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RCMI

Reclaimed Construction Material Insurance (RCMI)

Paving the way for the large-scale adoption of reclaimed construction materials

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The Circular Buildings Coalition (CBC) is a collaboration that convenes industry leaders who aim to accelerate the deployment of circular solutions as a way of securing a global built environment operating within planetary boundaries while ensuring a just transition. The CBC is an initiative of Metabolic, WorldGBC, WBCSD, EMF, Circle Economy and Arup. The CBC is funded by Laudes Foundation.

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List of abbreviations

BauGB	German Building Code
BGB	German Civil Code
CBC	Circular Buildings Coalition
CEAP	Circular Economy Action Plan
CO_2e	Carbon dioxide equivalent
RCMI	Reclaimed construction materials insurance
WorldGBC	World Green Building Council

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Executive summary

The white paper introduces an innovative insurance model tailored to the construction industry's use of reclaimed materials. This pioneering initiative, a result of a collaboration with different experts in the fields of insurance and circular construction, aims to provide comprehensive insurance coverage for reclaimed construction materials, addressing a significant gap in the market.

Beginning with a thorough market assessment, the document then examines the current state of the construction sector, highlighting the significant environmental benefits of integrating reclaimed materials. However, the paper also identifies a significant barrier: the lack of insurance products that adequately cover reclaimed materials, which hinders their broader adoption. The proposed RCMI is designed to overcome this obstacle by offering comprehensive coverage that equates the value and management of reclaimed materials with that of new materials.

The paper details the development process of the RCMI, highlighting the close cooperation with insurance providers, regulatory bodies and construction companies. This collaborative approach is essential to ensure that the product meets industry standards and legal requirements. Especially the partnership with VHV Versicherungen, an industry leader in the German insurance sector, is instrumental in formulating a product that aligns with both the needs of the construction industry and the regulatory requirements. The partnership with VHV included several workshops and discussions, which were pivotal in designing the insurance product, ensuring it addresses the current pain points of the customer side.

In contrast to traditional building and product liability insurance, the proposed insurance model offers an add-on module to existing building insurance policies. This module ensures that reclaimed materials receive the same insurance coverage as new materials, thus removing a major barrier to their wider adoption. The implementation strategy includes a carefully structured timeline. A pilot project with the aim to refine the insurance offering based on real-world application and feedback is scheduled for spring this year.

Following the pilot project and subsequent refinements, the RCMI will be launched in the course of 2024. The diffusion strategy for RCMI includes raising awareness through conferences, publications and leveraging networks within the construction industry.

In summary, the RCMI initiative, led by Concular in partnership with VHV Versicherungen, marks a significant advancement in promoting sustainable practices in the construction industry. By providing a reliable insurance solution for reclaimed materials, it paves the way towards a circular economy in construction, aligning with environmental sustainability goals and boosting market confidence in the use of reclaimed materials. This step towards incorporating reclaimed materials in mainstream construction practices not only fosters sustainability but also strengthens the market by reducing perceived risks and encouraging wider adoption.

1. Introduction

The construction industry stands as the world's largest contributor to pollution, responsible for a staggering 40% of CO_2 emissions and a whopping 60% of waste production (UNEP, 2022). This sector's substantial environmental impact is primarily driven by the carbon-intensive manufacturing of construction materials and inefficient waste management practices. A startling fact emerges: nearly half of the construction industry's emissions, equating to 20% of global emissions, stem from the production of these materials (UNEP, 2022). This alarming scenario has its roots in the prevailing 'take-make-waste' model, where construction materials are manufactured, used in buildings, and often discarded after only a brief service life, although many of these materials remain in excellent condition. Astonishingly, a mere 1% of materials are reused, with 13% going on to be recycled (Jacob & Kukovec, 2022).

There are significant efforts by policymakers to improve this situation. The European Union, for instance, has set ambitious targets within its EU Green Deal and Circular Economy Action Plan (CEAP), aiming to reduce 55% of construction sector emissions by 2035 (European Commission, 2019). The cornerstone of achieving this is transitioning towards a circular economy in construction. Various policies to stimulate the supply and demand for reclaimed construction materials have been drafted or are in the pipeline – essential steps towards realising these ambitious objectives.

