

D1.1.4 REPORT ON INITIAL ASSESSMENT OF CONSTRUCTION AND SPILL-OFF SECTORS IN THE URBAN AND RURAL AREAS.

M1 Revision

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BURST and ReBuilt partnership





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1. Introduction

The goal of this deliverable is to serve as a base for the follow-up activities of the ReBuilt project in the joint development and testing of the ReBuilt training programme with MOOC for different targeted audiences in WP1, harvest, optimised and demonstrate innovative technical, digital and systemic solutions in WP2 and the development of demand-side measures and first Circular and Digital Construction Strategy in the central Europe in WP3.

The D1.1.4 contains an excerpt of the information collected in A1.1 covering innovation (Chapter 2), policies, legislation and cooperations (Chapter 3) and further recommendations (Chapter 4) for successful implementation of the circular and digital construction in regions and countries in Central Europe programme area. The final deliverable will be available as an e-report on the website of the ReBuilt project and is also presenting a proof of achieving milestone M1 Initial assessment of construction and spill-off sectors in the urban and rural area in Central Europe.



2. Innovations and practices supporting the developing and testing of innovative solutions for circular and digital construction

The thematic WP2 - Developing and testing innovative solutions for circular and digital construction has a specific objective on the development and testing of new technological and digital solution for circular construction in Central Europe. It will be realized with active inclusion of stakeholders in co-creation and testing of innovative solutions and their dissemination for increased knowledge in circular and digital construction (also as part of the ReBuilt training programme for different target audiences in WP1).

The following activities are foreseen in WP2:

- Community-based innovation and co-creation for circular and digital construction
- Upscaling and testing of green and bio-concrete products
- Tool for digitalisation of circular value chains with material passports and digital market for circular construction
- Circular value chains and business models in construction sector
- Creation of Circular and Digital Construction Demo Centre

Initial mapping in activity A1.1 aimed at providing a baseline overview of the participating nine Central European countries and regions in the field of circular and digital construction sector to support further activities.

In the following chapter, we introduce such innovations, that contribute to the successful implementation of WP2.

This chapter gives an overview of innovative and existing solutions which could benchmark, and support innovations developed in WP2. Data were gained based on the interactions with stakeholders in individual countries of consortium and desktop research. Partners from each country or state gave at least 2 innovative solutions in the field of circular and digital construction to evaluate the current state-of-the-art in the Central European programme area. 27 innovative ideas are given with further comments how can be applied in the ReBuilt project.

HUNGARY

Light weight and waste-based concrete

The 40-50% of the light weight concrete is granulated solid waste of different origin (water plastic debris, shredded polystyrene and WEEE, ashes, plastics, agricultural byproducts, other industrial waste, glass, wood chops and saw dust). The first pavement (urban, highway road) was prepared with this technology in 2020.

Website: <https://enittv.wixsite.com/wastelightconcrete>

Considerations for further uptake in the ReBuilt project: Test the leaching of concrete composites from waste to prevent emissions of potential hazardous compounds from the original waste. Test and classify mechanical strength and durability of different waste-based concrete mixtures. Check the existing end-of-waste criteria and legislation for putting product on the market.



Foam glass granulate

Foam glass granulate is a thermal insulation product from waste glass with many beneficial properties such as stability enhancer, frost-proof, sound-insulating, inertness, light weight, compression-resistant, pest resistant, with capillary barrier effect.

Website: <https://www.energocell.hu/en/>

Considerations for further uptake in the ReBuilt project: Test and classify mechanical strength and durability of foam glass granulate, compare potential impacts with other thermal insulation materials through life cycle of product, assess possibilities of leaching due to waste and potential for alkali silica reaction in concrete.

Kenderhazepites

Hungarian producer of hempcrete for thermal insulation.

More information at: <https://kenderhazepites.hu/kenderbeton-tulajdonsagai/>

Considerations for further uptake in the ReBuilt project: To see complementary with hemp-based technical solutions to be developed in WP2. Check the regulation pathways in each country for putting hemp-based construction products on the market.

CZECH REPUBLIC

Rebetong

Rebetong is a concrete mixture made from recycled construction and demolition waste as a partial replacement for natural aggregates. Rebetong is suitable for common concrete and reinforced concrete building structures. The major advantages are energy and resource saving, reduction of construction debris landfilling. The company offers support for LEED/BREEAM credits for recycled content in materials, lower energy demand for buildings.

More information at: <https://www.skanska.cz/co-delame/specialni-cinnosti/vyroba-dodavka-a-cerpani-betonu/rebetong/>

Considerations for further uptake in the ReBuilt project: Check the availability of suitable construction and demolition waste in urban and rural areas of Central European programme areas.

Recyklujme stavby!

'Recyklujme stavby!' or 'Let's recycle buildings!' website is an innovative good practice, that can help promote, explain and remove myths related to the recycled materials and circularity.

More information at <https://www.recyklujmestavby.cz/>

Considerations for further uptake in the ReBuilt project: Check the complementary between CinderOSS upgraded in WP2 and this platform.

3D tisk Weber centrum - 3D printing Weber centre

The new Weber Centre in Prague uses 3D technology for printing partial building elements as well as for large building structures as a technological innovation in the construction industry.

The use of a robotic arm for printing from a special cement mixture allows the printing of building elements that are not filled with concrete in the entire volume of objects and elements, but used only in the necessary places where it is possible to save material with the same or higher strength and resistance (elements such as staircases or retaining walls save 80% of work on the construction site compared to monolithic buildings and the whole process is accelerated by up to 60%).

More information at: <https://www.czgbc.org/cs/novinky/v-praze-se-otevrela-centrum-komerčního-3d-tisku-pro-stavebnictví-využít-ho-mohou-města-developerů-architektů-i-verejnost>



Considerations for further uptake in the ReBuilt project: Check the content of Portland cement in cementitious mixtures for printing and compare life cycle assessment with conventional techniques of construction. Also compare mechanical and durability properties.

Modřanský cukrovar - inovace, digitalizace a cirkularita - Modřanský cukrovar - Innovation, digitalisation and circularity

The use of innovation, digitization and circularity in the Skanska Modřanský cukrovar residential project is an example of the best practice of residential construction and housing in the Czech Republic. Skanska, in cooperation with ICE Industrial Services, realized 3D printing and printed an atypical concrete sanitary during the project. The Modřany cukrovar is an example of sustainable housing based on the application of technology, photothermics, photovoltaics and recycling of water and materials, including the so-called LID concept (Low Impact Development).

More information at: <https://www.czgbc.org/cs/novinky/3d-tisk-z-betonu-poprve-na-stavbe>

Considerations for further uptake in the ReBuilt project: Compare with other countries in region regarding holistic evaluation of sustainability of construction works (e.g. existence of different certification schemes as DGNB, Leed, BREEAM or national sustainability indicators).

Residence Čertův vršek

An example of best practice of recycling and circularity in Skanska residential construction due to the use of Rebetong for 15% of all concrete, and about 2,000 tons of recycled material were used for foundations, partitions and supporting structures, which would end up in landfills.

More information at: <https://www.czgbc.org/cs/novinky/vystavba-certova-vrsku-zaujala-kameru-ceske-televize>

Considerations for further uptake in the ReBuilt project: Check similar good practices of use of concrete with recycled concrete aggregate in Central Europe and ways of collecting pure concrete waste streams.

GERMANY

DIN 1045-2

The national DIN 1045-2 standard for concrete was improved. New regulations were introduced to blend a higher amount of recycled aggregate in recycling concrete.

More information at: https://www.umwelt-online.de/recht/bau/din/1045_2ges.html

Considerations for further uptake in the ReBuilt project: Check the national legislation and allowed content of recycled aggregate used in concrete for different intended uses.

Hanf&Kalk

Construction company from Germany building wood-based structural houses with material mixers of hemp, lime and clay.

More information at: <https://www.hanfundkalk.de/>

Considerations for further uptake in the ReBuilt project: To see complementary with hemp-based technical solutions to be developed in WP2. Check the regulation pathways in each country for putting hemp-based construction products on the market.

ITALY

Grycle

Grycle has developed a machine that transforms undifferentiated waste into raw material granules, which are automatically separated and reusable in industrial transformation processes. The machine is equipped with an Artificial Intelligence (AI) module that enables progressive learning of automatic recognition of



raw materials. Depending on the capacity of its sensors, Grycle can be trained to recognise new materials in a self-learning mode, even composite materials.

More information at: <https://grycle.com/en/the-prototype/>

Considerations for further uptake in the ReBuilt project: Check the technology readiness level of the pilot technology and its applicability to mineral waste (e.g. concrete, soil, stone). Could be applicable for polymer composites.

Granella®

High grade manufactured aggregate with similar physical and mechanical characteristics compared to natural aggregates of volcanic origin (e.g. basalt, diabase, porphyry) for asphalt and concrete composites. Categorized as a by-product in the electric furnace steel-making process. Certified and CE marked under Regulation EU 305/2011 according to different harmonised standards for use in bituminous mixtures, concrete and unbound and hydraulically bound materials in civil engineering works and road construction. The product has received Environmental Product Declaration (EPD), an environmental declaration for products type III.

More information at: <https://www.pittini.com/en/products/road/granella/>

Considerations for further uptake in the ReBuilt project: Check the possibility of use of other EAF slags in Central European area for concrete manufacturing and durability and properties of such aggregate.

