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BIM4D

R.4.3

Trasnational Policy Report

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Table of contents

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List of Abbreviations

- BIM – Building Information Modelling
- BIM4D – Building Information Modelling for Deconstruction / End of Life (project title)
- EOL / EoL – End of Life
- EU – European Union
- VET – Vocational Education and Training
- CDW – Construction & Demolition Waste
- DPP – Digital Product Passport
- CAM – Criteri Ambientali Minimi (Minimum Environmental Criteria – Italy)
- MEC – Minimum Environmental Criteria (alternative English abbreviation for CAM)
- IFC – Industry Foundation Classes (interoperability data standard)
- ESPR – Ecodesign for Sustainable Products Regulation (EU)
- CDE – Common Data Environment
- LCA – Life Cycle Assessment
- SME – Small and Medium Sized Enterprise
- ISO 19650 – International Standard for information management using BIM
- 4D / 5D – BIM dimensions (time scheduling / cost & environmental data)

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1. Executive Summary

What BIM4D is and why it matters for EU policy

BIM4D demonstrates how Erasmus+ projects can function as policy enablers by bridging EU strategic objectives, national implementation realities and VET system capacities. By focusing on skills development, transferability and stakeholder engagement, BIM4D contributes to a balanced and inclusive digital transition, supporting both environmental objectives and labour-market resilience.

The BIM4D project, implemented under the Erasmus+ KA2 – VET framework, addresses a critical and currently underdeveloped dimension of the digital and green transition in construction: the use of Building Information Modelling (BIM) in End-of-Life (EOL) practices, including selective deconstruction, renovation, material recovery and reuse.

While BIM adoption has expanded significantly across Europe in the design and construction phases, its application at the end of the building life cycle remains fragmented, voluntary and largely experimental. This gap is increasingly problematic in light of the EU Green Deal and Circular Economy Action Plan, the revised EU Construction & Demolition Waste (CDW) Management Protocol (2024), the upcoming Digital Product Passport (DPP) framework, and the growing policy emphasis on lifecycle data, traceability and reuse.

BIM4D responds to this gap by focusing on skills, governance and implementation capacity rather than technology alone. Through five national policy roundtables held in Belgium, Germany, Greece, Italy and Slovenia, the project collected structured evidence from industry stakeholders, VET providers, public authorities and social partners. The resulting transnational policy recommendations aim to support EU and national decision-makers in designing realistic, scalable and inclusive policy interventions, particularly for SMEs and the VET ecosystem.

Cross finding across countries

Across all partner countries, BIM use at EOL remains marginal. BIM is predominantly applied in design coordination and construction planning, with only sporadic or pilot-based use in deconstruction and renovation. Existing building stock frequently lacks reliable digital documentation, further limiting EOL applications.

Despite this limited uptake, awareness of BIM's potential benefits for circular construction is high. Stakeholders widely acknowledge BIM's capacity to improve selective dismantling, enhance material traceability, support environmental reporting and increase safety.

Five recurring structural barriers were identified across countries: (a) lack of binding or incentivizing policy signals for EOL BIM use; (b) fragmented standards and weak interoperability; (c) skills gaps, particularly at site and SME level; (d) high upfront costs combined with uncertain

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return on investment; and (e) fragmented value chains in which demolition and waste actors are engaged too late.

At the same time, there is strong convergence on skills needs. Stakeholders consistently stressed the importance of role-specific, practice-oriented training that integrates digital and circularity competencies and is accessible to SMEs and workers.

Stakeholders also stressed that the main bottleneck is not only technological, but cultural and organizational: the practice of deconstruction and the 'reuse-first' mindset are still not widely embedded in everyday construction practice. Scaling BIM for End-of-Life therefore requires a bottom-up skills and culture shift (starting from school and vocational pathways), combined with top-down policy measures that are backed by concrete economic instruments (e.g., incentives, remuneration of digital EoL deliverables, and support for the additional time required for planning and selective dismantling).

Policy recommendations

Through the events, some key policy recommendations have been identified:

- **Raise awareness among project owners and public authorities** about sustainability, circularity, and the benefits of BIM.
- **Develop integrated training programs** that combine digital tools with end-of-life and material reuse knowledge.
- **Harmonize standards and workflows** to facilitate collaboration and ensure traceability of materials.
- **Train construction professionals from the outset to collaborate** more effectively across all stakeholders.
- **Support investments in BIM-enabled circular practices,** recognizing that initial costs generate long-term competitive and environmental advantagess.
- **Provide practical implementation support by** developing checklists for EoL digital deliverables and publish SME-oriented cost-benefit examples to demonstrate return on investment.

2. Summary of national discussion panels and events

Across Belgium, Germany, Greece, Italy, and Slovenia, partners organized nine national roundtables/stakeholder events between October 2025 till December 2025 (mix of physical and hybrid formats) to engage key target groups, including VET trainers, students, apprentices from construction companies, and architects, alongside a broader set of construction-sector stakeholders.

Overall, the events mobilized a wide ecosystem of stakeholders, construction and demolition companies, sector organisations, professional orders, training/VET providers, researchers, and local/national public authorities to discuss the integration of BIM in End-of-Life (EOL) practices, with particular emphasis on selective deconstruction, material traceability, and circular construction/circularity and highlight the training that has been developed in the context of project and last but not least to provide key policy recommendations.

