Interreg Danube Region

Co-funded by the European Union

Circular DigiBuild

Circular DigiBuild

Consolidated report on policies for harnessing innovations in the building industry for more "clean construction" in the Danube region

The Review

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Executive Summary

Overview:

This report, created under the Interreg Danube Region program, examines policies across Danube region countries related to fostering innovation for clean construction practices, emphasizing digitalization and circular economy approaches. It analyzes existing Research and Innovation Strategies for Smart Specialization (RIS3) and complementary policies to identify gaps, challenges, and transferable best practices.
The review aims to provide a regional context for policy development and promote collaborative efforts to transform the construction industry.

Objectives:

To assess existing policy instruments in Danube countries supporting innovation in clean construction. To analyze RIS3 enabling conditions and identify gaps and challenges hindering the adoption of digitalization and circular economy in the construction sector. To identify and share transferable policy elements and best practices from partner countries. To provide recommendations for policy improvements to enhance innovation and promote sustainable construction.

Findings:

The Danube region faces common challenges including:

- High initial investment costs for SMEs
- Skills gaps and lack of a skilled workforce
- Regulatory and policy gaps and lack of enforcement
- Low digital and circular readiness
- Fragmented or weak collaboration
- Lack of awareness and cultural barriers
- Limited R&D and innovation support

The report identifies a range of relevant good practices and policy frameworks across the partner countries such as, the European Digital Innovation Hub in the Construction Sector (EDIHCS) in Bulgaria and VIE.CYCLE in Austria; as well as financial instruments and digital infrastructure strategies which can be leveraged. Significant differences exist in the level of policy implementation and integration of digitalization and circularity in the construction sector across Danube region countries.

Key Recommendations:

Targeted Policy Interventions: Develop specific policies that address the unique needs of the construction sector, such as financial incentives, training programs, and regulatory frameworks.

- Increased Investment: Increase investments in skills development and training programs to address the lack of skilled professionals, including the construction sector.
- Robust Collaboration: Promote greater collaboration between governments, industry, and research institutions.
- Robust Frameworks: Create comprehensive regulatory frameworks and economic incentives to promote digital and circular practices
- Streamline Regulations: Simplify construction and sustainability regulations to speed up innovation deployment and public procurement of green solutions.
- Enhance Implementation: Enhance the implementation of the existing strategies and policies that are already in place but showing limited progress.

Overall, the report underscores the need for transformative policies that support digital innovation and circular economy principles to promote cleaner and more sustainable construction practices in the Danube region. It emphasizes the importance of collaboration, targeted financial instruments, skills development, and regulatory frameworks to address the identified challenges and achieve meaningful change.

Table of Contents

1. Introduction

Background on the circular economy and its importance in the construction industry

As the world's largest user of natural resources, the construction industry uses a non-sustainable, linear economic model. The resources are purchased, then used and then disposed as waste, resulting from the works.

This approach is only one way, and there is no possibility to demolish and reuse the construction materials. The buildings will eventually reach the end of life, and their demolition is a process with a rate of destruction that will not allow, but a few percentages recovery rate of construction materials to be reused. In the present when the sustainability and green construction are focus objectives, the linear approach must change.

Some of the enabling methods or projects to be considered for this change are product fragmentation, intensification of product use, and increased production efficiency. These will lead to better resource management and reduce the consumption of resources.

Purpose and objectives of the review

The purpose of this review is to elaborate a Danube area regional context policies report, including how the existing policy instruments in all partners countries meet or predict the needs for further boosting circular economy digitalization-led innovations implementation in the most powerful waste and gases emission industry - the construction.

The review will cover the analysis of partners' RIS3 enabling conditions for fostering innovations for "clean construction" and the existing policies for funding innovations in construction, digitalization and circular economy to formulate possible improvements. Good and transferrable policies elements and practices from RIS3 will be gathered to further support the related policy instruments'

improvement. This potential to adopt some of the Good Practices identified here will contribute to the action plan/policy recommendations "Country-level Territorial action plans" in Activity 3.5, deliverable D.3.5.4.

EU Strategy for the Danube Region

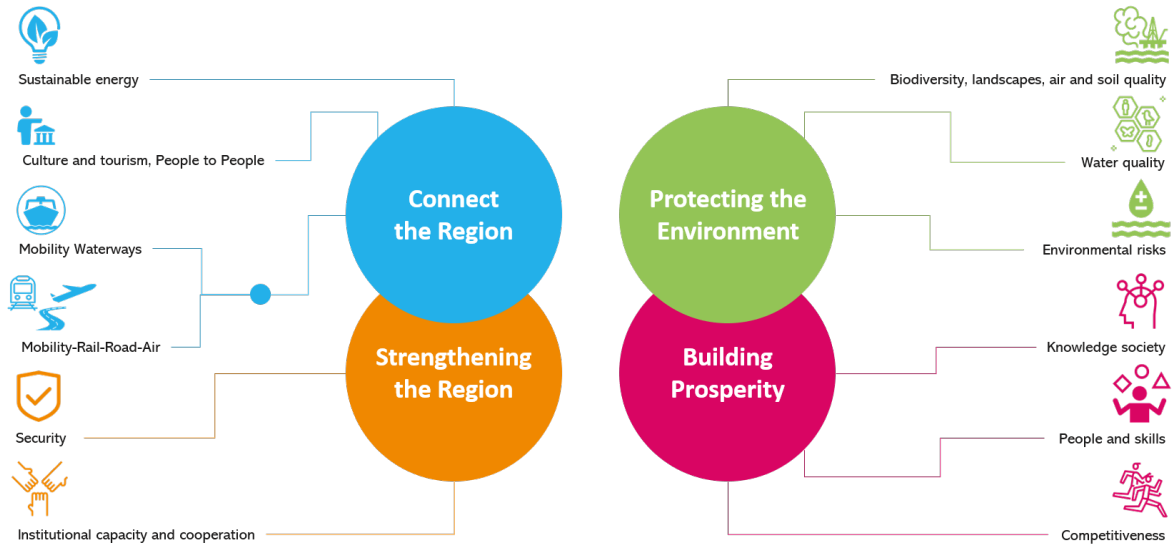
The area covered by the EU Strategy for the Danube Region stretches from the Black Forest (Germany) to the Black Sea (Romania-Ukraine-Moldova) and is home to 115 million inhabitants. 13 out of 14 countries participating in the Danube Strategy area, are members of the Circular DigiBuild project.

The EU Strategy for the Danube Region (EUSDR) [1]is a macro-regional strategy adopted by the European Commission in December 2010 and endorsed by the

[1] Source: https://danube-region.eu/about/

European Council in 2011. The Strategy was jointly developed by the Commission, together with the Danube Region countries and stakeholders, to address common challenges together. The Strategy seeks to create synergies and coordination between existing policies and initiatives taking place across the Danube Region.

Pillars and Priorities:

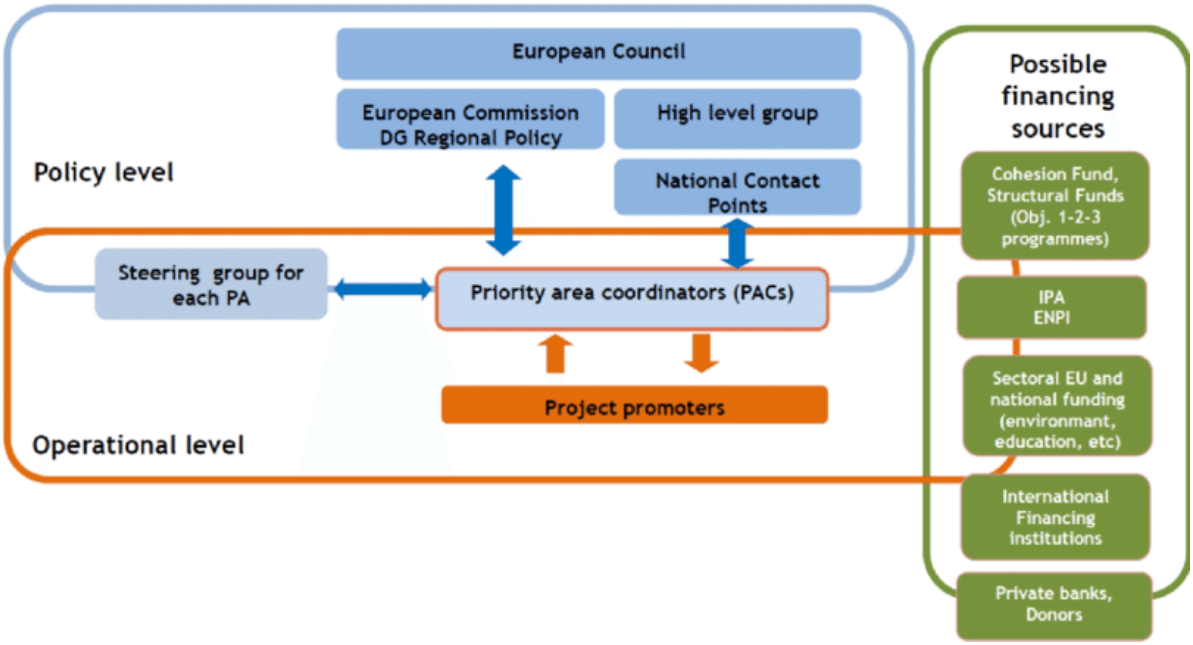


Source: http://www.danube-region.eu/about/priorities

Key Objectives:

- Promoting economic development and competitiveness.
- Improving transport and energy connections.
- Protecting the environment and managing natural resources sustainably.
- Strengthening social and cultural ties.
- Enhancing security and tackling cross-border crime.
- Boosting institutional capacity and cooperation.

Governance and Implementation:



- The EUSDR is implemented through a collaborative approach involving national authorities, regional and local actors, civil society, and the private sector.
- Each priority area is coordinated by designated Priority Area Coordinators (PACs), who facilitate cooperation and project development.
- Funding for EUSDR projects comes from various sources, including EU funds (e.g., European Regional Development Fund, European Social Fund), national budgets, and private investments.

2. Methodology

Description of the analytical framework used for the review

In this activity, a review of the Danube area regional context policies was elaborated, including how the existing policy instruments in all partner countries meet or predict the need to further boost the circular economy and incorporate digital tools and technologies to streamline circular economy processes in the construction field.

All countries partnering the project contributed to the review with regional policies assessments, under the guidelines of this methodology.

The review analyzed partner countries' RIS3 or similar policies that create conditions for fostering innovations in "clean construction," as well as existing policies for funding innovations in construction, digitalization, and the circular economy to identify potential improvements. Effective and transferable policy elements and practices from RIS3 or similar policies will be collected to enhance the related policy instruments. The working group conducted two online workshops. The review will be approved by the RMSG, and a thematic open webinar titled "Danube Policies for Cleaner Construction" was hosted online to present the analysis and outline opportunities for policy uptake, knowledge transfer, and awareness raising.

Data sources and collection methods

Summarizing the interview data – the questionnaire structure was focused on categories of information containing all countries' feedback and conclusions.
The collection of Good Practices was part of the report but as a separate annex due to the separate deliverable. Each Good Practice was collected based on the simplified structure template from Annex 1 of this document.
The potential to adopt good practices is described in the main report document, linking it to the annex containing the Good Practices. The potential to adopt one

or more good practices is reflected by the expression of interest coming from the partners after evaluating the GP database (the delivery of this action). The partners will present these good practices, assumed to have the potential to be adopted, to their country's policy owners in the RMSG.

This potential to adopt some of the Good Practices identified here will contribute to the action plan/policy recommendations "Country-level Territorial action plans" in (D.3.5.4), Activity 3.5.

Involvement of partner countries and stakeholders

Under specific Objective 2, Activity 2.4 is coordinated by PP10 ADRVEST within Working Group 4: LP1, PP3 AWS, PP6 SBA, and PP11 SERDA. The partners responsible for gathering information for the country interview questionnaire are listed in the application form under Activity 2.4.
Regarding Romania, ADRVEST is tasked with completing the interview questionnaire, along with the following partners: BAA, AWS, HSH, INCIEN, SBA, UL, PBKIK, IRCEM, SERDA, STP NS, ZWMNE, TERA, BAC.

3. Overview of Partner Countries

Countries contribution and number of Good Practices collected table:

No	Country	No of GPs
1	Bulgaria	1
2	Austria	3
3	Germany	3
4	Czech Republic	3
5	Slovakia	7
6	Slovenia	4
7	Hungary	3
8	Romania	4
9	Bosnia and Herzegovina	4
10	Serbia	3
11	Montenegro	5
12	Croatia	4
13	Moldavia	3
Total		**47**

RIS3 Strategy

Summary of the questionnaires per countries

<table>
<tr><th colspan="2">Bulgaria</th></tr>
<tr><td colspan="2">Bulgaria's Smart Specialization Strategy (RIS3)</td></tr>
<tr><td colspan="2">• A key national framework aligned with EU requirements (2021-2027).
• Coordinated by the Ministry of Innovation and Growth.
• Aims to accelerate innovation-led economic transformation.
• Identifies thematic priorities and high-potential sectors (mechatronics, clean technologies, ICT, construction).</td></tr>
<tr><td>Focus on Construction Sector</td><td>Emphasis on Collaboration</td></tr>
<tr><td>• Construction is a key sector undergoing digital transformation (BIM, automation, AI, green building).
• The sector is a platform for applied research and deployment of advanced tools.</td><td>• Public-private partnerships, academia-industry collaboration, and regional innovation ecosystems are emphasized.
• Regional Innovation Strategies, innovation hubs, clusters, and advisory councils are utilized.</td></tr>
<tr><td colspan="2">Role of EDIHCS
(European Digital Innovation Hub in the Construction Sector):</td></tr>
<tr><td colspan="2">• Channels RIS3 priorities into practical services (digital skills, software demonstration).
• Aligns with Bulgaria's and the EU's innovation and sustainability goals.
• Prioritizes capacity building, digital upskilling, and technology diffusion in construction.</td></tr>
</table>

<table>
<tr><td colspan="2">

- Formally recognized in Bulgaria's National Strategy for the Digitalization of the Construction Sector.
- Responsible for implementing key capacity-building measures (training, seminars, consultations) for SMEs.
- Provides "test-before-invest" opportunities, training, and advisory support.
- Acts as a bridge between national policy and industry needs.

</td></tr>
<tr><th>Funding and Priorities</th><th>Key Enabling Factors for Digital Innovation and Circularity</th></tr>
<tr><td>

- RIS3 is supported by national and EU instruments.
- Prioritizes circular processes, materials, and energy-efficient solutions.

</td><td>

- National policy commitment and strategic alignment.
- Availability of public funding instruments.
- Presence of dedicated innovation ecosystems and hubs (like EDIHCS).

</td></tr>
<tr><th>Bottlenecks/Barriers</th><th>EDIHCS as a Good Practice</th></tr>
<tr><td>

- Low digital and circular readiness among SMEs.
- Lack of standardization and interoperability.
- Skills gaps and limited workforce training.

</td><td>

- Acts as a national integrator to enable digital innovation and circularity.
- Main provider of digital capacity-building.
- Key reference hub for funding guidance.
- Facilitator of partnerships and science-industry collaboration.

</td></tr>
<tr><th>EDIHCS's Societal and Economic Benefits</th><th>EDIHCS's Transferability</th></tr>
<tr><td>

- Boosting competitiveness through innovation and BIM uptake.

</td><td>

- A highly transferable model as a sectoral change agent.

</td></tr>
</table>

• Driving green and digital transitions. • Scaling collaboration between academia and industry. • Reskilling and upskilling the workforce. • Supporting SME access to R&D and pilot projects. • Contributing to climate and circular economy goals.	• Key lessons: strategic alignment, cross-sector collaboration, practical training, public-private partnerships. • These points capture the main aspects of Bulgaria's RIS3, the focus on the construction sector, and the role of EDIHCS in driving digital transformation and sustainability.

Austria

Multi-Level Governance	
• Austria implements RIS3 through a multi-level framework, combining national coordination with regional specialization. • The national framework is anchored in the "Becoming an Innovation Leader" (RTI) strategy and the Policy Framework for Smart Specialisation. • Nine federal states have their own strategies aligned with local strengths and in association with RIS3.	
Policy Documents	
• Key documents include the Digital Action Plan Austria (DAA) and the Austrian Circular Economy Strategy, complementing RIS3. • The RTI Pact 2024-2026 aligns with the objectives of the RTI Strategy 2030.	
Role of Austria Wirtschaftsservice (aws)	**Digital Innovation in Construction**
• Provides financial and advisory support to innovative businesses, start-ups, SMEs, and research institutions.	• Establishment of Digital Innovation Hubs (DIHs) to support digital transformation.

Manages funding programs supporting digitalization, sustainable construction, and circular economy models.	• DIHs facilitate the integration of technologies like BIM, 3D printing, and robotics.
Circularity in Construction	
• The Austrian Circular Economy Strategy envisions transforming Austria into a sustainable, circular economy by 2050. • The RTI Initiative Circular Economy funds projects for sustainable construction. • A Policy Framework for Circularity in Construction emphasizes using secondary materials and promotes reconstruction projects.	
Regional Specialization	**Funding and Financing**
• Vienna focuses on digital innovation, particularly BIM, digital twins, and AI. • Upper Austria specializes in advanced manufacturing and digital construction technologies. • Styria leads in digital wood construction and smart materials. • Vorarlberg advances passive house and zero-carbon construction. • Lower Austria specializes in circular prefabrication and bio-based building materials.	• RIS3 is financially supported through a diverse range of instruments at national, regional, and European levels. • Key funding bodies include aws, FFG, and KLIEN. • The "Mission Climate-Neutral City" with its initiative “Technologies and Innovations for the Climate-Neutral City” supports smart city concepts and digital solutions. • The European Regional Development Fund (ERDF) and Horizon Europe co-finance initiatives. • Public-private partnerships (e.g., "Digital Findet Stadt") accelerate digital transformation.