Nonetheless, challenges persist, even after addressing the supply-and-demand aspects of reclaimed construction materials. This white paper utilises the concept of the waste hierarchy, a principle that prioritises material reuse over recycling due to the significant CO_2 and resource savings of reuse. As illustrated in Figure 1, the waste hierarchy locates the most desirable actions at its peak. 'Reduce,' positioned on top of the hierarchy, questions the necessity of producing new items. Just below sits 'reuse,' referring to the multiple uses of products or materials in their original form. This stage assumes critical importance, extending material lifecycles without incurring significant additional energy consumption or emissions. Reuse is a crucial strategy for conserving resources and energy while notably reducing greenhouse gas emissions, particularly CO_2. In contrast, 'recycling,' positioned lower in the hierarchy, entails breaking down materials to manufacture new products. Although superior to landfilling, recycling often leads to downcycling, resulting in lower-quality products. Moreover, recycling typically consumes more energy than reuse and generates increased emissions due to the requisite additional processing and manufacturing steps.

Our business model and, by extension, this white paper strictly focuses on the reuse strategy, an approach that maximises material use, minimises waste and substantially reduces our carbon footprint.

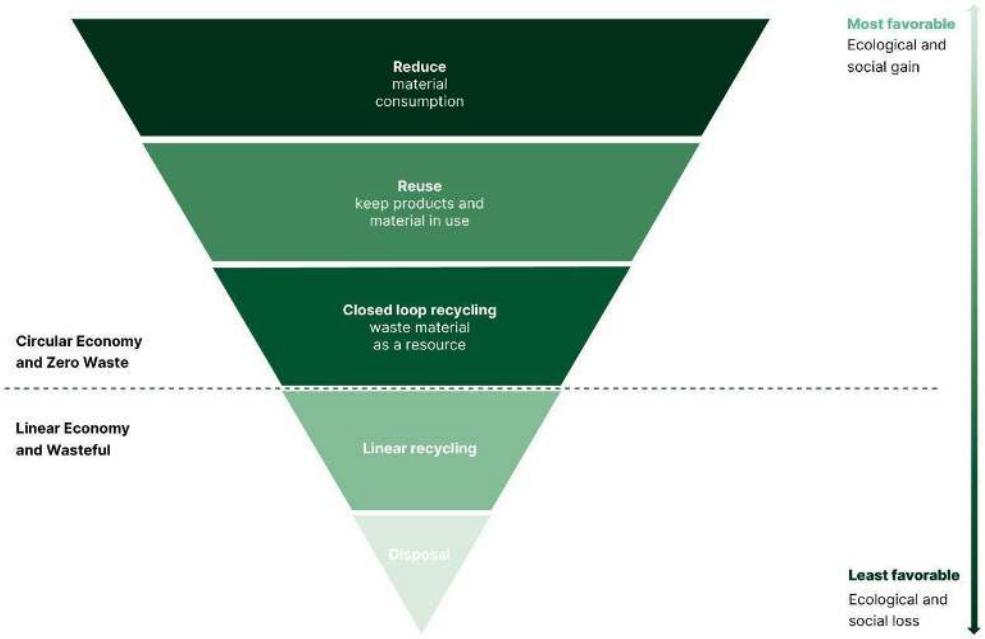

Figure 1. The waste hierarchy by WorldGBC
Source: Carpentier, 2022

1.1 Scope and objectives

The white paper's objective is to address the systemic challenges to circularity in construction defined by the CBC and strive to overcome them. A key focus is the field of material and supply chains, including addressing increased demand for recovered building materials, connecting supply with demand at scale, fostering the adoption of circular business models and encouraging innovative collaborations.