Highlights by country:

- Slovenia (CCIS – Ljubljana, in-person): Two roundtables were held on 16 Oct 2025 (39 participants) and 23 Oct 2025 (21 participants), engaging a diverse group of 60 national stakeholders including industry, engineering consultants, digitalisation providers, building managers, authorities, research, and VET institutions, focused on BIM uptake in EOL workflows.
- Belgium (2 events, hybrid and physical): Events linked to **the Working Group on Sustainable Construction and the Retrofit Innovation Summit**, with 33 participants, representing sector organisations, training, researchers, policymakers, architects, and companies.
- Germany (1 event, physical): A larger national event with 66 participants, mainly skilled workers, foremen/site managers, and trainers, with participation from some public clients.
- Greece (2 events, physical): Activities included the **Build Expo Fair** and a panel at PEDMEDE premises, with 16 and 45 participants, engaging construction/demolition companies, VET and public administration.
- Italy (2 events, physical): Sessions hosted at IIPLE – Bologna and Scuola Vicenza Andrea Palladio, with 31 and 28 participants respectively, involving construction/demolition firms, VET, public administration, and students/apprentices.

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In total, approximately 300 stakeholders participated (demonstrating strong national engagement and providing valuable feedback for strengthening BIM adoption in EOL and circular construction practices.

3. Key Findings

3.1 Countries Snapshots

Belgium

Stakeholders in Belgium recognise BIM as a valuable lever for sustainability, traceability and efficiency in construction. However, BIM adoption remains largely voluntary and is concentrated in the design and construction phases. The use of BIM in End-of-Life (EOL) activities, including deconstruction and renovation, is very limited and mainly confined to pilot initiatives or large-scale projects.

Key challenges identified include the absence of mandatory or incentivising policy signals, limited digital skills within SMEs, resistance to organisational change and a lack of shared standards. At the same time, Belgium presents a relatively mature ecosystem of complementary digital tools (e.g. inventories, waste management systems), raising the strategic question of whether BIM should function as an integrating backbone rather than a standalone solution.

Germany

Germany displays a comparatively advanced level of technical expertise and digital awareness within the construction sector. BIM is used in selected segments and large infrastructure projects, including occasional pilot applications in deconstruction. Nevertheless, systematic BIM use at EOL remains rare.

German stakeholders strongly emphasised the lack of uniform standards, interfaces and legally clarified responsibilities for data transfer and liability. These uncertainties, combined with high implementation costs, discourage broader uptake. There is strong demand for practical, site-oriented training and for clearly defined EOL-related BIM roles, such as a BIM Deconstruction Coordinator.

Italy

Italy stands out due to its advanced regulatory and technical framework for BIM in public procurement, aligned with ISO 19650 and supported by national standards and recognised professional roles. Despite this strong legal basis, stakeholders reported that BIM use rarely extends to EOL practices in real projects, particularly among SMEs.

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A central issue is the gap between regulatory requirements and operational guidance for EOL modelling, material passports and digital building logbooks. Stakeholders highlighted the potential of BIM to support compliance with Minimum Environmental Criteria (CAM) but stressed the need for clearer guidance and better interoperability with environmental databases.

Slovenia

In Slovenia, BIM for EOL remains largely conceptual. While awareness of EU circular economy and digitalisation objectives is growing, practical application is limited to isolated pilot projects. The high cost of digital documentation for existing buildings and the lack of national guidance were identified as major barriers.

Stakeholders expressed concern that emerging EU requirements, such as Digital Product Passports, could create additional administrative burdens for SMEs unless accompanied by financial support and clear implementation frameworks. Stronger coordination between policy, industry and VET systems was seen as essential.

Greece

Greece represents an emerging BIM ecosystem, characterised by increasing policy ambition but uneven implementation capacity. BIM adoption is still concentrated in design and construction, with very limited application in EOL workflows. The predominance of older building stock without reliable as-built documentation further complicates adoption.

Stakeholders stressed the risk that rapid regulatory or policy developments, if not matched by targeted skills development and SME support, could exacerbate fragmentation within the sector. At the same time, Greece was seen as a valuable test case for transferable, phased implementation strategies supported by EU funding instruments.

In general, participants consider BIM to be a relevant lever for improving sustainability, traceability and efficiency in construction and deconstruction projects. Awareness of its benefits is increasing; however, adoption remains voluntary and largely limited to large-scale projects.

3.2 Similarities Across Countries

Despite contextual differences, the BIM4D roundtables revealed a strong set of shared characteristics across all participating countries.

First, BIM adoption at End-of-Life is consistently low. Across all contexts, BIM is still predominantly associated with design coordination and construction planning, while deconstruction and renovation remain marginal use cases.

Second, stakeholders across countries identified a common barrier pattern, including interoperability challenges, limited digital skills among SMEs, resistance to organisational change and weak regulatory or economic incentives for EOL digitalisation.

Third, there is broad agreement on the potential benefits of BIM at EOL. Material traceability, improved planning of selective dismantling, enhanced safety and better circularity reporting were consistently highlighted as key value propositions.

Finally, there is strong convergence regarding skills and training needs. Stakeholders emphasised the importance of linking BIM competencies with circular economy principles, developing site-ready skills and introducing new or adapted professional roles.

3.3 Key Differences

While the challenges are similar, important differences affect how policy measures can be transferred and implemented.