SLOVAKIA

Talpa House

Talpa House, Faculty of Civil Engineering and Institute of Construction and architecture have provided good practices and innovations in realization of construction using recycled concrete with interesting architecture, education and material research

More information at: www.talpahouse.com

Considerations for further uptake in the ReBuilt project: To identify other similar good practices around Central Europe programme area and to integrate good practice in the CinderOSS platform.

Circular DigiBuilt (Danube region, SK, AT, DE, HR, CZ, HU, SI)

The project aims to capture the essence of the achievement at the intersection of the CE and digital technologies with a focus on forging pathways of CE implementation across Danube countries. a new Cluster for increasing regional capacities to absorb innovation will be formed to promote interregional RDI cooperation, exchanging cross-sectoral experiences between innovation actors from leading and lagging Danube countries. Barriers to digitalisation-led CE transition will be identified and related policies - improved. Important and applicable innovations for achieving the digitalisation enabled CE will be sought. Three pilots will be implemented to showcase how disruptive innovations for circular economy interventions can harness the 'clean construction' practices in Danube region. New Danube region strategy for improving circularity in the construction and building business will be deployed, agreed and popularised, with 13 national action plans and 1 Plan for up-scaling the Pilots.

More information at: <https://interreg-danube.eu/projects/circular-digibuild>

Considerations for further uptake in the ReBuilt project: Further networking to identify complimentary solutions and activities of both projects and to avoid repeating same activities.



SLOVENIA

CONSTRUCTION 4.0

The project aims to implement a comprehensive digital transformation of the consortium's lead partner, GIC GRADNJE, and several business functions in the other partners. This addresses the main challenges perceived and felt by the construction industry globally and consequently also in Slovenia, which are also significantly influenced by digital technologies and digitisation.

More information at: https://www.gic-gradnje.si/gradbenistvo_4_0

Considerations for further uptake in the ReBuilt project: To identify other similar good practice of digital tools applied to construction companies around Central Europe and possibility for promotion.

Concrete Plant Negonje 2022

The investment is co-funded by the Recovery and Resilience Facility, NextGenerationEU and consists of the installation of a new sustainable concrete batching plant, including a recycled plant, landscaped surroundings, with the aim of increasing production capacity, and a more economical and environmentally friendly way of operating and using materials.

More information at: https://www.gic-gradnje.si/betonarna_negonje

Considerations for further uptake in the ReBuilt project: To identify other similar good practice of digital tools applied to construction companies around Central Europe and possibility for promotion as good practice through the ReBuilt activities.

AshCycle (EU, SI, HR)

The AshCycle project provides tools for reducing the waste generation from the incineration of municipal solid waste (MSW), biomass, sewage sludge, or combinations of them by developing new utilization possibilities, among others in construction sector with special focus on CO₂ sequestration in construction products.

More information to provide: <https://www.ashcycle.eu/en/>

Considerations for further uptake in the ReBuilt project: To identify potential use of different ashes for CO₂ capturing in concrete (e.g. in WP2). Assess potential leaching of toxic elements and mechanical/durability properties of construction products.

CO2TREAT (EU, SI, GE)

The CO₂TREAT project is focused on designing resource-efficient, low-carbon binder products for concrete and civil engineering application by partially substituting Portland cement with secondary resources benefited by treatment with CO₂.

More information to provide: <https://co2treat.vito.be/en>

Considerations for further uptake in the ReBuilt project: To identify potential use of different ashes and slags for CO₂ capturing in concrete (e.g. in WP2). Assess potential leaching of toxic elements and mechanical/durability properties of construction products.

CoGreen

Construction company from Slovenija building with hempcrete.

More information at: <http://cogreen.si/>

Considerations for further uptake in the ReBuilt project: To see complementary with hemp-based technical solutions to be developed in WP2. Check the regulation pathways in each country for putting hemp-based construction products on the market.



AUSTRIA

BauKarussell

Austrian provider for the dismantling of buildings with a focus on preparation for re-use and recycling of construction waste. Educational: on the webpage resources on legislative and practical guidance is given to enable the dissemination and accessibility to their on-site insights on the deconstruction of buildings.

More information at: <https://www.baukarussell.at/know-how/>

Considerations for further uptake in the ReBuilt project: To identify other similar good practice of selective demolition in the Central European area and possibility for promotion as good practice through the ReBuilt activities.

Hanfdaemung

Website on Capatec hemp systems - hemp bricks, hemp facades and hemp acoustic systems produced by Synthesa group in Austria. It provides information about hemp construction products for acoustic and thermal insulations.

More information at: <https://www.hanfdaemmung.at/>

Hempstatic

Austrian producer of designed hemp-lime acoustic panels with addition of earth pigments.

More information at: <https://hempstatic.at/>

Considerations for further uptake in the ReBuilt project: To see complementary with hemp-based technical solutions to be developed in WP2. Check the regulation pathways in each country for putting hemp-based construction products on the market.

CROATIA

BLOOM project

The BLOOM – Empowering SMEs in the construction sector for circular economy - is financed by the Norwegian Financial Mechanism 2014-2021, within the framework of the Business Development and Innovation Croatia Program. It deals with exchanging the best global practices, collecting, and disseminating knowledge among entrepreneurs and companies in the field of circular economy in construction. The aim is to raise awareness and provide educational support for construction companies on circular economy, with a focus on agility, financial framework, and digitization. The project's idea is to support entrepreneurs from the construction sector (designers, contractors, supervisory engineers, construction companies, etc.) in Croatia, in earthquake-affected areas, through technical and business education to achieve better business results.

More information at: <https://eeagrants.org/archive/2014-2021/projects/HR-INNOVATION-0062>

Considerations for further uptake in the ReBuilt project: To identify other similar practices in lifelong trainings for SME in the Central European area in the field of circular construction and business modelling.

ReCreate (EU, HR, GE)

ReCreate is an H2020 funded project focused on deconstruction and reuse of precast concrete elements. The project aims to discover how used concrete elements can be deconstructed without damaging them to be reused in new buildings - and turn the process into a profitable business. ReCreate pushes towards circular construction by investigating the systemic changes needed in the whole ecosystems of construction and demolition. Hemp as building material has relevance in upscaling and testing of green and bio-concrete products



More information at: <https://recreate-project.eu/about-us/>

Considerations for further uptake in the ReBuilt project: To identify if legislative ways are identified how to put reused construction materials, kits, part of buildings on the market to still fulfil the essential requirements for construction works.

POLAND

Pankas (PL, GE, HU, SL)

Pankas is international group company seated in Denmark with 19 companies around Europe, including Poland, Czechia, Slovakia, Hungary in Central Europe. They are focused on sustainability of production and laying asphalt. Annually they are producing joint ESG report according to EU CSRD (EU 2022/2464) and other regulations on sustainability. Main sustainable practices in the field of asphalt are: cold recycling, where existing asphalt materials are milled and mixed in machine with fresh binders like bitumen emulsions, foamed bitumen and cement before applied on the road again (their practices are applied in Poland and Hungary); surface dressing where a layer of bituminous binder is sprayed on a prepared based and covered with stone chips rolled to prolong service life of road (applied in Germany); slurry seal as a homogenous mixture of bitumen emulsion, water, well-graded fine aggregate and mineral filler is applies to fill existing pavement surface defects or to prepare for other maintenance treatments for prolonging life span of road; hot remix method for on-site recycling of existing asphalt surface courses; recover of asphalt materials with cold milling (available in Hungary, Poland); soil stabilisation for using local low-grade materials (available in Hungary, Poland); in-plant cold recycling using reclaimed asphalt which is mixed with binders in plan - mobile plants are also available (available in Hungary); demolition of concrete pavements slabs with the crack and seat process to put asphalt layer on top of the old concrete without removal (available in Hungary).

More information at: <https://pankas.com/>

Considerations for further uptake in the ReBuilt project: The company gives nice review of possible techniques to save costs and decrease environmental impacts of road construction and maintenance which can be further disseminate in the ReBuilt project. To review life cycle assessment and compare it with conventional techniques.

Ekozec Veoila

Ekozec Veolia is a company dedicated to the management of waste from combustion by-products (ashes, slag, synthetic gypsum, ash slag mixtures, other incineration waste). They also produced aggregates and concrete mixtures as recycled aggregates, stabilisers, ready-to-use concrete mixtures and road concretes. Their total waste management service from waste collection, segregation, transport, reuse, recycling and recovery offer services along the whole value chain.

More information at: <https://ekozec.pl/en/products/aggregates-and-concrete-mixtures>

Considerations for further uptake in the ReBuilt project: To connect with the stakeholder for further interaction and potential use of incineration products in concrete as additive. To review life cycle assessment and risk assessments (ashes, slags) and compare it with conventional techniques. Potential applications in CO2 binding.

DOMIR

A polish company constructing dome houses using hempcrete, wood wool, compressed straw and clay plasters.

More information at: <https://www.domir.com.pl/en/>



Considerations for further uptake in the ReBuilt project: To see complementary with hemp-based technical solutions to be developed in WP2. Check the regulation pathways in each country for putting hemp-based construction products on the market.



3. Policies, cooperations for digital and circular construction

The thematic WP3 - Development of joint strategy for circular and digital construction in central European region has a specific objective on the development and partial testing of Common strategy for Circular and Digital Construction in Central Europe and deployment of Regional Circular and Digital Construction Hub network. The communication activities will boost the momentum for attitude and behavioural changes.