The scope of this white paper covers the analysis of the key problems encountered when using reclaimed instead of new materials in construction. It elaborates on a feasible solution to overcome these challenges and make the use of reclaimed materials more appealing. In the following, the main problem and its implications are outlined and the goal of the white paper is defined. The role of Concular and the other main parties involved is described briefly. In addition, readers should note that the white paper focuses on the German market, and insurance systems may operate differently in different countries. However, the paper's recommendations and the structure of the proposed insurance are developed in a way that accommodates adaptation to other markets.

The primary challenge associated with the utilisation of reclaimed construction materials concerns the uncertainty around who assumes responsibility for the materials' warranties. This lack of clarity poses significant financial risks. For instance, if bricks fail to meet the expected water permeability standards, an entire façade may need to be replaced, resulting in substantial costs. Consequently, insurance companies tend to carry out exhaustive tests before they provide coverage for reclaimed construction materials such as bricks. It is essential to note that these testing protocols are typically modelled after those applied to new materials by the manufacturers. This approach, while intended to mitigate risks, results in increased costs. The financial infeasibility of integrating reclaimed

construction materials into projects arises from insurance companies' reluctance to cover an entire building unless conformity with traditional testing standards is assured.

The goal of this white paper is to explain how insurance products for new construction materials currently work and how reclaimed construction materials can be included in them. The insurance product that we are developing and about to implement is called Reclaimed Construction Material Insurance (RCMI). The white paper serves as a resource to be used in the process of implementing the insurance product in partnership with leading insurance companies. This will decrease the risk of buying reclaimed construction materials and consequently result in wider acceptance of reclaimed materials, which will pave the way to being a standard option in construction.

1.2 Primary stakeholders

The white paper aims to present the current situation along with its challenges, highlight the need to overcome them and propose a solution. Its potential to serve as a valuable resource for insurance companies, project developers, manufacturers and architects makes it highly relevant. For insurance companies, the paper provides insights into the growing market of reclaimed construction materials, offering a blueprint for seamless integration into insurance portfolios. The paper advocates standardisation across the industry, establishing the insurance of these materials as a new norm.

With RCMI becoming a new standard, project developers as well as manufacturers will be encouraged to integrate reclaimed construction materials into their construction and manufacturing practices by observing the progress that is being made.

Architects inclined to use reclaimed construction materials often face challenges in convincing project developers to do so due to insurance-related concerns. The white paper equips architects with compelling arguments to facilitate discussions, aiding them in persuading clients to embrace sustainable materials.

1.3 Concular's role

Concular is the leading company for circular construction in Germany. Founded as recently as 2020, its team of 65 experts in six locations has already consulted on and executed more than 350 successful projects specifically focused on circular construction, gaining significant experience and developing new processes, digital tools and circular value chains.

So far, more than 10 million items have been reused in Concular's projects, which range from a single-family home to a 20-floor high-rise. These include a variety of materials, from bricks to lighting fixtures, and a wide range of buildings, such as residential buildings, offices, shopping centres and football stadiums. Up to now, the question of insurance has always been solved on a case-by-case basis. In small projects, the responsibility for the reclaimed construction materials is often assumed by the buyers of the materials. However, this approach is not suitable for larger projects. It would lead to very complex agreements between the seller of the materials, the construction company and the owners of the new object.

Beyond project execution, Concular's influence is seen in shaping the circular construction landscape. The company contributed to developing the first ever standard for circular construction (DIN SPEC 91484) and actively participated in creating a building resource passport for the German government.

In summary, Concular's role in this white paper reflects its general commitment to bridging the gap between insurance companies and project planners or developers. The company's expertise, practical experience and influential contributions to the field uniquely position it to lead the development of a blueprint for insuring reclaimed construction materials.

2. Methodology

Our approach to developing RCMI involved a multi-faceted strategy to ensure a comprehensive understanding of the concerns and challenges within the insurance market. In this chapter, our methodological approach is outlined and the individual steps of developing an insurance product are illustrated and explained.

In creating RCMI, we are following a general guide that outlines the systematic development and successful introduction of an insurance product. However, this is only being used as a guideline and may be adapted as the need arises. The step-by-step process is visually represented in the graphic below.