Enabling Factors	Bottlenecks/Barriers
• RIS3 is supported by national and EU instruments. • Prioritizes circular processes, materials, and energy-efficient solutions.	• High initial investment costs and lack of incentives. • Economic conditions and low demand. • Fragmented regulatory frameworks. • Lack of digital and circular skills. • Cultural barriers and insufficient collaboration.
EU Smart Specialization Community of Practice (S3 CoP)	
• Austria actively engages in the S3 CoP to exchange best practices and foster innovation. • In essence, Austria's approach combines a multi-layered governance structure, targeted funding initiatives, regional specializations, and a strong emphasis on collaboration to promote digital innovation and circularity in its construction sector.	

Germany

Regional RIS3 Implementation	
• RIS3 is primarily a regional strategy, implemented by the 16 federal states (Bundesländer), reflecting Germany's federal structure. • Each state develops its own RIS3 strategy tailored to its specific economic and innovation strengths.	
National Policy Influence	**Key National Policy Documents**
• RIS3 aligns with and is influenced by national-level policies such as the	• High-Tech Strategy 2025 (HTS 2025): Strategic framework for research and innovation policy.

<table>
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- High-Tech Strategy 2025, Digital Strategy 2025, and the German Circular Economy Strategy
- These national strategies provide overarching guidelines, but coordination can be complex.

</td><td>

- Digital Strategy 2025: Outlines priorities for developing digital capabilities.
- National Circular Economy Strategy: Aims to conserve resources through efficiency and circularity.

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<tr><td colspan="2">University's Role</td></tr>
<tr><td colspan="2">

- Plays a role in the elaboration and implementation of RIS3 strategies at the federal state level.
- Acts as a stakeholder, contributing expertise in research and development.
- Drives the "Third Mission" through knowledge and technology transfer. Participates in funding programs and projects within the RIS3 framework.

</td></tr>
<tr><td colspan="2">Integration of Digital Innovation and Circularity in Construction</td></tr>
<tr><td colspan="2">

Regional innovation strategies integrate digitalization and circularity through:

- BIM (Building Information Modeling) Initiatives.
- Sustainable Construction Programs.
- Smart Cities and Urban Development Programs.

</td></tr>
<tr><td>Digital Innovation in Construction</td><td>Circularity in Construction</td></tr>
<tr><td>

- Digital Models and Platforms (BIM, material passports).
- AI and Big Data for detecting reusable materials.
- Smart Building Technologies for meeting ESG requirements.
- Predictive Analytics for risk management.

</td><td>

- Material Management (recycled/sustainable materials).
- Waste Reduction strategies.
- Circular Business Models.
- Circular Design.
- Digital Material Registry.
- Resource Efficiency Measures (reused content, material substitution).

</td></tr>
</table>

Funding Instruments	Main Enabling Factors
• Federal and EU Programs (Horizon Europe, ERDF, national research grants). • Regional Development Funds (state-level). • Private Investment and Public-Private Partnerships.	• Digitalization and Key Enabling Technologies (BIM, Digital Twins, AI, IoT, Cloud, Big Data). • Business Model Innovation (systemic change, circular competencies). • Collaborative Ecosystems and Knowledge Sharing (inter-regional cooperation).
Bottlenecks/Barriers	**Available Funding**
• Regulatory Challenges (complexity in construction and sustainability regulations). • High Initial Investment Costs. • Lack of Skilled Workforce.	• Federal Government Funding (e.g., "Zukunft Bau" program). • State-Level Innovation Grants (e.g., Bavaria's Digitalization Strategy). • Industry-Specific Funding (e.g., German Construction Industry Digitalization Grants).
Good Practice Examples	
• BIM Germany: National initiative promoting digital construction planning and execution. • Circular Wood Initiative: Using recycled wood in modular construction. • Smart Cities Model Hamburg: Digital urban planning integrating circular construction.	
In summary, Germany's approach involves a decentralized, regional implementation of RIS3, guided by national strategies, with a focus on digital innovation and circularity in construction, supported by various funding instruments and enabling factors, while also facing specific bottlenecks.	

Czech Republic

National RIS3 Strategy

- Built upon regional economic, innovation, and research capacities.
- Aims to generate high-value-added activities, strengthen value chains, and create niche markets.
- Addresses societal challenges and global megatrends ("mission-oriented" innovation policy).
- Reflects a dynamic and process-oriented approach.
- Identifies priority domains based on data, regional expertise, and collaboration (Entrepreneurial Discovery Process - EDP).
- Supported by cross-cutting pillars (R&D, digitalisation, skills, innovation system support).
- Embeds core values: entrepreneurship, cooperation, creativity, sustainability, ambition, resilience.
- Influence of Global Megatrends:
- Shaped by rapid technological change, climate crisis, resource depletion, demographic shifts, and urbanisation.
- Views megatrends as catalysts for innovation in digital technologies, renewable energy, sustainable agriculture, bioeconomy, and smart mobility.

Governance Structure	Regional Variations
• Led by Regional Innovation or Competitiveness Councils at the regional level. • Councils coordinate and approve proposals from the executive RIS3 unit. • Executive RIS3 unit manages regional RIS3 interventions and updates.	• Each region has its own RIS3 strategy, defining key regional transformation areas. • Support includes national-level programs and region-specific tools like innovation and creative vouchers.

• Ministry of Industry and Trade (MPO) acts as the RIS3 strategy coordinator at the national level.	• Industrial transformation is a major focus in structurally affected regions.
Broader Strategic Framework	**Role of INCIEN**
• Situated within a broader framework shaped by documents like the National Policy for Research, Development and Innovation (NP VaVal). • Interconnected with the Innovation Strategy of the Czech Republic 2019–2030, Economic Strategy 2020-2030, and Education Policy Strategy 2030+.	• Stakeholder and implementation partner, integrating circular economy principles into RIS3. • Contributes to the formulation and implementation of priorities as a project partner in the CirkArena project in Třinec. • Actively contributes to awareness-raising, research and innovation (RDI) support, and cooperation among stakeholders.
Integration of Digital Innovation and Circularity in Construction	**Niches of Specialization** (Examples)
• The National RIS3 Strategy addresses both digital innovation and circularity in the construction sector. • Emphasizes the integration of digital technologies and the adoption of BIM, automation, and robotics. • Prioritizes support for digitalization to strengthen competitiveness. • Integrates circular economy principles through the DS09	• Lifecycle thinking, material efficiency, and digital tools into construction practices (INDICATE project). • Cross-border exchange and capacity building in circular construction, utilizing German best practices to assist stakeholders in the Czech Republic, Poland, and Slovenia (CIRCON4CLIMATE project). • Automated tools and digitalised workflows for managing

Smart Settlements specialization domain.	construction and demolition waste (RECONMATIC). • Circular construction skills framework for vocational and professional training (BUS-GoCircular). • Pre-demolition audits and material reuse (Mercury).
Funding	**Enabling Factors**
• Primarily supported through targeted calls within EU operational programmes and national public funding schemes. • Interventions align financial support with priorities of applied and mission-oriented research. • Strategy anticipates mobilisation of private funding through project co-financing with the EDP playing a key role.	• Improving innovation capacity, digital transformation, and sustainable development through regional approaches. • Advancing Industry 4.0 technologies. • Creating stronger academia-business collaboration, internationalisation, and support for SMEs.
Barriers	
Most regions face similar structural challenges, including limited R&D investment, talent shortages, weak innovation ecosystems, and insufficient digital infrastructure.	
Good Practice Examples	
Regional innovation strategies integrate digitalization and circularity through: • BIM (Building Information Modeling) Initiatives. • Sustainable Construction Programs. • Smart Cities and Urban Development Programs.	

Niches of Specialization
• CirkArena project: Realizing a Circular Economy R&D Centre. • The Robotic 3D Printing of Concrete project: Providing advanced architectural and urban solutions. • Mobile application for visualization of timber buildings with augmented reality: Enhancing digitalization in sustainable construction. • Energy-efficient foundation slab “Základy Rýč” • CirkTech • GREENE 4.0
In summary, the Czech Republic's RIS3 strategy aims to promote digital innovation and circularity in the construction sector through a combination of national strategy, regional adaptation, targeted funding, and collaborative initiatives, while also addressing challenges related to innovation capacity and skills development.

Slovakia

RIS3 Strategy
• **National Level:** Slovakia's Research and Innovation Strategy for Smart Specialisation (SK RIS3 2021+) is a national-level strategic document. • **Goals:** Aims to increase research and innovation capacity and excellence. It focuses the use of EU funds and concentration of resources on research, development, and innovation (RDI). • **Objectives:** Defines objectives into 3 strategic areas and 5 domain-specific objectives, achieved through systemic measures and public policies. • **Domains:** The domains arise from the entrepreneurial discovery process (EDP) and will be developed through specific projects to advance technologies, products, infrastructure development, or establish collaboration platforms.

Strategic Goals and Domain-Specific Goals
The strategic goals include: • Increase the quality and availability of human resources in RDI. • Improve the innovation performance and position of the SR in international comparison. • Increase the contribution of the research to the economic growth by means of development of the quality of the RDI. **The Domain-Specific Goals are the following:** • Innovative industry for the 21st century. • Mobility for the 21st century. • Digital transformation of Slovakia. • Healthy society. • Healthy food and environment
Other Policy Documents
Slovakia has particular national strategies related to the examined areas: • Strategy of the Digital Transformation of Slovakia 2030. • Action plan for the digital transformation of Slovakia for the years 2023-2026. • National Digital Skills Strategy of the Slovak Republic and the Action Plan 2023-2026. • Strategy and action plan to improve Slovakia's position in the DESI index until 2025. • SUPPORT FOR THE DEVELOPMENT OF 5G NETWORKS IN SLOVAKIA FOR THE YEARS 2020 – 2025. • Recovery and Resilience Plan Component 17. • Closing the loop in the Slovak Republic (A roadmap towards circularity for competitiveness, eco-innovation and sustainability). • Strategy of the Environmental Policy of the Slovak Republic until 2030.

- Low-Carbon Development Strategy of the Slovak Republic until 2030 with a View to 2050.
- Strategy for the Adaptation of the Slovak Republic to Climate Change.
- Integrated National Energy and Climate Plan 2021-2030.
- Waste prevention programme of the Slovak Republic for the years 2019-2025.
- Waste Management Programme of the Slovak Republic for 2021-2025.
- Recovery and Resilience plan.
- Economic Policy Strategy of the Slovak Republic until 2030 (Proposal).

Role of the Slovak Business Agency (SBA)

- Did not participate in the development of the RIS3 strategy, but could be perceived as a facilitator.
- RIS3 serves primarily as an informative and strategic tool for strengthening the innovation base of Slovakia's business sector.
- RIS3 interweaves digital innovation, circular economy principles, and construction in a cross-cutting manner.
- Digitalization is addressed through the promotion of breakthrough technologies.
- Circular economy principles are primarily framed through the lens of waste management, focusing on recycling, processing, and reusing materials.

Specific Mentions in RIS3

Four priority areas have been identified within the Digital Transformation of Slovakia domain:

- Smart and Connected Sensors and Devices.
- Increasing the Utility Value of Data and Databases.
- Smart Energy Systems.
- Cybersecurity and Cryptography

• The circular economy is discussed in relation to biomass and raw materials derived from land. • Construction/Building sector - the Integrated National Energy and Climate Plan of Slovakia for 2021-2030 highlights the primary goal of reducing greenhouse gas emissions and increasing the share of renewable energy sources in total energy consumption.
Niches of Specialization
High-impact niches of specialization with transformative potential resulting in the data-driven economy, advanced waste management, and energy efficiency.
Financing Instruments

• An updated Smart Specialisation Strategy of the Slovak Republic for 2021-2027 (RIS3 SK 2021+) is a requirement for the next programming period 2021-2027 of EU funds.
• The Programme Slovakia draws money from the following four European funds:
  ○ European Regional Development Fund (ERDF)
  ○ Cohesion Fund (CF)
  ○ European Social Fund Plus (ESF+)
  ○ Just Transition Fund (JTF)

Enabling Factors for digital innovation and circularity	**Bottlenecks/Barriers**
• Data Standardization and Traceability. • Promotion and Integration of Secondary Material Usage. • Supportive Regulatory Frameworks and Digital Collaboration Platforms	• Lack of Data Standardization and Traceability. • Missing or Unclear Quality Standards and End-of-Waste Criteria. • Regulatory Gaps and Fragmented Collaboration. • Circularity and Digitalisation in the Construction Sector Are Not Yet Mainstream

Funding Availability	**S3 CoP Involvement**
• Envirofond.sk • KInIT.sk (EDIH) • Expandi4.0.sk (EDIH) • SCDI.sk (EDIH) • Cassovium.sk (EDIH) • NPC.sk (SBA) • SIEA.sk	They are not currently involved in the Smart Specialization Community of Practice (S3 CoP)
Good Practice Examples	
• Slovak Business Agency (SBA) • SKAI-EDIH – Slovak AI Digital Innovation Hub SIEA - EXPANDI 4.0 The fourth practice – the Innovation Voucher Scheme by the Ministry of Economy	

Slovenia

Slovenian S5 Strategy	
The Slovenian Sustainable Smart Specialisation Strategy (S5) is a national-level strategy focusing on research, development, and innovation, aligning with EU Cohesion Policy 2021-2027. It emphasizes sustainability, digitalization, and the green transition.	
Quadruple Helix Approach	**University of Ljubljana's Role**
• The strategy uses a quadruple helix approach, involving	• The University of Ljubljana (UL) actively participates in the S5

government, businesses, research institutions, and civil society, with Strategic Research and Innovation Partnerships (SRIPs) playing a central role.	strategy through involvement in national innovation processes and SRIPs, contributing scientific expertise and linking academic knowledge with industry and policy goals.
Digital Innovation and Circularity in Construction	
The strategy addresses digital innovation and circularity in construction through several priority areas: • Horizontal Network for Information and Communication Technologies (HOM IKT) for digitalization. • Networks for Transition to a Circular Economy for reducing resource consumption and waste. • Smart Buildings and Homes with the Wood Value Chain for energy-efficient and sustainable buildings using wood. • Factories of the Future for advanced manufacturing and automation.	
Key Niches	**Industry 4.0**
• Key niches include Smart and Nearly Zero-Energy Buildings (NZEB), the Strategic Research and Innovation Partnership for Smart Buildings and Homes with a Wood Value Chain (SRIP PSiDL), Industry 4.0 in Construction and Circular Economy and Sustainable Materials	• Emphasizes digital transformation through robotics, AI, digital twins, and IoT.
Circular Economy	**Funding Instruments**
• Focuses on reducing material waste, increasing resource	• The S5 strategy is funded through EU programs (Cohesion Policy

efficiency, and promoting sustainable material use.	Funds, Horizon Europe, Just Transition Fund) and national development programs.
Circular Economy	**Bottlenecks/Barriers**
Key enabling factors include: • Adoption of key enabling technologies. • Development of new business models. • Internationalization. • Public-private collaboration.	Key bottlenecks and barriers include: • Uneven pace of digital transformation. • Limited integration of horizontal and enabling technologies. • Insufficient and unstable investment in R&D and digitalization. • Weak knowledge transfer and commercialization of innovations. • Resistance to change. • Skills shortages. • Limited access to financial support for circular economy initiatives.
Funding Opportunities	**EU S3 CoP**
• Funding is available through the Slovenian Enterprise Fund and the Public Agency for Science and Innovation (ARIS), among others.	• The University of Ljubljana is not currently involved but interested in joining the EU Smart Specialisation Community of Practice (S3 CoP).

Hungary

National RDI Strategy

<table>
<tr><td colspan="2">Hungary's Research, Development and Innovation Strategy (2021-2030) aims for a knowledge-based, balanced, and sustainable economy. The goal is to become a major European innovator by increasing the value-creating capacity of the RDI ecosystem and boosting business innovation performance. The government is committed to increasing R&D expenditure as a share of GDP to 3% by 2030.</td></tr>
<tr><td colspan="2">Key Objectives of the Strategy</td></tr>
<tr><td colspan="2">• Making greater use of research results from public research institutions.
• Improving the innovation performance of domestic enterprises, especially SMEs.
• Strengthening cooperation within the research, development, and innovation system.</td></tr>
<tr><td>Organization's Role (CCIPB)</td><td>Integration of Digital Innovation and Circularity</td></tr>
<tr><td>• Has no role in the preparation of the S3 strategy but can communicate the strategy to undertakings in the region.
• CCIPB is an active coordinator of regional economic development jointly with the university, the city and major companies.
• Objectives include developing human resource capacities, facilitating innovation potential, and export readiness of SMEs.
• CCIPB uses domestic and European resources to strengthen regional innovation potential.</td><td>• The strategy pays particular attention to promoting digital innovation and the circular economy, which also play a significant role in the construction sector.
• The strategy aims to create a knowledge-based, sustainable economy by boosting innovation performance.
• Making better use of knowledge is linked to increasing business innovation and the use of digital technologies in construction.
• The strategy emphasizes the development of low-carbon and clean industries and circular industries, including increasing</td></tr>
</table>

	the use of recycled materials and reducing waste.
Niches of Specialization	
• Building Information Modelling (BIM) improves communication and collaboration, reducing errors and waste. • Internet of Things (IoT) provides real-time data on material use and waste management. • Robotic sorting systems increase recycling efficiency • Digital material tracking systems optimize logistics and minimize material wastage. • 3D printing has the potential to optimize material use and reduce waste. • Integrated information systems support circular economy by promoting the use of sustainable and recycled materials.	
Funding	
Hungary needs to overhaul its entire RDI funding system to reach the 3% of GDP target by 2030.	
Key funding instruments include	**Enabling Factors**
• Economic Development and Innovation Operational Programme (GINOP Plus). • Digital Renewal Operational Programme Plus (DIMOP Plus). • Cluster development strategy	• Regulatory and standardization measures. • Financial support and tenders. • Education and training programmes.
Bottlenecks/Barriers	**Involvement in S3 CoP**
• Slow adoption of digital technologies. • Regulatory and standardization barriers. • Data management and legal challenges.	• The partner organization does not participate in S3 CoP.

Lack of technological development and investment.	

Good Practice (GP)

- Digital tracking and retrieval of building materials
- Creating digital platforms for construction waste management
- Using smart buildings and sensors to increase resource efficiency

In summary, Hungary's RDI strategy recognizes the importance of digital innovation and circularity in the construction sector. It aims to create a knowledge-based economy, promote business innovation, and enhance sustainability through specific initiatives, though challenges exist regarding adoption, regulation, and investment.