The following activities are foreseen in WP3

- Development of Circular and digital construction demand-side measures
- Development of Common Strategy for Circular and Digital Construction in Central Europe
- Implementation of Regional Circular and Digital Construction Hubs under Circular Construction Umbrella in Central Europe

A1.1 initial mapping aimed at providing a baseline overview of the participating 9 Central European countries in field of circular and digital construction sector to support further activities. In the following chapter, we introduce policies, demand-side measures, cooperation hubs and platforms that contribute to the successful implementation of WP3.

3.1 Supporting policies and regulation/legislation in the Central European countries

European territorial cooperation (ETC) (EU)

European territorial cooperation (ETC) is the goal of cohesion policy that aims to solve problems across borders and to jointly develop the potential of diverse territories. Cooperation actions are supported by the European Regional Development Fund (ERDF) through three key components: cross-border cooperation, transnational cooperation and interregional cooperation. For the circular economy the CTE develops waste recovery and recycling protocols, as well as cross-border policies on the waste system and environmental protection, along with concrete management models for renewable energy, waste and its reuse, and material recovery. In addition, it contributes to the identification of good practices for the adoption of green procurement geared toward efficient use of resources.

A European Green Deal (EU)

The European Green Deal improves the well-being and health of citizens and future generations by providing fresh air, clean water, healthy soil and biodiversity, renovated, energy-efficient buildings, healthy and affordable food, more public transport, cleaner energy, and cutting-edge clean technological innovation, longer lasting products that can be repaired, recycled and re-used, future-proof jobs and skills training for the transition globally competitive and resilient industry

A new Circular Economy Action Plan (EU)

This Plan provides a future-oriented agenda for achieving a cleaner and more competitive Europe in co-creation with economic actors, consumers, citizens, and civil society organisations. And, it provides a future-oriented agenda for achieving a cleaner and more competitive Europe in co-creation with economic actors, consumers, citizens, and civil society organisations. It aims at accelerating the transformational change required by the European Green Deal, while building on circular economy actions implemented since 2015. This plan will ensure that the regulatory framework is streamlined and made fit for a



sustainable future, that the new opportunities from the transition are maximised, while minimising burdens on people and businesses. This plan presents a set of interrelated initiatives to establish a strong and coherent product policy framework that will make sustainable products, services, and business models the norm and transform consumption patterns so that no waste is produced in the first place. This product policy framework will be progressively rolled out, while key product value chains will be addressed as a matter of priority. Further measures will be put in place to reduce waste and ensure that the EU has a well-functioning internal market for high quality secondary raw materials. The capacity of the EU to take responsibility for its waste will be also strengthened.

New European Bauhaus (EU)

The New European Bauhaus is a creative and interdisciplinary initiative that connects the European Green Deal to our living spaces and experiences. The New European Bauhaus initiative calls on all of us to imagine and build together a sustainable and inclusive future that is beautiful for our eyes, minds, and souls, representing diverse stakeholders, from government to civil society, citizens' initiatives, and companies. The main is to embody the 'design for everyone' principle and ensure that the benefits of the digital and green transitions are shared broadly. The Neu Bauhaus core values: Sustainability (circular economy, energy efficiency, use the sustainable materials and construction techniques, re-use of materials and spaces, green mobility, restoring biodiversity); Aesthetics (places in harmony with nature, rediscovery of history and architectural heritage, work with people's creativity and imagination); Inclusivity (attention to the need of marginalized groups, wider participation in design -making, expanding access).

EU Construction Products Regulation (EC/305/2011)

The Construction Products Regulation (CPR) lays down harmonised rules for the marketing of construction products in the EU. The Regulation provides a common technical language to assess the performance of construction products. It ensures that reliable information is available to professionals, public authorities, and consumers, so they can compare the performance of products from different manufacturers in different countries. On 30 March 2022, the Commission put forward a proposal to revise the CPR. The proposal is part of a package with several other sectoral proposals aimed at making sustainable products the norm in the EU and boosting circular business models. The stated aims of the proposal are to improve the functioning of the internal market for construction products, address the implementation challenges that still exist at national level (particularly regarding market surveillance), simplify the legal framework and support the green and digital transition in the sector.

Waste Framework Directive (EC/2008/98)

The Waste Framework Directive (WFD) sets the basic concepts and definitions related to waste management, including definitions of waste, recycling and recovery. It requires that waste be managed without endangering human health and harming the environment, without risk to water, air, soil, plants or animals, without causing a nuisance through noise or odours and without adversely affecting the countryside or places of special interest. The foundation of EU waste management is the five-step "waste hierarchy", established in the Waste Framework Directive. It establishes an order of preference for managing and disposing of waste. In 2023 a proposal for amendment of Directive was given focusing additionally on two resource intensive sectors: textiles and food.

Strategy for the Digital Transformation of Enterprises

The digital transformation of the economy is supported by the adoption of the Strategy for the Digital Transformation of Enterprises, guidelines for innovative procurement, and the operationalisation of a single digital identity (e-identity) for companies. The Strategy provides for the transfer of different registers to one single business register. In accordance with the Strategy, at least 200 businesses shall acquire an e-identity.

HUNGARY



Nemzeti Fenntartható Építésgazdasági Stratégia 2021-2023 - National Sustainable Building Strategy 2021-2023

Reflecting the problems and needs of the building sector, the document formulates proposals to improve the quality and sustainability of the built environment and to improve the efficiency, productivity and stability of the sector - and thus the preservation of Hungarian jobs and the standard of living of Hungarian citizens.

Magyarország zöld közbeszerzési stratégiája 2022-2027 - Hungary's Green Public Procurement Strategy 2022-2027

Green public procurement is a procedure whereby public authorities give preference to the procurement of goods, services and works that have a lower environmental impact than other goods, services and works with the same purpose. The present strategy is also based on the above definition, with the addition that a public procurement can only be green, where the contracting parties take environmental considerations into account in the procurement process, over and above the mandatory requirements generally applicable to the goods/services/works concerned.

Nemzeti Fenntartható Fejlődési Keretstratégia 2012-2024 - National Sustainable Development Framework Strategy 2012-2024

The document serves as a long-term concept in the public policy decision-making system. It provides a framework, targets and priorities for the preparation of other decisions, so that policy strategies or plans can establish a target-means-period-financing-resource system that can meaningfully serve the sustainability transition together with and in coherence with other policy strategies or plans.

5. Nemzeti Környezetvédelmi Program - 2026-ig szóló szakpolitikai stratégia - 5th National Environment Programme - Policy Strategy to 2026

The Programme defines the country's environmental objectives and the tasks and means necessary to achieve them, considering the country's environmental status, the development objectives of society and the obligations arising from international cooperation and EU membership. Emphasis is placed on the cross-cutting nature of environmental protection, i.e. its cross-sectoral nature, and it is important that environmental considerations are properly mainstreamed in all socio-economic processes.

Nemzeti Tiszta Fejlődési Stratégia 2020-2050 - National Clean Development Strategy 2020-2050

Hungary supports achieving full climate neutrality by 2050. The National Clean Development Strategy, which takes the form of a long-term concept, outlines a socio-economic and technological development pathway with a 30-year horizon that will enable us to achieve climate neutrality by 2050 while ensuring the protection of our natural assets and economic development, with the well-being of the Hungarian people at the centre.

Act about public construction investments - Az állami építési beruházások rendjéről szóló 2023. évi LXIX. törvény

Order on public construction based on local traditions, economically and environmentally sustainable. The purpose of this law is to (a) promote the efficiency of implementation and predictability for public works in the preparation and implementation of public works; (b) lay down the basic rules for public works preparation from preparation to design, construction work to the operation and maintenance, taking account of the requirements of cost-effectiveness and budgetary use of the public and Union funds, and the environmental sustainability, (c) to strengthen the transparency of public works, with particular respect to investment costs; d) determine the tasks and relations of the participants of public works.

Act about the Hungarian building industry - A magyar építészetéről szóló 2023. évi C. törvény



Act of law on Hungarian architecture which aims to promote civic sense, improve the quality of life and preserve our architectural heritage and green spaces. The new legislation affects all property investments due to aesthetic and townscape requirements for construction plans and the preference for underused areas that have lost their industrial and logistical role. It intends to define the architectural direction for the future by respecting the Hungarian architectural heritage and architectural identity, with a strong emphasis on the pursuit of greater aesthetic quality.

CZECH REPUBLIC

[Strategický rámec cirkulární ekonomiky České republiky 2040 - Strategic framework of the circular economy of the Czech Republic 2040](#)

The purpose of the Strategic Framework of the Circular Economy of the Czech Republic 2040 is to formulate assumptions, goals and measures for the Czech Republic to be long-term resistant to future environmental threats, including climate change, and to develop an overall sustainable social system through the circular economy. The Czech Republic must be able to respond to future fundamental challenges also in connection with natural disasters or pandemics, etc.

