HOLCIM ÖSTERREICH

WIE **WERDEN** WIR BAUEN?
WIE **WOLLEN** WIR BAUEN?

8. MAI 2025

Reparatur der Zukunft

Kreislaufwirtschaft im Bauwesen

Architekt Thomas Romm

ÜBER UNS

Reparatur der Zukunft

Veränderung beginnt im Kleinen, auch wenn sie das große Ganze im Blick hat. Dieser Satz steht für die Ö1 Initiative Reparatur der Zukunft, die seit 2020 innovativen Ideen eine mediale Plattform gibt.

https://oe1.orf.at/artikel/681641/Reparatur-der-Zukunft

BÜRO BRAUNER

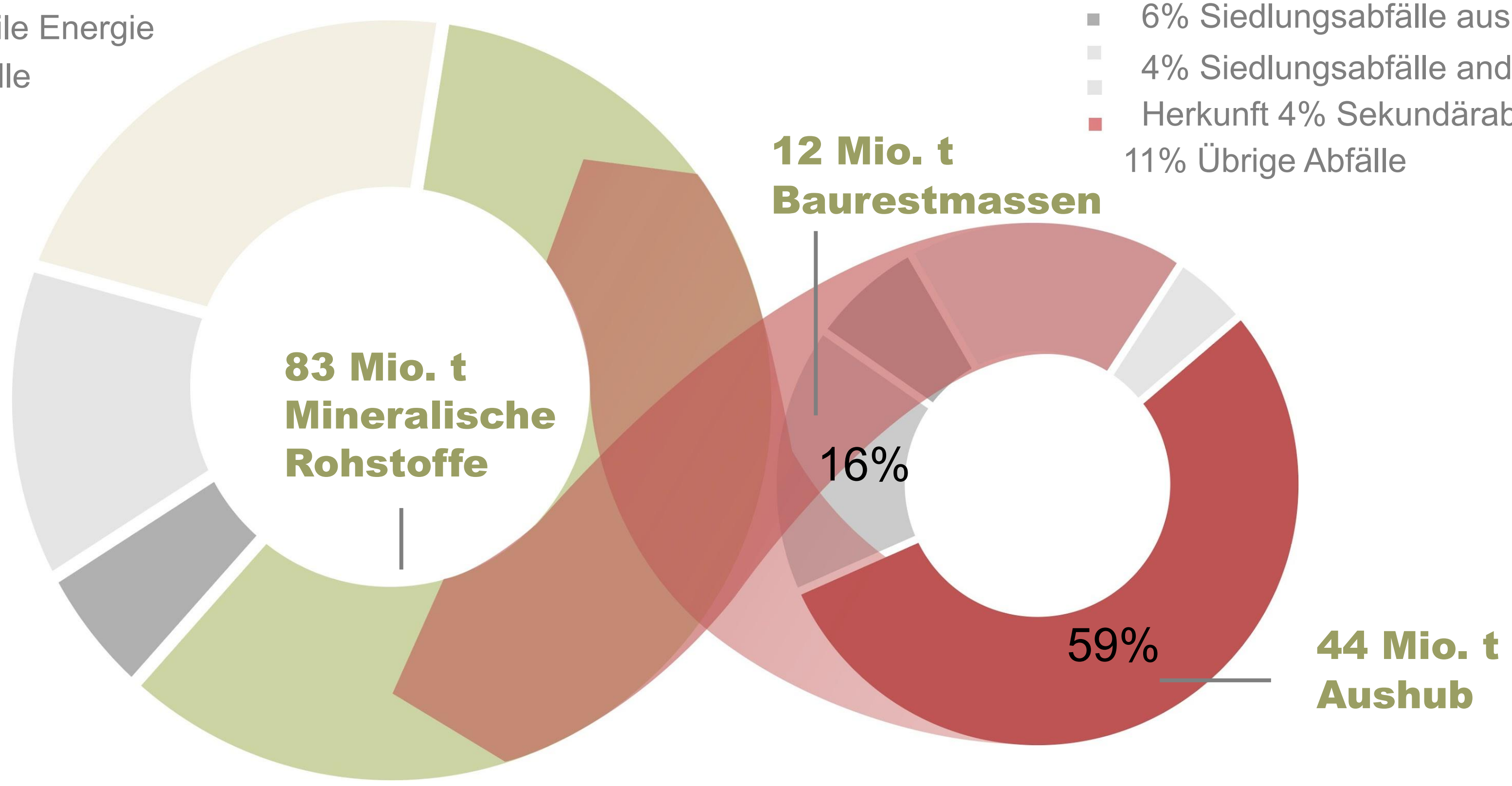
KREISLAUFWIRTSCHAFT IN ÖSTERREICH

Rohstoffbedarf

- 54% Mineralische Rohstoffe
- 25% Biomasse
- 14% Fossile Energie
- 7% Metalle

Abfallaufkommen

- 59% Aushubmaterialien
- 16% Bau- und Abbruchabfälle
- 6% Siedlungsabfälle aus Haushalten
- 4% Siedlungsabfälle anderer Herkunft
- 4% Sekundärabfälle
- 11% Übrige Abfälle



Input: 154 Mio. t/a

Quelle: BMK, Ressourcennutzung in Österreich 2022

Output: 74 Mio. t/a

Quelle: BMK, BAWP Statusbericht 2024 für das Jahr 2022

Bundesministerium
Land- und Forstwirtschaft,
Klima- und Umweltschutz,
Regionen und Wasserwirtschaft