Romania

Regional RIS3 Strategy

- RIS3 West is a regional-level strategy reflecting a territorial innovation policy.
- Prioritizes regional development through innovative sectors identified via Entrepreneurial Discovery Processes (EDPs).
- Developed in response to EU requirements for accessing Cohesion Policy funds for RDI (2021-2027).

Development Process	Specialization Domains
• The first step was analyzing the "regional DNA" to identify key regional characteristics. • Analyzed economic dynamics, societal challenges, and existing RDI potential.	• Agriculture and food industry. • Energy efficiency and sustainable construction (buildings). • ICT and Automotive (main industries in West Region Romania). • Cultural and creative industries. • Tourism, health, and quality of life.

<table>
<tr><td>

- Considers RIS3 West as a bridge between national and regional objectives.

</td><td></td></tr>
<tr><td colspan="2">Focus on Construction</td></tr>
<tr><td colspan="2">

- The strategy splits "energy efficiency and sustainable construction" into two areas: energy efficiency, and constructions (sustainable buildings and circular economy).
- Specifies NACE codes with dynamic increases in the West Region economy (e.g., recovery of recyclable materials).

</td></tr>
<tr><td colspan="2">National Strategy Objectives</td></tr>
<tr><td colspan="2">

- OG1. Development of the research, development, and innovation system.
- OG2. Supporting innovation ecosystems associated with smart specializations.
- OG3. Mobilization towards innovation.
- OG4. Increasing European and international collaboration.

</td></tr>
<tr><td colspan="2">Implementation</td></tr>
<tr><td colspan="2">

- West RDA (regional development agency) coordinates implementation through the West Regional Programme 2021–2027.

</td></tr>
<tr><td>West Regional Programme Priority Axes</td><td>Other Policy Documents</td></tr>
<tr><td>

- Innovative and competitive region.
- Smart region.
- Green region.
- Sustainable mobility region.
- Connected region.
- Educated and attractive region.

</td><td>

- The National Strategy for Research, Innovation and Smart Specialisation 2021–2027 complements RIS3.
- Connects with the National Recovery and Resilience Plan (PNRR), the Digital Decade vision 2030, and Horizon Europe.
- The Romanian Strategy for the Circular Economy (NSCE) is a

</td></tr>
</table>

	roadmap for accelerating Romania's transition to a circular economy. • Includes an Action Plan with measures geared towards specific sectors (including construction).
Organization's Role	
• Participated as a stakeholder and facilitator in the elaboration of RIS3 West. • Contributed expertise and regional insights. • Helped guide EDP consultations. • Acts as stakeholder and RDI facilitator during implementation. • Promotes awareness, supports business development, and fosters collaboration. • Supports implementation through the West Regional Programme 2021-2027.	
Relevant Initiatives	**Funding**
• "Building Renovation Wave," "Fit for 55," EU Circular Economy Action Package, and various other EU strategies.	• West Regional Programme 2021–2027 is the main financing instrument. • Other sources: Horizon Europe, Digital Europe Programme, Interreg, and national RDI funds.
Digital Innovation and Circularity in Construction	
• "Energy Efficiency and Sustainable Construction" is a key specialization domain. • Emphasizes transitioning to climate-neutral buildings through digital innovation.	

<table>
<tr><td colspan="2">

- Circularity is addressed through sustainable construction practices, resource efficiency, and digital technologies (BIM, IoT).

</td></tr>
<tr><td colspan="2">Niches of Specialization</td></tr>
<tr><td colspan="2">

- Smart buildings.
- New models and technologies for modular buildings.
- Green construction and sustainable materials.
- Circular economy.
- Smart energy networks.
- Digital Building Management Systems (BMS) and IoT-enabled smart buildings.
- Modular and prefabricated construction with circular design principles.
- Eco-construction materials developed through local R&D.
- Energy-efficient retrofitting solutions leveraging AI and sensor-based technologies.
- Urban regeneration using digital twin models.

</td></tr>
<tr><td>Enabling Factors</td><td>Key Barriers</td></tr>
<tr><td>

- Access to key enabling technologies (KETs) such as IoT, AI, and advanced materials.
- Emergence of clusters and partnerships.
- Increasing awareness and demand.

</td><td>

- Limited capacity and resources among SMEs.
- Fragmented collaboration between research and business.
- Regulatory and bureaucratic constraints.

</td></tr>
<tr><td colspan="2">Good Practice Example</td></tr>
<tr><td colspan="2">

- ADRVest Accel: Acceleration program for projects and start-ups.

</td></tr>
<tr><td colspan="2">In summary, the RIS3 for the Western Region of Romania is a key strategic document aimed at promoting regional development through innovation in various sectors, including a strong focus on energy efficiency and sustainable</td></tr>
</table>

construction. It leverages both national and European frameworks and funding and emphasizes the importance of collaboration and awareness.

Bosnia and Herzegovina

RIS3 Status in BiH
• BiH does not currently have a RIS3 at the regional or national level, but it is under development. • The creation of a RIS3 is anticipated under the Green Agenda for the Western Balkans (GAWB).
Green Agenda for the Western Balkans (GAWB)
• Focuses on innovation-driven economic growth, digitalization, and sustainability. • The circular economy is one of the five pillars of the GAWB. • Actions relevant include applying an industrial ecosystem approach and implementing Smart Specialization Strategies – S3.
Key Policy Documents
• Development Strategy for Construction Materials Industry in the Federation of Bosnia and Herzegovina for the period 2016-2025: • Mission: to be competitive in the domestic market and in the surrounding region. • Main strategic goals: development of the construction materials industry based on sustainable development principles. • Development Strategy of the FBiH (2021-2027, Government of FBiH): Includes actions to encourage the green transition and accelerate digital transformation. • The Development Strategy for Small Business in the FBiH (2022-2027), Federal Ministry of Development, Entrepreneurship and Crafts: Strategic goal1 focused on fostering a competitive small industry landscape that leverages innovations, digitalization and principles of the green circular economy • Environmental Strategy and Action Plan of FBiH (ESAP 2030 +): includes measures for creating conditions for adequate collection and disposal of

<table>
<tr><td colspan="2">specific waste categories focused on enhancing the collection and reuse of construction waste
• Environmental Strategy and Action Plan of RS (ESAP 2030 +) Establishing a system for managing demolition/construction waste materials
• Economic Reform Program (ERP) of Bosnia and Herzegovina focuses on digital transformation
• Roadmap for Circular Economy in BiH: A draft roadmap that identifies the construction sector as a priority for transitioning to a circular economy.</td></tr>
<tr><th>Enabling Factors</th><th>Bottlenecks/Barriers</th></tr>
<tr><td>• Adoption of key enabling technologies to maintain market competitiveness.
• Business model transformation towards circularity.
• Internationalization and innovation-driven partnerships.</td><td>• Low level of digitalization among businesses.
• Digital skills gap.
• Weak implementation of strategic documents and regulations.
• Limited access to financing for digital and circular innovations.
• Fragmented institutional support.
• Resistance to change and lack of awareness.</td></tr>
<tr><th>Funding</th><th>Participation in S3 CoP</th></tr>
<tr><td>• Financed through a combination of domestic budgets, international grants, and collaborative projects with development partners.
• International donors : EBRD, EU, GIZ and UNDP
• Also supports through support of the Government of Switzerland and the Government of Sweden</td><td>• SERDA is involved in S3 CoP but didn't participate in the creation of strategic documents within S3 CoP. SERDA is actively working on monitoring and providing support to S3 CoP implementation.</td></tr>
</table>

Good Practice Examples
• Development Bank of FBiH Credit Lines • BOOST Project (EU4DigitalSME Initiative) • "Strengthening the Competitiveness of SMEs" Grant Scheme • Circular Accelerator for SMEs
In summary, while BiH doesn't have a fully developed RIS3 strategy yet, it is working towards one and has implemented numerous policies and initiatives to support digital innovation and circularity within the construction sector. The adoption is mainly hindered by economical barriers, lack of skills, fragmentation, and resistance to change.

Serbia

National RIS3 Strategy
• Serbia adopts and implements the Research and Innovation Strategy for Smart Specialisation (4S Strategy) at the national level. • It does not employ separate regional smart specialisation strategies. • The Autonomous Province of Vojvodina previously developed a regional Smart Specialisation Strategy for 2015-2020. • The Smart Specialisation Strategy of the Republic of Serbia for 2020-2027 represents Serbia's core strategic framework.
Development Process
• Developed in line with European Commission guidance for candidate countries. • Resulted from a structured, multi-year entrepreneurial discovery process (EDP).
Priority Domains
• Information and Communication Technologies (ICT).

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- Food for the Future (agri-food technologies).
- Machines and Production Processes of the Future.
- Creative Industries.

</td></tr>
<tr><td colspan="2">Cross-Cutting Support Areas</td></tr>
<tr><td colspan="2">

- Environmental protection.
- Energy efficiency.
- Human health.

</td></tr>
<tr><td>Implementation & Coordination</td><td>Role of STP NS
(Science and Technology Park Novi Sad)</td></tr>
<tr><td>

- While national in scope, it incorporates regional consultation mechanisms.
- Implementation is coordinated by the Public Policy Secretariat and the
- Ministry of Science, Technological Development and Innovation.

</td><td>

- Played a regional stakeholder role during the elaboration of the strategy.
- Provides incubation and technical support to startups in ICT, automation, AI, IoT, and advanced materials.
- Acts as a platform for collaborative R&D and knowledge transfer with the University of Novi Sad.

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<tr><td colspan="2">Complementary Policy Documents</td></tr>
<tr><td colspan="2">

- Supports digital transformation, innovation, and the transition to a circular economy.
- They serve as either operational extensions of the RIS3 or as parallel, thematically-focused strategies.

</td></tr>
<tr><td colspan="2">Key Strategies</td></tr>
<tr><td colspan="2">

- Strategy for the Development of the Digital Skills in the Republic of Serbia (2020-2024).
- Artificial Intelligence Development Strategy of the Republic of Serbia for the Period 2020-2025.

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- Circular Economy Development Programme of the Republic of Serbia (2022-2024).
- Strategy for Industrial Policy of the Republic of Serbia (2021-2030).
- Strategy of Sustainable Urban Development (until 2030).

</td></tr>
<tr><td>Digital Innovation in the Construction Sector</td><td>Key initiatives</td></tr>
<tr><td>

- ICT is a foundational enabler.
- Integration of digital tools: Building Information Modeling (BIM), artificial intelligence, Internet of Things (IoT), and digital twin technologies.

</td><td>

- National BIM Mandate Roadmap
- Innovation Fund & RIS3-aligned Grants
- EU-Funded Projects
- Academic Implementation

</td></tr>
<tr><td colspan="2">Circularity in the Construction Sector</td></tr>
<tr><td colspan="2">

- Circular economy principles are included in sectoral strategies.
- Circular Economy Development Programme (2022-2024) identifies construction and demolition waste (CDW) as a critical area.
- Key actions include New Waste Regulation (2023), National Recycling Infrastructure, Innovation Pilot Projects, and Industry Engagement.

</td></tr>
<tr><td colspan="2">Niches of Specialization (Vojvodina/Novi Sad)</td></tr>
<tr><td colspan="2">

Circular Materials and Sustainable Building Components from Agricultural Waste:

- Bio-based thermal insulation panels.
- Composite panels using lignocellulosic waste.
- Natural binders and low-carbon brick prototypes.

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<tr><td>Funding</td><td>Enabling Factors</td></tr>
<tr><td>

- Operationalized through national and international funding instruments thematically aligned.

</td><td>

- Technological Capacity and Key Enabling Technologies (KETs).
- Internationalization and EU Project Participation.

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</table>

• Financing mechanisms come from national public funds, EU pre-accession assistance (IPA), donor-supported programs (e.g. UNDP), and regional development instruments.	
Bottlenecks/Barriers	**Available Funding**
• Financial and Investment Constraints for SMEs. • Skills Gap and Cultural Resistance to Change. • Regulatory Gaps and Weak Enforcement Mechanisms.	• Innovation Fund of the Republic of Serbia. • Circular Economy Innovation Challenge (UNDP + Ministry of Environmental Protection). • European Union – IPA III Programme & Green Agenda Support.
Good Practice Examples	
• National ePermitting System (eDozvola): Digitalization of Construction Permitting in Serbia. • CornHusk Development of Bio-based Insulation Panels from Agricultural Waste. • Construction Waste Recycling Hub – Novi Sad Pilot within National C&D Waste Network	
In summary, Serbia's approach to digital innovation and circularity in the construction sector is driven by a national RIS3 strategy, supported by complementary policies, targeted funding, and the activities of key regional stakeholders like STP NS. While the construction sector isn't a specific priority domain, digital innovation and circular economy principles are integrated across various initiatives.	

Montenegro

National RIS3 Strategy

- Montenegro's "Smart Specialization Strategy of Montenegro 2019-2024" (S3 Strategy) is a national-level document.
- Aims to promote sustainable economic development by leveraging strengths in research and innovation.
- Montenegro was the first country in the region to receive official EU Commission approval for its S3 Strategy.

Key Priority Areas for S3	Importance of Construction
• Sustainable Agriculture and Food Value Chain. • Energy and Sustainable Environment. • Sustainable and Health Tourism. • Information and Communication Technologies.	• The construction industry was identified as a potential priority during the mapping phase. • While not initially selected as a priority, it was underlined in the "Energy and sustainable environment" area. • It is possible that "innovations in construction industry" will be mapped as an independent strategic area in the new round of S3 2025-2029.
Governance System for S3 Implementation	**Key Institutions and Structures**
• The Government of Montenegro is the executive board. • The Council for Innovation and Smart Specialisation is the key advisory body. • Innovation working groups facilitate the	• Science and Technology Park of Montenegro (STP MN): Head of S3 Strategy implementation infrastructure. • The Innovation Fund of Montenegro: Implements innovation policy.

Entrepreneurial Discovery Process. • Inter-institutional S3 Group of the Ministry of Science and Technological Development manages and coordinates inter-agency cooperation.	• Innovation and Entrepreneurship Centre "Tehnopolis" Nikšić and ICT Cluster organisation “ICT Cortex”.
New S3 Strategy Design *(2025-2029)*	**Other Policy Documents**
• A Roadmap guides the development of the new Smart Specialisation Strategy (S3) 2025–2029. • Quantitative and qualitative analysis has been carried out with expert support. • The new Strategy is based on innovations as a driver of regional development and EU integration for a more resilient, digital, and sustainable economy.	• **The National Strategy for Circular Transition until 2030:** regulates the transition to a circular economy. • **The Law on Waste Management:** enforces waste reduction, reuse, and recycling requirements. • **The National Climate Change Strategy until 2030 and the Energy Development Strategy of Montenegro util 2030:** promoting sustainable practices.
Organization's Role	**Digital Innovation and Circularity in Construction**
• Plans to take part in community consultations for the New Smart Specialisation Strategy (S3) 2025–2029.	• S3 Strategy underlined innovation in the "Energy and Sustainable Environment” priority area by providing innovations for the use of industrial waste in the production of building materials.

• Provides advocacy, participation in the policy-making process, exchange of knowledge, and influence decision-makers to include the best waste management practices in the legislative documents. • NGO is providing collaborative partnerships with stakeholders from Montenegrin public institutions	• The S3 strategy identified the greatest use potential in the structure of industrial waste in fly ash, red sludge, slag, metal dust, and wood waste • The "Information and Communication Technologies" (ICT) direction of S3 Strategy underlines the use of advanced ICT solutions in all branches of the economy. In the construction industry it is reflected in Smart technologies (cities, buildings, etc.) and Green ICT
Niches of Specialization	
• Integration of Digital Tools (Building Information Modeling (BIM), Internet of Things IoT) to enhance planning, efficiency, and circularity. • Modular & Prefabricated Construction implement 3D printing, robotic assembly, and adaptive design tools to speed up construction and enable circular designs	
Funding	
• Strategy implementation is budgeted under grants and co-financing instruments financed by national budget, donor programmes, EU programmes, private sector. • S3 Smart Specialization Strategy 2019-2025 investments worth around 174 million euros were planned. • Programmes with national level : Ministry of Economy Development programmes, Ministry of Science and Technological Development programmes. • Topics on S3 takes part at the several international programmes (like interreg, Erasmus, etc).	

Enabling Factors	Bottlenecks/Barriers
• Establishment of the infrastructure for technological development on a national level. • The Chamber of Commerce of Montenegro has established the Circular Economy HUB as a center of knowledge and expertise. • A sharp increase in the price of building materials.	• The adoption of digital tools remains limited, and most projects in the construction industry are still managed using traditional project management techniques. • Prefabrication and modular construction are also emerging but are not widely adopted, partly due to workforce training gaps and higher upfront costs. • Recycling and reuse of materials in construction are still in the early stages
Involvement S3 CoP	**Good Practice Examples**
• Montenegro is the first state in the region and the first state non-EU member to get official approval from the EU Commission for the Strategy • Zero Waste Montenegro is involved as a stakeholder	• Creation of the Innovation Fund of Montenegro • Program for Collaborative grants for innovation • Program for checking the innovative concept
In summary, Montenegro's approach to S3 involves a national strategy, with a roadmap for the future (2025-2029), and is focusing on key sectors and enabling factors for digital innovation and circularity in the construction sector. Although not directly prioritized, there's an understanding of the potential benefits, and efforts are being made to address barriers and explore funding opportunities.	

Croatia

RIS3 Strategy

Croatia's RIS3 is a national-level strategy used to implement the National Development Strategy and National Recovery and Resilience Plan (NRRP), focusing on areas like health, energy, security, transport, food, and key technologies.

Organization's Role	Other Policy Documents
• TERA Tehnopolis contributes to RIS3 through awareness, RDI support, and facilitating cooperation among stakeholders.	• Other key documents include the National Recovery and Resilience Plan (2021-2026) focusing on energy-efficient renovations, seismic reinforcement, and sustainable mobility, and the Waste Management Plan (2023-2028) emphasizing a circular economy through waste prevention, reuse, and recycling.
Circular Economy Action Plan	**Digital Innovation and Circularity**
• Croatia's Circular Economy Action Plan (2023–2027) integrates circular economy principles into waste management, aligning with EU targets. Despite efforts, Croatia's performance in reducing construction and demolition waste (CDW) needs improvement.	• Croatia's RIS3 integrates digital innovation and circularity in the construction sector via targeted policies and projects like the DIGIT Project, aiming for economic, environmental, and innovative outcomes.