[Akční plán Cirkulární Česko - Action plan Circular Czech Republic](#)

The Circular Czech Action Plan 2022-2027 is an implementation document of the Strategic framework of the circular economy of the Czech Republic 2040; for the period 2022-2027, The main function of the Action Plan is to set in more detail the method of fulfilling strategic goals, specific goals and typical measures of Circular Czech 2040 in the form of activities, thereby establishing a clear method of fulfilment, justifies the necessity, determines the main responsibilities for the activity (carriers, implementers), will estimate their financial demands and measurability. Circular Czech Action Plan 2022-2027 develops selected type measures in ten priority areas in the form of cards of activities, which is needed from the point of view of the development of the circular economy of the Czech Republic to be implemented in the next six years. One of the priority areas is also Circular cities and infrastructure.

[Koncepte zavádění metody BIM v České republice - BIM Implementation Strategy in the Czech Republic](#)

This strategy was elaborated based on Government Resolution No 958, on the importance of the Building Information Modelling (BIM) method for building practice in the Czech Republic and the proposal for further steps in its implementation, of 2 November 2016. In the Strategy, the Government expressed its support for the introduction of the BIM method in the Czech Republic in connection with its influence on the growth and competitiveness of the Czech economy and ordered the Ministry of Industry and Trade (MIT), with the support of other ministries, to elaborate the BIM Implementation Strategy in the Czech Republic.

[Plán odpadového hospodářství ČR - Waste management plan of the Czech Republic](#)

The Waste Management Plan of the Czech Republic (Waste Management Plan of the Czech Republic) for the period 2015-2024 was approved by the government on 22 December 2014. The Waste Management Plan of the Czech Republic is a tool for managing the waste management of the Czech Republic and implementing a long-term waste management strategy. The obligation of the Czech Republic to prepare a waste management plan on its territory (Waste Management Plan of the Czech Republic) is stipulated in Directive 2008/98/EC of the European Parliament and of the Council on waste. Pursuant to the Waste Act, the Ministry of the Environment prepared the POH of the CR in cooperation with the relevant public administration bodies and the public.

ITALY

[Decreto Legge 12 settembre 2014, n.133, "Decreto Sblocca Italia" - Decree-Law No. 133 of 12 September 2014](#)

This decree law introduced urgent measures in Italy for the opening of construction sites, for the realisation of public works, for the digitisation of the country, and for bureaucratic simplification, with



the objective of revitalising many productive activities in crisis, as well as ensuring sustainable development processes. In the building sector, the novelties have mainly concerned the single building regulation, a model scheme indicating the performance requirements for buildings, particularly about safety and energy saving.

[Il D.lgs. 24 dicembre 2015 - Legislative Decree 24 dicembre 2015](#)

This decree establishes the adoption of minimum environmental criteria for the procurement of design and construction services for new construction, renovation, and maintenance of buildings for public administration construction sites. It outlines criteria to be followed in the construction of buildings, also with a focus on sustainability.

[Decreto Ministeriale 11 ottobre 2017 "Affidamento di servizi di progettazione e lavori per la nuova costruzione, ristrutturazione e manutenzione di edifici pubblici" - Ministerial Decree 11 October 2017 "Contracting of design and works services for new construction, renovation and maintenance of public buildings"](#)

In this decree, we find for the first time the CAM (minimum environmental criteria - see row 7) for the construction sector. The document defines environmental criteria identified for various stages of the procurement procedure, aiming to enhance the service or work provided, striving for environmental performance above the sector's average. These criteria, where possible, correspond to characteristics and environmental performance superior to those required by current national and regional laws. These criteria were subsequently reviewed and expanded in the Ministerial Decree of June 23, 2022, No. 256.

[Criteri ambientali minimi \(CAM\) - Minimum environmental criteria](#)

The acts constituting the regulatory framework often refer to minimum environmental criteria (CAM). CAM are the environmental requirements aimed at identifying the best design solution, the best product or service, in the green procurement phases of public administrations. Their application allows for the dissemination of technologies and products preferable from an environmental point of view. To date, CAM for the construction sector can be found in the Ministerial Decree of 11 October 2017 "Contracting of design services and works for the new construction, renovation and maintenance of public buildings" (see row 5). The document defines the environmental criteria, identified for the different stages of defining the tendering procedure that allow for the improvement of the service or the work provided, to ensure environmental performance above the sector average. These criteria, therefore, correspond where possible to characteristics and performance environmental characteristics and performance above those required by national and regional laws in force.

[d.P.R. 13 giugno 2017, n. 120 - Legislative DECREE on excavated earth and rocks](#)

Excavated earth and rocks finally make the quantum leap required by the circular economy. The difference between yesterday and today lies essentially in their classification, which has changed from 'waste' to 'by-product'.

[DECRETO 27 settembre 2022, n. 152 - Regulation regulating the end-of-waste status of inert construction and demolition waste and other inert waste of mineral origin](#)

Regulation regulating the end-of-waste status of inert construction and demolition waste and other inert waste of mineral origin.

[Legge regionale 4 ottobre 2018 n. 16 \(Misure per il riuso, la riqualificazione dell'edificato e la rigenerazione urbana\) - Regional law 4 October 2018 no. 16 \(Measures for reuse, redevelopment of the built environment and urban regeneration\)](#)

With this law, the Region of Piedmont intended to promote and incentivise the reuse and redevelopment of the existing building heritage and the regeneration of parts of the city, with the aim of regulating innovative and simplified building procedures that promote the recovery of the built heritage and of



attics and rustic buildings. The aim of the law is to renovate parts of urbanised territory, generally made up of degraded and obsolete heritage, lacking functional, energy sustainability and seismic safety criteria, and at the same time promote the beauty, understood as urbanistic quality, of the landscape. With the implementation of these provisions, the Region also intends to achieve the objectives of sustainability in the building industry by assigning to urban requalification and regeneration projects requirements relating to the quality of materials, the saving of natural resources, the treatment of waste in the production cycle and the containment of energy consumption.

Legge regionale n. 14 del 04 aprile 2019 - Regional Law No. 14 of 4 April 2019

Veneto is one of the most advanced regions in the bio-building sector, so much so that with the regional law of 4 April 2019, no. 14 has set itself the objective of promoting policies for the densification of areas of consolidated urbanisation, through the demolition of incongruous artefacts and the environmental redevelopment, contemplating specific bonuses and volumetric increases connected to the use of building credits from renaturalisation (Art.1, paragraph 2 Regional Law regional law no. 14 of 4 April 2019).

Programma Nazionale Prevenzione Rifiuti - National Waste Prevention Program

Achieve very high levels of preparedness for reuse, recycling and recovery of waste; adapt the network of plants necessary for integrated waste management; minimization, as a last and residual option, of final disposal; establishment of monitoring systems; avoid launching new infringement procedures against Italy address the low waste collection rate, discourage landfilling and ensure complementarity with regional waste programmes, allowing the objectives of EU legislation to be achieved and national waste management system and combating illegal waste dumping and open-air incineration.

Strategia nazionale per l'economia circolare - National strategy for the circular economy

For these reasons the "National strategy for the circular economy" is a programmatic document providing actions, objectives and measures that are intended to be pursued as institutional policies with the purpose to ensure an effective transition towards a circular economy.

GPP CAM - Criteri ambientali minimi / Green Public Procurement - minimum environmental criteria

The Minimum Environmental Criteria (CAM) are the environmental requirements defined for the various phases of the purchasing process, aimed at identifying the best design solution, product or service from the environmental point of view along the life cycle, considering market availability. CAMs are defined within the framework of the Plan for the Environmental Sustainability of Consumption in the Public Administration Sector and are adopted by Decree of the Minister.

POLAND

Mapa drogowa transformacji w kierunku gospodarki o obiegu zamkniętym (GOZ) - Roadmap for the transformation towards a circular economy (CE)

The circular economy road map is a document containing a set of tools, not only legislative ones, aimed at creating conditions for the implementation of a new economic model in Poland. The proposed activities concern primarily analytical, conceptual, informational, promotional and coordination work in areas within the jurisdiction of individual ministries.

The document adopted by the Council of Ministers of the Republic of Poland on October 10, 2019 is the result of the work of working groups operating in the Team for the Circular Economy and extensive public consultations. More than 100,000 people took part in them. 200 socio-economic partners, as well as representatives of government and local government administration.

Act on spatial planning



Spatial Planning Law of September 24, 2023, regulates the spatial planning system in Poland, including the development of spatial policies and spatial plans (concepts, plans, studies) and divides various powers among the administrative tiers of government. It brings several novelties to construction sector and future investments in Poland. No legal tools at the regional level to establish land-use planning regulation exists. Local spatial development plans are legally binding documents; they are an essential planning document for an area.

National Waste Management Plan 2022

This plan outlines Poland's approach to waste management, emphasizing the prevention of waste generation and the promotion of recycling. It includes specific targets for the recycling of construction and demolition waste to ensure these materials are effectively reused.

Polish Strategy for Responsible Development (2017-2020)

This strategy incorporates elements of the circular economy, particularly focusing on sustainable resource management and innovation in the construction sector. It promotes the use of recycled materials and the development of new technologies to support circular practices.

Poland's Energy Policy until 2040 (PEP2040)

While primarily focused on energy, this policy integrates circular economy principles by promoting energy efficiency and the use of renewable energy sources. It also includes measures to support the circular economy in construction through energy-efficient building practices.

Act on Waste (2012, several times changed)

This act provides the legal framework for waste management in Poland, incorporating the principles of the circular economy by emphasizing waste prevention, reuse, and recycling. It includes specific provisions for the management of construction and demolition waste.