Across all countries, stakeholders recognize BIM's value for circularity and traceability, yet systematic BIM use in End-of-Life (EoL) workflows remains rare; the differentiator is implementation capacity rather than awareness.

The discussion panels **highlight five structural differences** that shape transferability of policy and training measures:

- ⚠ **Policy maturity**

Italy stands out with a strong legislative, and standards base for BIM in public procurement and lifecycle digitalisation, but stakeholders still report a "law → practice" gap at EoL, especially for SMEs and EoL-specific modelling guidance.

Belgium (Wallonia) and Greece are characterised by more voluntary/fragmented uptake, where stakeholders expect uptake to accelerate mainly through incentives, pilots and integration with existing tools rather than strict mandates.

Slovenia links the policy debate strongly to upcoming EU requirements (ESPR/DPP) and fears administrative burden without support, indicating policy measures must prioritize enablement and guidance. Germany shows "advanced in segments" but calls strongly for uniform standards and liability clarity to unlock EoL deployment beyond pilots.

- ⚠ **BIM maturity vs. EoL real uptake**

Even in countries with relatively higher BIM maturity, EoL adoption is consistently low: BIM is mostly used in design/construction and rarely for deconstruction; existing building stock often lacks reliable as-built models.

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The starting point differs: Belgium and Greece describe very limited EoL use; Germany and Slovenia report pilots or conceptual interest; Italy reports limited EoL practice despite a strong framework.

- ⚠ **Primary drivers: environmental criteria vs. digital product data agenda**

In Italy, CAM/MEC (Minimum Environmental Criteria) are mandatory in public works and are perceived as a powerful lever to operationalize traceability and compliance through BIM—yet interoperability with LCA/environmental databases is weak.

In Slovenia, the driver is the Digital Product Passport trajectory, with BIM seen as the building-level integrator for product-level data—paired with concerns about burden without enabling infrastructure.

- ⚠ **Tool ecosystem and integration approach**

Stakeholders repeatedly noted that many digital tools are already used (inventories, waste tracking, site monitoring), and the key question is whether BIM should act as an integration backbone rather than a replacement. This is particularly explicit in Belgium (integration with existing tools) and in the transnational synthesis.

- ⚠ **Skills and site usability**

All countries request site-oriented, practical training and role-based learning pathways, but capacity differs: some contexts emphasize new roles (e.g., inventory specialist), while others highlight specific technical gaps.

The more site-ready the training and workflows, the more likely SMEs and demolition actors are to engage.

- ⚠ **Market structure and SME capacity**

In countries with a high share of small firms and limited investment capacity, such as Greece and Slovenia, support mechanisms and shared resources are critical preconditions for adoption.

Finally, differences in VET system capacity influence the speed and scale of skills deployment. Countries with established BIM-related training structures can more rapidly integrate EOL modules, whereas others require foundational capacity-building.

These differences underline the importance of flexible, principle-based policy recommendations that allow for phased and context-sensitive implementation rather than uniform regulatory solutions.

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3.4 Current Status of BIM in EOL

Across the five partner countries, stakeholder evidence converges on the same baseline: **BIM uptake in End-of-Life (EOL) activities (selective demolition, deconstruction planning, pre-demolition audits, reuse/recovery planning) remains limited and non-systematic**. In most countries, BIM is still used primarily in **design and construction**, with EOL applications appearing mainly in **isolated pilots** or when driven by specific client requirements. Belgium explicitly describes EOL BIM use as "very limited" and still largely underexploited for decision-making.

Germany similarly notes that BIM is used only sporadically in deconstruction, with pilots not yet translating into widespread practice. Slovenia confirms that BIM use in EOL workflows is negligible and that the national ecosystem is still at an early stage of operationalising BIM for demolition/renovation. A shared structural constraint is the **lack of reliable digital information for existing buildings**, which makes it hard to establish EOL-ready models and inventories without additional surveying and data reconstruction. Slovenia highlights that digital twins/laser scanning are technically feasible but financially inaccessible for many SMEs without support. Greece similarly reports that older building stock often lacks reliable as-built information, constraining BIM-enabled pre-demolition audits.

Generally, the use of BIM at the end-of-life (EOL) stage remains very limited in Wallonia, both for deconstruction and renovation projects. In most cases, BIM is still primarily applied during the design and construction phases, while its potential to support informed decision-making at EOL is largely underexploited.

3.5 Benefits and Potential

Despite limited current adoption, stakeholders across all countries strongly align on BIM's strategic relevance for circularity and the green transition at EOL. Core benefits consistently identified include:

- Material traceability and transparency, especially via digital twins and material passports, supporting reuse and recycling decisions and reducing information loss across lifecycle stages. Germany frames this as a "gamechanger" for circular economy traceability.

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- Belgium also highlights digital twins/material passports as mechanisms to strengthen traceability across the lifecycle.

- Better planning, sequencing, and risk reduction for selective dismantling through structured information and model-based coordination, contributing to efficiency gains and reduced waste/operational errors.

- Improved coordination across actors, by providing a shared digital basis for collaboration between designers, contractors, and waste/recovery actors.

- Stronger health & safety and hazardous substance documentation, when hazard information is embedded and managed through model-based workflows.

A key transnational learning is that BIM's impact is maximised when it acts as an integration backbone for EOL workflows (inventory → planning → dismantling → reporting) rather than as a standalone digital product.

