN DER BAU- UND IMMOBILIENWIRTSCHAFT	Network for driving digital innovation and strengthening the industry over the long term	www.digitalfindetstadt.at
DRZ – DEMONTAGE-UND RECYCLING-ZENTRUM DER WIENER VOLKSHOCHSCHULEN GMBH	Recycling-, ReUse und Upcycling Unternehmen für Elektroaltgeräte (Recycling, re-use and upcycling enterprise for second-hand electrical appliances)	www.drz-wien.at
E7 ENERGY INNOVATION ENGINEERING	Putting into operation and monitoring	www.e-sieben.at/de/expertise/dienstleistungen/1.3/Technisches_Monitoring.php

COMPANIES	DESCRIPTION	WEBSITE
ECOWORK	Courtyard revitalisation, tree preservation	www.ecowork.at/gartengestaltung/hofbegruenung
EINSZUEINS ARCHITEKTEN	Planning of modular, convertible living concepts	www.einszueins.at/project
EOOS NEXT GMBH	Development and implementation of transformative technologies and strategies to achieve sustainability	eoonext.com
EQUANS – ENGIE AUSTRIA GMBH	Holistic building monitoring to achieve sustainable development.	www.equans.at/loesungen/service-digitalisierung/energiemonitoring-fuer-gebaeude
FAB – VEREIN ZUR FÖRDERUNG VON ARBEIT UND BESCHÄFTIGUNG	FAB is a non-profit association that provides job seekers with qualifications, employment, advice and support, e.g. with building demolition work.	www.fab.at
FAMILIENWOHNBAU GEMEINNÜTZIGE BAU-UND SIEDLUNGS-GESELLSCHAFT M.B.H.	Implementation of urban mining in residential construction projects	www.familienwohnbau.at
GARTELN IN WIEN MIT WOHNPARTNER WIEN	Organisation promoting urban gardening in Vienna	wohnpartner-wien.at/zusammenleben/gaertengarteln
GAUPENRAUB+/- ARGE	Circular redevelopment and regeneration projects	gaupenraub.net/profil
GOODSDOCK – ÖSTERREICHS PLATTFORM FÜR KREISLAUFFÄHIGES BAUEN – IÖB INFORMATIONSPLATTFORM	Networking platform for large-scale establishment of the circular economy for sustainable construction	www.ioeb-innovationsplattform.at/challenges/detail/von-der-planung-bis-zum-abriss-den-baukreislauf-neu-organisieren/detailidea/goodsdock-oesterreichs-plattform-fuer-kreislauffaehiges-bauen
GRAT – GRUPPE ANGEPASSTE TECHNOLOGIE – WISSENSCHAFTLICHER VEREIN, TECHNISCHE UNIVERSITÄT WIEN	Carbon-neutral and life cycle-oriented residential buildings and developments	www.grat.at

COMPANIES	DESCRIPTION	WEBSITE
GREEN4CITIES GMBH	Centre of excellence for urban green infrastruc	www.green4cities.com/?lang=de
GRÜNSTATTGRAU	Centre of excellence for greening of buildings	gruenstattgrau.at
HEMPSTATIC	Hempstatic processes high-quality agricultural residues from industrial hemp into insulating materials. The insulating materials have recyclable properties and can be either reused or recycled after their useful life.	www.hempstatic.at
HERI&SALLI ARCHITEKTUR ZT GMBH	Architectural, spatial and temporal concepts	www.heriundsalli.com/stadtregal
IBO – ÖSTERREICHISCHES INSTITUT FÜR BAUEN UND ÖKOLOGIE	Research into interactions between people, buildings and the environment	www.ibo.at
IBR&I – INSTITUTE OF BUILDING RESEARCH & INNOVATION ZT-GMBH	Research and strategy consulting for sustainable buildings and property portfolios	www.building-research.at
IDRV – INSTITUTE OF DESIGN RESEARCH	Non-profit association for the design studies, creation of templates in line with the Circular Design Rules	www.idrv.org
IFM – IMMOBILIEN FACILITY MANAGEMENT UND DEVELOPMENT GMBH	Strategic facility management with a holistic approach	ifm.team/ueber-uns
IG LEBENSZYKLUS BAU – INTERESSENS-GEMEINSCHAFT	Working groups on climate neutrality and the circular economy in construction	ig-lebenszyklus.at/arbeitsgruppen/gebaeude
INGENIEURBÜRO P. JUNG	Integrated engineering and monitoring, renewable energy supply planning, certification	www.jung-ingenieure.com
INSTITUT FÜR INGENIEURBIOLOGIE UND LANDSCHAFTSBAU IBLB, UNIVERSITÄT FÜR BODENKULTUR	Research and development of green-blue infrastructure	boku.ac.at/baunat/iblb