Bundesministerium
Innovation, Mobilität
und Infrastruktur

eco plus
PLATTFORM FÜR GREEN TRANSFORMATION UND BIOÖKONOMIE

WKO
DIE INDUSTRIE

wirtschafts agentur wien
Für die Stadt Wien

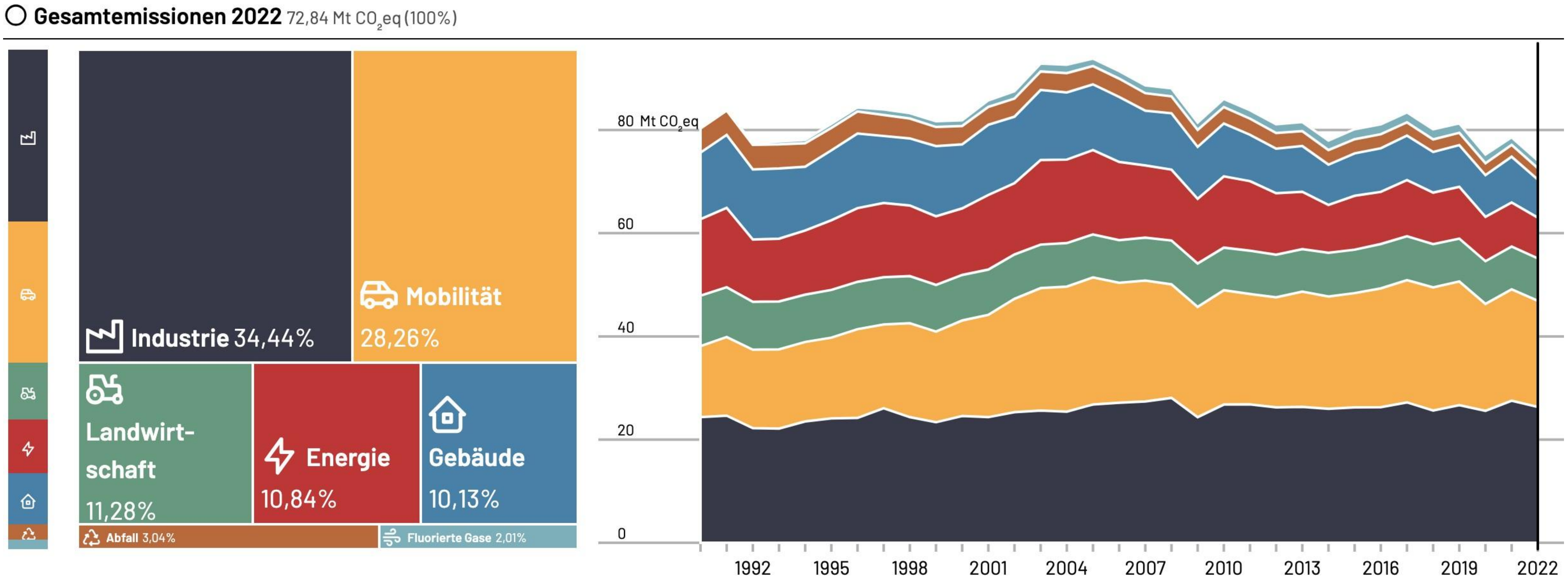
Kofinanziert von der Europäischen Union

CIRCULAR CARBON ECONOMY SUMMIT 2025

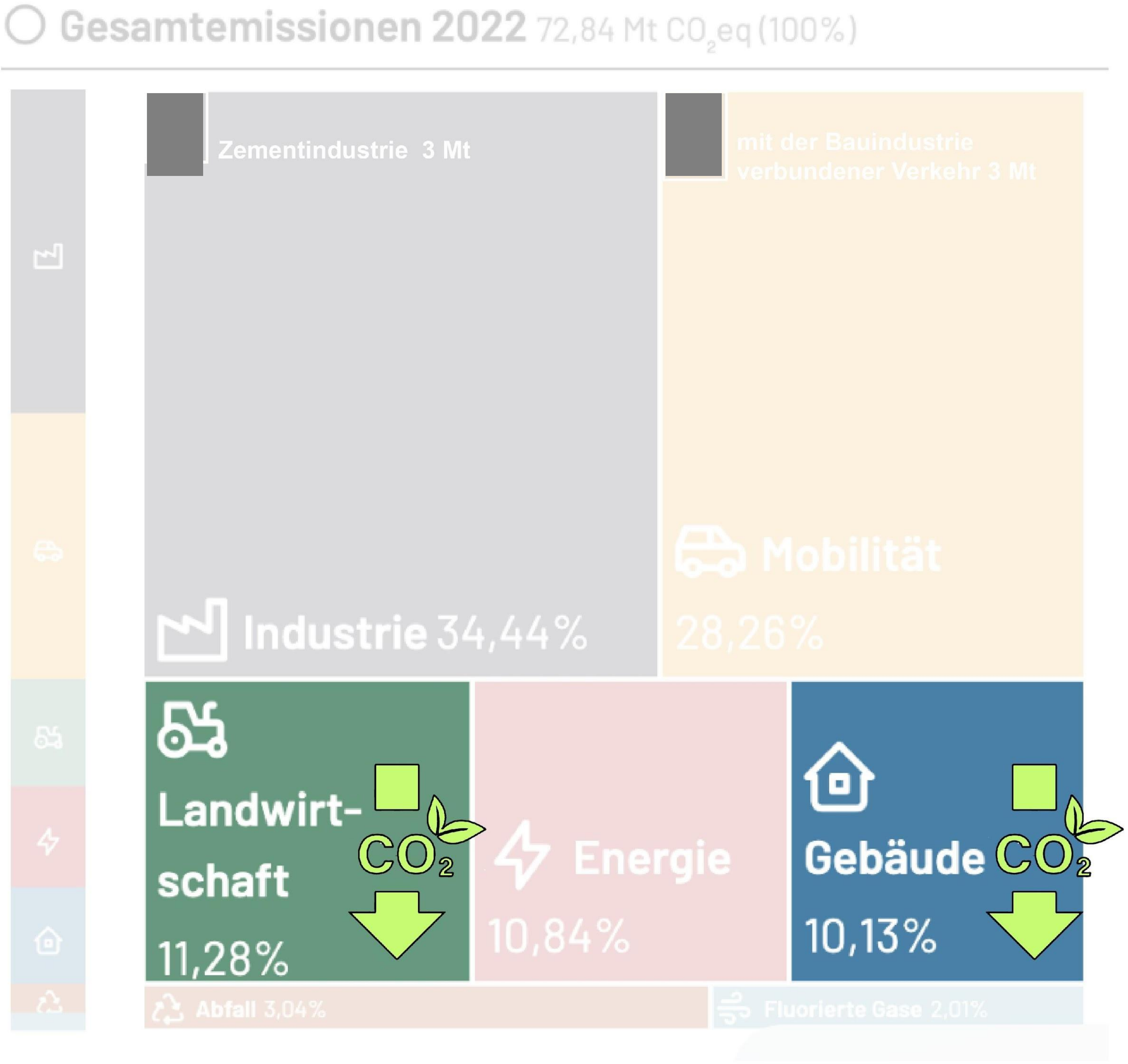
BioBASE

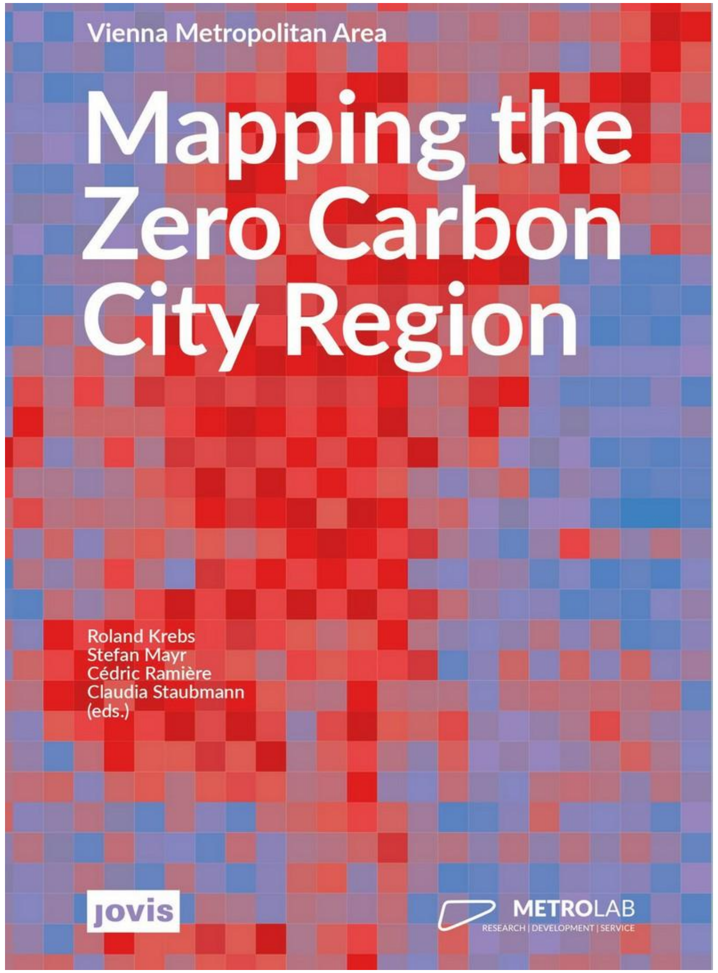
4. & 5. NOVEMBER 2025 | Palais Niederösterreich, 1010 Wien