3.6 Challenges and Barriers

The integration of BIM into EOL phases in Wallonia faces several significant challenges. First, the **absence of mandatory regulatory requirements** limits incentives for stakeholders to adopt BIM beyond the design and construction stages. This is compounded by a **lack of digital skills and dedicated human resources within SMEs**, which represent a large share of the construction and deconstruction sector. In addition, **resistance to organisational and technical change** remains strong, particularly where new workflows disrupt established practices. The situation is further complicated by the **lack of shared standards and homogeneous data formats**, which hinders effective data exchange and collaboration between stakeholders.

At the same time, many digital tools are already in use across the sector for tasks such as inventories waste management, or site monitoring, but these tools are often developed independently and are not connected to BIM models. This fragmentation raises the question of whether BIM should evolve to better integrate with, and interface between, these complementary digital solutions rather than operate as a standalone system.

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Additional barriers raised by stakeholders include the lack of consistent national standards for classification, categorization and modelling, as well as the limited accessibility of some standards due to licensing costs. High software and management costs (licenses, hardware, and specialist staff) remain a obstacle for SMEs. Finally, several contributions highlighted a public-sector capacity gap: even when BIM is produced for major projects, public technical offices often lack resources and workflows to maintain and use models over the asset life cycle, leading to information 'freezing' on local servers and being unavailable for later renovation or deconstruction decisions.

Despite these barriers, several enabling levers have been identified. **Material passports**, in particular, are seen as a promising tool to improve material traceability and support circular economy practices at EOL. Likewise, **eco-design** is essential to facilitate easier deconstruction and higher-value material recovery. Finally, there is a clear need to **anticipate the long-term evolution of digital tools**, with particular attention to data accessibility, interoperability, and long-term data management throughout the entire building life cycle.

In national level

Belgium: key barriers include no mandatory rules, SME skill/resource limits, change resistance, and lack of shared standards.

Germany: the "major hurdle" is lack of standardization and interfaces between tools, plus legal uncertainty and unclear responsibilities for data transfer.

Slovenia: feasibility barriers are amplified by the existing stock lacking models and the high cost of scanning, alongside concerns about administrative burden from new EU requirements without support.

Greece: in addition to cost/skills issues (SME-dominated market), Greece highlights a policy need to clarify selective demolition / pre-demolition audit requirements and waste tracking linkages.

3.7 Skills, Competencies, and Workforce Development

Across Belgium (Wallonia), Germany, Greece, Italy and Slovenia, stakeholders highlighted that: While BIM skills are increasingly present in design and construction planning, EoL applications require additional, role-specific competences that are currently scarce, especially in SMEs and site-based occupations.

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EoL BIM competence is not more BIM; it is a hybrid capability combining:

I. construction/demolition sector knowledge (how buildings come apart),
II. information management and interoperability (how data is structured, exchanged and validated), and
III. circularity literacy (how data supports recovery, reuse and reporting).

National reports consistently differentiated skills needs by professional group. For the transnational report, the skills framework can be structured into four main role clusters aligned with the EoL workflow:

A) Site workers and technicians (execution and data capture)

A recurring gap is basic digital literacy combined with the ability to work with simple model/inventory views in real site conditions. Priority competences include:

- Reading and interpreting model-based or inventory-based information (zones, components, material IDs).
- Following traceability instructions (tagging, separation rules, storage conditions, documentation).
- Capturing field updates through simple digital tools (photos, IDs, basic measurements, structured checklists).

Belgium and Slovenia were explicit that site-level capability is foundational; without it, traceability collapses in practice.

B) Foremen, supervisors and site managers

Germany and Belgium strongly emphasised the need to upskill this group because they translate digital intent into operational delivery. Priority competences include:

- Using model/inventory outputs to sequence tasks and coordinate trades (4D logic at a practical level).
- Supervising traceability and quality assurance (checking completeness/accuracy of inventories and site records).
- Coordinating logistics for segregation, temporary storage and recovery handover.
- Integrating safety and compliance requirements into EoL planning (including hazardous-substance documentation where relevant).
- Using mobile workflows on site (a specific deficit highlighted in Germany).

C) Engineers, architects and BIM specialists (EoL information creation and interoperability)

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Across countries, this group often has design-phase BIM experience but lacks EoL-specific capabilities. Key competences include:

- Creating EoL-ready datasets: modelling/inventorying strategies suitable for existing buildings and partial documentation.
- Defining and applying consistent attributes/classifications that support recovery and reporting.
- Managing interoperability and open exchange (notably IFC), including coordination of multi-source information.
- Integrating circularity requirements into planning: dismantlability, modularity, material flow logic, and environmental implications.
- Linking BIM/inventories to systems: procurement/quantity systems, waste/recovery reporting, and environmental datasets.

Belgium additionally stressed 4D/5D capabilities for cost/time/environmental impact planning; Germany highlighted IFC coordination and quantity determination as persistent gaps.

Common competencies required in all countries

Across the country inputs, the same core skill needs come up again and again. People need basic interoperability literacy—how information is exchanged, which formats are used, and how to use attributes consistently (especially stressed in Germany, Greece and Belgium). They also need information management, so they can handle structured information flows between many actors (highlighted in Slovenia and Belgium).