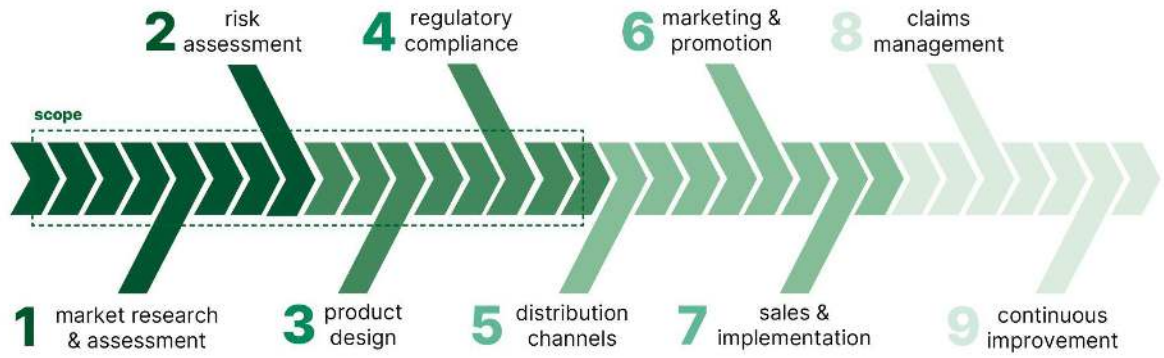

Figure 2. General process for developing and introducing an insurance product, with scope of white paper indicated

We started with an initial market research and risk assessment phase (steps 1 and 2) before proceeding to product design and establishing guidelines (steps 3 and 4). It is important to recognise that the subsequent steps (5-9) of distribution, sales, implementation and improvement are crucial components, integral to the finalised insurance product. However, for Phase 1 of this project, we predominantly focus on stages 1-4, addressing the foundational aspects of setting up the insurance product and laying the groundwork for its implementation. Steps 5 to 9 are strategically important for the second phase with the goal of a successful launch to market.

We started with a call to action to over 25 insurance companies to begin a discussion about possible insurance solutions. Simultaneously, it was essential to familiarise ourselves with the current predominant approach to insuring reclaimed materials and to understand the general workings of building insurance products. Extensive desk research and gathering the experiences of Concular team members and those from similar

companies provided valuable insights and sparked fruitful discussions about the current situation and the underlying problem.

After the initial research phase, our investigations led us to MOCEDI Modern Insurance Versicherungsvermittlung GmbH, a German-based insurance broker specialised in providing insurance solutions for the real estate industry, with a particular focus on commercial properties. MOCEDI's expertise in the field of insurance provided first insights into potential challenges and opportunities. MOCEDI also helped us identify and connect with suitable insurance companies.

One of these valuable connections was VHV Versicherungen, a leading German insurance company with a demonstrated commitment to environmental sustainability and a strong focus on innovation. VHV showed enthusiasm for our proposed insurance solution and expressed their interest in working with us on this project. They committed a team of four people, all with leading roles within VHV, to supporting our project. Over the course of six extensive workshops, we discussed possible approaches to the current insurance structure and learned a lot on the topic of insurance in general. Further information on the cooperation with VHV Versicherungen and the content of our workshops will be outlined in detail in Chapter 5.

Simultaneously, through our network we made contact with AIG, a global insurance giant renowned for its diverse range of products and services, including property and casualty insurance. We interviewed AIG representatives to gain additional industry perspectives. During the conversation, we presented our proposed insurance solution and received positive feedback regarding its potential benefits. AIG recognised the significance of addressing the risk associated with reclaimed materials but stated that for a company their size, the volume of the anticipated insurance sum is not sufficient to justify launching a new product.

Furthermore, we also received positive feedback from Gothaer, another prominent insurance company in Germany that has wide-ranging expertise, particularly in extended product liability as well as in the construction sector. Gothaer has shown a keen interest in our project and is in the process of setting up a small project team for an initial introduction meeting. This potential collaboration with Gothaer opens up exciting possibilities, particularly in the realm of product liability insurance, which could complement our existing focus on building insurance.