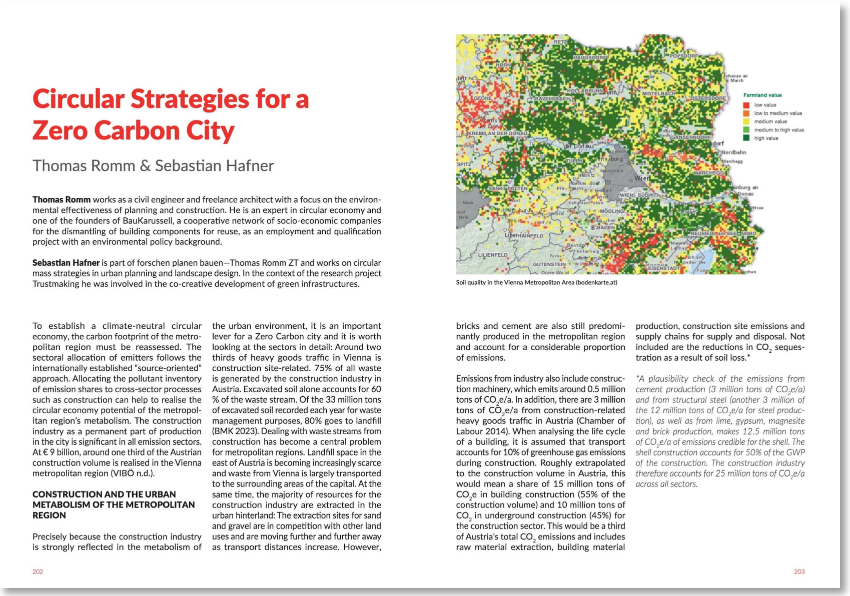
CCES 2025



Quelle: Klimadashboard. (2025). Produktionsbasierte Emissionen. Klimadashboard Österreich. Abgerufen am 06.05.2025 von https://klimadashboard.at/emissionen


Gesamtemissionen 2022 72,84 Mt CO2eq (100%)
Zementindustrie 3 Mt
mit der Bauindustrie verbundener Verkehr 3 Mt
Mobilität
28,26%
Industrie 34,44%
Landwirt-schaft
CO2
11,28%
Energie
10,84%
Gebäude
CO2
10,13%
Abfall 3,04%
Fluorierte Gase 2,01%





Circular Strategies for a Zero Carbon City

Thomas Romm & Sebastian Hafner

Thomas Romm works as a civil engineer and freelance architect with a focus on the environmental effectiveness of planning and construction. He is an expert in circular economy and one of the founders of BauKarussell, a cooperative network of socio-economic companies for the dismantling of building components for reuse, as an employment and qualification project with an environmental policy background.

Sebastian Hafner is part of forschen planen bauen—Thomas Romm ZT and works on circular mass strategies in urban planning and landscape design. In the context of the research project Trustmaking he was involved in the co-creative development of green infrastructures.

Soil quality in the Vienna Metropolitan Area (bodenkarte.at)

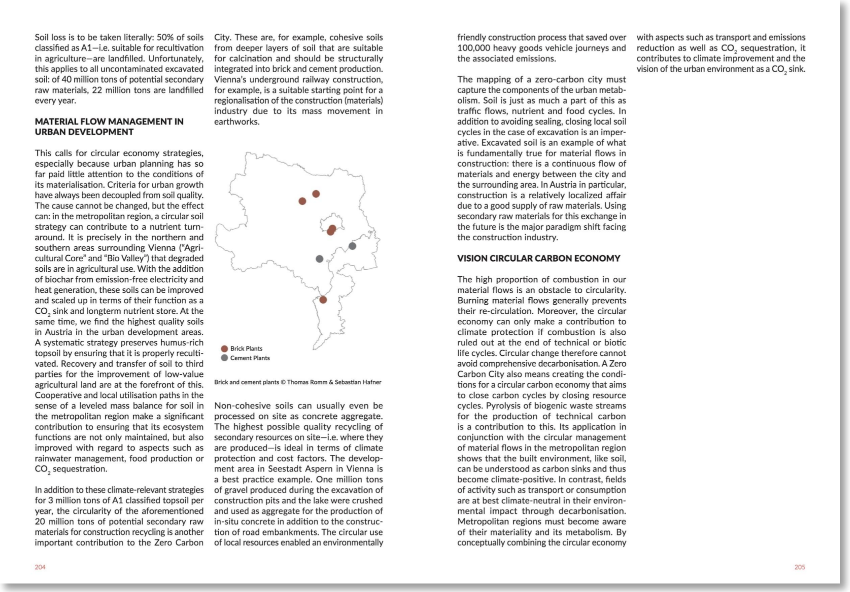
To establish a climate-neutral circular economy, the carbon footprint of the metropolitan region must be reassessed. The sectoral allocation of emitters follows the internationally established "source-oriented" approach. Allocating the pollutant inventory of emission shares to cross-sector processes such as construction can help to realise the circular economy potential of the metropolitan region's metabolism. The construction industry as a permanent part of production in the city is significant in all emission sectors. At € 9 billion, around one third of the Austrian construction volume is realised in the Vienna metropolitan region (VIBÖ n.d.).

CONSTRUCTION AND THE URBAN METABOLISM OF THE METROPOLITAN REGION

Precisely because the construction industry is strongly reflected in the metabolism of the urban environment, it is an important lever for a Zero Carbon city and it is worth looking at the sectors in detail: Around two thirds of heavy goods traffic in Vienna is construction site-related. 75% of all waste is generated by the construction industry in Austria. Excavated soil alone accounts for 60 % of the waste stream. Of the 33 million tons of excavated soil recorded each year for waste management purposes, 80% goes to landfill (BMK 2023). Dealing with waste streams from construction has become a central problem for metropolitan regions. Landfill space in the east of Austria is becoming increasingly scarce and waste from Vienna is largely transported to the surrounding areas of the capital. At the same time, the majority of resources for the construction industry are extracted in the urban hinterland: The extraction sites for sand and gravel are in competition with other land uses and are moving further and further away as transport distances increase. However, bricks and cement are also still predominantly produced in the metropolitan region and account for a considerable proportion of emissions.

Emissions from industry also include construction machinery, which emits around 0.5 million tons of CO_2e/a. In addition, there are 3 million tons of CO_2e/a from construction-related heavy goods traffic in Austria (Chamber of Labour 2014). When analysing the life cycle of a building, it is assumed that transport accounts for 10% of greenhouse gas emissions during construction. Roughly extrapolated to the construction volume in Austria, this would mean a share of 15 million tons of CO_2e in building construction (55% of the construction volume) and 10 million tons of CO_2 in underground construction (45%) for the construction sector. This would be a third of Austria's total CO_2 emissions and includes raw material extraction, building material production, construction site emissions and supply chains for supply and disposal. Not included are the reductions in CO_2 sequestration as a result of soil loss.*

**A plausibility check of the emissions from cement production (3 million tons of CO_2e/a) and from structural steel (another 3 million of the 12 million tons of CO_2e/a for steel production), as well as from lime, gypsum, magnesite and brick production, makes 12.5 million tons of CO_2e/a of emissions credible for the shell. The shell construction accounts for 50% of the GWP of the construction. The construction industry therefore accounts for 25 million tons of CO_2e/a across all sectors.*



Soil loss is to be taken literally: 50% of soils classified as A1—i.e. suitable for recultivation in agriculture—are landfilled. Unfortunately, this applies to all uncontaminated excavated soil: of 40 million tons of potential secondary raw materials, 22 million tons are landfilled every year.