COMPANIES	DESCRIPTION	WEBSITE
INSTITUTE FOR INTERDISCIPLINARY CONSTRUCTION PROCESS MANAGEMENT, VIENNA UNIVERSITY OF TECHNOLOGY PROCESS DESIGN FOR A	BIM-based material Building Passport and digital urban mining platforms	www.tuwien.at/cee/ibb
INSTITUTE OF SPATIAL PLANNING AND RURAL DEVELOPMENT (IRUB), UNIVERSITY OF NATURAL RESOURCES AND LIFE SCIENCES	Studies on environmental aspects of general spatial planning for preventive environmental protection	boku.ac.at/rali/irub
INSTITUTE OF SANITARY ENGINEERING AND WATER POLLUTION CONTROL (SIG), UNIVERSITY OF NATURAL RESOURCES AND LIFE SCIENCES	Supplying households with water through water exploration, extraction and treatment	boku.ac.at/wau/sig
INSTITUTE OF WATER QUALITY AND RESOURCE MANAGEMENT, VIENNA UNIVERSITY OF TECHNOLOGY	Recording and prognosis of material flows, recycling potential and waste mass	www.tuwien.at/cee/iwr/ressourcen
KREATIVE RÄUME WIEN	Service for reactivating abandoned properties	www.kreativeraumewien.at
LAUFEN – AUSTRIA AG	Wastewater system decontamination and nutrient recovery for fertiliser production through urine separation in toilet facilities	www.nextproducts.at/hersteller/laufen/produkt/save/44463156
MADASTER AUSTRIA	Madaster is a global online platform that facilitates the circular use of products and materials in the construction industry	madaster.at
MUNICIPAL DIRECTORATE – BUILDINGS AND TECHNOLOGY DIVISION (CITY BUILDING DIRECTORATE)	The City Planning Directorate provides the technical and spatial planning basis for a Vienna that will be home to over 2 million people in future. It forms the bridge between business, policy and administration. The City Building Directorate is part of the Municipal Directorate.	www.wien.gv.at/kontakte/md-bd

UNTERNEHMEN	DESCRIPTION	WEBSITE
MARTIN KÜHNERT. CIVIL ENGINEER, FORESTRY	Expert reports, tree conservation, large tree transplanting	suche.gerichts-sv.at/Default.aspx?LV=wnb&SV=W794016
MATERIALNOMADEN – HARVESTMAP GENOSSENSCHAFT ZUR VERMITTLUNG VON REUSE-BAUTEILEN EG	Evaluation of material and building components and circular process services in the construction industry	www.materialnomaden.at
NEST – AGENTUR FÜR LEERSTANDS-MANAGEMENT GMBH	Concepts for responsible use of vacant properties in commercial areas, public places and on brownfield sites	www.nest.agency
OEAD-WOHNRAUM-VERWALTUNGS GMBH	Experience in operating according to the circular economy and ensuring the physical treatment and thermal use of waste water from buildings	nachhaltigwirtschaften.at/de/sdz/projekte/green-water-recycling.php
ÖSW – ÖSTERREICHISCHES SIEDLUNGSWERK GEMEINNÜTZIGE WOHNUNGSAKTIEN-GESELLSCHAFT	Project surveying and analysis of potential for cycle-based renovation	www.oesw.at
ÖWAV – ÖSTERREICHISCHER WASSER- UND ABFALLWIRTSCHAFTS-VERBAND	Non-profit association for the achievement of sustainability targets through education, training, public relations and drafting regulations	www.oewav.at
PKE FACILITY MANAGEMENT GMBH	Holistic building management throughout the entire life cycle	pke-fm.at
PULSWERK GMBH	Consulting company of the Austrian Ecology Institute, which conducts research into the sustainable development of our society	www.pulswerk.at
REEDUCE – NOISE PROTECTION TECHNOLOGIES	REEDuce creates environmentally friendly noise protection screens out of reeds, wood and clay. The noise barriers are constructed with the circular economy in mind.	www.reeduce-noise.com
RENOWAVE.AT E.G.	Innovation lab for climate-neutral building and district re-development	www.renowave.at/ueber-uns