In parallel, there is need for clear understanding of circularity and eco-design, so digital work supports real reuse/recovery decisions and sustainability results (emphasised in Belgium and Italy). Strong collaboration and communication is also essential to connect fragmented value chains and align demolition/recovery actors with designers and contractors.

Finally, adoption depends on people and organisations, not just tools. Organisational readiness for change, culture, roles, and workflows, strongly affects whether solutions are used (explicitly noted in Belgium). Overall, there is a need for interdisciplinary profiles that combine engineering practice with data/IT skills and circularity knowledge (highlighted in Germany and reflected across countries).

Country-specific skills

Each country emphasised in different parts:

Germany: urgent need to strengthen model-based quantity determination, IFC coordination, and legally compliant hazardous substance documentation, alongside greater use of mobile devices and practical site workflows. The emergence of a “BIM Deconstruction Coordinator” profile was explicitly discussed as a new competency focus.

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Belgium (Wallonia): strong emphasis on integrating technical BIM skills with sustainability/circularity (eco-design), and on differentiating training by stakeholder role (workers/technicians vs engineers/architects vs clients). Belgium also stressed that workforce development must be accompanied by an organisational culture that values circularity and innovation.

Greece: clear skills gaps across (i) workers with limited digital literacy and weak familiarity with model navigation and sequencing, (ii) engineers needing EoL-ready datasets and links to waste-tracking, and (iii) public authorities needing capability to define requirements and evaluate deliverables. Stakeholders also stressed the need for multi-actor training reflecting Greece's fragmented value chain.

Italy: stakeholders highlighted difficulty finding technicians combining information modelling, environmental data management and interoperable software capability. Education-sector inputs stressed strengthening digital and environmental skills in VET, expanding training on BIM for deconstruction (currently almost absent), and reinforcing collaboration between industry and training institutes. =

Slovenia: the workforce gap is broad: BIM for renovation/demolition contexts, CDE understanding, circular economy literacy, and basic digital skills for on-site workers. A major constraint is training system capacity: vocational schools often lack equipment, curricula and staff able to teach BIM with deconstruction/reuse focus.

Emerging occupational profiles

Across reports, stakeholders described a shift toward new or strengthened roles needed to make EoL digitalisation work in practice:

- BIM Deconstruction Coordinator / EoL BIM Manager: bridging model/inventory information, sequencing, compliance documentation and site execution.
- Material inventory and traceability specialist: supporting structured inventories, recovery tagging and documentation across projects
- VET trainers with EoL BIM capability: capacity building for instructors is essential to avoid training bottlenecks

3.8 Training Needs and Improvements

The transition towards greater material reuse and circular construction requires **new skills, new combinations of skills, and in some cases new occupational profiles** (e.g., material inventory and traceability specialists, BIM-enabled deconstruction coordinators). Across Belgium, Germany, Greece, Italy and Slovenia, stakeholders consistently stressed that training is the main

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enabler for scaling BIM use in End-of-Life (EoL) practices—because current BIM competence is still concentrated in design offices and does not translate automatically into renovation and selective demolition contexts.

Integrated and practice-oriented training as a core requirement

Participants across countries emphasized that training must go beyond "software learning" and focus on **real EoL workflows**. The preferred approach combines theoretical foundations (standards, information requirements, circularity logic) with **hands-on application** using realistic cases. This practical emphasis was particularly strong in Germany (site relevance, actionable competence) and Slovenia (need for operational methodologies).

Role-specific pathways and differentiated learning outcomes

A clear transnational message is that training must be **tailored by professional role** and aligned with responsibilities along the EoL chain. This differentiation is important because EoL implementation depends on **coordinated actions across roles**, not on one "BIM expert" within a project team.

Strengthening open exchange and interoperability competences

Training needs across all countries include practical literacy in **interoperability and information management**. Stakeholders repeatedly described fragmentation of tools and inconsistent data structures as a barrier; therefore, training must incorporate:

- structured information principles (minimum datasets, consistent attributes),
- basic exchange workflows and "common language" practices across stakeholders,
- quality assurance for inventories and traceability records (completeness, consistency, auditability).

This is particularly relevant where actors must exchange information between designers, contractors, demolition teams, and waste/recovery operators.

Specific competence areas repeatedly highlighted in national reports

Across the national reports, stakeholders pointed out the concrete competence gaps that training should address:

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- **Model-based quantities and estimation** relevant to deconstruction and recovery planning (strongly emphasized in Germany).
- **Hazardous materials documentation logic** and compliance-oriented reporting where applicable (raised in Germany and Greece).
- **Environmental and circularity data handling**, including how digital deliverables support sustainability compliance and reporting (a strong theme in Italy, where alignment with CAM/MEC and environmental data is a key leverage point).
- **Renovation/demolition-specific methods**, especially where buildings lack reliable as-built information and where scan-to-model approaches may need to be selective and proportionate (strongly emphasized in Slovenia and Greece).

Accessibility and SME feasibility

Accessibility remains a decisive condition for training uptake. Across countries, SMEs face constraints in time, staffing, and funding. Stakeholders therefore requested **flexible formats** combining short, targeted modules, blended delivery (face-to-face plus online components).

Training also needs to be inclusive for participants with **lower digital maturity**, particularly site workers and smaller demolition firms. This implies the use of simplified interfaces, step-by-step exercises, and learning materials that prioritise "what to do on site" rather than advanced modelling tasks.