MATERIAL FLOW MANAGEMENT IN URBAN DEVELOPMENT

This calls for circular economy strategies, especially because urban planning has so far paid little attention to the conditions of its materialisation. Criteria for urban growth have always been decoupled from soil quality. The cause cannot be changed, but the effect can: in the metropolitan region, a circular soil strategy can contribute to a nutrient turnaround. It is precisely in the northern and southern areas surrounding Vienna ("Agricultural Core" and "Bio Valley") that degraded soils are in agricultural use. With the addition of biochar from emission-free electricity and heat generation, these soils can be improved and scaled up in terms of their function as a CO_2 sink and longterm nutrient store. At the same time, we find the highest quality soils in Austria in the urban development areas. A systematic strategy preserves humus-rich topsoil by ensuring that it is properly recultivated. Recovery and transfer of soil to third parties for the improvement of low-value agricultural land are at the forefront of this. Cooperative and local utilisation paths in the sense of a leveled mass balance for soil in the metropolitan region make a significant contribution to ensuring that its ecosystem functions are not only maintained, but also improved with regard to aspects such as rainwater management, food production or CO_2 sequestration.

In addition to these climate-relevant strategies for 3 million tons of A1 classified topsoil per year, the circularity of the aforementioned 20 million tons of potential secondary raw materials for construction recycling is another important contribution to the Zero Carbon City. These are, for example, cohesive soils from deeper layers of soil that are suitable for calcination and should be structurally integrated into brick and cement production. Vienna's underground railway construction, for example, is a suitable starting point for a regionalisation of the construction (materials) industry due to its mass movement in earthworks.

Brick Plants
Cement Plants

Brick and cement plants © Thomas Romm & Sebastian Hafner

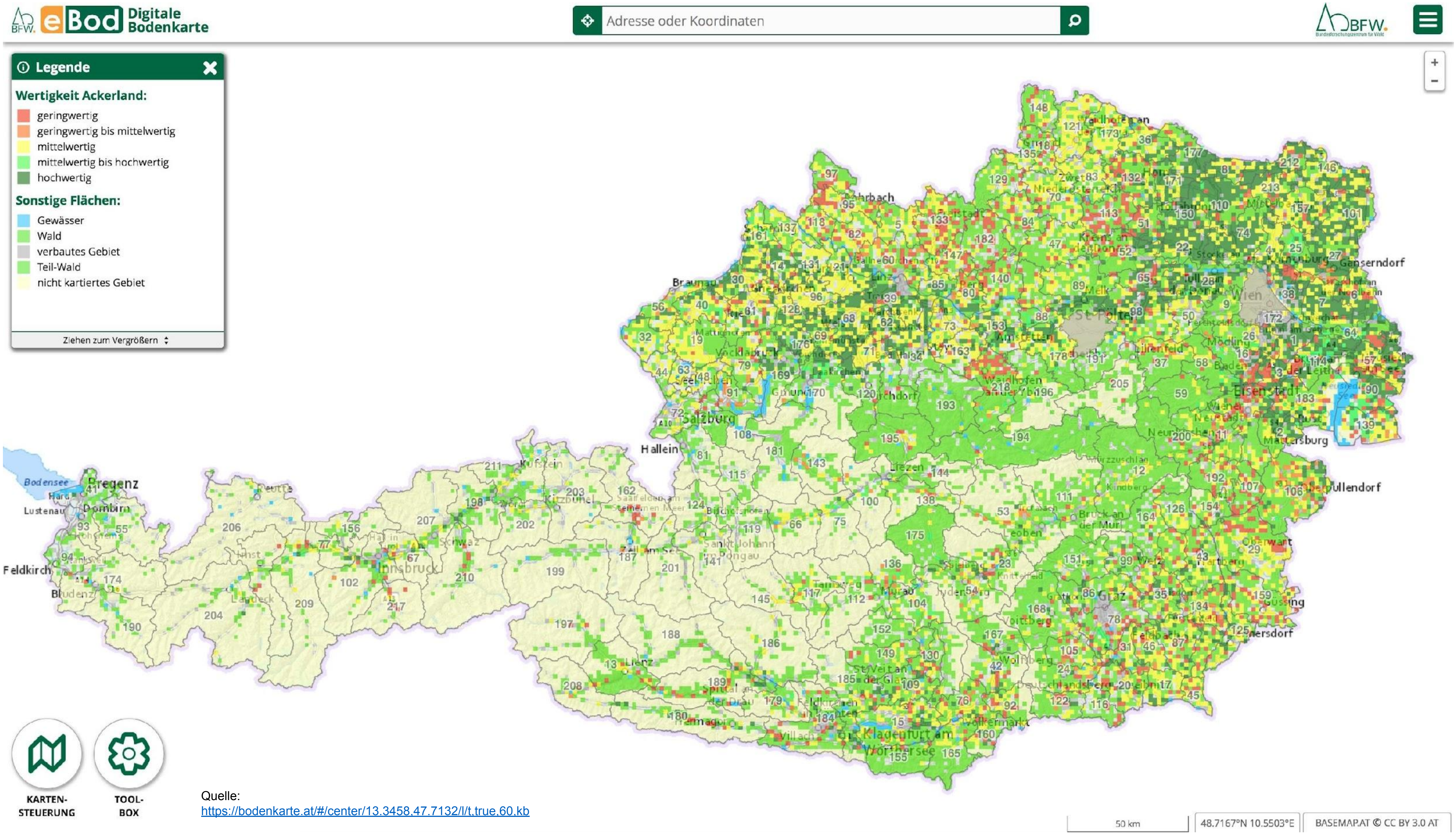
Non-cohesive soils can usually even be processed on site as concrete aggregate. The highest possible quality recycling of secondary resources on site—i.e. where they are produced—is ideal in terms of climate protection and cost factors. The development area in Seestadt Aspern in Vienna is a best practice example. One million tons of gravel produced during the excavation of construction pits and the lake were crushed and used as aggregate for the production of in-situ concrete in addition to the construction of road embankments. The circular use of local resources enabled an environmentally friendly construction process that saved over 100,000 heavy goods vehicle journeys and the associated emissions.

The mapping of a zero-carbon city must capture the components of the urban metabolism. Soil is just as much a part of this as traffic flows, nutrient and food cycles. In addition to avoiding sealing, closing local soil cycles in the case of excavation is an imperative. Excavated soil is an example of what is fundamentally true for material flows in construction: there is a continuous flow of materials and energy between the city and the surrounding area. In Austria in particular, construction is a relatively localized affair due to a good supply of raw materials. Using secondary raw materials for this exchange in the future is the major paradigm shift facing the construction industry.