These documents and initiatives form the backbone of Poland's approach to integrating circular economy principles, particularly within the construction sector, and highlight the country's commitment to sustainable development and resource efficiency.

SLOVENIA

Zakon o varstvu okolja ZVO-2 - Environmental Protection Act

This Act regulates the protection of the environment from pollution as a fundamental condition for sustainable development and, in this context, defines the basic principles of environmental protection, environmental protection measures, monitoring of the state of the environment and information on the environment, economic and financial instrumental protection, public services of environmental protection and others with protection environment related issues.

Uredba o odpadkih 2022 - Decree on waste

This Decree has a view to protect the environment and safeguard human health, lays down management rules and other conditions to prevent or reduce the adverse impacts of the generation and management of waste, reduce the overall effect of the use of natural resource, and improve the efficiency of the use of natural resources, following Directive 2008/89/EC.

Uredba o ravnanju z odpadki, ki nastanejo pri gradbenih delih - Decree on management of waste arising from construction work

This Decree stipulates the mandatory handling of waste generated during construction works due to the construction, reconstruction, adaptation, renovation, or removal of the building (after this: construction waste).

Uredba o odlagališčih odpadkov - Decree on waste landfill



The regulation aims to reduce waste disposal in landfills gradually, especially those suitable for recycling or other processing. The transition to a circular economy, conditions and measures related to the planning, construction, disposal, and closure of waste disposal sites, and reduction of environmental impacts. - reduction of greenhouse gas emissions and prevention of risks to human health.

Gradbeni zakon - Building Act

The purpose of the Act is to protect the public interest in the construction of buildings: respect for the principle of equal opportunities, environmental protection, nature conservation, water protection, protection of cultural heritage, promotion of sustainable construction, compliance with the placement of buildings in space, architecture, recording, usability, efficiency, quality of facilities and their compatibility with the environment throughout their life cycle.

Zakon o gradbenih proizvodih - Construction Products Act

The Act regulates the placing on the market of those products or sets of products intended for permanent installation in construction facilities and whose properties affect the properties of construction facilities. The Act first regulates the determination of requirements for construction products for which there are no harmonized European technical specifications. The Act represents an adaptation of Slovenian legislation in placing construction products on the market to the requirements of the European legal order, i.e., Regulation (EU) no. 305/2011.

Program ravnanja z odpadki in program preprečevanja odpadkov 2022 - A new Waste Management Programme and Waste Prevention Programme of the Republic of Slovenia

To achieve the goals of sustainable waste management per the Environmental Protection Act, Slovenia prepares an operational environmental protection program in waste every four years, consisting of a Waste Management Program and a Waste Prevention Program for the period up to 2035. In this way, it follows the implementation of European policies and obligations from EU environmental protection regulations. The emphasis is on preventing the generation of waste: i) preparation of waste for reuse and recycling before energy processing of waste, ii) processing of waste before its disposal, if this is the best option from the point of view of environmental protection, considering technical feasibility and economic sense.

Kažipot krožnega gospodarstva Slovenije - Roadmap towards the circular economy in Slovenia

The Roadmap is based on the so-called "Circular Triangle", the core of systemic change: Circular Economy (business models), Circular Change (government policies), and Circular Culture (citizens). We especially emphasize the importance of Circular Culture, since without reconsidering our values, creating new narratives, and changing our behavioral patterns, we cannot hope for a change in the economic models or corresponding shifts on a governmental level. Circular Culture is the aspect that seems to hide the greatest transformative capital for Slovenia.

Strategija Digitalna Slovenija 2030 - Digital Slovenia 2030 strategy

The strategy anticipates orientations and targets with indicators to address the biggest development gaps to accelerate the development of digital transformation in all areas, from gigabit infrastructure to the digital transformation of the economy, digital public services, the road to Smart Society 5.0, cybersecurity, digital competences and inclusion, and related content such as enabling supportive environments and the green transition. The strategy is a strategic document and contains specific measurable indicators in each of the thematic areas. The overarching objective of the strategy is to promote the digital transformation of Slovenia in all segments - society, government, local communities, and the economy. The ministry responsible for digital transformation will be responsible for managing the implementation of the strategy.

Občinski program varstva okolja Mestne občine Maribor za obdobje 2021-2030 - Municipality of Maribor: environmental protection program 2021-2030



The purpose of the municipal environmental protection program is to guide the implementation of environmental protection activities, establishing conditions for a quality and healthy living environment and enabling enforcement obligations from ratified international treaties of EU strategies, programs, and regulations related to various environmental areas. The program recognizes and it also raises awareness of, those challenges for which clear solutions are yet to be found are not known.

More information at:

[Strategija prehoda mesta Maribor v krožno gospodarstvo - Strategy for the transition to circular economy in the Municipality of Maribor](#)

The Municipality of Maribor is currently the only municipality in Slovenia (member of the Partnership on Circular Economy) that redirects its activities, the operation of its companies and inhabitants into the model of circular management. This does not only include the concept of a circular economy in the field of municipal waste, but also the implementation of the concept in construction and industry, energy, water management, land use and mobility in the city. At the same time, MOM continues to implement the network of cooperative economy by promoting collaboration with NGOs, younger population, the elderly and minorities.

[Trajnostna urbana strategija \(TUS\) - Sustainable Urban Strategy](#)

The Sustainable Urban Strategy of the Municipality of Maribor (TUS-MOM) is a document that presents an outline of the situation and challenges, facing the city today. At the same time, it sets out the directions with which the city can and must move forward. Move forward, to lay the foundations for its sustainable development and to ensure an improved quality of life for its inhabitants. The strategy was developed by an expert working group in cooperation with the MOM and the public. The Sustainable Urban Strategy of the Municipality of Maribor (TUS-MOM) is based on the concept of integrated urban strategy, which places the city at the forefront of social, cultural and economic development in the EU.

SLOVAKIA

[Stratégia dekarbonizácie SK cementárskeho priemyslu / Cement industry decarbonisation strategy for SK](#)

The strategy entails the fit for 55 program fulfillment until 2030 and targeted carbon neutrality until 2050 using CCUS technology.

[Greener Slovakia. Strategy of the Environmental Policy of the Slovak Republic until 2030](#)

Slovakia has implemented a project related to the Organisation for Economic Co-operation and Development (OECD) and EC Roadmap for Circular Economy of the Slovak Republic (1). The Roadmap focuses on the following priority areas: sustainable consumption and production with a focus on economic instruments; CE potential in the construction sector; and achieving circularity in the food and bio-waste value chain. The identified policy measures across these three areas will help to increase the use of secondary raw materials, support eco-design and eco-innovation, stimulate circular consumption patterns as well as improve waste management, reuse and recycling.

[Program predchádzania vzniku odpadu Slovenskej republiky na roky 2019 - 2025 - Waste Prevention Program of the Slovak Republic for the years 2019 - 2025](#)

With this obligatory environmental programme a shift was made from priority of Slovak waste management from waste management to waste prevention. Similar document present conventional [Waste Management Plan of the Slovak Republic for the years 2021 - 2025](#).

[Zakon o odpadoch a o zmene a doplnení niektorých zákonov - Slovak Waste Act \(79/2015\)](#)



Slovak Waste Act (79/2015 Coll) was [amended on 15.6.2022](#) which introduces new legislation on construction and demolition waste as well as new obligations for producers of such waste. The amendment introduced a new concept of selective demolition, preferable on-site recovery of construction and demolition waste to reduce the need for transport and reporting obligations before and after demolition.

The Construction Act

The new legislation entered into force in 2024. The aim of the new legislation was to eliminate the shortcomings of existing legislation and consider the current needs of society. The result should be simplification and acceleration of construction permits, digitization, but also stricter sanctions against unauthorized constructions. One of the important areas of new legislation was also electronisation of the proceedings and digitization of data

The Spatial Planning Act

The Spatial Planning Act was also introduced a new in 2024 in order to strengthen research in the field of spatial planning and transfer research results into the principles of spatial planning, professionalize the state administration and reduce the administrative burden in spatial planning activities.

AUSTRIA

[Recyclingbaustoffverordnung - Regulation on recycled building materials](#)

Regulation on the preparation for re-use of building components and quality assurance measures for recycled building materials with the aim to promote circular economy and material efficiency in construction

[Deponieverordnung - Regulation on landfilling](#)

Regulation on criteria and processes for the acceptance of waste for landfill including construction waste. The regulation enforces the separation of construction waste on site.

[Kreislaufwirtschaftstrategie - The Austrian Circular Economy Strategy](#)

Strategy on the implementation of circular economy strategies throughout resource intensive sectors in Austria. The construction industry is addressed and goals are defined on the basis of the EU Waste framework Directive 2018/851/EC.

[Abfallwirtschaftsgesetz \(AWG 2002, BGBl I Nr. 102/2002 idgF\) - Waste Management Act \(AWG 2002, BGBl I Nr. 102/2002 idgF\)](#)

Regulation on general and treatment obligations, licensing rights of waste collectors and stakeholders in treatment, collection and recycling facilities.

CROATIA

[Waste Management Act \(OG 84/21\)](#)

The Act stipulates the measures to protect the environment and human health by preventing or reducing waste generation, reducing the negative effects of waste generation and waste management, reducing the overall effects of the use of raw materials and improving the efficiency of the use of raw materials as well as increasing recycling and the reuse of recycled materials.