Additionally, our network facilitated introductions to two more key industry players: Flaxman Partners (also known as Flaxmans) and Lignum Risk Partners. The latter is a risk management consultancy with an extensive presence in the UK construction market and a specific focus on the sustainable building sector. Lignum's expertise in risk management aligns well with our general project objectives. Flaxmans is known as the UK's largest specialist in insurance dispute resolution and mediation. Therefore, the firm's insights into insurance-related issues are invaluable for our research. Flaxmans' vast experience in dispute resolution offers a unique perspective on potential challenges in the insurance landscape.

The interactions with all these companies have been essential in shaping our understanding of the insurance landscape and gathering insights from different segments

of the industry. It has also shown us that there is a lot of interest on the part of insurance companies in developing a product like the one we propose. To decrease the complexity of the task, we decided to focus our work on the partnerships with MOCEDI and VHV Versicherungen for the time being.

3. Key insights into the reclaimed construction materials market

To formulate RCMI, it is important to be familiar with the current status quo and future trends of the market for reclaimed construction materials. This chapter explores these crucial aspects, providing valuable insights into the current dynamics of that market in Germany.

3.1 Current state

In 2018, the carbon emissions related to material production in the construction sector made up 9% of the total carbon emissions. This corresponds to 5 Gt CO_2eq in 2018 alone, which once more highlights the sector's substantial environmental impact and the urgent need for rethinking the current waste of resources. These figures are visualised in the below charts (Sweco Group, 2022).

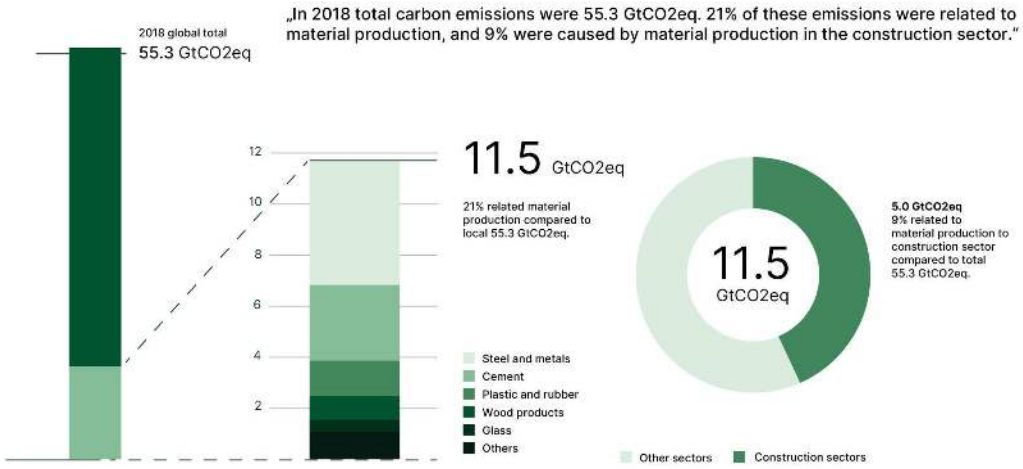

Figure 3. Global carbon emissions related to material production
Source: Sweco Group, 2022

To promote a sustainable and environmentally friendly construction industry, the EU has established ambitious goals for reusing and recycling construction and demolition waste. By 2030, the EU aims to achieve a reuse or recycling rate of at least 70% for all construction and demolition waste, with a specific target of reusing at least 50% of demolition waste (EEA, 2022).

The current market movements show that this shift in thinking of material usage and construction in general is arriving at even the biggest companies. Concular has been working with many companies from the construction industry to try to convince them to take back their products for resale. In Concular's network of partners, big industry players

such as Saint-Gobain, Clestra, Lindner Group and Wienerberger have been adapting and expanding their business models to embrace the principles of the circular economy. Clestra is focusing on reducing the environmental impact of office fit-outs by designing their products for reuse or repurposing rather than disposal. Additionally, Clestra has introduced a take-back system for its partitioning walls system. After a quality check, clean and, if needed, some retouching, the walls are being resold through a dedicated reuse channel. As a result, Clestra customers have the freedom to choose between new and refurbished products (Clestra, 2023).