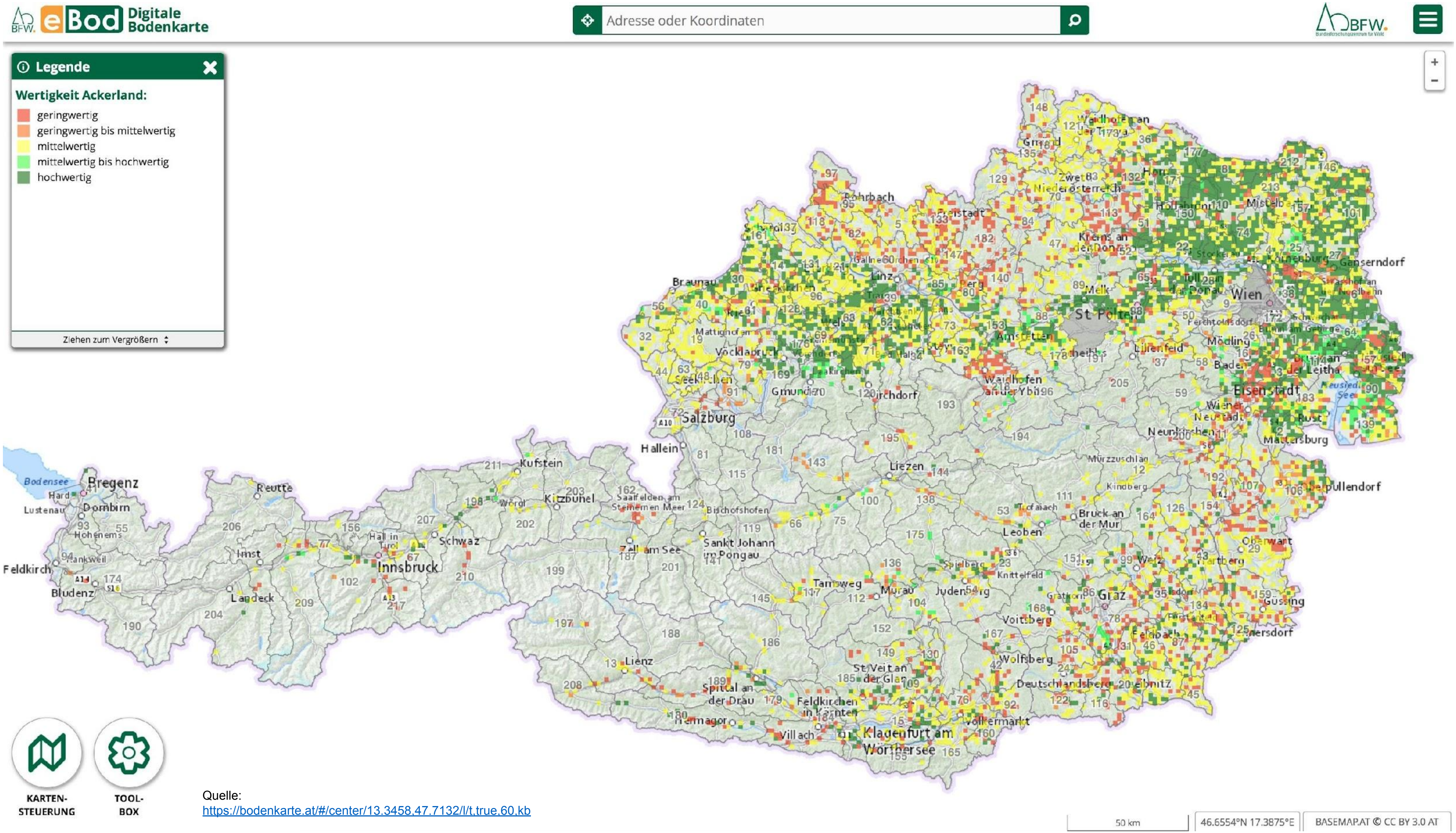
VISION CIRCULAR CARBON ECONOMY

The high proportion of combustion in our material flows is an obstacle to circularity. Burning material flows generally prevents their re-circulation. Moreover, the circular economy can only make a contribution to climate protection if combustion is also ruled out at the end of technical or biotic life cycles. Circular change therefore cannot avoid comprehensive decarbonisation. A Zero Carbon City also means creating the conditions for a circular carbon economy that aims to close carbon cycles by closing resource cycles. Pyrolysis of biogenic waste streams for the production of technical carbon is a contribution to this. Its application in conjunction with the circular management of material flows in the metropolitan region shows that the built environment, like soil, can be understood as carbon sinks and thus become climate-positive. In contrast, fields of activity such as transport or consumption are at best climate-neutral in their environmental impact through decarbonisation. Metropolitan regions must become aware of their materiality and its metabolism. By conceptually combining the circular economy with aspects such as transport and emissions reduction as well as CO_2 sequestration, it contributes to climate improvement and the vision of the urban environment as a CO_2 sink.

Quelle:
https://www.jovis.de/de/book/9783986121952



Quelle:
https://bodenkarte.at/#/center/13.3458,47.7132/l/t,true,60,kb



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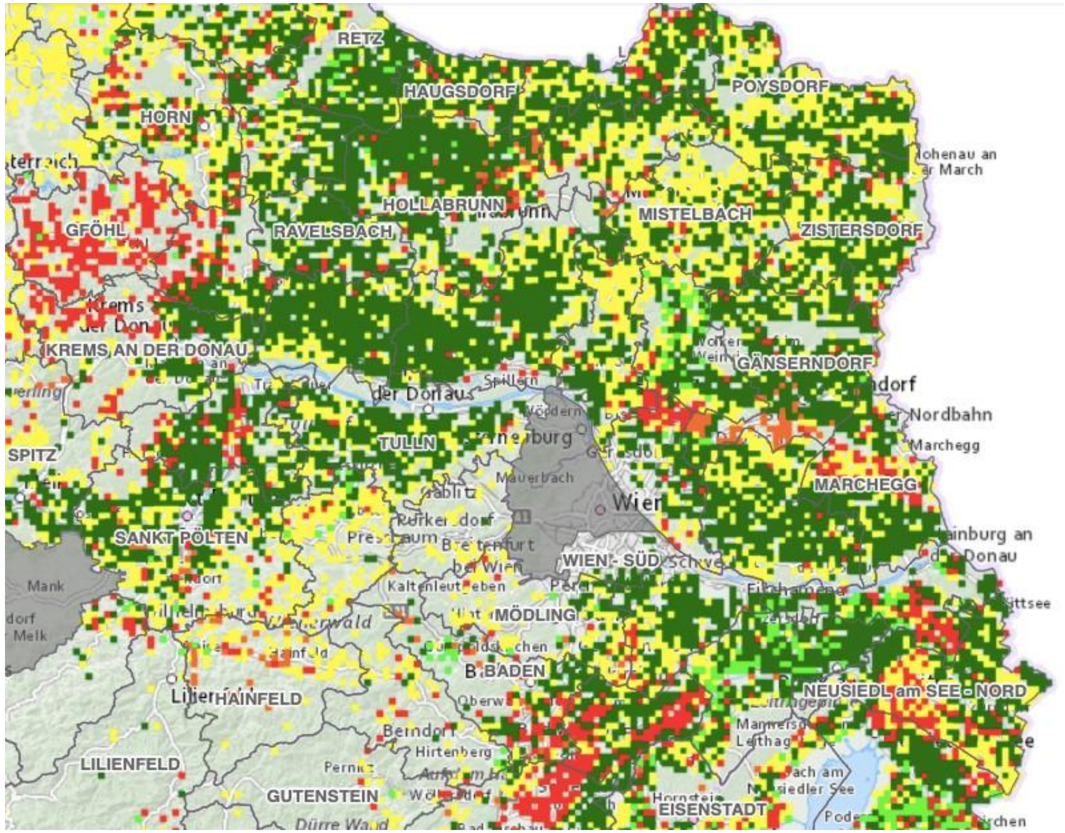