[Ordinance on Waste Management \(OG 81/20\)](#)

The Ordinance prescribes conditions for waste management, duties of the subjects responsible for waste management and method of operation of the recycling yard. The Ordinance prescribes the content, the manner of keeping, and the content of the decision on entry in the Waste Register. The Ordinance prescribes the recovery procedures, the manner of performing the recovery and the type and quantity of waste for which it is not necessary to obtain a waste management permit. Details are presented of the



financial guarantee and the manner of action of the Ministry responsible for environmental protection. A special condition for waste treatment with mobile equipment is that the location of the waste management where the waste treatment will be done with mobile equipment must be the place of origin of the waste to be treated by the mobile equipment or must be the place where the waste generated by the mobile equipment treatment incorporates into materials. Specific limits for the recovery capacity are defined for the treatment of construction waste including asphalts

Ordinance on the Methods and Conditions of Waste Disposal, Categories and Working Conditions for Landfills (OG 114/15, 103/18, 56/19)

The Ordinance prescribes the categories of landfills, procedures and other conditions for waste disposal, procedures and other conditions for acceptance into underground landfills, emission limit values for waste disposal. It also prescribes the conditions and measures related to planning, construction, operation, and closure of landfills and the procedure after landfill closure. Disposal of waste at the landfill is allowed if the basic characterization of waste for disposal has been previously performed. For waste that the landfill has taken over for disposal, it is obliged to keep an electronic Register of waste generation and flow, which contains information on the total amount, types of waste and the origin of its generation according to a special regulation.

Ordinance on Construction Waste and Asbestos-Containing Waste (OG 69/16)

The Ordinance prescribes the objectives of the CDW management system, obligations of the construction material manufacturers, conditions for CDW management, obligations to keep records of construction waste and other obligations related to the asbestos-containing waste management system.

Ordinance on the Waste Catalogue (OG 90/15)

The Catalogue contains the categorization of waste other than the categorization for transboundary movement of waste, the list of groups and subgroups of waste and the list of waste. The List of waste is based on the EU Decision 2000/352/CE and its amendments. The categorization of waste is regulated by determining the origin and places of waste of that group, subgroup, type and properties of waste used to determine data on existing waste for the purpose of keeping the Register of waste generation and flow, prescribed by a special regulation governing waste management and for other purposes.

Ordinance on By-products and End-of-waste Status (OG 117/14)

The Ordinance defines the contents of the application for entry in the “End-of-Waste Register” and the “Register for By-products”, including specific criteria for the end-of-waste status for certain waste types, further determining the limit values of pollutants and harmful effects of substances and articles as regards the impact on environment. The EoW procedure approved by the MoESD is in line with other EoW legislations on CDW derived materials adopted by European countries as shown in the report drafted by IMPEL (European union Network for the Implementation and Enforcement of Environmental Law), “Making circular economy works”. Material derived from waste cannot be placed on the market unless its manufacturer has drawn up a Declaration of Conformity (DOC). In relation to CDW, the EoW status is ruled at Annex V - CDW assessment and circularity baseline- Part 6 “Special criteria for the end-of-waste status for construction products”. Byproducts and EoW status also require obtaining the decision of the Ministry on entry in the Register.

First Circular Economy Action Plan (CEAP)

The first Circular Economy Action Plan (CEAP) for the CDW sector in Croatia, aims to illustrate the sector specific challenges that Croatia is facing in realizing CE in the construction and demolition waste sector and to recommend the potential measures and actions that may help Croatian CDW sector to transition into CE. The CEAP development started with a diagnostic analysis of the CDW sector to understand the status of CDW management in Croatia. Based on the analysis and multiple stakeholder consultation meetings, the diagnostic extracted the six major challenges in the sector and translated them into the



corresponding objectives of the CEAP. To propose the best available measures and actions for CE transition in Croatia, stocktaking of international good practices and policy examples on CE in the CDW sector was conducted to provide guiding principles for the development of the CEAP in Croatia

GERMANY

Digitalstrategie Deutschland (Digital strategy Germany)

Implementation - Smart City Competence Center and BIM portal. By 2025, BIM should be a standard tool in Germany: a) BIM has to be a standard tool for the planning, construction and operation of building and infrastructure projects - a role model for private construction projects too. b) At least one platform should be established for federal construction projects that enables all participants to exchange information via the cloud. c) The federal government's BIM portal for transport projects and digital twins for infrastructure measures are used. d) Urban development as a whole should benefit from innovative and digital solutions from smart city model projects and a smart city competence center should support municipalities in the digital transformation.

Kreislaufwirtschaftsgesetz (Circular Economy Act)

The Circular Economy Act came into force on June 1, 2012. The purpose of the Act is to promote the circular economy to conserve natural resources and ensure the protection of people and the environment in the generation and management of waste

Ersatzbaustoffverordnung (EBV) (Substitute Building Materials Ordinance)

The Substitute Building Materials Ordinance (EBV) comes into force on 01.08.2023. The EBV applies directly to all those who produce and/or sell (place on the market) substitute building materials (secondary building materials) for use in technical structures (e.g. recycled building materials or unprocessed/processed soil material) and incorporate these substitute building materials (secondary building materials) into technical structures (e.g. as road and path construction material, for backfilling working areas, for construction roads, for embankment/wall filling, etc.). The EBV regulates a) the requirements for the stationary and mobile production of mineral substitute building materials and for the placing on the market of mineral substitute building materials, b) the requirements for the sampling and testing of unprocessed soil material and unprocessed dredged material that is to be incorporated into a technical structure, c) the requirements for the installation of these mineral substitute building materials in technical structures and the requirements for the harmless use of these mineral substitute building materials in technical structures and d) the requirements for the removal of these mineral substitute building materials from technical structures (separation, reference to GewAbfV).

Selective demolition is not common in the CE region, though there are some regulations, innovation projects - In Austria and Germany there are legal regulations and standards for selective demolition or utilization-oriented dismantling. These are regulations on waste separation, disposal and recycling of building materials and the environmental compatibility of demolition as: Recycled Building Materials Ordinance) and an accompanying national Standard (ÖNORM B 3151), DAfStb Beton, rezyklierte Gesteinskörnung:2010-09, DAfStb Alkali-Richtlinie 2013-10. Different EN standards are also covering use of recycled materials, e.g. recycled aggregates in construction products such as EN 206:2021 - Concrete - Specification, performance, production and conformity, DIN 1045-2:2014 - Concrete, reinforced and prestressed concrete structures - Part 2: Concrete - Specification, performance, production and conformity - Application rules for DIN EN 206, DIN 1045-2:2023 - Concrete, reinforced and prestressed concrete structures - Part 2: Concrete- DIN 4226-101:2017 - Recycled aggregates for concrete in accordance with DIN EN 12620, Part 101: Types and regulated dangerous substances, DIN 4226-102:2017 - Recycled aggregates for concrete in accordance with DIN EN 12620, Part 102: Type testing and factory production control, DIN EN 12620:2002 - Aggregates for concrete; German version EN 12620:2002+A1:2008. The Ordinance on requirements for the installation of mineral replacement building materials in technical



structures (Ersatzbaustoffverordnung) in Germany define the whole process of mineral secondary raw materials in construction from acceptance of waste, production, quality monitoring to installation. Regarding excavated soil and stone as larger quantity of construction and demolition waste group the Bavarian state ministry for the environment and consumer protection has defined Backfilling guidelines in 2023. In Poland, the onsite building waste separation starts from 2025.01.01 following the finalized legislation in 2024. The challenge of introduction is the acquisition of the environmental permissions for this onsite activity. In other countries the regulations, standards regarding selective demolition and construction and demolition waste separation on site are under preparation.

3.2 Major platforms, hubs for circular and digital construction to be considered from the Central European region

Cinderela OSS platform

The platform operates as a circular business model. It encompasses a library providing information on the production and usage of circular construction materials made from waste. Additionally, it functions as a marketplace where businesses can engage in the buying and selling of waste or recycled secondary raw materials. Furthermore, it serves as a tool for identifying potential partners within the circular economy

Gaia-X framework

Gaia-X is an initiative led by European industries with the aim of authoritatively and securely interconnecting company data. The framework is designed to ensure European digital sovereignty.