UNTERNEHMEN	DESCRIPTION	WEBSITE
REPANET – REUSE AND REPAIR NETWORK AUSTRIA	Volunteer organisation representing socio-economically oriented re-use enterprises, repair networks and repair initiatives	www.repanet.at
RETROFIT LABSVIENNA – ONLINE DIALOGUE MODULE, VIENNA UNIVERSITY OF TECHNOLOGY	Process design for the sustainable transformation of post-war modernist residential districts	www.stadtebau.at/forschung/projekte_plattformen/retrofit_labsvienna
RIOCOM INGENIEUR-BÜRO FÜR KULTUR-TECHNIK UND WASSER-WIRTSCHAFT	Blue infrastructure roll-out; river renaturation	riocom.at
RMA – RESOURCE MANAGEMENT AGENCY	Project management and consulting agency for sustainable resource management	www.rma.at
SCHMIDTREUTER PLANUNGSBÜRO	Integrated planning with a focus on building technology	www.schmidtreuter.at
SCHÖBERL & PÖLL GMBH	Structural planning, research and development of highly energy-efficient buildings	www.schoeberlpoell.at
SCHÜTTFLIX	Schüttflix offers a digital networking platform for contractors, bulk material suppliers and freight forwarders.	www.schuettflix.com
SOZIALBAU AG	Implementation of social urban mining concepts in housing projects and communal composting on site	www.sozialbau.at
STRABAG SE / CAPE 10	Design in BIM 5D, ongoing development	bim5d.strabag.com
TECNO OFFICE CONSULT	Consulting in the field of building optimisation and occupancy planning	www.tecno.at/organisatorische-gebaeudeplanung
UIV – URBAN INNOVATION VIENNA GMBH	Agency for sustainable and innovative urban development	urbaninnovation.at
URBAN MINING CONSULTING	Implementation of dismantling, demolition, pollutant clean-up and disposal projects	www.urban-consulting.at