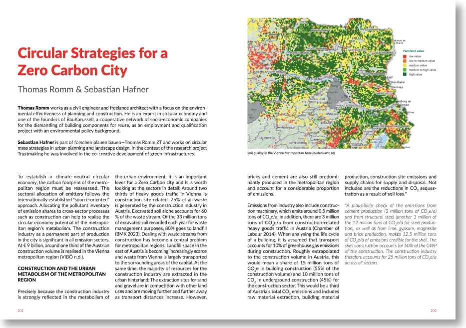

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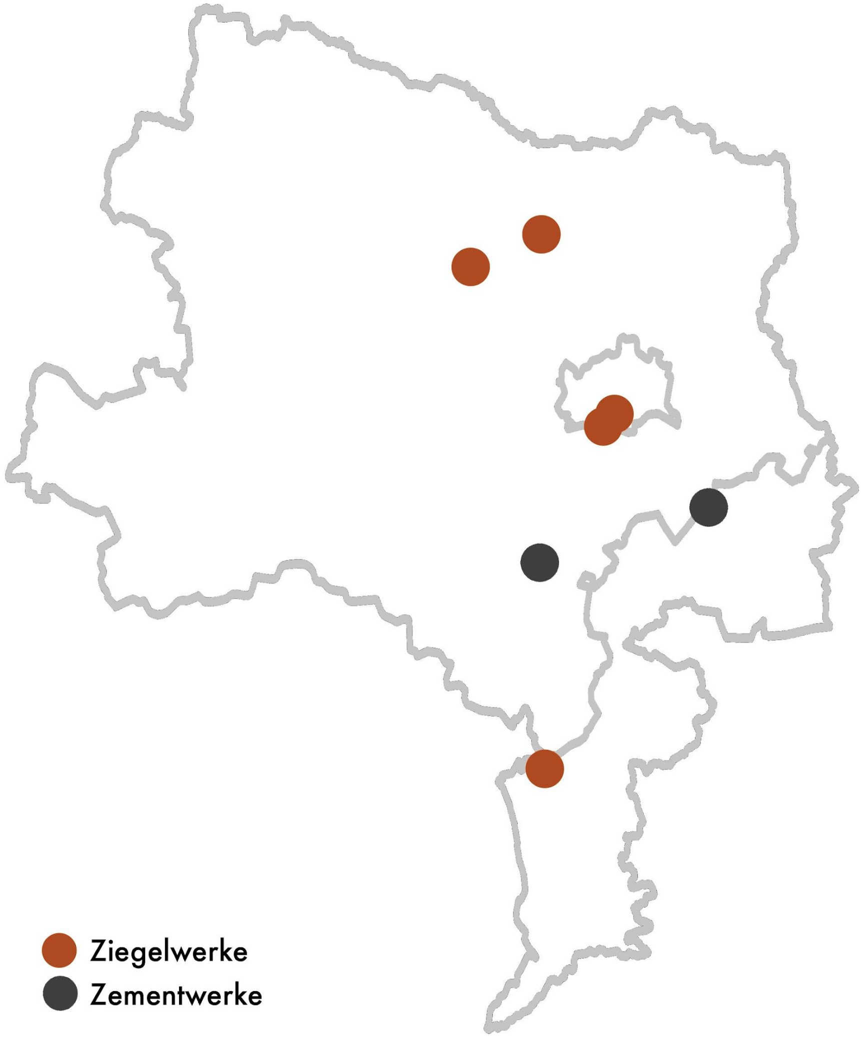

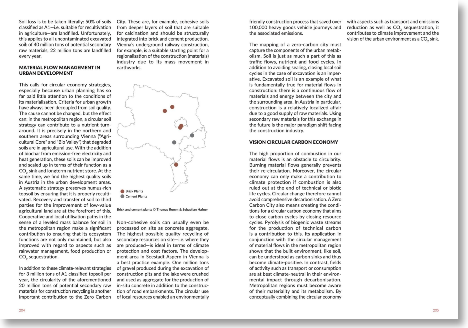

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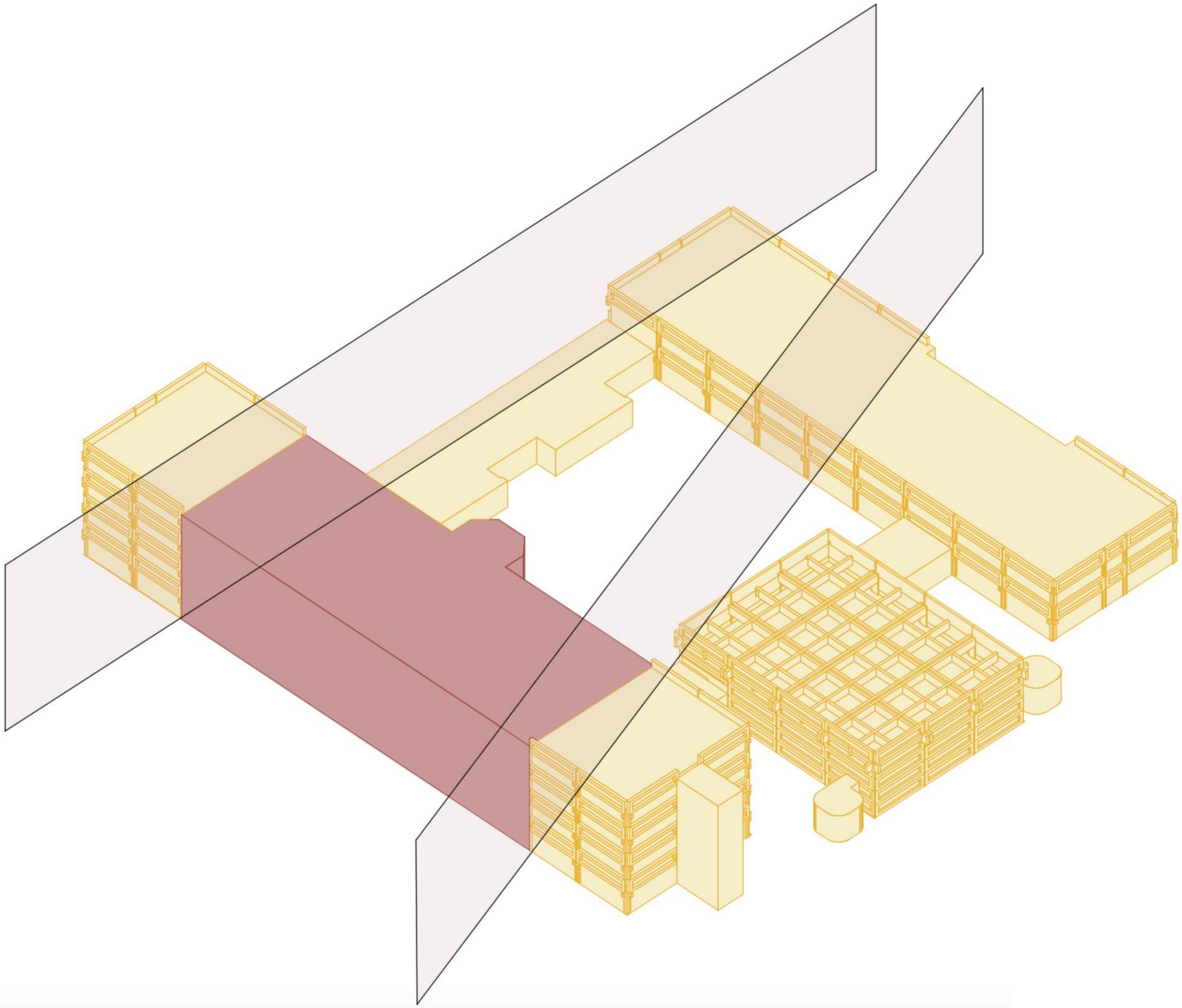