The Central European entities coordinating **EU digital innovation hubs** are:

Hungary - [Hun-Ren Institute For Computer Science And Control \(Sztaki\)](#)

Czech Republic - [National Centre for Industry 4.0 Czech Institute of Informatics, Robotics and Cybernetics](#)

Slovakia - [GAIA - X Hub Slovakia](#)

Austria - [Austrian Institute of Technology \(AIT\)](#)

Poland - [Polish Chamber of Information Technology and Telecommunications](#)

Slovenia - [Chamber of Commerce and Industry of Slovenia](#)

Croatia - [EDIH Adria](#)

All EU Digital Innovation Hubs are available on <https://european-digital-innovation-hubs.ec.europa.eu/edih-catalogue>

Hubs, databank and umbrella organizations for circular construction and economy in the CE Region

- Institute of Circular Economy (INCIEN)
- University Centre for Energy Efficient Buildings of CTU (CVUT UCEEB)
- The Association for the Development of Recycling Building Materials (ARSM)
- Czech Green Building Council (CZGBC)
- Austrian Construction Materials Recycling Association (BRV)
- Circular Economy Forum Austria
- Circular Futures - Circular Economy Platform Austria
- ecoplus. The Business Agency of Lower Austria
- GRÜNSTATTGRAU Forschungs- und Innovations- GmbH
- Interest group Life Cycle Construction
- Clay network



- Austrian Sustainable Building Council (ÖGNB)
- Austrian Society for Environment and Technology (ÖGUT)
- Austrian Economic Chamber (WKO)
- Climate Lab
- DoTank Circular City Vienna 2020-2030 (DTCC30)
- Thinkubator
- Austrian Institute for Building Technology (OIB)
- Austrian Society for Construction Technology (ÖBV)
- BayerischesUmweltministerium
- Landeshauptstadt München, Baureferat- nachhaltiges Bauen
- Green Building Council Italia - Green Building Council Italy
- Ecoforum rifiuti / Congress Ecoforum on waste
- Circular Hungary - Circular Economy Technology Platform
- Business Council for Sustainable Development in Hungary - Circular Economy Platform
- www.Recyklujemestavby.cz,
- Vie.Cycle
- Czech Circular Hotspot,
- Czech Green Building Council (CZGBC)
- Hungarian Green Building Council (HUGBC)
- Madaster
- baubook - Deklaration Zentrale
- Österreichischen Recycling-Börse Bau
- Database for Recycling Facilities (AT)
- Circular Construction Platform
- German Sustainable Building Council (DGNB)
- ÖEPEA
- Croatian Chamber of Commerce: Waste Exchange (Burza otpada)
- e-ONTO (HR) electronic register on waste transport and storage
- Austrian databases for subsidies for circularity projects
- www.ncs40.cz

3.3 Demand-side measures for circular and digital construction

Digital Product Passport

The Digital Product Passport is a traceability and data-sharing system using technologies like QR codes and blockchain. Manufacturers can offer details on product durability, reusability, upgradeability, repairability, energy and resource efficiency, environmental impact, manufacturing practices, and other pertinent information based on the product category. In the region, there are pilot projects, initiative (e.g. Germany such as Madaster, Erdpool (DB) and the BODEN CHECK APP), while in other countries there is an ongoing discussion and investigations about them (e.g. Austria, Croatia)

Demand management measures in Germany include various political and economic incentives to promote the circular economy and sustainable development. These include Kreislaufwirtschaftsgesetz (KrWG) and initiatives to promote energy efficiency and reduce CO₂-emissions. In the construction industry, there are various initiatives and programmes aimed at increasing the demand for sustainable construction products and services. These include incentives for energy-efficient construction, support programmes for renewable energies and energy-efficient renovations as well as subsidies for the use of environmentally friendly building materials



Financial incentive

Financial incentives are not widespread in the CE region, though in some countries there are already good practices such as in Germany, where various tax incentives and support programmes exist for companies that use recycled materials and apply sustainable building practices. Companies that honour specific criteria can benefit from improved credit conditions (KfW).

Green Public Procurement (GPP)

Green Public Procurement is an effective tool, to promote sustainable development and environmentally friendly procurement. Local authorities and government agencies are encouraged to take ecological criteria into account when awarding public contracts, however, not compulsory in all CE countries. GPP in construction sector could cover the use of recycled building materials in construction and infrastructure projects.

The [Austrian Action Plan for Sustainable Public Procurement](#) specifies of the Federal Procurement Act 2018 (BundesvergabeGesetz 2018). The plan lists the criteria for the procurement in different areas including civil and structural. There are mandatory and optional criteria. In Germany, there are criticism that the criteria for GPP are not strict enough and that there is a lack of concrete specifications for the use of recycled building materials. Administrative barriers and complex procurement procedures can also limit the actual use of recycled materials. For example, in Hungary GPP is applicable, but not compulsory. Similarly in Croatia, is voluntary except for some state authorities, which are required to procure according to GPP criteria. Moreover, the Croatian national green public procurement criteria do not include criteria related to the construction sector. In Slovenia at least two items of GPP relate to construction: buildings and road maintenance and constructions. While for buildings a preferential use of wood is suggested with no use of recycling and secondary raw materials mentioned, the road construction and maintenance list only preferential use of reclaimed asphalt in road maintenance.

Innovation procurement is key in facilitation innovation process by the Member States in order to achieve their objectives. Germany has numerous different programmes and initiatives to promote innovation procurement in the construction industry. These include public funding for research and development projects as well as partnerships between industry and research. In Hungary, they legal background for innovation is embedded in the public procurement law, whereas they are manifested through supporting R&D projects, development of the startup ecosystem etc. In Austria, the research on circularity in construction is in parts funded by the [Austrian Research Promotion Agency \(FFG\)](#) and the [Austrian Business Service \(AWS\)](#).

Environmental labelling and certification systems

Several certification systems and labelling / declarations can be found around Central Europe, most of them focusing on sustainable buildings less on infrastructure.

LEED - Leadership in Energy and Environmental Design certification provides a framework for healthy, highly efficient, and cost-saving green buildings, which offer environmental, social and governance benefits.

BREEAM - Building Research Establishment Environmental Assessment Method is a sustainability assessment method that is used to masterplan projects, infrastructure and buildings.

SBToolCZ - SBToolCZ is a national Czech certification tool for expressing the quality level of buildings, in accordance with the principles of sustainable construction. The certification process was officially introduced and put into operation in June 2010.

WELL - The WELL Building Standard is a performance-based system designed for measuring, certifying, and monitoring features of the built environment that impact human health and wellbeing, through air, water, nourishment, light, fitness, comfort and mind.



DGNB - the German Sustainable Building Council certification is internationally regarded as the "Global Benchmark for Sustainability" among certification systems for sustainable buildings and districts. The DGNB system does not evaluate individual measures, constructions or components, but the overall performance of a building based on criteria. There are criteria for new constructions and renovations.

EPD - Environmental Product Declarations form the data basis for ecological product assessments over the entire life cycle of construction products and buildings.

Klimaaktiv (AT) awards standards (gold, silver and bronze) for the construction and renovation of buildings that meet the criteria. Criteria are location and infrastructure, Eco-index of the entire building, disposal of construction waste, avoidance of PVC, avoidance substances of very high concern (chemicals according to ECHA), avoidance of climate-damaging substances (HFCs), the use of material with environmental labeling and energy consumption. Klimaaktiv criteria recognize the following certifications for building materials and products: Austrian Ecolabel, natureplus and IBO test mark. The Klimaaktiv standards are used in public procurement according to naBe.

Austrian Ecolabel (AT) (Österreichisches Umweltzeichen) was created in 1990 and provides the public with information on the environmental impact arising from production, usage and disposal. It is awarded by the federal ministry of agriculture and tourism. A utilization fee must be paid to the federal ministry of agriculture, forestry, environment and water management. Criteria for the label are energy and raw material consumption, toxicity, emissions, disposal/recycling, packaging, distribution and transportation, safety, longevity, ease of repair and quality.

Natureplus is a label given by the NGO Natureplus starting 2002. Criteria are complete declaration of all raw materials including their origin, a maximum content of renewable and ecologically gathered inorganic materials (including water) and minimal usage of petrochemicals. Furthermore, regarding renewable materials the criteria are avoidance of pesticides, chemicals and artificial fertilizers, unsustainable plantation management and illegal deforestation. Depending on the product there are different limit values that are tested in laboratories (pesticides, VOCs, Formaldehyde, etc.).

IBO testmark (IBO Prüfzeichen) has been given by the IBO since 1980, mainly targeting building materials. The label takes the entire life cycle of a product into account. General criteria are toxicological requirements and requirements for mineral raw material extraction. For a holistic approach, supplementary system products and construction services are also included.

There are also **quality labels** from the Building Materials Recycling Association (BRV) for **recycled building materials** (Gütezeichen für Recycling-Baustoffe) and **mobile recycling plants** (Das Gütezeichen für mobile Recycling-Anlagen). For the quality label for recycled building materials an external monitoring by an accredited laboratory must be carried out twice a year in addition to internal monitoring. The quality label for mobile recycling plants also requires Monitoring by external bodies to ensure to ensure that processing of mineral, non-hazardous construction waste is possible in relation to individual sites.

The **Austrian standards ÖNORM B 3140, B 3131 EN 12620 and EN 13043** include criteria for the correct labelling of recycled aggregate.