Niches of Specialization	Budgeting
• Transformative potential is focused on digitalization in the construction sector, including education and implementation, as well as monitoring construction work.	• Digital innovation and circularity are budgeted through ERDF & RRP, but digital innovation in construction isn't specifically targeted in calls.
Enabling Factors	**Bottlenecks/Barriers**
• Key enabling factors include changing the business model, improving awareness towards innovation, and applying digital procedures for short-term cost reductions.	• Bottlenecks include unwillingness of decision-makers to accept change and a lack of integration among strategies and plans. Also, lack of expected favorable outcomes commensurable with the strategies and plans.
Funding	
• Available funding includes the DIGIT Project, National Recovery and Resilience Plan (NRRP), Smart Specialization Strategy (S3), Environmental Protection and Energy Efficiency Fund (FZOEU), and Digitalization Vouchers.	
Good Practice Proposals	
• Includes the DIGIT project, Digitalization vouchers programmes, Pilot Project for the Development of Green Infrastructure and/or Circular Management of Space and Buildings and Investment in Efficient Resource Use and Support for Transition to a Circular Economy.	

Republic of Moldova

National RIS3 Strategy

- Moldova's Smart Specialization Strategy (RIS3) is a national-level strategy.
- Coordinated by the Ministry of Education and Research with support from national and international partners.
- The "Smart Moldova" national programme (2024–2027) was officially approved on August 28, 2024.

Key Sectors	Aims & Focus:
• Agriculture and food processing. • Information and communication technology (ICT). • Energy. • Biomedicine and biopharmaceuticals.	• Foster economic transformation, increase competitiveness, and align with EU standards. • Focus on innovation and the use of emerging technologies.

Budget

- Estimated cost of implementation is 163 million MDL.
- Funded by partial state funding and external donor support.

Complementary Policy Documents

- **Digital Transformation Strategy of Moldova (2023-2030):** focuses on e-governance, digital economy, and innovation ecosystems.
- **National Development Strategy "European Moldova 2030":** outlines sustainable development priorities, including green transition.
- **National Energy and Climate Plan (NECP):** includes links to circularity and green innovation in the energy sector.

<table>
<tr><th colspan="2">Organization's Role
(Potential)</th></tr>
<tr><td colspan="2">• Business Support organization, eligible for future calls of projects aimed at implementing the proposed action plan.</td></tr>
<tr><th>Digital Innovation and Circularity in Construction</th><th>Digital Innovation</th></tr>
<tr><td>• Digital innovation is explicitly addressed, particularly through the ICT sector.
• Construction sector is not a directly targeted area of specialisation in the current RIS3.
• Circularity in the construction sector is not explicitly reflected in the strategy.</td><td>• Advanced ICT solutions for smart building management, energy efficiency, predictive maintenance.
• Electronic engineering and nano/micro materials for sensors and smart materials.
• Digital public services and e-Governance platforms for urban planning and digital permitting systems.</td></tr>
<tr><th colspan="2">Potential for Cross-Sectoral Innovation</th></tr>
<tr><td colspan="2">• Applying digital tools (from the ICT sector) and sustainable practices (from the energy sector) to the construction field.</td></tr>
<tr><th>Circularity</th><th>Funding for Digital Innovation</th></tr>
<tr><td>• Sustainable agriculture and bio-based materials.
• Energy sector innovations in energy efficiency and renewable energy integration.
• Biotechnologies and materials innovation for recyclable or biodegradable materials.</td><td>• Digital innovation is a formal priority under RIS3 (via the ICT sector), and funding instruments are applicable.
• Additional digital transformation actions may be co-financed via Moldova's Digital Transformation Strategy 2023–2030.</td></tr>
</table>

Funding for Circularity in Construction
• Circular economy in the construction sector is not reflected in RIS3 as a standalone sector or niche. • No RIS3-aligned financing instrument directly targets this theme. • Green transition, energy efficiency, or cross-sectoral innovation initiatives could potentially be aligned.
Enabling Factors
• Using key enabling technologies • Changing business model • Internationalization capabilities • Awareness towards innovation
Bottlenecks/Barriers
• Lack of Strategic Focus on Construction in RIS3 • Fragmentation and Lack of Cross-sectoral Integration
Funding Available
• Organisation for Entrepreneurship Development (ODA) for technology startups. • European Village Program for infrastructure improvements. • European Union's LIFE Programme for environmental and climate action projects.
Involvement in S3 CoP
• Not yet involved in the S3 CoP but plan to join.
Good Practice (GP) Proposal
Creation of a GreenBuild Lab - Digital & Circular Construction Innovation Hub. The hub will focus on: • Prototyping • circular design studio

• training & incubation • policy sandbox & green procurement support
In summary, Moldova's RIS3 strategy focuses on key sectors like ICT, with the construction sector not directly prioritized. However, digital innovation is covered, and there's potential to integrate circularity in construction through cross-sectoral opportunities and updates to policy.

Complementary Policy Documents

Overview of existing policies for circular economy and digitalization in each country

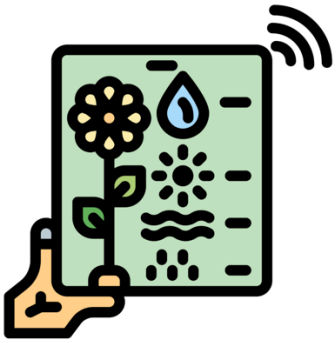
BULGARIA

Smart Specialization Strategy (RIS3) in place for the 2021–2027 programming period. This strategy is complemented by other key policy frameworks:

- **National Recovery and Resilience Plan**
- **National Strategy for Circular Economy** *(adopted in 2021).*

Together, these documents outline Bulgaria's strategic priorities in digitalization, innovation, and green transformation, with specific relevance to the construction sector as a target for technological advancement and sustainable development.

AUSTRIA



The RIS3 strategy in Austria is implemented through a multi-level governance framework that combines national coordination with regional specialization. This approach is anchored in the national:

- **RTI** *(Research, Technology and Innovation)* **strategy "Becoming an Innovation Leader" launched in 2011**
- **Policy Framework for Smart Specialization developed in 2016.**

Austria has also developed other complementary policy documents that address digitalization, innovation, and the circular economy:

- **The Digital Action Plan Austria** (DAA)

	This document provides a strategic framework for the government's digitalization projects and stakeholder initiatives. This plan aims to create growth, jobs, and prosperity while improving quality of life and providing secure, modern, and accessible public administration services. • **The Austrian Circular Economy Strategy** Adopted by the Austrian Federal Government in December 2022, this strategy focuses on reducing resource consumption, avoiding waste, preventing environmental pollution, and reducing greenhouse gas emissions. It sets concrete measurable goals for 2030 and 2050, including reducing domestic material consumption and increasing the circularity rate. • **The RTI Pact 2024-2026** The Pact aligns with the objectives of the RTI Strategy 2030 and outlines strategic priorities for research, technology, and innovation.

GERMANY

	The Research and Innovation Strategy for Smart Specialization (RIS3) is primarily a regional-level strategy in Germany, as it is implemented by the 16 federal states (Bundesländer). Each state develops its own RIS3 strategy. Nevertheless, Germany has several key policy documents that address digitalization, innovation, and circular economy: • **High-Tech Strategy 2025** (HTS 2025)**:**

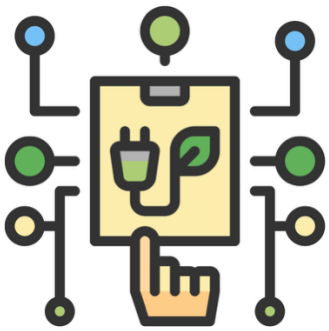
	This is the strategic framework for the Federal Government's research and innovation policy. It aims to address societal challenges in areas such as health, sustainability, mobility, and the economy. • **Digital Strategy 2025:** This programme outlines the priorities of the German Government for developing digital capabilities and using new tools to enhance Germany's digitalization processes. It focuses on ten pillars important for digitalization, including digital education. • **National Circular Economy Strategy:** This strategy aims to examine production and consumption over the entire life cycle and highlight ways to conserve resources through efficiency and circularity. These documents collectively address innovation, digitalization, and circular economy in Germany, although they are separate strategies rather than a single comprehensive document like a RIS3.

CZECH REPUBLIC

	All regions in the Czech Republic have their respective RIS3 strategies. Other policy documents are: • **Circular Czechia 2040 Strategic Framework** (2021) • **Associated: Circular Czechia 2040 Action Plan** (2023)

	These documents, while not formally part of the RIS3 framework, focuses on advancing the circular economy. The strategy and action plan include a priority area for the construction sector (alongside energy, raw materials and industry) and recognizes the critical role of digitalization.

SLOVAKIA



RIS 3 strategy is in place in Slovakia, however, there are national strategies related to the examined areas:

DIGITAL TRANSFORMATION

- ***National Strategy for Research, Development and Innovation 2030***

The strategy defines goals, policies, and measures in the field of research, development, and innovation (RDI). A set of 69 measures aims to boost the effectiveness of RDI support, such as simplifying grant schemes, reducing information barriers through a one-stop shop, facilitating the entry of foreign experts, introducing employee stock ownership plans (ESOP), ensuring predictable funding, reforming the legal framework, and streamlining procurement and audit processes.

- **Strategy of the Digital Transformation of Slovakia 2030, and Action plan for the digital transformation of Slovakia for the years 2023-2026**

	Key and decisive document for Slovakia reflecting the necessary transformation of an industrial society to an information society with the goal of Slovakia becoming a modern country with innovative and environment-friendly industry. The Action plan is divided into four thematic areas: ▪ ***Digitalization of the wider economy.*** ▪ ***Digital infrastructure.*** ▪ ***Support of the potential of artificial intelligence.*** ▪ ***Digital society.*** • **National Digital Skills Strategy of the Slovak Republic and the Action Plan 2023-2026** It is a strategic document that defines the goals and measures necessary to increase the level of digital competencies and skills of the entire society following on from the previous two publications. • **Strategy and action plan to improve Slovakia's position in the DESI index until 2025** It is a framework strategic document of the Government of the Slovak Republic, which responds to the long-term trend of stagnation or decline in Slovakia's rating in the Digital Economy and Society Index (DESI). The main intention is for Slovakia to actively develop digital trends within the next five years and, thanks to innovations, to improve the quality of life of its citizens, the conditions for doing business, and to use the full potential that digitization provides across the economy and society to the maximum extent.

	• **Support for the development of 5G networks in Slovakia for the years 2020 – 2025** The document is based on a digital strategy and aims to contribute to the digital transformation of Slovakia from the point of view of building a modern, functional, and secure infrastructure of electronic communications. • **Recovery and Resilience Plan Component 17** The aim of this component of the Slovak Republic's Recovery and Resilience Plan is to prepare society and the economy for digitalization.
	CIRCULAR ECONOMY • **Closing the loop in the Slovak Republic** *(A roadmap towards circularity for competitiveness, eco-innovation and sustainability)* This report outlines key strategies for Slovakia's transition to a circular economy, emphasizing the need for policy reforms due to the projected increase in material consumption where the construction sector is ranked among the three top priorities for the circular economy transition. • **Strategy of the Environmental Policy of the Slovak Republic until 2030** Envirostrategy 2030 was published in 2019 and its need also reflects that the last Strategy - Principles and Priorities of the State Environmental Policy was approved in 1993 and has not been updated since. The Envirostrategy 2030 defines a vision until 2030,

	identifies the fundamental systemic problems, sets the objectives until 2030, and provides indicators enabling the measurement of the achieved goals. • **Low-Carbon Development Strategy of the Slovak Republic until 2030 with a View to 2050** This Strategy was approved by the Government of the Slovak Republic (SR) on March 5, 2020, and its main aim is to identify measures to achieve climate neutrality in Slovakia by 2050. • **Strategy for the Adaptation of the Slovak Republic to Climate Change** The updated version was published in 2018 with the main goal of improving Slovakia's readiness to face the adverse consequences of climate change, increasing general awareness, and bringing the widest possible information about the current adaptation processes in Slovakia. • **Integrated National Energy and Climate Plan 2021-2030** This Plan was published in 2019 by the Ministry of Economy of the Slovak Republic. It updates the current energy policy, which was originally based on energy security; energy efficiency; competitiveness, and sustainable energy; (including science and R&I). The plan represents an update of the energy policy approved by a resolution of the Government of the Slovak Republic in 2014.

	• **Waste prevention programme of the Slovak Republic for the years 2019-2025** This document was published in 2018. Its main objective is the shift from material recovery as the only priority in the waste management of the Slovak Republic to waste prevention in accordance with the waste hierarchy. • **Waste Management Programme of the Slovak Republic for 2021- 2025** This sixth national program sets basic requirements, goals, and measures for waste management, based on the evaluation of the 2016-2020 program and the current needs in Slovakia. It covers all waste categories as per the Waste Act, with district offices required to create regional programs aligned with this document. In the future, it may be merged with the Waste Prevention Program. • **Recovery and Resilience plan** The plan was adopted in 2021 and updated in 2022-2023, containing a new green chapter called REPowerEU, which aims to contribute to reducing dependence on Russian fossil fuels and fighting the climate crisis. • **Economic Policy Strategy of the Slovak Republic until 2030** (Proposal) The main vision of the strategy is to increase the competitiveness of the Slovak economy by 2030 by enabling flexible responses to new global trends and technologies built on the principles of sustainable development.

SLOVENIA

The Slovenian Sustainable Smart Specialization Strategy (S5) is a national-level strategy. On the national level, it is closely linked to various key policy frameworks, including:

- **Slovenia's Development Strategy 2030:** The Slovenian Development Strategy 2030 is the country's long-term framework aimed at achieving a high quality of life for all citizens through sustainable and balanced economic, social and environmental development. The Strategy focuses on inclusion, lifelong learning, a productive economy, environmental sustainability, and effective governance, aligned with regional and global trends.

- **Digital Slovenia 2030:** Digital Slovenia 2030 is the national strategy guiding digital transformation by 2030, aligned with EU goals and developed through broad stakeholder cooperation. It focuses on key digital challenges and priorities to support Slovenia's strategic digital development.

- **Scientific Research and Innovation Strategy** (ZRISS 2030)**:** the main framework for guiding research, development, and innovation to support social, economic, and sustainable progress. It focuses on effective governance, increased investment, career development, international competitiveness,

	science-industry cooperation, open science and gender equality. • **Slovenia's Industrial Strategy 2021–2030:** The Slovenian Industrial Strategy 2021–2030 outlines the vision of a green, creative, and smart industry, aiming to boost productivity and transition toward a sustainable, innovation-driven economy. It focuses on competitiveness, entrepreneurship, innovation, and support for green, digital, and societal development. • **National Energy and Climate Plan (NEPN):** The National Energy and Climate Plan (NEPN) is Slovenia's strategic action plan for energy and climate policy until 2030 (with a view to 2040). It sets goals and measures across five key areas: decarbonisation, energy efficiency, energy security, internal market, and research, innovation and competitiveness.

HUNGARY

Hungary's policy instruments primarily emphasize digitalization, resource efficiency, and circular practices in construction, reinforcing its RIS3 strategic priorities in sustainable development, innovation, and smart urban growth.

- **National Digitalization Strategy:** A comprehensive framework aimed at integrating digital technologies across

	industries, including construction, to enhance efficiency, transparency, and innovation. ▪ **Smart City Development Programs:** Initiatives focused on deploying IoT, sensors, and digital infrastructure to create resource-efficient, intelligent urban environments. ▪ **Building Information Modeling** (BIM) **Adoption Policy:** Support for implementing BIM standards and practices within construction projects, promoting digital workflows and data sharing. ▪ **Circular Economy Action Plan:** National policy promoting resource efficiency, waste reduction, and the reuse/recycling of construction materials. ▪ **Waste Management and Recycling Regulations:** Policies setting targets and standards for waste minimization, recycling, and sustainable material use in the construction industry. ▪ **Innovation Policy for Green Technologies:** Supporting R&D and deployment of environmentally friendly, resource-conserving construction materials and techniques.

ROMANIA

Since the West Region has a dedicated RIS3, it remains the main document. However, nationally, the following documents are part of the Romanian policy:

- **National Strategy for Research, Innovation and Smart Specialization 2021-2027**

The document complements regional strategies. It sets the overall framework for supporting innovation, digitalization, and sustainable economic transformation, emphasizing Industry 4.0, green transition, and the digital economy. It also connects with the National Recovery and Resilience Plan (PNRR), the Digital Decade vision 2030, and Horizon Europe.

- **National Strategy for the Circular Economy in Romania**

The Romanian Strategy for the Circular Economy (NSCE) is a roadmap for accelerating Romania's transition from a linear to a circular economic model. The implementation of the Action Plan will provide a framework for this transition.

- **Action Plan promoting the Circular Economy**

In the circular economy field, The Romanian Government has approved an Action Plan promoting the Circular Economy as part of the National Strategy for the Circular Economy (NSCE). The action plan sets out a national vision for speeding up the transition

	to a circular economy, with measures geared to the nine economic sectors with the greatest potential for circularity in Romania's economy: agriculture and forestry; automotive; construction; food and beverages; packaging; textiles; electrical and electronic equipment; waste; water; wastewater.

BOSNIA AND HERZEGOVINA

- **Development Strategy for Construction Materials Industry in the Federation of Bosnia and Herzegovina for the period 2016-2025 / Federal Ministry of Energy, Mining and Industry**

Mission strategy: To be competitive both in the domestic market and in the surrounding region, ensuring constant growth based on knowledge, innovation, and the sustainable use of available resources.

To achieve the defined Mission, the following main strategic goals have been established:

- Development of the construction materials and non-metal industry based on sustainable development principles, including rational energy use with the recycling and reuse mechanism, utilizing domestic resources and enhancement of the environmental protection.
- Aligned, harmonized and adopted technical legislation at the state level of Bosnia and Herzegovina with the technical legislation of the European Union.