3.9. Financial Considerations and Barriers

Across the national discussion policy panels, stakeholders were clear that there are many financial barriers. Participants explained that the first hurdle is the initial investment in licences, hardware and internal capacity building. For smaller companies, the real pressure point is not only the purchase of tools but the time required to train staff and adapt routines while continuing to deliver day-to-day work. Several stakeholders underlined that this time cost is often overlooked and becomes a practical problem.

Stakeholders also highlighted a second cost layer that is often even more decisive: creating usable digital information for existing buildings. Many projects start from incomplete or unreliable documentation, which means that inventories, surveys, and sometimes additional data capture activities are needed before BIM can meaningfully support selective dismantling and traceability. This requirement is widely perceived as expensive and difficult to justify, especially when it is not explicitly funded or recognized as part of project budgets.

A third cost driver identified in multiple countries relates to coordination. Stakeholders emphasized that collaborative workflows require additional effort in the short term: setting up shared data spaces, agreeing responsibilities, validating datasets, and managing information exchanges across designers, contractors, demolition teams and recovery actors. While these steps can reduce errors and improve outcomes over time, participants noted that they raise costs during the initial transition phase.

For many stakeholders, these costs are hard to justify because return on investment remains uncertain at the scale of individual projects. Participants widely acknowledged benefits such as waste reduction, higher reuse rates, better recovery planning and improved compliance, yet they stressed that these benefits are difficult to quantify and are often captured by other actors in the value chain. A recurring observation was that clients, public authorities and recovery operators may gain significant value from improved traceability and reporting, while the SME contractor or demolition firm is often expected to carry most of the upfront effort and cost.

Stakeholders also pointed out that the enabling environment is still weak. Public support and incentive schemes were described as limited or uneven, and procurement practices do not consistently recognise digital End-of-Life deliverables as priced and remunerated outputs. Without clearer economic signals or stronger demand from public clients, companies struggle to justify investment beyond exceptional cases or pilot projects.

To make adoption feasible, stakeholders converged on a combination of measures. They called for targeted financial support that reduces upfront costs and covers training time, shared resources that reduce duplication and lower entry barriers, and public–private pilots that de-risk early implementation and demonstrate measurable value. At the same time, participants stressed that a broader shift in mindset is needed, supported by a long-term vision that treats BIM as enabling infrastructure for circular construction if expectations remain for SMEs.

Stakeholders requested more explicit, quantified evidence of cost-benefit, especially for SMEs: practical examples comparing baseline vs BIM-enabled EoL workflows (including time for surveys/inventories, software/training costs, and achievable gains such as reduced rework, improved recovery rates, higher-value reuse, and smoother compliance reporting).

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3.10 Collaboration and Value Chains

Across the national reports, stakeholders consistently described BIM as a coordination tool that is already familiar in design and construction, but still weakly connected to the actors and decisions that determine circular outcomes at end-of-life. In practice, collaboration remains strongest upstream—between designers, engineers and main contractors—while downstream coordination with building operators, demolition firms, waste managers and reuse/recovery actors is still fragmented and often reactive.

A repeated finding in all five countries is that the value chain becomes most fragile at the phase transitions. Information produced during design and construction is rarely handed over in a form that is usable for operations, refurbishment planning, or deconstruction. Stakeholders noted that even when BIM exists, it is not routinely updated during the operational phase; as a result, when renovation or demolition begins, teams often fall back to partial drawings, local knowledge, and rapid site surveys. This “data discontinuity” was strongly linked in the reports to missed reuse opportunities and conservative decisions that favour conventional demolition and low-value recycling.

National reports also converge on the organizational dimension of collaboration barriers. Stakeholders repeatedly pointed to unclear responsibilities for who creates, validates, updates and owns lifecycle data. In Germany, participants emphasized missing interfaces between BIM and downstream processes, including tendering and disposal partners, which breaks information flows and limits practical cooperation beyond pilots. In Belgium (Wallonia), stakeholders described a fragmented tool ecosystem and highlighted that many digital tools exist in parallel but are not connected in a way that supports shared workflows across actors. In Greece, the sector was described as disconnected, with stakeholders stressing the need for clearer role definitions and a shared collaboration framework (including common approaches to data environments and exchange). Slovenia similarly highlighted siloed operation across stakeholders in renovation and demolition, reinforcing that collaboration is still not structured around shared information practices. In Italy, stakeholders explicitly emphasized that demolition professionals are poorly integrated into early phases, which reduces the ability to design and plan for dismantling and recovery.

A strong and consistent message across the reports is that circularity requires earlier and more continuous involvement of downstream actors. Stakeholders argued that demolition and recovery operators should not be engaged only at the end, because they hold practical knowledge about dismantling feasibility, separation quality, logistics constraints, cost drivers, and market

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viability for recovered materials. When they are brought in late, key decisions have already been made: recovery-friendly design choices are missed, inventories are incomplete, and reuse becomes difficult to verify. This was reflected in the Italian report through the emphasis on early inclusion of demolition expertise, and echoed across the other countries in discussions about value chain fragmentation and late-stage engagement.

Within this context, stakeholders in several countries highlighted material traceability as the most concrete "value chain bridge" BIM can offer—if data is structured and exchanged consistently. The Belgian and German reports emphasized traceability and the role of structured information in enabling circular decision-making; the Slovenian and Greek reports linked traceability needs to emerging European directions around product/building data, warning that duplication and administrative burden will increase if information is captured repeatedly in disconnected systems. Across countries, material passports and structured inventories were repeatedly framed as practical instruments because they translate model or survey information into records that can be reused by different actors over time, including for recovery planning and reporting.