Lindner is another pioneer in the field, having integrated sustainability and environmental protections into its corporate culture. The company's approach to circular construction is evident in its ReUsed Products line, which covers building materials designed for long-term reuse. Lindner also offers to take back used products such as calcium sulphate floor panels and refurbishes them for resale through its own channels (Lindner Group, 2023).

This is where Concular comes in, working to protect materials reclaimed from demolition projects from being recycled or discarded by connecting them with developers or, as in this case, with their original manufacturers. Over the past years, Concular has successfully reintegrated around 10 million items into the construction industry, allowing us to collect and analyse data on various material demands in the process.

The focus materials include:

- Stone
- Bricks
- Lighting fixtures
- Handrails
- Cables
- Tiles
- HVAC
- Sanitary fixtures
- Interior doors
- Exterior doors
- Windows
- Heating elements
- Wooden beams
- Steel beams
- Fire escapes
- Façade elements
- Fire resistance doors
- Furniture (chairs, shelves, cabinets etc)
- Partition walls
- Raised floor systems

This list was created based on the construction materials with the highest volume of sales. The list covers around 80% of the 10 million construction items sold via Concular in the past four years.

3.2 Legal basis and regulatory requirements in Germany

The significance of a strong legal framework for facilitating a swift transition to the circular economy is highlighted by a survey conducted by the Bavarian Chamber of Engineers (Bayerische Ingenieurekammer-Bau) in December 2022. According to the survey, 48% of respondents view changes in legal regulations as the primary driver for enhancing sustainable construction practices, while 24% propose strengthening financial incentives. These responses highlight that the government has both the authority and the responsibility to establish the fundamental prerequisites for a thriving market for reclaimed construction materials. The survey results are visually represented in the chart below (Bayerische Ingenieurekammer-Bau, 2023).

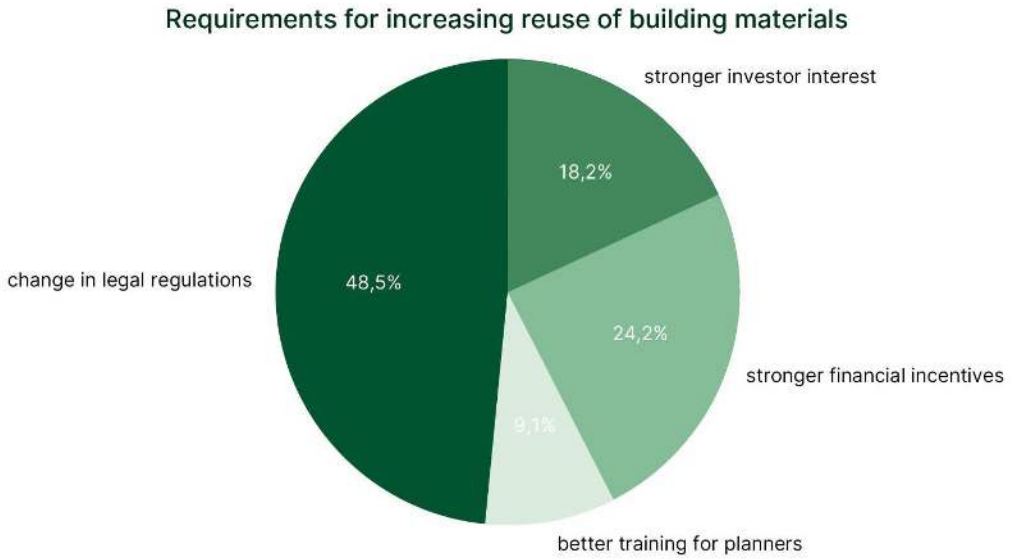

Figure 4. Survey results on the requirements for increasing the use of reclaimed construction materials
Source: Bayerische Ingenieurekammer-Bau, 2023

It can thus be concluded that legal hurdles persist in the field of circular construction practices and that new regulations are needed and demanded. In the following, we will summarise the current legal framework in Germany and outline the most relevant barriers that need to be tackled to clear the way for a market where, from a legal perspective, it doesn't matter whether the material is new or reclaimed.