	• Strengthening the institutional support and attracting foreign investments in the field of construction, including residential construction, road construction and other infrastructure projects. • **Development Strategy of the FBiH** *(2021-2027, Government of FBiH)* In the Development Strategy of the FBiH (2021-2027), specific directions for government action to encourage the green transition are outlined. Measures aligned with this project objective include: • 1.1.2. Accelerate the digital transformation of small and medium enterprises • 1.2.1. Support research, development, and innovation activities • 3.1.7. Improve integrated waste management and the circular economy system • **The Development Strategy for Small Business in the FBiH (2022-2027), Federal Ministry of Development, Entrepreneurship and Crafts** Strategic goal 1: Innovations and digital transformation of small businesses set forth a comprehensive vision aimed at fostering a competitive small industry landscape that leverages innovations, digitalization, and principles of the green circular economy. Key initiatives include promoting circular economy principles, enhancing energy efficiency, utilizing renewable energy

	sources, and importantly, fostering the acquisition of "green skills" among the workforce. • **Environmental Strategy and Action Plan of FBiH** (ESAP 2030 +) **/ Federal Ministry of Environment and Tourism** Measure 2.5.1: Creating conditions for adequate collection and disposal of specific waste categories Enhancing the collection and reuse of construction waste through activities such as: • Planning and establishing recycling yards and landfills for construction waste, • Implementing standards and regulations on construction materials to remove waste status in compliance with the Regulation on Construction Waste (Official Gazette of FBiH, 93/19) • Developing guidelines for green/sustainable construction incorporating methods to reduce construction waste (material reuse, adaptability, material exchange, and use of less toxic materials) • **Economic Reform Program (ERP) of Bosnia and Herzegovina** ERP BiH is a strategic document for the coordination and planning of economic policies, the management of reforms that are considered as key to improving competitiveness, encouraging new job opportunities and social inclusion as well as for meeting the economic criteria in the pre-accession process.

	Among its structural reform measures, 5.2.3 focuses on digital transformation, with a specific emphasis on Measure 5.2.3.2, which aims to drive the digitalization of industry and small and medium-sized enterprises (SMEs) to improve efficiency, innovation, and overall economic resilience. • **Roadmap for Circular Economy in BiH – DRAFT / Ministry of Foreign Trade and Economic Relations of BiH** The construction sector has been identified in the Circular Economy Roadmap as one of the priority sectors for the transition to a circular economy. Although the draft of the Roadmap was prepared two years ago, it has not yet been officially adopted. It is important to note that the Roadmap has identified the construction sector as one of the priority sectors for transitioning to a circular economy. The following initiatives are planned: • Promoting best practices such as the EU Level(s) framework for assessing and reporting on the sustainability of buildings throughout their entire life cycle. • Advocating for the use of green building standards, such as LEED. • Designing buildings with a focus on reuse, longevity, flexibility, and deconstruction (dismantling individual building components for reuse). • Utilizing Building Information Modeling (BIM) and material passports to transform buildings into material banks.

	• Changing production and material usage practices through:
	  ○ Supporting prefabrication, modular design, additive manufacturing/3D printing (e.g., reusable modular concrete components).
	  ○ Replacing conventional high-carbon-intensity materials with low-carbon alternatives, including renewable-based materials (e.g., promoting the use of wood instead of concrete).
	
	Improving resource efficiency in energy, water, and materials during construction and operation by integrating renewable energy, energy efficiency measures, and lean methodologies.

SERBIA

	Although Serbia has a national RIS3 strategy in place, it is supported by a broader framework of national policies and strategic documents that directly address digital transformation, innovation, and the transition to a circular economy. These documents serve either as operational extensions of the RIS3 or as parallel, thematically focused strategies that guide implementation in key sectors, including construction. Key complementary strategies include: • **Strategy for the Development of the Digital Skills in the Republic of Serbia** (2020–2024)

	This strategy aims to equip the population with digital competencies at all levels, from basic digital literacy to advanced ICT capabilities, particularly in sectors such as education, public administration, and industry. It supports the digitalization of the workforce and contributes to building a knowledge economy. • **Artificial Intelligence Development Strategy of the Republic of Serbia for the Period 2020–2025** Serbia is among the first Western Balkan countries to adopt a national AI strategy. It envisions the application of AI in priority sectors, including public infrastructure, education, transport, and smart construction, with a focus on developing domestic AI solutions and creating a regulatory framework. • **Circular Economy Development Programme of the Republic of Serbia** (2022–2024) This is Serbia's first strategic framework dedicated entirely to the circular economy. It outlines objectives for reducing resource use, increasing recycling rates, and creating secondary markets — with specific emphasis on construction and demolition waste (CDW) as a priority stream. The programme is part of Serbia's obligations under the Green Agenda for the Western Balkans, endorsed by the Sofia Declaration (2020). • **Strategy for Industrial Policy of the Republic of Serbia** (2021–2030)

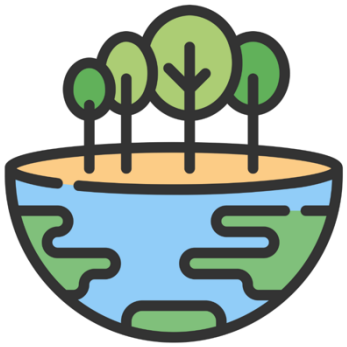
	This strategy emphasizes industrial modernization through innovation, digitalization, and sustainable practices. It recognizes the need for the construction sector to adopt circular models and modern technologies such as BIM. One of its explicit objectives is to transition Serbian industry to low-carbon and circular business models. • **Strategy of Sustainable Urban Development** (until 2030) Adopted in 2019, this strategy promotes integrated urban planning, energy-efficient buildings, and smart infrastructure, supporting both circularity and digitalization in the urban construction context.

MONTENEGRO

	Alongside the preparation of the new Smart Specialization Strategy Montenegro is providing other significant ongoing R&I policy reform activities, including publishing in 2024 the Strategy for Scientific Research Activity of Montenegro 2024-2028, work on the Roadmap for Research Infrastructure until 2028, and the Law on Scientific Research Activity. These efforts are fully integrated into Montenegro's Reform Agenda within the Growth Plan for the Western Balkans. • **The National Strategy for Circular Transition** The transition to a circular economy is regulated in until 2030 on the country level. The Strategy identifies sustainable construction as a critical area for the circular economy (CE) development with

	increased resource efficiency, use of construction waste, and sustainable infrastructure that will facilitate the circular transition in other sectors. The Strategy is promoting Building Information Modeling (BIM) aimed at enhancing resource management, project planning, and waste reduction. • **The Law on Waste Management** This is a foundational regulatory document enforcing waste reduction, reuse, and recycling requirements. It aligns Montenegro's waste management practices with EU directives, aiming to minimize landfill dependency and increase recycling rates, particularly for construction waste. • **National Climate Change Strategy until 2030 and the Energy Development Strategy of Montenegro until 2030** These strategies are also playing an important role in the transition of the construction industry in Montenegro to more sustainable practices.

CROATIA

	Croatia's policy instruments and projects are designed to reinforce RIS3 by fostering research excellence, digital innovation, and sustainable urban development, thereby aligning national efforts with smart specialization priorities. • **National Recovery and Resilience Plan** (2021-2026) Energy Renovation and Seismic Reinforcement: NRRP includes investments in energy-efficient

	renovations and seismic reinforcement of buildings, which can incorporate circular and digital practices. Sustainable Mobility Investments: EUR 728 million is allocated for sustainable mobility projects, which may involve green construction practices and digital infrastructure. • **Waste Management Plan** (2023–2028) Aims to implement a circular economy by emphasizing waste prevention, reuse, recycling, and composting. It targets improved recycling rates, establishment of recycling centers, and construction waste prevention to meet EU standards. • **Circular Economy Action Plan** (2023–2027) Integrates circular economy principles into waste management to minimize waste generation and improve resource efficiency, aligning with EU targets. Despite efforts, Croatia's performance in CDW management remains below EU average, requiring a transition to a circular economy to address growing waste from the construction sector.

REPUBLIC OF MOLDOVA

	Although the Republic of Moldova now has an RIS3 strategy in place, other complementary national policy documents also guide digitalization, innovation, and circular economy. These include: • **Digital Transformation Strategy of Moldova** (2023–2030) A policy document that focuses on e-governance, digital economy, innovation ecosystems, and

	infrastructure. It complements RIS3 by fostering digitalization across sectors. • **National Development Strategy "European Moldova 2030"** This high-level strategy outlines the country's sustainable development priorities, including green transition, innovation, and economic modernization through circular economy principles. • **National Energy and Climate Plan** (NECP) While not focused directly on innovation, it includes strong links to circularity and green innovation in the energy sector. Each of these documents either supports or is aligned with the objectives of RIS3, forming a multi-pronged policy landscape aimed at fostering innovation, economic competitiveness, and sustainable development.

4. Analysis of RIS3 Enabling Conditions

Criteria

Governance and institutional frameworks	Research and development capabilities	Educational and skills frameworks	Collaboration between public and private sectors

Bulgaria	
Governance and Institutional Frameworks	**Research and Development Capabilities**
Strong national-level RIS3 strategy aligned with EU requirements and the National Development Programme Bulgaria 2030. Clear policy mandate and long-term direction provided by the National Strategy for the Digitalization of the Construction Sector (2023–2030) and integration with the Smart Specialization Strategy (RIS3) and the National Strategy for Circular Economy.	Focus on cross-sectoral innovation, integrating digital and clean technologies into traditional industries like construction. Emphasizes public-private partnerships and academia-industry collaboration. The European Digital Innovation Hub in the Construction Sector (EDIHCS) plays a key role.are utilized.
Collaboration between Public and Private Sectors	**Educational and Skills Frameworks**
Strong emphasis on public-private partnerships, academia-industry collaboration, and the creation of regional innovation ecosystems	EDIHCS designated as the responsible institution for implementing key capacity-building measures, including trainings,

through Regional Innovation Strategies, innovation hubs, clusters, and advisory councils. EDIHCS acts as a key intermediary.	seminars, and consultations focused on Building Information Modeling (BIM) and related digital technologies. Focus on digital upskilling and technology diffusion in construction. Persistent barriers include a lack of adequate skills and targeted training across the workforce.).

Austria

Governance and Institutional Frameworks	Research and Development Capabilities
Multi-level governance framework combining national coordination with regional specialization. Anchored in the "Becoming an Innovation Leader" strategy (2011) and the Policy Framework for Smart Specialization (2016). Strong transnational collaboration.	Focus on establishing Digital Innovation Hubs (DIHs) and the RTI Initiative Circular Economy. Strong commitment to integrating digital innovation and circularity within the construction sector.
Collaboration between Public and Private Sectors	**Educational and Skills Frameworks**
Austria Wirtschaftsservice (AWS) plays a crucial role in supporting innovation policies, funding instruments, and strategic initiatives. Collaboration with regional governments and research institutions. Public-private	Strong emphasis on training and skills development, including the integration of circular economy principles and digital competencies (Vienna's Smart City Framework)

partnerships contribute significantly to Austria's RIS3 strategy.	

Germany

Governance and Institutional Frameworks	Research and Development Capabilities
Primarily a regional-level strategy implemented by the 16 federal states (Bundesländer). Aligned with national-level policies like the High-Tech Strategy 2025 and the Digital Strategy Germany.	Focus on BIM initiatives, sustainable construction programs, and smart cities/urban development programs.
Collaboration between Public and Private Sectors	**Educational and Skills Frameworks**
Roles in implementation include funding partners, awareness and RDI support, business support, and facilitating cooperation between research, industry, and policy.	Mentions the importance of raising awareness on innovation and sustainability. Shortage of professionals trained in BIM, circular design, and digital construction tools.

Czech Republic

Governance and Institutional Frameworks	Research and Development Capabilities
National RIS3 Strategy (2021–2027) with regional governance led by Regional Innovation or	Focus on integrating digital technologies and circular economy principles in the construction sector.

Competitiveness Councils. Emphasizes the Entrepreneurial Discovery Process (EDP).	Support for digitalization through the DS09 Smart Settlements specialization domain.
Collaboration between Public and Private Sectors	**Educational and Skills Frameworks**
Regional innovation platforms facilitate the EDP involving public sector, businesses, and research. The Ministry of Industry and Trade (MPO) acts as the RIS3 strategy coordinator.	Focus on skills development as a cross-cutting pillar..

Slovakia

Governance and Institutional Frameworks
National-level strategic document (SK RIS3 2021+) defines objectives and measures to increase research and innovation capacity in segments with the highest competitive advantage.
Research and Development Capabilities
Digital technologies serve as a cross-cutting area across all domains. Focus on efficient waste management and biomass. The construction sector is an indirect beneficiary. Nevertheless, Data Standardization and Traceability was mentioned as enabling factor - Establishing a standardized system for tracking material origins, quality, and lifecycle is a foundational step toward circularity. Digital technologies such as Digital Product Passports and Building Information Modelling (BIM) play a crucial role in enabling selective demolition, material reuse, and overall resource efficiency.

Promotion and Integration of Secondary Material Usage - The second enabling condition mentioned, the use of secondary materials can be achieved by introducing quality standards, end-of-waste criteria, and minimum content requirements for recycled materials. Supportive Regulatory Frameworks and Digital Collaboration Platforms - The third enabling condition is to improve the regulatory actions, such as mandatory waste monitoring, selective demolition, and increased landfill taxes to create economic and compliance drivers for digital adoption. All these enabling factors originate from the Roadmap for a Circular Economy in Slovakia.

Collaboration between Public and Private Sectors	**Educational and Skills Frameworks**
SBA provides complex business support for SMEs. RIS3 falls under the purview of VAIA - the Research and Innovation Authority in Slovakia.	Digital skills are addressed through the National Digital Skills Strategy of the Slovak Republic and the Action Plan 2023-2026.

Slovenia

Governance and Institutional Frameworks	**Research and Development Capabilities**
National-level Sustainable Smart Specialization Strategy (S5). Closely linked to various key policy frameworks.	Digital innovation and circularity reflected through several priority areas, including the Horizontal Network for Information and Communication Technologies (HOM IKT) and Networks for Transition to a Circular Economy. Focus on Smart Buildings and Homes with the Wood Value Chain.

Collaboration between Public and Private Sectors	Educational and Skills Frameworks
Strategic Research and Innovation Partnerships (SRIPs) play a central role.	Integration of strategic innovation themes into research, education, and project development activities.

Hungary

Governance and Institutional Frameworks	Research and Development Capabilities
National Research, Development and Innovation Strategy (2021-2030).	Emphasis on promoting digital innovation and the circular economy. Focus on the development of low-carbon and clean industries and circular industries.
Collaboration between Public and Private Sectors	**Educational and Skills Frameworks**
Chamber of Commerce and Industry of Pécs-Baranya (CCIPB) is an active coordinator.	Introduction of digitalization training courses for construction in universities.

Romania

Governance and Institutional Frameworks	Research and Development Capabilities
Regional-level RIS3 for the Western Region of Romania (RIS3 West). Aligns with national strategic documents.	Focus on the Energy Efficiency and Sustainable Construction sector. Integrates EU priorities like the

	European Green Deal and Digital Europe.
Collaboration between Public and Private Sectors	**Educational and Skills Frameworks**
ADR Vest coordinates implementation through the West Regional Programme 2021–2027.	Not explicitly mentioned in the provided text.

Bosnia and Herzegovina

Governance and Institutional Frameworks	**Research and Development Capabilities**
RIS3 is under development at the national level.	Several existing strategic documents outline measures related to digital innovation and circularity within the construction sector.
Collaboration between Public and Private Sectors	**Educational and Skills Frameworks**
SERDA plays a facilitative role in the development of the Smart Specialisation Strategy (RIS3).	Not explicitly mentioned in the provided text.

Serbia

Governance and Institutional Frameworks	**Research and Development Capabilities**

National-level Research and Innovation Strategy for Smart Specialisation (4S Strategy).	Digital innovation and circular economy principles are embedded across the RIS3 strategy and its complementary policy instruments.
Collaboration between Public and Private Sectors	**Educational and Skills Frameworks**
The Science and Technology Park Novi Sad (STP NS) plays a significant role in implementation.	Faculties of Civil Engineering and Technical Sciences are incorporating digital construction methods into curricula.

Montenegro

Governance and Institutional Frameworks	**Research and Development Capabilities**
National-level Smart Specialisation Strategy (S3). The government's decisions are based on the conclusions of the Council for Innovation and Smart Specialisation.	Focuses on the use of industrial waste in the production of building materials. The "Information and Communication Technologies" (ICT) direction underlines the use of advanced ICT solutions..
Collaboration between Public and Private Sectors	**Educational and Skills Frameworks**
Support structures include the Science and Technology Park of Montenegro (STP MN) and the Innovation Fund of Montenegro.	The S3 Strategy facilitated Montenegro's participation in European thematic platforms for smart specialisation.

Croatia

Governance and Institutional Frameworks	Research and Development Capabilities
National-level RIS3 strategy. Serves as a key instrument for implementing Croatia's National Development Strategy and National Recovery and Resilience Plan (NRRP).	Integrates digital innovation and circularity in the construction sector through targeted policy frameworks and aligned projects.
Collaboration between Public and Private Sectors	**Educational and Skills Frameworks**
TERA Tehnopolis performs roles including awareness, RDI support, and facilitating cooperation between key stakeholders.	Limited information available in the provided text. Focus on actualization of digitalisation in the construction sector.

Republic of Moldova

Governance and Institutional Frameworks	Research and Development Capabilities
National-level Smart Specialisation Strategy (RIS3). Coordinated at the central government level, led by the Ministry of Education and Research.	Digital innovation is explicitly addressed through the ICT sector.
Collaboration between Public and Private Sectors	**Educational and Skills Frameworks**
Information is limited in the provided text.	Not explicitly mentioned in the provided text.