Overall, the national reports point to the same collaboration conclusion: BIM's contribution to circular value chains will remain limited unless lifecycle information becomes a shared asset rather than an upstream deliverable. That shift requires predictable participation of downstream actors, clearer responsibility models for data continuity, and collaboration routines that work in real renovation and demolition conditions. Without these conditions, BIM remains concentrated in early phases, and end-of-life decisions continue to be made with insufficient information, undermining reuse, traceability and high-quality recovery.

3.11 Policy Gaps and Institutional Support

Across all five national reports, stakeholders agreed that public authorities are key to scaling BIM-enabled circular practices because they act as regulators, asset owners and major clients. Today, circular construction, material tracking and reuse remain largely voluntary. This keeps adoption limited to a small number of pioneering organisations and makes it difficult for SMEs to invest in new practices without clear demand.

Main policy gaps identified across countries

Stakeholders across Belgium, Germany, Greece, Italy and Slovenia repeated four core gaps.

First, there is still weak market demand from permits and procurement for End-of-Life phases. Digital inventories, traceability reporting, selective dismantling plans and (where relevant)

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hazardous-material documentation are not consistently required, priced or verified. As a result, companies have little incentive to develop capacity beyond pilot projects.

Second, operational guidance is missing. Even where policy ambition exists, stakeholders pointed to a lack of clear definitions on what data should be produced, at what level of detail, in which format, and who is responsible for creating, updating and validating it. Fragmented standards and interoperability problems reinforce this barrier.

Third, policies do not sufficiently reflect the reality of existing buildings. Many buildings have incomplete or unreliable documentation, so creating inventories or usable datasets adds cost and uncertainty. Stakeholders stressed that without support mechanisms, SMEs cannot absorb these costs.

Fourth, the public sector itself often lacks capacity. Several national reports noted that public clients and authorities need skills to specify proportionate requirements, assess deliverables, and use digital outputs to monitor circular outcomes.

Country highlights from the national reports

In **Belgium (Wallonia)**, stakeholders pointed to the importance of publicly supported pilot projects to demonstrate feasibility and build confidence. The ACEC site redevelopment in Herstal was presented as a strong example of a circular pilot that combines selective demolition and reuse strategies and functions as a learning platform for the sector. Belgium also benefits from the existence of GRO 2025, a practical framework that can help public authorities translate sustainability ambitions into procurement criteria and monitoring.

In **Germany**, stakeholders emphasised that wider adoption depends on clearer institutional rules: common standards, interoperable exchange, and clarity on responsibilities and liability for data handover—especially between BIM processes and downstream disposal/recovery actors.

In **Greece**, stakeholders stressed that uptake remains limited because requirements are not yet embedded in routine procedures and procurement. They highlighted the need for clearer implementation rules and stronger public-client capability to define requirements and evaluate outputs.

In **Italy**, stakeholders described a "law-to-practice" gap: strong policy foundations exist, but EoL deliverables and guidance are not yet normalised in projects, and integration with environmental compliance data remains weak.

In **Slovenia**, stakeholders linked the issue to future EU data requirements, while warning that new obligations could increase burden unless support and practical methodology are provided, especially for SMEs and the training system

4. Transnational Policy recommendations

I. **Adopt a Minimum Digital Dataset for EoL (End-of-Life) processes**
Establish a common baseline dataset (open standards) that enables selective deconstruction and material recovery even when no original BIM model exists.

II. **Make End-of-life digital inventories a standard deliverable for relevant projects**
Normalise digital inventories and traceability outputs (inventory → planning → dismantling → reporting) as expected deliverables in renovation, selective demolition and circular redevelopment.

III. **Align BIM-enabled inventories with Material Passports, building logbooks and Digital Product Passports**
Ensure information captured once can serve multiple policy instruments, avoiding duplicate reporting and supporting long-term traceability.

IV. **Use public authorities to create demand and legitimacy**
Public programs and tenders should require proportionate EoL digital deliverables and open exchange formats, helping shift the market from pilots to routine practice.

V. **Reward EoL digitalization and circular outcomes through procurement mechanisms**
Introduce scoring criteria and contract requirements that recognize digital deliverables (inventories, traceability reporting, hazard documentation where relevant) and link them to measurable circularity outcomes (e.g., traceability completeness, reuse targets where measurable).

VI. **Strengthen interoperability and standardization for EoL use-cases**
Promote consistent attribute sets, classifications, and exchange conventions so information can move across actors and tools, and so downstream recovery stakeholders can use the data.

VII. **Embed EoL BIM competences into VET, lifelong learning and professional upskilling**
Introduce role-specific learning outcomes and pathways for site workers/technicians, site managers, engineers/BIM specialists and public clients, including recognition of emerging roles (e.g., BIM Deconstruction Coordinator, material inventory specialist).

VIII. **Reduce SME adoption barriers through targeted enabling measures**
Design SME-friendly support (training time, access to interoperable tools, and the cost of producing inventories in existing buildings with missing as-builts) to avoid excluding smaller demolition and renovation firms.