COMPANIES	DESCRIPTION	WEBSITE
VIENNA CITY COUNCIL DEPARTMENT 18 – URBAN DEVELOPMENT AND URBAN PLANNING	MA 18 creates overarching, spatial-strategic plans and concepts in the fields of spatial planning and mobility. These form the basis for key urban development policy decisions.	www.wien.gv.at/kontakte/ma18/index.html
VIENNA CITY COUNCIL DEPARTMENT 19 – ARCHITECTURE AND URBAN DESIGN	Vienna is growing, with obvious effects on the cityscape. Change in society also has an impact on the resolution of design issues. The mission of City Council Department 19 is the contemporary development of the Viennese cityscape.	www.wien.gv.at/stadtentwicklung/architektur
VIENNA CITY COUNCIL DEPARTMENTS 21A UND 21B – DISTRICT PLANNING AND ZONING	MA 21 ensures innovative urban development through sustainable, high-quality urban planning. Zoning and development plans create the legal conditions for urban development. Divided into Southwest (MA21 A) and Northeast (MA21 B).	www.wien.gv.at/kontakte/ma21a bzw. MA 21 B – Stadtteilplanung und Flächen-nutzung Nordost (wien.gv.at)
VIENNA CITY COUNCIL DEPARTMENT 22 – ENVIRONMENTAL PROTECTION	The Vienna Environmental Protection Department (MA 22) is entrusted with many important environmental protection concerns in Vienna, including preventive, integrative and collaborative environmental protection.	www.wien.gv.at/kontakte/ma22
VIENNA CITY COUNCIL DEPARTMENT 23 – ECONOMY, LABOUR AND STATISTICS	MA 23 oversees economy, labour market and innovation policy issues and state statistics. As such, it provides a well-founded basis for decision-making in relation to measures taken by the city or the state of Vienna and helps to reinforce Vienna's status as a business location.	www.wien.gv.at/kontakte/ma23
VIENNA CITY COUNCIL DEPARTMENT 25 – TECHNICAL URBAN REGENERATION	High-quality living and a corresponding living environment are important parameters for an liveable and lovable city. The Department of Technical Urban Regeneration (MA 25) offers a wide array of information, advice and services relating to residential construction technology.	www.wien.gv.at/wohnen/wohnbautechnik
VIENNA CITY COUNCIL DEPARTMENT 28 – ROAD MANAGEMENT AND CONSTRUCTION	MA 28 takes care of all issues relating to roads and considers the needs of all road users on an equal basis.	www.wien.gv.at/kontakte/ma28
VIENNA CITY COUNCIL DEPARTMENT 29 – BRIDGE CONSTRUCTION AND FOUNDATION ENGINEERING	The City of Vienna looks after around 836 bridges. MA 29 is responsible for bridge construction, foundation engineering and maintenance.	www.wien.gv.at/kontakte/ma29

COMPANIES	DESCRIPTION	WEBSITE
VIENNA CITY COUNCIL DEPARTMENT 34 – CONSTRUCTION AND BUILDING MANAGEMENT	Vienna is thriving and growing. People need functional, contemporary and secure buildings. MA 34 builds and runs nurseries, schools, fire stations, office buildings and more for the city of Vienna.	www.wien.gv.at/kontakte/ma34/index.html
VIENNA CITY COUNCIL DEPARTMENT 37 – MUNICIPAL BUILDING INSPECTION	MA 37 deals with compliance with the legal regulations relating to construction.	www.wien.gv.at/wohnen/baupolizei
VIENNA CITY COUNCIL DEPARTMENT 39 – TESTING, INSPECTION AND CERTIFICATION AUTHORITY	Whether for water quality, hospital hygiene, radiation protection or tests in the construction sector: Austria's most modern test centre ensures safety.	www.wien.gv.at/kontakte/ma39
VIENNA CITY COUNCIL DEPARTMENT 48 – WASTE MANAGEMENT, STREET CLEANING AND MUNICIPAL	The key targets and concerns of MA 48 are waste prevention, waste separation and ensuring that the city is clean.	www.wien.gv.at/umwelt/ma48
MUNICIPAL DEPARTMENT 50 – HOUSING SUBSIDIES AND ARBITRATION BOARD FOR HOUSING LAW MATTERS	MA 50 deals with housing subsidies and and housing research.	www.wien.gv.at/wohnen/wohnbauforderung/index.html
VIENNA CITY COUNCIL DEPARTMENT 56 – SCHOOLS IN VIENNA	The tasks of the department include the establishment, maintenance, modernisation and administration of Vienna's public elementary schools, new secondary schools, special schools, polytechnic schools and vocational schools.	www.wien.gv.at/kontakte/ma56/index.html
VIENNA CITY COUNCIL DEPARTMENT 64 – CONSTRUCTION, ENERGY, RAILWAY AND AVIATION LAW	The Department of Construction, Energy, Railway and Aviation Law creates the legal prerequisites for land development in Vienna and issues permits under aviation, railway, metro and energy law. It also drafts legal regulations, prepares legal opinions and conducts administrative criminal proceedings in accordance with the building regulations for Vienna.	www.wien.gv.at/umwelt/ma48
VIENNA CITY COUNCIL DEPARTMENT 69 – REAL ESTATE MANAGEMENT	The Real Estate Management department (MA 69) is the point of contact for all enquiries relating to real estate owned by the City of Vienna. It is also a hub for real estate transactions.	www.wien.gv.at/verwaltung/grundstuecke