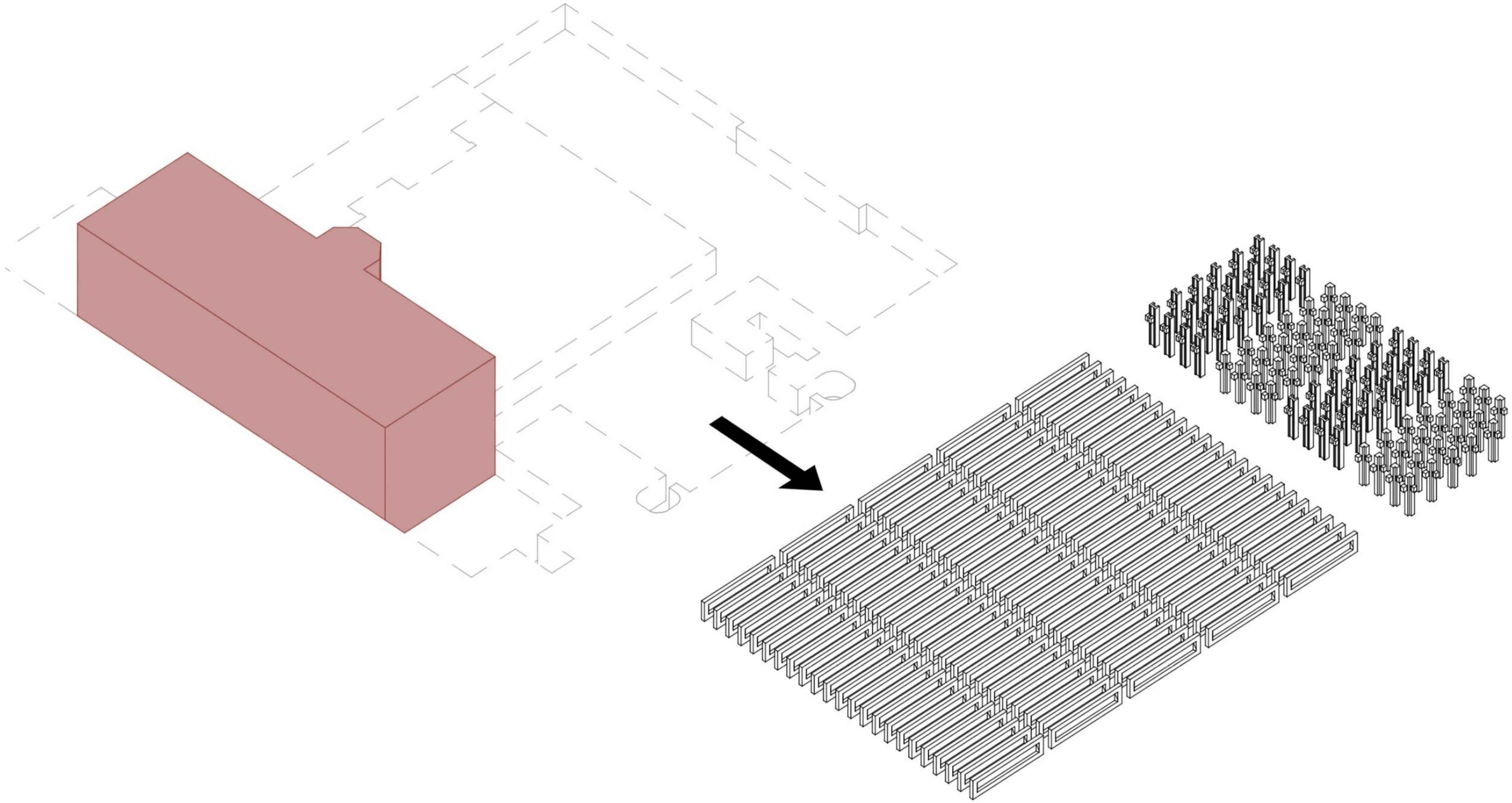

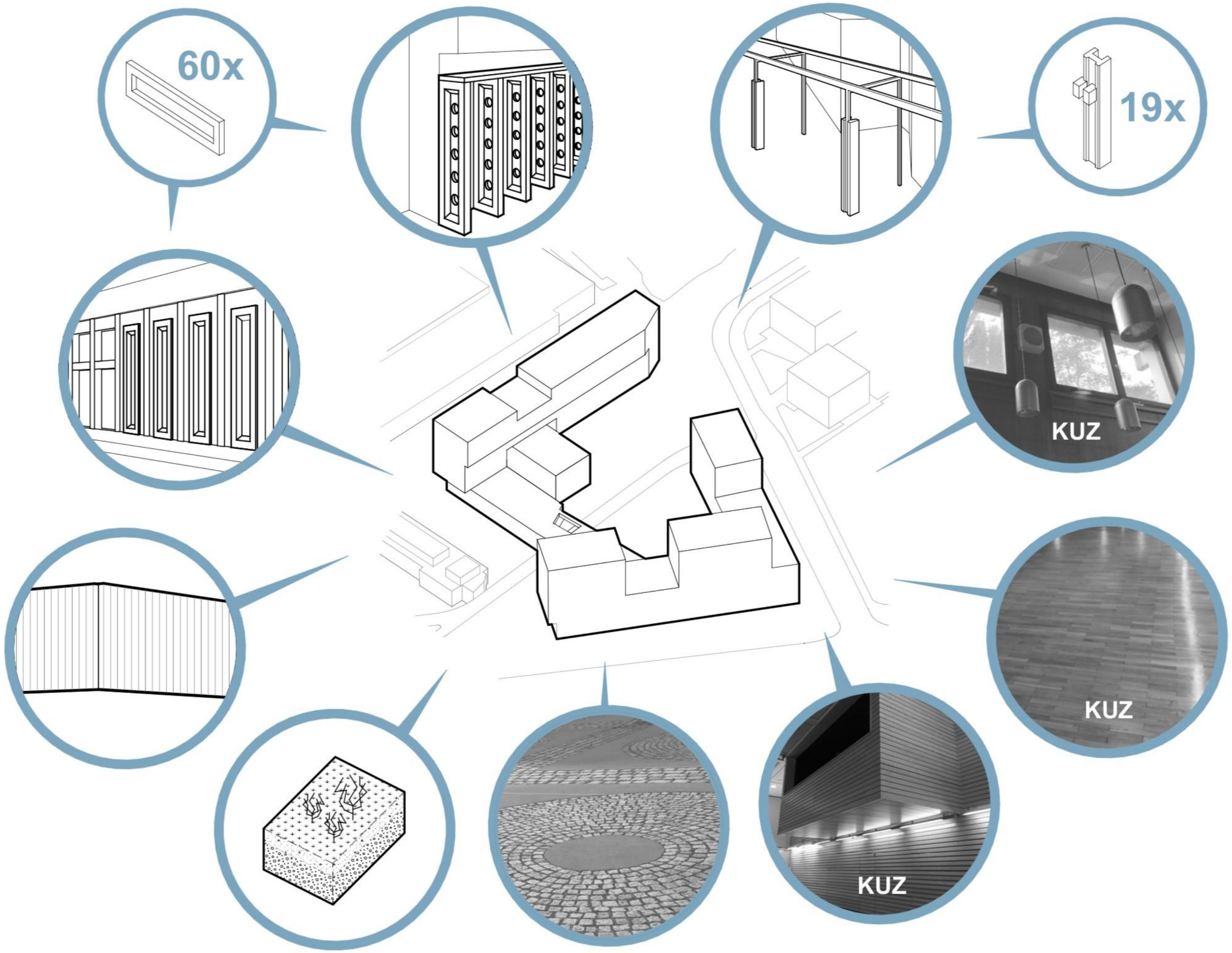
60x
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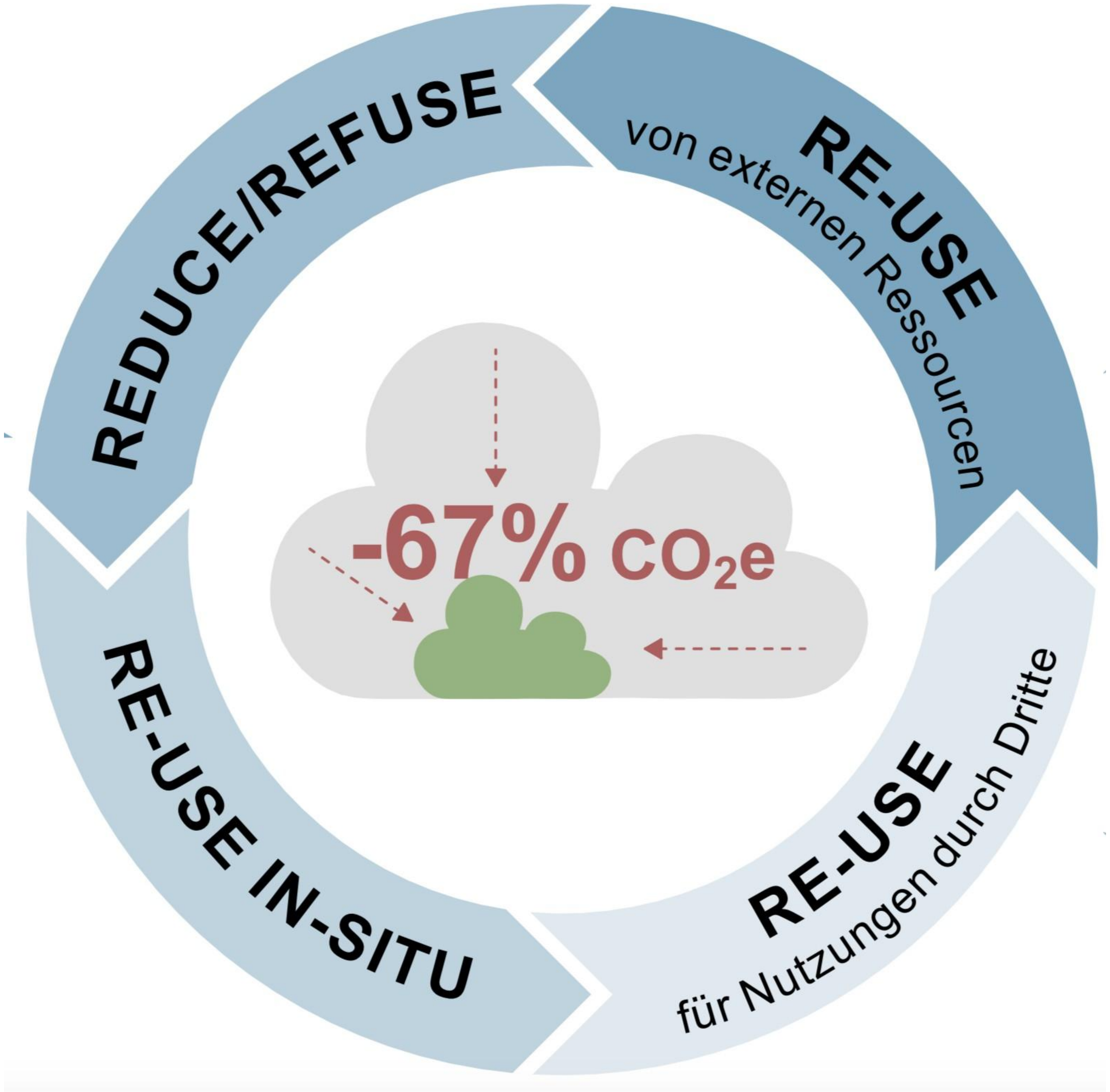
REDUCE/REFUSE
RE-USE
von externen Ressourcen
RE-USE
für Nutzungen durch Dritte
RE-USE IN-SITU
-67% CO₂e

GW_R-Klassen: Betonbau auf dem Niveau von Holzbau

Hochbau								
CO_2-Klassen	X0[2]	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C50/60
GW_R0	91 - 100	163 - 180	189 - 209	214 - 237	226 - 250	248 - 275	265 - 294	284 - 314
GW_R1	81 - 90	145 - 162	168 - 188	190 - 213	201 - 225	221 - 247	236 - 264	252 - 283
GW_R2	71 - 80	127 - 144	147 - 167	167 - 189	176 - 200	194 - 220	207 - 235	221 - 251
GW_R3	61 - 70	109 - 126	126 - 146	143 - 166	151 - 175	166 - 193	177 - 206	190 - 220
GW_R4	51 - 60	91 - 108	105 - 125	119 - 142	126 - 150	139 - 165	148 - 176	158 - 189
GW_R5	41 - 50	73 - 90	84 - 104	96 - 118	101 - 125	111 - 138	118 - 147	127 - 157
GW_R6	31 - 40	55 - 72	64 - 83	72 - 95	76 - 100	84 - 110	89 - 117	95 - 126
GW_R7	21 - 30	37 - 54	43 - 63	48 - 71	51 - 75	56 - 83	60 - 88	64 - 94
GW_R8	11 - 20	19 - 36	22 - 42	25 - 47	26 - 50	29 - 55	30 - 59	32 - 63
GW_R9	0 - 10	0 - 18	0 - 21	0 - 24	0 - 25	0 - 28	0 - 29	0 - 31

Legende: Grün = weitgehend verfügbar, Gelb = eingeschränkt verfügbar, Rot = in der Regel nicht verfügbar

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