IX. **Scale through pilots and structured knowledge transfer**
Fund and require demonstrators that produce reusable templates and evidence (datasets, reporting structures, responsibility models) that can be transferred across regions and integrated into training and procurement practice.

5. Summary

Stakeholder reflections on WP2/WP3

Across the five national reports, stakeholders confirmed the main WP2 conclusion: while BIM is increasingly recognised as valuable for sustainability, traceability and efficiency, its use in End-of-Life (EoL) practices remains limited, largely voluntary and concentrated in pilots. In most cases, BIM is still primarily associated with design coordination and construction planning, with only partial or sporadic application in renovation, selective deconstruction and material recovery.

WP3 responded to this gap through a structured training programme addressing BIM and deconstruction. Stakeholders across countries considered the training relevant, particularly for raising awareness of circular EoL strategies and introducing structured approaches to inventories, traceability and planning. At the same time, they emphasised that training impact depends on how strongly it is connected to real project workflows and site realities, especially in older buildings where documentation is incomplete.

Perceptions and experiences

Stakeholders across countries described BIM as a tool with clear potential to optimise planning, reduce waste, improve material traceability and mitigate risk. Its potential at EoL remains underexploited, mainly because EoL projects often start without reliable as-built information, and because demolition and recovery actors are not systematically integrated into digital workflows.

The main opportunities identified across the five countries were consistent: BIM can strengthen coordination between stakeholders, improve quantity reliability and resource management, and support circular practices through structured inventories, material passports and lifecycle data continuity. Several reports also highlighted the value of BIM for safer and more predictable site operations when hazards and constraints are documented and communicated.

At the same time, stakeholders across countries stressed that EoL value depends on collaboration beyond the design office. Where processes are fragmented and responsibilities unclear, information is lost between phases and actors, and reuse decisions become conservative or impossible to verify.

Policy gaps and institutional needs

Across the five countries, stakeholders identified similar shortcomings in current national and EU-level enabling frameworks. These include the absence of consistent requirements for circular deliverables (traceability, inventories, reuse planning), limited incentives and support for SMEs,

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and insufficient institutional backing for demonstrators that turn circular ambitions into repeatable practice.

A strong transnational message was that public authorities must act as lead clients and market shapers. Stakeholders argued that without clear demand signals from public procurement and permitting, EoL digital deliverables remain optional and adoption remains niche. They also stressed the importance of publicly supported pilot projects to demonstrate measurable value and to produce practical templates that can be reused by SMEs.

National examples reinforced this. In Belgium (Wallonia), stakeholders pointed to large-scale circular redevelopment pilots such as the ACEC site in Herstal as evidence of how public support can embed circular thinking and create learning effects across the ecosystem. Belgium was also highlighted for GRO 2025, a structured public framework that can operationalise sustainability ambitions and translate them into procurement criteria, performance levels and monitoring approaches. Other countries stressed that even where policy frameworks exist, operational guidance and normalisation in tender practice remain insufficient, contributing to a "law-to-practice" gap.

Training and upskilling needs

Across all national reports, stakeholders strongly converged on the need for new skills and role profiles to enable EoL BIM uptake. The most frequently referenced needs were role-specific and practice-oriented training that combines digital competence with circularity and deconstruction know-how.

Stakeholders emphasised that training must be differentiated by professional profile: Workers and technicians need practical model/inventory handling, tagging and traceability routines; foremen and site managers need sequencing and coordination skills to translate digital outputs into site delivery; engineers and architects need EoL-focused information requirements, interoperability competence and the ability to integrate dismantlability and reuse into planning; and clients/public authorities need capability to specify requirements and evaluate deliverables.

Across countries, accessibility for SMEs was repeatedly highlighted. Stakeholders called for flexible, modular formats and hands-on methods such as workshops and site-based learning, and stressed that training must explicitly connect BIM to circular outcomes so that adoption is motivated by practical value rather than treated as an abstract digital exercise.

Stakeholder recommendations

Stakeholder recommendations converged on the following priorities:

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- Raise awareness among project owners and public authorities on sustainability, circularity and the benefits of BIM for EoL practices.
- Embed eco-design and deconstruction thinking in professional practice across new build and renovation, including earlier involvement of downstream actors.
- Develop integrated training programmes that combine digital tools with end-of-life planning, material inventories and reuse decision-making.
- Improve interoperability by harmonising data structures, standards and workflows to enable collaboration and traceability across the value chain.
- Strengthen cross-actor collaboration from the outset of projects, ensuring demolition and recovery stakeholders are involved earlier and information is preserved across lifecycle stages.
- Support investment in BIM-enabled circular practices, recognizing that initial costs can generate long-term competitiveness, compliance capability and environmental benefits—especially when digital deliverables are clearly defined and valued in procurement.
- Provide ready-to-use artefacts (minimum dataset templates, inventory forms and implementation checklists) to reduce administrative burden and accelerate consistent uptake.

Conclusion

BIM can become a practical enabler of circularity in renovation and demolition, but only if the enabling conditions are strengthened. Stakeholders highlighted the need for a combined approach that aligns policy and procurement demand, standardization and interoperability, targeted SME support, and role-based workforce development. Public authorities have a pivotal role in accelerating this shift by supporting demonstrators, normalizing EoL digital deliverables in public projects, and strengthening training ecosystems. With these conditions in place, the construction sector can translate BIM's potential into measurable circular outcomes and more resilient value chains across Europe.

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