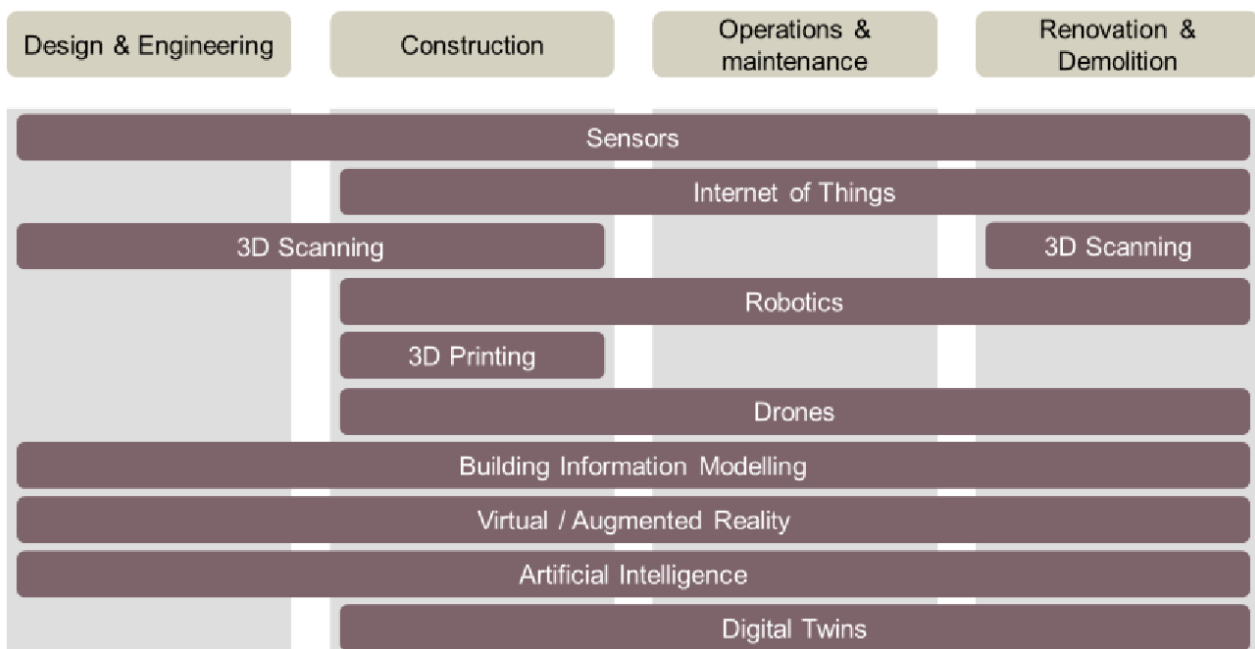
The **QNG label** in Germany is a state quality seal for buildings. The prerequisite for awarding the quality seal is proof of fulfillment of general and special requirements for the ecological, socio-cultural and economic quality of buildings. Certification according to the QNG quality seal runs parallel to the planning and construction process of your building. Your auditor accompanies your building from planning to construction completion. All residential buildings can be certified with the QNG seal of quality since 2023. Furthermore, it could enable better credit conditions and subsidies for construction projects.

LEVELS - Slovenia developed sustainability indexes for construction and maintenance of buildings based on LEVELs in the frame of LIFE IP Care4Climate project. It is foreseen that during the current renewal of GPP regulation such framework will be amended as part of GPP.



3.4 Digital solutions used in the CE Region

Different tools to be digital solutions to be used in construction sector is well illustrated by JRC report 2019 (Digital Transformation in Transport, Construction, Energy, Government and Public Administration) illustrated below. Different tools can be used in different life cycle phases from design and engineering, construction, operation and maintenance and to renovation and demolition phase. The most common tools used are connected with different sensing devices, internet of things, 3D scanning, robotics, 3D printing, use of drones, building information modelling, digital twins, virtual and augmented reality, artificial intelligence, cloud computing, mobile technology, blockchain (digital logbooks, digital product passports). The essential tool for digitisation is Building Information Modelling (BIM) which transformed significantly the construction in past years from construction work planning to end-of-life by giving possibility to refine construction processes and make information-driven decisions.



Source: EU Report Digitalization in construction sector (April 2021) - adapted from JRC (2019)

Differing country by country, the introduction on obligatory BIM use in Central Europe is still not effective while introduced by most countries. Other digital solutions are also in use, though they are not widespread either and to what extent they are really in use, it is hard to assess.

To begin with an example, in Austria, BIM was planned to make mandatory for public procurements in 2018 but has not been implemented yet. In general, Austria has standards for the application (ÖNORM A 6241) and the use is required in some procurement procedures. First example, where it is made mandatory are the procurement procedures for Austrian Federal Railways Infrastructure since 1.1.2024. In addition, BIM and Digital Twins are used in general, and increasingly artificial intelligence. In Germany, the largest variety of digital solutions are in use such as BIM, digital product passports, virtual construction site planning and management software, automated dismantling processes, digitalised waste management and recycling processes, 3D-scans, 3D-printing. The use of BIM is not mandatory in Germany however, it is increasingly being used in large construction projects, particularly in public projects. In Hungary, the use of digital solutions is in an early stage, however, larger construction firms and universities test the use of these solutions especially BIM. BIM is not mandatory yet; however, it will be for public constructions. Croatia is in a similar situation, the use of digital solutions is in an early stage. BIM is already used in Croatia as part of the certification process, to increase the use of BIM in



Croatia, the responsible Ministry has formed a working group including relevant stakeholders. In Slovenia obligatory use of BIM was introduced in GZ-1 2023 amendment planning the obligatory use in public works by 1.1.2025. Some examples of companies like GIC Gradnje in Slovenia are more and more adopting digital tools, but a general practice of introducing digital tools is lagging behind.



4. Discussions and conclusions on initial assessment

Based on initial mapping of construction sectors and spill-off sectors readiness for circular transition and digitisation it was concluded that most countries and regions in the Central Europe Region are on the way to embed circularity and digital technologies into their construction sector, adjust legislation and test new innovative technologies and start cross-border cooperations but the level of progress varies from country to country. Most of countries has adopted a top-down strategies for circular transitions and identifying the construction as important pillar for transition, however despite different measures and good examples circularity and digitisation is not everyday business for construction companies. Most of the countries have relatively new legislative acts on construction some introducing obligatory use of BIMs in (public) construction works in future, but BIM is still mostly reserved for some larger EU funded public projects (e.g. railway constructions) or smaller private buildings projects. The protagonist of BIM introduction are construction work designers, mostly in form of smaller private architectural/design firms or departments in mostly infrastructural public private companies (e.g. road and railway asset managing companies).

We have identified only few construction companies applying other digital solutions, e.g. digital product passports, digital logbooks, daily use of on-line platforms and markets for exchange of materials, 3D printing in large-scale.

Regarding End-of-Waste criteria as a prerequisite for the secondary raw materials' use in construction sectors, only a few countries/regions (e.g. Austria, Germany) have adopted End-of-Waste criteria for waste to be recycled in construction while use of recycled aggregates or backfilling is general known but rarely use in high-strength materials. Some countries have general rules for turning waste into construction materials or backfilling as in Slovenia where national waste regulation gives limits of chemical elements and compounds of reclaimed waste for different intended uses. In most countries the End-of-Waste is not regulated and is considered on individual base. Germany/Bavaria has successfully developed national standard for use of higher contents of recycled aggregate in structural concrete which will be also demonstrated in the ReBuilt WP2 activities.

In all countries the companies, including SMEs, are promoting use of recycled materials. Some companies are developing market name for producing more sustainable, secondary raw materials-based products for construction (e.g. Granella in Italy, Pankas in Poland). Most of companies identified are focusing on recycling of construction and demolition waste and its use for geotechnical works and partly in concrete. Other companies are also promoting use of industrial waste, by-products in construction sector and others innovative products related to this. Many innovations were identified from running or past EU-funded projects. A certain caution needs to be made with materials regarding scalability and applicability (market share, business models, environmental impacts, mechanical and physical properties). In all companies the use of traditional materials like hemp was identified though mostly limited on hempcrete (hemp mixed with lime) as alternative material. No comparison was done how such materials are put on the market.

The framework of this deliverable does not let compare the existing legislation among the CE countries, however, the existence and core objective of the legislation is defined, that describes the ongoing activities of a CE country.

No specific differentiation was identified between rural and urban use of circular and digital construction practices. It can only be presumed that in the case of urban activities higher quantities of secondary raw materials can be found due to intensive urbanisation in cities therefore innovative and more sustainable solutions are even more needed than in rural parts of Central Europe due to higher intensity of construction activities, limited space for demolition and construction, larger environmental impacts (e.g. dust emissions) during construction and demolition phase. In rural region more focus could be given in use of different agricultural residues in construction composites, like hemp, which store large quantities of CO₂, grows quickly and is present as traditional material in most countries considered. Hemp can also be used



in urban areas with historical industrial use which today presents less valued urban space especially because they have remediation possibilities (caution needs to be practices in construction uses in the case of presence of potential toxic compounds).

Based on initial mapping a general recommendation can be given that countries in Central Europe needs to learn from each other not only in exchanging technical solutions of good practices but also learn and look for common solution in adapting demand-side measures, implementing circular and digital construction policies and suitable legislative/regulative acts for more sustainable but zero tolerant to pollution construction. For this increased cross-border cooperation and exchange of experience and know-how is essential. Special focus should be given due to many times common geographic and cultural background in developing successful cross-border business models, e.g. bio-circular construction practices like utilisation of hemp on larger scale. The promotion of successful business cases and good practices can further be enhanced through custom made digital platform such as CinderOSS to be upgraded in WP2 and support of hubs working under common management (ReBuilt circular and digital hubs will be developed in WP3).

The D1.1.4 is not only summarizing initial mapping activity, but focuses the targeted information gathered in A1.1 to support the process for the thematic WP2 and WP3 by collecting relevant data on national, regional and sometimes local levels. Moreover, the identified innovations in this field, products, standards, or demand-side measures are forming a common base for all project's partners and relevant stakeholders with which the consortium has built relationship (including on-going Interreg Central Europe projects). The identification of the major hubs, platforms and database will enable the closer cooperation with the most relevant stakeholders of the region which will result in joint and inclusive facilitation of circular and digital construction in the Central European area.