COMPANIES	DESCRIPTION	WEBSITE
WBV-GPA – WOHNBAU-VEREINIGUNG FÜR PRIVATANGESTELLTE GEMEINNÜTZIGE GESMBH	Implementation of urban mining and social urban mining concepts in residential construction projects	www.wbv-gpa.at
WGE-GRÄTZL-ENERGIEGEMEINSCHAFT EGEN	Vienna's first regional renewable energy community	www.graetzlenergie.wien
WIEN 3420 ASPERN DEVELOPMENT AG	Experience in handling on-site resources, mass balancing	www.aspern-seestadt.at
WIEN BAUT VOR	Improving dialogue with residents to generate information about construction projects at an early stage and to prevent conflicts	wienbautvor.at
WIEN ENERGIE GMBH	Thermal water waste heat recovery	www.wienenergie.at
WIENER LINIEN GMBH & CO KG	Uptake and recycling of demolition materials from track systems	www.wienerlinien.at
WIENER WOHNEN	Wiener Wohnen administers, refurbishes and manages Vienna's municipal housing complexes. Wiener Wohnen is the largest municipal property management company in Europe.	www.wienerwohnen.at
WIEN-SÜD – GEMEINNÜTZIGE BAU- U. WOHNUNGSGENOSSENSCHAFT EINGETRAGENE GENOSSENSCHAFT M.B.H.	Implementation of urban mining concepts in residential construction projects	www.wiensued.at
WOHNFONDS_WIEN – FONDS FÜR WOHNBAU UND STADTERNEUERUNG	Unsealing measures during small block renovations	www.wohnfonds.wien.at
WSE – WIENER STANDORTENTWICKLUNG GMBH	Implementation of social urban mining concepts and removal of building elements	www.wse.at

Design

seitezwei.com

Producer, Production site

Print Alliance HAV Produktions GmbH
2540 Bad Vöslau



printed according to the Austrian
Ecolabel criteria for printed matter
(UZ 24), UW-Nr. 715



Klimaneutral
Druckprodukt
ClimatePartner.com

REACT-EU ALS TEIL DER
REAKTION DER UNION AUF DIE
COVID-19-PANDEMIE FINANZIERT.



Europäische Union Investitionen in Wachstum & Beschäftigung, Österreich.

The Project "Fit für die Zukunft" contributes to the development of corporate research and innovation activities in Vienna, encourages cooperation and awakes enthusiasm for research and innovation among young Viennese. Additional information on the www.efre.gv.at/en

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Media owner, Publisher

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A service offered by the City of Vienna.
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Cover: unsplash/Matt Seymour
Vienna Business Agency/Karin Hackl



Technology reports are available on the following topics:

- Additive manufacturing
- Assistive Technologies
- Big data and AI
- Blockchain
- City Logistics
- Cloud Computing
- Data Sharing
- Data4Good
- Digital Twins
- Digital Planning, Building and Operation
- e-commerce
- e-government
- e-health
- Enterprise Software
- Entertainment Computing
- FinTech
- Food
- Green Building
- HR-Tech
- Impact Assessment
- Intelligent Automation and Robotics
- Intelligent Production
- Internet of Things
- IT-Security
- Mobile Computing
- Open Source/Open Standards
- Prototyping – von der Idee zum Produkt
- Rainwater in the city
- Sustainable urban logistics
- Urban Energy Innovations
- Urban Mobility

- User Centered Design
- Visual Computing

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viennabusinessagency.at/technology/lets-talk-innovation/sustainable-technologies

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COVID-19-PANDEMIE FINANZIERT.



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