5. Current Policy Instruments

Inventory of existing policy instruments related to funding for:

- Innovations in construction
- Digitalisation initiatives
- Circular economy practices
- Assessment of how each instrument aligns with or meets the needs for boosting innovations in "clean construction"

BULGARIA	AUSTRIA
• Programme for Innovation and Competitiveness: Funds projects that support digital transformation, the implementation of circular economy solutions, and the advancement of technological innovation within the construction sector. • Programme "Research, innovation and digitalization for smart transformation": Same as above. • National Recovery and Resilience Plan (NRRP): Same as above. • National Innovation Fund: Same as above. • Horizon Europe and Interreg programmes (e.g., Circular DigiBuild): Funding for projects that support digital transformation, the implementation of circular economy solutions, and the advancement of technological	• Austrian Research Promotion Agency (FFG): Provides financial incentives for businesses, research institutions, and public-sector organizations developing innovative solutions in digital construction and circular economy models. • Climate and Energy Fund (KLIEN): Finances research into climate-neutral and circular construction technologies • Austria Wirtschaftsservice (AWS) ”Building(s) Tomorrow“ program, which supports startups, SMEs, and research institutions that develop innovative solutions for digitalized and resource-efficient construction. • "Technologies and Innovations for the Climate-Neutral City" (formerly Stadt der Zukunft) initiative: Focuses on advancing smart city concepts, energy-efficient building technologies, and digital solutions in construction.

innovation within the construction sector.	• "Smart & Sustainable City" grant program (Vienna): Provides funding for projects in digitalization, smart urban planning, and circular construction models.
Note: *These instruments support digital transformation and circular economy solutions, but the extent to which they specifically target the construction sector, or "clean construction" is not fully detailed in the questionnaire.*	**Note:** *Strong alignment with needs for boosting innovations in "clean construction", particularly through the AWS programs and the "Technologies and Innovations for the Climate-Neutral City" initiative.*
GERMANY	**CZECH REPUBLIC**
• Federal Government Funding (e.g., "Zukunft Bau" program): Provides funding for construction innovation. • State-Level Innovation Grants (e.g., Bavaria's Digitalization Strategy): Supports digitalization at the state level. • Industry-Specific Funding (e.g., German Construction Industry Digitalization Grants): Provides financial support for digitalization in the sector • Federal and EU Programs: Horizon Europe, ERDF (European Regional Development Fund), and national research grants.	• EU operational programmes and national public funding schemes. • Technology Agency of the Czech Republic (TA ČR) *EU-funded programmes including Horizon Europe and the ERDF.
Note: *Instruments support general construction innovation, digitalization, and sustainability, but specific*	**Note:** *Primarily supports applied and mission-oriented research and*

alignment with "clean construction" is not fully detailed in the document.	*innovation outlined in RIS3, but more specific details are not provided.*
SLOVAKIA	**SLOVENIA**
• European Regional Development Fund (ERDF) • Cohesion Fund (CF) • European Social Fund Plus (ESF+) • Just Transition Fund (JTF) • The following is a summary of selected policy objectives to which the above-mentioned funds will contribute, highlighting links to three main research areas. • strengthening cooperation between the public, academic, and business sectors • supporting small and medium-sized enterprises with a specific focus on innovative enterprises, especially in relation to RIS3 domains and the transition to a circular economy • developing an innovation ecosystem • developing skills and competencies • improving energy efficiency in enterprises and improving the energy efficiency of buildings • transition to a circular economy with an emphasis on waste management	• EU Cohesion Policy Funds (ERDF) - Supports R&D and industrial transformation in the construction sector • Just Transition Fund (JTF) - Focused on helping coal-dependent regions (Savinjsko-Šaleška and Zasavje regions) transition towards climate neutrality • Recovery and Resilience Plan (NOO): Funding research and innovation projects supporting green transition and digitalization • Horizon Europe & Digital Europe: Encouraged technological advancements, including smart building solutions and digital transformation initiatives • National Development Programs

Note: *Nevertheless the specific financial distribution and its impact is not clear.*	**Note:** *There are no construction focused instruments, but construction sector can benefit from all the general support schemes as well (e.g. vouchers).*
HUNGARY	**ROMANIA**
• Economic Development and Innovation Operational Programme (GINOP Plus) • Digital Renewal Operational Programme Plus (DIMOP Plus) • Cluster development strategy • Sándor Demján Sándor Programme • Digital Product Innovation Support Programme • Support for Focal Area Innovation Projects • Technological Upgrading of the Construction Sector • Recognition of Sustainable and Circular Construction	• West Regional Programme (PRV) 2021–2027, Axis 1 (RDI & digitalization) and Axis 2 (energy efficiency) • PNRR (National Recovery and Resilience Plan) measures supporting building renovation and green tech • Horizon Europe for collaborative innovation projects • Innovation Norway and Interreg funds for cross-border projects
Note: *The programs are very diverse.*	**Note:** *Supports RDI & digitalization, energy efficiency.*
BOSNIA AND HERZEGOVINA	**SERBIA**
• Small and medium-sized enterprises (SMEs) support on the path toward circular economy and digitalization through various public calls by UNDP • The EBRD's Go Digital programme with grants from the	• Innovation Fund of the Republic of Serbia • Circular Economy Innovation Challenge (UNDP + Ministry of Environmental Protection) • European Union – IPA III Programme & Green Agenda Support

EU, is designed to help SMEs in Bosnia and Herzegovina accelerate their digital transformation • GIZ EU4DigitalSME (co-financed by the European Union), which supports small and medium-sized enterprises (SMEs) in successfully implementing digitalization and innovation transformations	• These instruments can take to account: • Co-financing for construction waste recycling infrastructure • Support for urban digitalization, including smart planning platforms and energy efficiency in public buildings.
Note: *Limited in providing the financial scope*	**Note:** *The instruments need to be adapted to the specific case of the construction industry, considering its specific challenges.*
MONTENEGRO	**CROATIA**
• Many of the instruments presented in the description are planned • Ministry of Economic Development programmes • Ministry of Science and Technological Development programmes • Interreg IPA Adrion • Interreg VI-A IPA CBC Croatia – Bosnia and Herzegovina – Montenegro 2021-2027 • ERASMUS-EDU-2022-CBHE-STRAND-2 • European Commission, Western Balkan Fund • Interreg MED programme	• Smart Specialization Strategy (S3) by focusing on Thematic Priority Areas like sustainable environments and key enabling technologies • National Recovery and Resilience Plan (NRRP) focusing on Energy Renovation and Seismic Reinforcement, as well as Sustainable Mobility Investments • Waste Management Plan (2023–2028)aAims to implement a circular economy by emphasizing waste prevention, reuse, recycling, and composting. • Circular Economy Action Plan (2023–2027) Integrates circular

• Horizon Europe • COST • EUREKA • EIC • IPARD • Creative Europe • Single market program • COSME	economy principles into waste management to minimize waste generation and improve resource efficiency, aligning with EU targets. • Environmental Protection and Energy Efficiency Fund (FZOEU) offering Green Transition Grants • Digitalization Vouchers with Cybersecurity and Digital Skills Vouchers • Local and regional authorities with Subsidies for raising the energy performance of residential buildings.
Note: *the description does not go in many details*	**Note:** *the implementation of most of these instruments have a relatively low result so far.*
REPUBLIC OF MOLDOVA	
• Organisation for Entrepreneurship Development (ODA) • European Village Program • European Union's LIFE Programme • Digital Europe Programme • EIT Manufacturing Grants • Smart Moldova National Programme (2024–2027)	
Note: *This funding is not broken down by sector.*	

6. Identification of Gaps and Challenges

Criteria

- Analysis of existing gaps in policies and funding
- Challenges in implementing digitalisation-led innovations in construction
- Barriers to adopting circular economy practices

Bulgaria		
Low Digital and Circular Readiness Among SMEs: Many construction SMEs lack the internal capacity, digital skills, or awareness needed to adopt technologies such as BIM, IoT, or circular design principles.	**Lack of Standardization and Interoperability:** Absence of nationally endorsed digital standards and low interoperability between systems slows down adoption and integration across the value chain.	**Skills Gaps and Limited Workforce Training:** Shortage of trained professionals in digital construction technologies and circular economy practices. Existing education and training programs are not fully aligned with market needs or evolving innovation trends.
Insufficient Digital Competencies: Lack of basic digital literacy or familiarity with essential digital tools.	**Lack of Awareness and Understanding of Circular Principles:** Limited understanding of design for disassembly, material reuse, life-cycle assessment (LCA), or waste valorization.	

Austria		
High Initial Investment Costs and Lack of Incentives: Implementing	**Economic Conditions and Low Demand:** The ongoing recession in the	**Fragmented Regulatory Frameworks:**

digital technologies and circular construction methods requires significant upfront investments, which are often prohibitive for small and medium-sized enterprises (SMEs). There is a lack of targeted financial incentives.	construction and real estate sectors increases price sensitivity and limits investments in innovative, circular solutions. Demand remains low due to higher prices and limited economic viability of circular business models.	Divergent building codes and regulations across Austria's federal states, along with unclear legal frameworks for secondary materials.
Lack of Digital and Circular Skills: There is no coherent, nationwide education pathway for circular economy and digital construction skills.	**Cultural Barriers and Insufficient Collaboration**: The construction industry is traditionally conservative and often resistant to change. Collaboration between companies, research institutions, and public authorities is insufficient.	

German

Regulatory Challenges: Complexity in construction and sustainability regulations.	**High Initial Investment Costs:** Digital technologies and sustainable materials require substantial funding.	**Lack of Skilled Workforce:** Shortage of professionals trained in BIM, circular design, and digital construction tools.

Czech Republic

Most regions face similar structural challenges, including limited R&D investment, talent shortages, weak innovation ecosystems, and insufficient digital infrastructure.

Common Gaps and Challenges in Policies and Funding:	Common Challenges in Implementing Digitalization-Led Innovations:
• Limited R&D Investment: Several regions highlight insufficient investment in research and development as a barrier to innovation. • Weak Academia-Business Links: A recurring challenge is the lack of strong collaboration between academic institutions and businesses, hindering knowledge transfer and commercialization of research findings. • Limited Support for Innovative Entrepreneurship: Insufficient support for startups and innovative SMEs, including access to funding, mentoring, and business development services. • Underused Infrastructure: Lack of effective usage of existing infrastructures and knowledge base in a smart, innovative and sustainable approach.	• Insufficient Digital Infrastructure: A lack of adequate digital infrastructure, including high-speed internet access and advanced technology platforms, is a common barrier. • Shortage of Skilled Professionals: A shortage of skilled professionals in areas like ICT, engineering, data science, and other STEM fields is a significant challenge for digital transformation. • Labour market mismatches: Lack of labour force that has the right education and knowledge to match the needs of the industry and the overall business expectations. • Low Digital Readiness: Many regions report low levels of digital readiness among businesses, including a lack of awareness, skills, and capacity to adopt digital technologies.

Common Barriers to Adopting Circular Economy Practices:

- While not explicitly stated as a primary focus across all regions, the strategies focus on the transition from the already existing practices to new ones, based on a smart approach and on sustainability as one of the main drivers for innovation. This change is complex and does not depend only on a single entity or decision maker.
- Many regions underline the need to lower material and energy intensity in the region, a key factor for adopting circular economy practices.

Slovakia		
Lack of Data Standardization and Traceability: Absence of common frameworks or digital tools; inconsistent or unavailable data on material composition, quality, and lifecycle performance.	**Missing or Unclear Quality Standards and End-of-Waste Criteria:** Weak market demand due to a lack of incentives or awareness; lack of trust in the quality or performance of recycled materials.	**Regulatory Gaps and Fragmented Collaboration:** Lack of a clear digital infrastructure or strategy at the national level; limited collaboration platforms for sharing best practices, data, and secondary materials.
Circularity and Digitalization in the Construction Sector Are Not Yet Mainstream: Low awareness and prioritization within the sector; dominant focus on energy performance of the buildings; lack of green and digital skills in the workforce.		

Slovenia		
Uneven Pace of Digital Transformation: More complex and advanced digital transformation projects face delays due to resource constraints, technical limitations, and a lack of coordination.	**Limited Integration of Horizontal and Enabling Technologies:** The adoption of key technologies like IoT, AI and digital twins is hindered by weak connections between different parts of the value chain.	**Insufficient and Unstable Investment in R&D and Digitalization:** Lack of coordinated, stable and long-term investment in research, development and digital transformation, particularly for small and medium-sized enterprises (SMEs).

Weak Knowledge Transfer and Commercialization of Innovations: There is a disconnect between research institutions and the construction industry.	**Resistance to Change and Low Entrepreneurial Mindset:** Risk-averse and hesitant to adopt new digital tools and circular economy principles.	**Skills Shortages in Digital and Circular Construction:** Lack of skilled professionals in key technological areas.
Limited Access to Financial Support for Circular Economy Initiatives: Difficulties in accessing financial resources specifically dedicated to circular construction practices.		

Hungary

Slow Adoption of Digital Technologies: The uptake of digital innovations in the construction industry is slow.	**Regulatory and Standardization Barriers:** The development of the circular economy is hampered by existing regulatory barriers and a lack of supporting standards.	**Data Management and Legal Challenges:** Data management and legal issues related to the use of digital technologies are additional barriers to innovation.
Lack of Technological Development and Investment: The realisation of a circular economy is highly dependent on the development of new technologies; lack of investment.		

Romania		
Limited Capacity and Resources Among SMEs: SMEs lack the resources to adopt digital/circular solutions.	**Fragmented Collaboration between Research and Business:** Insufficient collaboration between research and business limits innovation.	**Regulatory and Bureaucratic Constraints:** Constraints slow innovation deployment and public procurement of green solutions.

Bosnia and Herzegovina		
Low Level of Digitalization Among Businesses: BiH is at the very bottom of the business digitalization scale..	**Digital Skills Gap:** The digital knowledge gap, caused by the low level of digital literacy among owners, managers and employees.	**Weak Implementation of Strategic Documents and Regulations:** Slow and inconsistent implementation of policies limits progress.
Limited Access to Financing for Digital and Circular Innovations: SMEs struggle to secure funding for digitalization and circular economy initiatives.	**Fragmented Institutional Support:** Lack of coordination results in inefficiencies and a slow response to industry needs.	**Resistance to Change and Lack of Awareness:** Many construction companies still rely on traditional business models and practices.

Serbia		
Financial and Investment Constraints for SMEs: High upfront cost of adopting digital tools and the lack of dedicated financial instruments for the construction sector.	**Skills Gap and Cultural Resistance to Change:** Shortage of skilled professionals with expertise in BIM, digital construction tools, LCA/LCC analysis, and circular design. Conservative professional culture.	**Regulatory Gaps and Weak Enforcement Mechanisms:** Limited enforcement capacity at the municipal level; absence of technical standards for many circular practices; public procurement procedures that rarely include criteria promoting innovation.

Croatia		
Passive Business Model: The currently dominant business model is passive, enforcing status quo and driven by maximizing profit.	**Improve Awareness Towards Innovation:** Majority of the organizations in the construction sector of Croatia act as if any innovation is disruptive and destructive to the current business model.	**Short-sighted planning:** Digital procedures are applied there where they bring short-term costs reductions. However, he lack of workforce pushes more business processes towards the digital domain.
Unwillingness of the decision makers in the sector to accept change: Decision makers are willing to	**Lack of integrative "spirit":** Although digital innovation and circularity strategies are all-encompassing, their	**Lack of digital skills:** Insufficient emphasis on the importance of relevant digital skills in the sector. This includes all of the

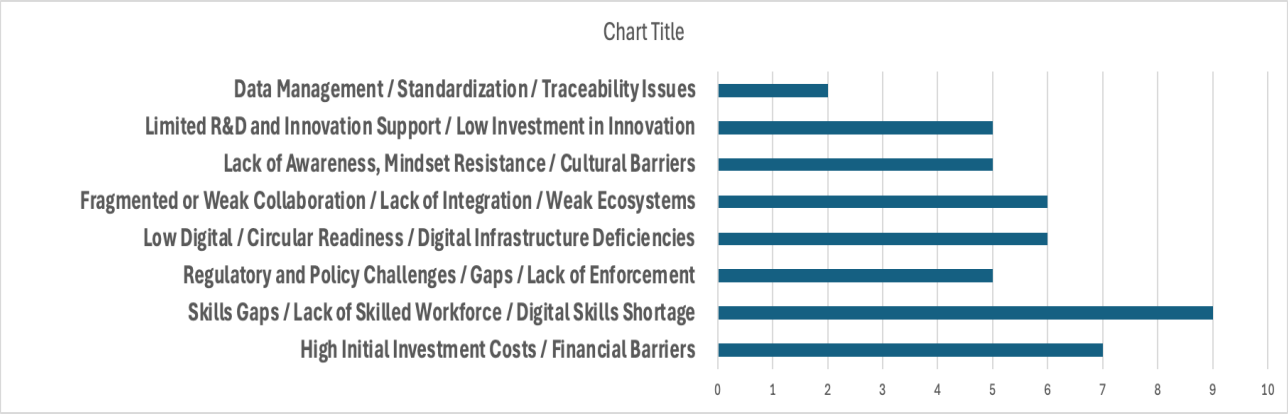
invest resources in maintaining the status quo, instead of updating and/or upgrading their business practice.	implementations are rarely perceived as unified.	actors in the sector in all helices.

Republic of Moldova

Lack of Strategic Focus on Construction in RIS3: The construction sector is not identified as a priority in Moldova's RIS3.	**Fragmentation and Lack of Cross-sectoral Integration:** Digital innovation and circular economy principles are treated in isolation without integration into the construction field.	**Traditional and Low-tech Construction Sector:** Moldova's construction industry remains dominated by low-tech practices.
Skills Gap and Human Capital Limitations: Shortage of skilled professionals with knowledge of digital tools, green construction methods, or life-cycle thinking.	**Limited Financial Incentives and Risk Aversion:** Lack of dedicated financial instruments or risk-sharing mechanisms.	**Weak Data Infrastructure and Interoperability:** Moldova lacks a national construction digitization framework.
Regulatory Gaps and Slow Policy Adaptation: The regulatory framework for green buildings, circularity, or digital construction standards is underdeveloped or outdated.		

Chalanges	Countries	Count
Here is a summary of the challenges that are present in more than one country, along with the number of countries where each challenge appears:		
• Skills Gaps • Lack of Skilled Workforce • Digital Skills Shortage	Bulgaria, Austria, Germany, Slovakia, Slovenia, Hungary, Bosnia and Herzegovina, Serbia, Moldova, Croatia	9 countries
• High Initial Investment Costs • Financial Barriers	Bulgaria, Austria, Germany, Slovenia, Hungary, Croatia, Moldova, Slovakia	7 countries
• Low Digital • Circular Readiness • Digital Infrastructure Deficiencies	Bulgaria, Slovakia, Slovenia, Bosnia and Herzegovina, Montenegro, Moldova	6 countries
• Fragmented or Weak Collaboration • Lack of Integration • Weak Ecosystems	Austria, Slovakia, Slovenia, Bosnia and Herzegovina, Moldova, Croatia	6 countries
• Regulatory and Policy Challenges • Gaps • Lack of Enforcement	Austria, Germany, Slovakia, Serbia, Moldova	5 countries
• Lack of Awareness, Mindset Resistance • Cultural Barriers	Bulgaria, Austria, Slovenia, Bosnia and Herzegovina, Croatia	5 countries
• Limited R&D and Innovation Support • Low Investment in Innovation	Austria, Czech Republic, Slovenia, Slovakia, Bosnia and Herzegovina	5 countries
• Data Management • Standardization • Traceability Issues	Slovakia, Moldova	2 countries

This list highlights the most common challenges across the analyzed countries, particularly emphasizing issues related to high costs, skills shortages, regulatory hurdles, digital infrastructure, and collaboration deficiencies.



Representation of the main gaps and challenges per number of countries.

7. Good Practices and Transferable Policy Elements

Collection of successful case studies and new projects proposals from partner countries

Criteria

- Highlight good practices in policy implementation
- Examples of successful projects in clean construction
- Policy elements that can be adapted or learned from for further improvements

Good Practices submitted by partner countries

Bulgaria	
The European Digital Innovation Hub in the Construction Sector (EDIHCS) as a national good practice in bridging the gap between research, innovation, and industry.	
Description	**Success**
EDIHCS acts as a national integrator, connecting stakeholders from academia, government, and the private sector to enable digital innovation and circularity across the entire construction value chain. It is the country's main provider of digital capacity-building services, primary access point to specialized research infrastructure, key reference hub for funding guidance, and facilitator of partnerships.	Boosting the competitiveness of the construction sector, driving green and digital transitions, scaling collaboration between academia and industry, embedding BIM in higher education, and supporting SME access to R&D.

Adaptable Policy Elements
Strategic alignment with national digital and circular priorities, emphasis on cross-sector collaboration, use of practical training and pilot demonstrations, and establishment of public-private partnerships.

Austria

Circular Construction Innovation and Financing Hub (CCI Hub)

Description

This public-private partnership would bring together construction firms, digital technology developers, sustainability experts, and financial institutions to create a cohesive ecosystem that encourages resource-efficient construction while integrating cutting-edge digital solutions.
Potential: Bridging the gap in Austria's construction sector between digital innovation and circular economy practices. Financial support, technological adoption, and knowledge exchange.

Good Practices

Building(s) Tomorrow Funding Program

The aws Building(s) Tomorrow initiative aims to identify and support Austrian innovation potential in the technical development and early economic implementation phases within the building sector. Through awareness-raising measures, networking, know-how exchange, and financial support, it seeks to address disruptive innovation opportunities in the building sector. The program contributes to the transformation towards a more economically, ecologically, and socially just building sector. It focuses on establishing closed resource cycles and promoting the use of sustainable materials in the construction industry. Projects can address challenges in the building sector through disruptive approaches, such as the added costs associated with incorporating circular economy principles. Communication and transparency are essential aspects, with projects potentially focusing on structuring, digitizing, or simplifying collaboration among various stakeholders. The program supports radical, disruptive innovations in the building sector along a specific challenge, such as implementing circular economy principles.

"City of the Future" (Stadt der Zukunft) Program & successive "Technologies and Innovations for the Climate-Neutral City" (TIKS) Initiative
The "City of the Future" (Stadt der Zukunft) program and its successor, the "Technologies and Innovations for the Climate-Neutral City" (TIKS) initiative, are key instruments of the Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK, now BMIMI) under its overarching Mission Klimaneutrale Stadt. As the funding body, BMK/BMIMI commissions the Austrian Research Promotion Agency (FFG) to implement and manage these initiatives. Their goal is to support the development of sustainable, climate-resilient urban ecosystems by fostering innovation in technologies, services, and integrated systems across buildings, districts, and entire cities. Focus areas include energy transition, resource efficiency, sustainable mobility, and the creation of livable urban spaces, with the overarching aim of accelerating Austria's transition to climate-neutral cities while enhancing the international competitiveness of Austrian businesses and research institutions in the field of intelligent urban development.
DoTank Circular City Wien 2020-2030 (DTCC30) / VIE.CYCLE – zirkuläres Bauen
The DoTank Circular City Wien 2020-2030 (DTCC30), presented under the VIE.CYCLE initiative, is the central implementation program for circular construction in Vienna. As a cross-departmental hub, it develops, coordinates, and manages measures to implement the circular economy in the built environment. The program aims to reduce resource and emissions consumption throughout the entire building lifecycle. It is structured around seven fields of action, including agile program management, information and communication, collaboration and strategic networking, operational groundwork and scaling, regulatory and funding frameworks, economic and socio-economic integration, and strategy/roadmap/governance. The initiative brings together stakeholders from administration, business, and research to drive systemic change towards a circular city, focusing on knowledge transfer, regulatory adaptation, and the integration of circular principles into urban planning, infrastructure, and building projects.

Germany

BIM Germany	Circular Wood Initiative	Smart Cities Model Hamburg
National initiative promoting digital construction planning and execution. Enhanced efficiency and reduced waste in construction. Scalable to regional and international construction projects.	A project using recycled wood in modular construction. Increased use of sustainable materials in public infrastructure. Replicable in different regions with access to timber resources.	Digital urban planning integrating circular construction. Innovative solutions for energy-efficient and waste-reducing construction. Applicable in other metropolitan areas looking to enhance smart infrastructure.

Czech Republic

CirkArena project	Robotic 3D Printing of Concrete project
Realising a Circular Economy R&D Centre in the Czech Republic that optimizes material flows, enhances waste valorization, and fosters systemic approaches to sustainable resource management. Facilitates innovation in waste management and supports businesses in adopting circular solutions.	Advanced architectural and urban solutions, contributing to public space development, interior design, and industrial applications. Promoting interdisciplinary cooperation and accelerating the adoption of advanced 3D printing technologies.
Mobile application for visualization of timber buildings with augmented reality	**Energy-efficient foundation slab "Základy Rýč"**
Enhances digitalization in sustainable construction by leveraging AR technology	Custom-designed monolithic foundation slabs for houses,

to provide interactive visualizations of timber structures.	featuring a 30-year warranty and potential savings up to CZK 100,000. The service includes geotechnical surveys, design documentation, prefabricated thermal insulation, delivery, and full construction in a streamlined timeframe. An interactive online calculator helps clients estimate costs quickly.
CirkTech	**GREENE 4.0**
Is a cutting-edge circular-technology research centre launched in June 2021 by the University of Chemistry and Technology Prague at the Holcim cement plant in Čížkovice, Ústí nad Labem Region. It operates under Technopark Kralupy and focuses on developing advanced mechanical and chemical processes for the circular economy, including piloting a patented semi-industrial process (InCeMet) in an experimental rotary kiln for lithium recovery from cement industry by-products.	Is a transnational project supporting manufacturing SMEs in Central Europe in their transition toward smart and green value chains. It focuses on co-developing sustainable digital products, enhancing supply chain resilience, and fostering cross-sector collaboration through open innovation. The project introduces practical tools such as digital toolkits, innovation contests, and user-centered design models to accelerate green transformation in sectors like electronics, food, machinery, and construction materials.
CIRCONOM	
Is a Czech-based company that transforms mixed recycled materials—primarily wood and plastic—into durable construction products such as cladding, decking, and furniture. Their innovation lies in combining sustainable material sourcing, closed-loop production, and high-quality design suitable for architecture and public space applications.	

Slovakia

The following good practice examples (SBA, SKAI-eDIH, and SIEA) showcase impactful initiatives that support digitalisation, innovation, and the circular economy in Slovakia, closely aligning with the thematic priorities of the RIS3 strategy. Although not directly or unequivocally financed through the RIS3 framework, these initiatives embody its goals and make significant contributions to Slovakia's broader innovation and policy ecosyste

Slovak Business Agency (SBA)	**SKAI-eDIH – Slovak AI Digital Innovation Hub**
As a national institution for SME support, SBA delivers various financial and non-financial tools in line with RIS3. It promotes circularity and digital transformation through national platforms and services, combining policy implementation with practical SME support.	Coordinated by the Kempelen Institute of Intelligent Technologies (KInIT), this hub enables AI-driven digital transformation in SMEs and public institutions. It offers digital maturity assessments, pilot testing, and innovation training – fully aligned with RIS3 domain priorities.

SIEA – EXPANDI 4.0

This European Digital Innovation Hub is operated by the Slovak Innovation and Energy Agency. It focuses on Industry 4.0, providing SMEs with access to testbeds, funding guidance, and skills development. It illustrates RIS3 implementation through a national innovation infrastructure.

Innovation Vouchers – Supporting SME-driven innovation and digital transformation in Slovakia

The Innovation Vouchers scheme is a national financial instrument implemented by the Ministry of Economy of the Slovak Republic (MHSR) in cooperation with the Slovak Innovation and Energy Agency (SIEA). It provides small and medium-sized enterprises (SMEs) with grants of up to €15,000 to support innovation, research, and the development of new products, processes, or services. The vouchers are part of Slovakia's strategy to enhance private sector R&D capacity and are directly aligned with the RIS3 strategy, especially in the fields of innovation and digital transformation. The instrument also

stimulates cooperation between SMEs and research institutions, enabling knowledge transfer and the practical implementation of innovation in business environments.
Good Practices from Private Sector
• Ecorec Slovensko s.r.o. • BIM asociácia Slovensko (BIMaS) • JRK Slovensko s.r.o.

Slovenia

InnoRenew CoE's innovations in renewable materials and construction sustainability	**The Strategic Research and Innovation Partnership – Networks for the transition into circular economy** *(SRIP – Circular economy)*
InnoRenew CoE, established in 2017, is an independent research institute in Slovenia focusing on renewable materials and sustainable building practices. It emphasizes wood innovation and restorative environmental and ergonomic design. The institute's headquarters in Slovenia's largest wooden building, serves as a living lab for sustainable construction. InnoRenew CoE collaborates internationally, integrating traditional knowledge with advanced technologies to promote eco-friendly architectural solutions.	The Strategic Research and Innovation Partnership – Circular Economy (SRIP – Circular Economy) is a Slovenian initiative that unites over 90 members, including businesses, research institutions, and NGOs, to facilitate the country's transition to a circular economy. Established under the Slovenian Smart Specialization Strategy (S4), SRIP focuses on creating closed material loops and developing new business models to enhance sustainability and competitiveness. Since its inception, members have implemented over 150 projects across sectors such as construction, forestry, and waste management, promoting resource efficiency and innovation.
Research Infrastructure Roadmap 2030 – NRRI 2030	

The NRRI 2030 is Slovenia's strategic plan to improve national research infrastructures It emphasizes sustainable development and aligns with the Smart Specialisation Strategy (S4). It outlines diverse financing methods, including public funding, EU structural and investment funds, international collaborations, public-private partnerships, and performance-based funding, ensuring the sustainable development and operational excellence of research infrastructures. The NRRI 2030 aims to strengthen Slovenia's position within the European research area.
Regional Development Agency of Ljubljana Urban Region
The Regional Development Agency of Ljubljana Urban Region works as a development agency with 25 municipalities around the city of Ljubljana. Not only they connect local partners but also work with regional and international stakeholders. Some of the Agency's main objectives closely relate to construction.

Hungary

ADRVest Accel
Entrepreneurs from the western region of the country were enrolled in the first acceleration program dedicated to projects and start-ups at the beginning of their journey, organized by the Institute for Excellence in Entrepreneurship, in partnership with the WEST Regional Development Agency. The program was free of charge, started on July 1, 2022. The program was open in September 2022, with participants from Timiș, Arad, Caraș-Severin and Hunedoara counties, selected based on submitted applications. Participants were trained over three months, in three modules each loaded with activities, workshops, presentations and work sessions on essential business topics.

NIDUS Home – Modular Eco-Passive Prefabricated Homes from Natural Materials	**Digital solutions for sustainable design in architecture, engineering, and construction**
NIDUS Home is a Romanian startup founded in 2020 that	Fabrit Software SRL has implemented the project titled "Digital Solutions for

designs and builds modular prefabricated homes using natural materials such as wood, straw, cellulose, and clay. The project aims to reduce the environmental impact of the construction sector by offering eco-passive, energy-efficient, and affordable homes. These houses are quickly assembled and fully customizable to meet various living needs. NIDUS Home aligns with Romania's RIS3 objectives by promoting sustainable and innovative construction models tailored for the green transition.	Sustainable Design in Architecture, Engineering, and Construction (Fabrit ESD)", starting on July 19, 2022. The project was co-financed by the European Regional Development Fund under the Competitiveness Operational Programme (POC), through a financing contract signed with the Romanian Authority for Digitalization, acting as the Intermediate Body. The total value of the project was 7,496,952.52 RON, with a non-reimbursable funding contribution of 4,923,562.21 RON. The project was implemented in Cluj-Napoca, Romania, and supports the development of digital tools aimed at enabling sustainable and efficient design practices in the fields of architecture, engineering, and construction.
Urban Regeneration through Green Infrastructure – The Transformation of "Cartierul Nou" Park in Gherla	
The regeneration project in Gherla's "New Neighborhood" aims to transform a neglected and underused urban space into a multifunctional, eco-friendly park that integrates biodiversity, accessibility, and community needs. The intervention promotes sustainable urban development by introducing green infrastructure, inclusive public spaces, and environmentally conscious design. The initiative was developed through participatory planning and is aligned with Romania's RIS3 goals on urban innovation and green transition. It was recognized as a national and international model of good practice in sustainable development and urban regeneration.	

Bosnia and Herzegovina

Development Bank of FBiH Credit Lines	**BOOST Project** *(EU4DigitalSME Initiative)*
Credit lines targeting IT sector digital transformation, energy efficiency, and renewable energy projects, promoting sustainability and cleaner energy transitions.	Innovation Voucher Scheme (IVS), supporting SMEs by enabling collaborations with academic institutions and digital innovation hubs to adopt digital technologies and improve competitiveness.
"Strengthening the Competitiveness of SMEs" Grant Scheme	**Circular Accelerator for SMEs**
Grant scheme aiding SMEs in adopting technological upgrades, digital transformation, and circular economy practices.	Pilot program supporting companies in adopting circular economy principles through specialized training, mentorship, and Circular Transformation Plans.

Serbia

National ePermitting System *(eDozvola)*

Digitalization of Construction Permitting in Serbia.

- *Short Description:* Centralized, fully digital system for managing the entire construction permitting process.
- *Why it is a Good Practice:* Massive reduction of bureaucracy and corruption risk, foundation for BIM integration and future digital twin planning, applicable in other Danube countries with complex permitting systems.

CornHusk – Development of Bio-based Insulation Panels from Agricultural Waste	**Construction Waste Recycling Hub – Novi Sad Pilot within National C&D Waste Network**

• *Short Description:* Development of wall and roof insulation panels made from compressed corn husks. • *Why it is a Good Practice:* Closed material loop, combines local supply chains with green innovation.	• *Short Description:* Piloting a Construction & Demolition (C&D) Waste Recycling Hub • *Why it is a Good Practice:* Integrates circularity into public infrastructure, enables recovery of concrete, bricks, and wood at scale

Montenegro

In the case of Montenegro, **Innovation Fund of Montenegro** is promoted as a program generating different interventions in the policy ecosystem of the country

Creation of the Innovation Fund of Montenegro	**Program for Collaborative grants for innovation**
This Fund makes implementation of innovation policy possible by ensuring and spending funds to encourage innovation activity. Its aim is to significantly strengthen innovative entrepreneurship in the country, contribute to a more efficient implementation of the Smart Specialization Strategy, and improve absorption capacities within efforts to attract EU funds and prepare for European Structural and Cohesion funds. The establishment of the Innovation Fund of Montenegro represents a significant step forward in strengthening the implementation framework for innovation and S3.	This program is provided by the Innovation Fund of Montenegro, which makes implementation of innovation policy possible by ensuring and spending funds to encourage innovation activity. The subject of the Program for Collaborative grants for innovation is the award of grants to Micro, Small, and Medium Enterprises that carry out research and development projects with the aim of developing new products, services, technologies or processes in cooperation with "organizations for research and dissemination of knowledge".

Program for checking the innovative concept
The Program for checking the innovative concept was provided by the Innovation Fund of Montenegro, which makes implementation of innovation policy possible by ensuring and spending funds to encourage innovation activity. The aim of this program for checking the innovative concept is to support innovations in the earliest stages of research, to prove the feasibility of new processes or technologies and their potential for commercial application.

Croatia

DIGIT project	Digitalization vouchers programmes
The DIGIT project will support a comprehensive structural reform of the research and innovation sector by financing interventions that will produce transformative effects on research excellence, increased productivity, and the achievement of a green, digital, and globally competitive economy.	The Vouchers for Digitalization program in Croatia is designed to support micro, small, and medium-sized enterprises (SMEs) in enhancing their digital capabilities. The program is part of the National Recovery and Resilience Plan (NRRP), ensuring alignment with broader national goals for digital transformation.
Pilot Project for the Development of Green Infrastructure and/or Circular Management of Space and Buildings	**Investment in Efficient Resource Use and Support for Transition to a Circular Economy**
The project aims to implement pilot initiatives at the local level, focusing on green infrastructure and circular management of urban spaces and buildings. It is part of broader reforms under Croatia's green urban renewal strategies. The objectives include improving energy efficiency,	This initiative aims to enhance Croatia's transition to a circular economy by improving resource efficiency, reducing waste, and promoting recycling and reuse. It focuses on aligning national waste

integrating nature-based solutions (NbS), adapting to climate change, and enhancing resilience against climate risks.	management practices with EU directives, including reducing landfilling to 10% and increasing recycling rates to 65% by 2035.

Republic of Moldova

Moldavian partners propose the creation of a GreenBuild Lab – Digital & Circular Construction Innovation Hub:

Description

A proposed regional innovation hub dedicated to promoting circular economy in construction through digital tools, recycled materials, and smart design techniques. The lab would act as a testbed and accelerator for sustainable construction startups, SMEs, and public-private pilot projects. Its core mission is to accelerate the digital and green transformation of Moldova's built environment, especially in regions like Cahul and Bălți, while supporting objectives under the Smart Specialisation Strategy and Digital Transformation Strategy 2023–2030.

Originating Program & Funding Source	**Complementary Strategies**
Proposed Under: "Smart Moldova" National Smart Specialisation Program (2024–2027)	Digital Transformation Strategy 2023–2030; National Strategy on Innovation & Technology Transfer
Funding Sources (Proposed)	**Estimated Pilot Budget**
• National Fund for Innovation and Technology Transfer • EU4Green, RECONOMY, UNDP Green Transition Projectand EIB green innovation financing	~€500,000 (co-funded through national innovation funds + donor support)

Anticipated Results

The GreenBuild Lab would be structured around four core functions:

1. Prototyping Zone – Equipped with 3D printers, CNC machines, BIM stations, and recycled material processing lines to allow SMEs and

startups to co-develop construction components using plastic, glass, textile or wood waste.

2. Circular Design Studio – A digital design hub where engineers and architects can collaborate on eco-designs, material life-cycle simulations, and modular green infrastructure prototypes.
3. Training & Incubation – Offering technical training and startup incubation in green building technologies, EPR compliance, energy efficiency and IoT solutions for buildings.
    a. Train and incubate at least 50 startups/SMEs in circular building practices and digital tools by 2027.
    b. Launch 10+ pilot projects using recycled construction materials in public or commercial infrastructure.
    c. Introduce BIM and circular design curriculum in partnership with 3 technical universities.
    d. Support EPR implementation pilots in construction materials (plastic, textile-based insulation, etc.)
    e. Enable 2–3 regional authorities to integrate green procurement rules for public buildings.
4. Policy Sandbox & Green Procurement Support – Collaborating with municipalities to pilot circular public procurement criteria, simulate green tendering, and propose updates to construction regulations.

In-Depth Examples of Successful Projects

BULGARIA

European Digital Innovation Hub in the Construction Sector *(EDIHCS):* Acts as a key connector between academia, government, and industry, enabling digital capacity-building, research infrastructure access, and partnership development. It successfully boosts sector competitiveness and promotes digital and circular transitions.
Learnings: Establishing national innovation hubs with strong stakeholder engagement can foster collaboration, innovation, and workforce development.

AUSTRIA

VIE.CYCLE *(Circular City Wien 2020-2030)***:** A holistic program targeting resource reduction, urban circular economy integration, and stakeholder coordination in Vienna.
Replication: Similar city-wide circular urban planning initiatives can be adopted in other urban centers aiming for sustainability and resource optimization.
"Building(s) Tomorrow" Funding Program: Focuses on disruptive innovations, sustainable materials, and digitization in construction.
Learnings: Structured funding programs incentivize innovative projects and facilitate the transition to circular models.
"City of the Future" & TIKS: Frameworks for developing sustainable urban ecosystems, integrating smart urban infrastructure, and advancing climate neutrality.
Replication: Governments can adapt such integrated urban planning frameworks to meet climate and resource efficiency goals.

GERMANY

BIM Germany & Circular Wood Initiative: Promoting digital construction planning and sustainable material use, both scalable models for other countries.
Lessons: Emphasizing industry-wide adoption of BIM and sustainable materials supports resource efficiency and waste reduction.

CZECH REPUBLIC

CirkArena R&D Centre: Focuses on systemic resource management, waste valorization, and innovation incubation.
Replicability: Establishing dedicated research hubs supports innovation pipelines and industry transformation.

SLOVAKIA

Slovak Digital Innovation Hubs *(SKAI-eDIH, EXPANDI 4.0)* as the European Digital Innovation Hubs *(EDIH)* offer assessments, pilot testing, and SME support in digital and circular transformation. There are currently 5 EDIHs officially listed in Slovakia.
Business support organizations *(SBA, SIEA)* SBA is an interest association of legal entities that provides both financial and non-financial support to SMEs, for example through "vouchers" that can be used for various purposes, including digitalization and circular transformation.SIEA is a state subsidy organization that operates the EXPANDI 4.0 European Digital Innovation Hub *(EDIH)* and offers instruments such as innovation and digital vouchers to support the private sector.
Best Practice: National innovation infrastructure tailored to industry needs accelerates SME transformation.

SLOVENIA

InnoRenew CoE: Focuses on renewable materials and eco-friendly construction.
Lesson: Creating innovation centers that combine research with real-world demonstration acts as a flagship for eco-building solutions.
SRIP Circular Economy: Over 150 projects by diverse stakeholders, proving cross-sector collaboration’s impact.
Key takeaway: Multi-actor networks breed practical innovation and industry change.

Policy Frameworks and Elements for Scaling and Replication

Establishing Innovation Hubs & Centers
Examples:
• Bulgaria's EDIHCS • Slovenia's InnoRenew CoE • Moldova's GreenBuild Lab
Purpose:
• facilitate R&D • pilot testing • industry collaboration • capacity building.
Targeted Funding & Incentives
Examples:
• Austria's Building(s) Tomorrow • Croatia's vouchers • Serbia's digital permitting system
Purpose:
• Reduce financial barriers • promote innovation • accelerate adoption of circular practices
Cross-Sectoral & Multi-Stakeholder Partnerships
Examples:
• Austria's Circular City Wien • Moldova's GreenBuild Hub
Purpose:
• Break silos • foster systemic change • incorporate diverse expertise
Digital Infrastructure & Tools Adoption
Examples:
• BIM Germany • Slovakia's Industry 4.0 platforms • digital tracking in Hungary
Purpose:
• enhance transparency • reuse • waste tracking • resource efficiency

Urban & Regional Pilot Projects
Examples:
• Vienna's circular city initiatives • Gherla's urban regeneration • Hamburg's smart city models
Purpose:
• demonstrate scalable models • pilot innovative solutions • inform policies
Education and Workforce Development
Examples:
• Austria's embedding BIM in higher education • Moldova's curriculum development
Purpose:
• Build skills aligned with digital and circular economy needs
Regulatory & Procurement Innovations
Examples:
• Serbia's digital permits • Croatia's green infrastructure pilots • Moldova's public procurement support
Purpose:
• pilot innovative practices • test regulations • promote sustainable procurement

8. Recommendations for Policy Improvements

Criteria

- Suggested improvements to existing policies to better support innovations in construction
- Recommendations for enhancing digitalisation and circular economy practices
- Strategies for stakeholder engagement and collaboration

Suggested Improvements to Existing Policies to Better Support Innovations in Construction:

- **Bulgaria:** More direct inclusion of the construction sector in the RIS3 strategy, rather than relying on horizontal priorities.
- **Austria:** Targeted financial incentives for SMEs to adopt digital and circular technologies.
- **Germany:** Simplify construction and sustainability regulations.
- **Czech Republic:** Strengthening support for applied and mission-oriented research and innovation.
- **Slovakia:** There are several policies related to Digital transformation or Circular Economy, but not in the same document. A more focused integration of policies is necessary to understand and raise awareness of digitalization and circularity in construction.
- **Slovenia:** More coordinated, stable, and long-term investment in research, development and digital transformation, particularly for small and medium-sized enterprises (SMEs).
- **Hungary:** More open to the new technologies for decision makers.
- **Romania:** Streamline regulatory and bureaucratic processes to speed innovation deployment and public procurement of green solutions.
- **Bosnia and Herzegovina:** Enhance the implementation of various strategies and policies already in place but showing limited effect and progress.

- **Serbia:** Create dedicated financial instruments for digital adoption within the construction sector, which considers: the high upfront cost of adopting digital tools (e.g. BIM software, laser scanners, drones, IoT systems) and the lack of dedicated financial instruments for the construction sector.
- **Montenegro:** Develop policies to promote the processing of the industrial waste in the production of building materials.
- **Croatia:** Policies should offer financial incentives (grants, tax breaks) or non-financial recognition for adopting digital/circular practices, and they should promote workshops/training for industry leaders demonstrating benefits. Policies should create task forces across ministries, industries, research to align efforts.
- **Republic of Moldova:** The document highlights that the circularity in the construction sector is not reflected in RIS3 as a standalone sector or niche.

Recommendations for Enhancing Digitalization and Circular Economy Practices:

- **Bulgaria:** Address skills gaps and provide targeted training programs in digital construction technologies and circular economy practices. Promote standardization and interoperability of digital systems.
- **Austria:** Develop a coherent, nationwide education pathway for circular economy and digital construction skills.
- **Germany:** Focus on increasing digital skills among construction professionals.
- **Czech Republic:** Leveraging and further improvement to integration of digital technologies and circular economy principles in the construction sector.
- **Slovakia:** Establish common frameworks and digital tools for data standardization and traceability. Develop quality standards and end-of-waste criteria.
- **Slovenia:** Improve integration of horizontal and enabling technologies in complex projects.
- **Hungary:** Promote increased awareness, technological investments and digitalization, create supporting standards that will improve sustainable building practices.

- **Romania:** The increase in the awareness level of digital technologies
- **Bosnia and Herzegovina:** Create financial instruments for SMEs to be able to finance digitalization and circular economy initiatives.
- **Serbia:** Encourage for further progress - in defining circularity standards
- **Croatia:** Business model restructuring: Encourage more integration. Implementation: There must be clear incentives and an explanation as to digital improvement
- **Montenegro:** Implement policies to provide the infrastructure for technological development.

Strategies for Stakeholder Engagement and Collaboration:

Bulgaria:

- **Bulgaria:** EDIHCS as a bridge between policy and industry: Serving in a bridge between public strategies, digital transformation, and industry to translate strategic goals in smart specialization, digital innovation, and green transformation into practical outcomes within Bulgaria's construction sector.EDIHCS should encourage multi-actor collaboration: By acting as a bridge between policy, research, and industry to accelerate adoption of digital and circular practices.
- **Austria:** Promote multi-stakeholder collaboration: Strengthen collaboration through multi-stakeholder involvement to unlock the full potential of circular economy practices
- **Germany:** Form connections: Provide more assistance for universities, industries and stakeholders so that sustainable strategies can be formed
- **Czech Republic:** Collaboration with Innovation Hubs: All efforts of digital construction must integrate high potential collaborations with SME's and Innovation Hubs
- **Slovakia:** Increase support: A digital support and action plan should be considered in order to improve inter-entity actions and engagements.
- **Slovenia:** Collaboration platform implementation: Use the collaborative model to generate more new opportunities that focus on data implementation and circular practices
- **Hungary:** Universities must be given assistance to develop collaborative programs to promote digitalization and innovation.

- **Romania:** Collaboration of SMEs : In order to create successful green processes, these changes must be encouraged on the SME level
- **Bosnia and Herzegovina:** Create new foundations: By encouraging working groups between the private and public sectors, new ways to advance innovative and high priority strategies can be facilitated
- **Serbia:** Collaboration in building and implementing strategies: A long-term effort for new projects must have local input with international backing. Collaboration with academic and private sectors: This collaboration will assist in modern building and implementing new programs Montenegro. Promote new relationships: These relationships between researchers and entrepreneurs is essential to progress
- Croatia: Encourage implementation. Create a strong focus in collaboration.
- Moldova: Establishment of The GreenBuild lab. In this way, local participation can be achieved, increasing both the interest, impact and success of the proposed projects.

Note: *These recommendations are based on the analysis of the questionnaires and aim to provide a roadmap for improving policy support for innovation, digitalization, and circularity in the construction sector within the partner countries.*

9. Conclusion

Summary of the findings

(Below is a consolidated summary of the most prevalent common gaps and challenges)

Gaps and Challenges in Policies and Funding

- **Lack of Targeted Financial Instruments:** A recurring theme is the absence of dedicated funding streams or financial instruments that specifically target "clean construction," digital innovation in construction, or circular economy practices within the construction sector. Existing funding tends to be either too general or focused on other sectors.
- **High Initial Investment Costs for SMEs:** The high upfront costs associated with adopting digital technologies (e.g., BIM, IoT) and sustainable materials/methods pose a significant barrier, particularly for SMEs.
- **Insufficient Financial Incentives:** A lack of attractive incentives (e.g., tax breaks, subsidies) to encourage businesses to invest in green and digital solutions.
- **Fragmented or Complex Regulatory Frameworks:** Complicated or inconsistent regulations, varying across regions or municipalities, hinder the standardization and scaling of circular practices and digital technologies.
- **Weak Enforcement and Monitoring:** Even where regulations exist, a lack of robust enforcement mechanisms and monitoring systems limits their effectiveness.
- **Limited Public Procurement of Green Solutions:** Public procurement procedures often prioritize the lowest initial cost rather than lifecycle performance, sustainability, or innovation.

Challenges in Implementing Digitalization-Led Innovations in Construction:

- **Skills Gap and Lack of Digital Literacy:** A consistent shortage of skilled professionals with expertise in digital construction tools (BIM, AI, IoT) and a lack of digital literacy among construction workers.

- **Resistance to Change and Traditional Mindsets:** A deeply rooted conservative culture within the construction industry, making it resistant to adopting new digital tools and workflows.
- **Lack of Data Standardization and Interoperability: Absence** of common data standards and a lack of interoperability between different digital systems hinder the efficient exchange and use of information.
- **Poor Digital Infrastructure:** In some regions, limited access to reliable internet connectivity and digital infrastructure creates a basic barrier to adopting digital tools.

Barriers to Adopting Circular Economy Practices:

- **Lack of Awareness and Understanding of Circular Principles:** Limited knowledge and awareness among construction professionals regarding circular economy principles, such as design for disassembly, material reuse, and lifecycle assessment.
- **Limited Markets for Recycled Materials:** Weak demand and limited market opportunities for recycled or secondary construction materials.
- **Missing or Unclear Quality Standards for Recycled Materials:** Lack of clear quality standards and certification for recycled construction materials, leading to concerns about their performance and reliability.
- **Lack of Waste Management Infrastructure:** Insufficient infrastructure for the collection, sorting, and processing of construction and demolition waste.
- **Complex and Costly Waste Management Processes:** High costs associated with proper waste disposal and a lack of economic incentives for waste reduction and reuse.

Final thoughts on the importance of transformative policies in the construction sector

These common challenges highlight the need for:

Targeted policy interventions to address the specific needs of the construction sector.	**Increased investment in skills** development and training.
Greater collaboration between governments, industry, and research institutions.	Creation of **robust regulatory frameworks and economic incentives** to promote digital and circular practices.

10. Instruments used the collection of information

ANNEX 1 – Good Practice template

RIS3 or equivalent:
The purpose of this template is to gather initial information from RIS3 or equivalent strategies good practices, likely to be shared by the partners in the Circular DigiBuild project. Some examples were suggested above in the methodology.

NOTE: *Please do not mention any GP originating from a strategy that is not linked with an implementation instrument: a financing program or similar.*

Target: 3 Good Practices - GPs per country.

1. Partner contact information	
Name	
Email	
Telephone	
Your organisation	
Country	
Region	
City	

1. Organisation in charge of the good practice *[If your organisation is not the one in charge of the good practice, you can indicate the relevant organisation in this section of the form.]*	
Is your organization the main institution in charge of this good practice?	

In case 'yes' is selected under: **Does this practice come from another Interreg Danube Project?** please fill in the following sections:

Please select the project acronym		
Thematic objective of the practice		
The geographical scope of the practice	*Select National/Regional/Local*	
The Good Practice is related to: **a. circularity** **b. digitalization** **c. innovation**		
Location of the practice	Country	
	Region	
	City	

2. Detailed description	
Short summary of the practice	*Minimum 500 characters - maximum 2000 characters*
Detailed information on the practice	*Minimum 2000 characters - Maximum 3000 characters*
Timescale (start/end date; it can be a good practice that is in process or finalized)	
Evidence of success (results achieved) brief description	*Minimum 300 characters - maximum 1500 characters*

ANNEX 2 – Interview questionnaire

NOTE: *Please deliver elaborated answers with explanations included. Do not use yes or no answers, or short sentences. Remember, this questionnaire is your contribution to the final policy review document.*

1. Is the RIS3 a **regional**-level or a **national**-level strategy? Please describe the policy context of the target strategy.
2. What **other policy document** (if there is no RIS3 in place) is the main planning document envisaging digitalization, innovation, and circular economy in your country?
3. What is your organization's role within the **elaboration** of the RIS3 or equivalent, if any?
4. What is your organization's role within the **implementation** of the RIS3 or equivalent?
5. How are the following sectors: digital innovation and circularity in the construction sector reflected by the **RIS3** or equivalent?
6. If they are not reflected, do you intend to discuss them in your EDPs (entrepreneurial discovery processes), or other types of instruments used to update your equivalent strategies?
7. Which are the **niches of specialization** in your region that have the transformative potential for the following sectors: digital innovation and circularity in the construction sector?
8. Is your RIS3 or equivalent strategy budgeted under different financing instruments covering the following sectors: digital innovation and circularity in the construction sector?
9. Which are the **main enabling factors** for digital innovation and circularity in the construction sector at regional level? (Please describe up to three factors)
10. What are the **bottlenecks/barriers** to digital innovation and circularity in the construction sector at the regional level?
11. What are the regional/national **funding available** targeting digital innovation and circularity in the construction sector?
12. The **EU Smart Specialisation Community of Practice** (S3 CoP) is the central node on guidance, networking, support, and peer-learning on S3, covering its conceptual development and its implementation. The S3 CoP aims at reaching

out to all quadruple-helix stakeholders interested in Smart Specialisation and creates a space for learning and advancing together. Are you involved in the S3 CoP? To what extent?

13. Please describe your proposal for a **Good Practice (GP) or several (up to 3 per country)** containing description, success, and potential for inspiration to the other project partners. Please make a short description here and use the Annex 1 template for detailed information about the GP.