The German Building Code (Baugesetzbuch, BauGB) is a comprehensive legal framework regulating various aspects of construction in Germany. It covers planning, zoning, safety and structural integrity. Although the BauGB doesn't explicitly mention the use of reclaimed materials, ensuring that reclaimed components meet safety and quality standards is an integral part of the BauGB. Even though products have been tested and certified for use in their original building, when they are reclaimed, some products such as fire doors have to be approved again before installing them in the new building. Rigorous testing, certification and documentation are therefore once more required. These time-consuming and expensive checks present an additional obstacle for planners wanting to use reclaimed materials. Since the BauGB is the primary legal reference for construction, no one wants to assume responsibility for the reclaimed materials' quality by trusting the initial testing approval. Currently, if a construction project involves using reclaimed construction materials, one of the involved parties needs to take on duty of care for these materials. For instance, if Concular is one of the parties of a construction project using reclaimed materials, it covers part of the materials' basic tests and with that takes on duty of care, meaning Concular is responsible for their safety. Another scenario is that manufacturers take on responsibility for a material when it passes through their take-back system. However, this option cannot be used consistently since it is only applicable to certain materials. For example, in many cases, such as steel beams, it can be difficult to track down the original manufacturers or they have ceased trading. However, in the case of interior materials such as raised floors, the manufacturers are usually well known.

The German government is aware of the importance of circular construction practices and is in ongoing discussions about potential updates of the BauGB to address the implementation of reclaimed materials and to support circular construction in general (Hoffmann et al., 2023). The first step in this direction would be to adapt the regulations regarding construction-related recycling from 2018 that followed the implementation of the German Circular Economy Act (Kreislaufwirtschaftsgesetz, KrWG) (European Commission, 2018). The document stipulates how to handle and process construction waste to make it suitable for reuse. This involves protocols for sorting, cleaning and categorising materials. However, these regulations are not sufficient because they focus primarily on construction waste and strategies for recycling it, while lacking specific guidelines and strategies for supporting a market specifically for reclaimed construction materials. For a robust reclaimed materials market, there needs to be a framework that encourages the procurement and use of such materials in new construction projects. But one must also recognise that the recycling regulations are a step in the right direction, and that in general the current legislative trend at the national and the European level offers a positive outlook for circular construction practices. One example is the revision of the EU's Construction Product Regulation (CPR) which will be introduced this year. The revised CPR will introduce performance sheets for products which are especially of interest in the case of reuse. In doing so, it will include reclaimed construction materials for the first time and expresses a preference for reclaimed over new construction materials (Circular Economy – Consilium, 2024).

3.3 Challenges

As the materials used in construction range from materials with strict technical requirements to those for which requirements relate more to aesthetics, risk assessment factors equally vary.

Strategies for continuous risk monitoring and adjustment of insurance products based on risk assessments for reclaimed materials have to be created in the process of the development of RCMI.

Crucial in risk assessment is the consideration of factors such as material quality, structural integrity, historical data and compliance with regulations.

The main factors we identified are described below.

1. Quality and durability

Inconsistency: reclaimed materials often come from various sources, leading to variation in quality and durability. The challenge lies in ensuring that these materials consistently meet the required structural and safety standards, as inconsistencies may compromise the overall integrity of the construction.

Example: A building that needs 100,000 bricks might procure the bricks from different sources, increasing the risk due to potential variation in quality and durability.

2. Hidden defects and contaminants

Unknown history: reclaimed materials may have a history that is not easily traceable. Hidden defects, damage or contamination from previous use (e.g. exposure to chemicals or hazardous substances) could pose risks that may not be immediately apparent during the construction phase.

Example: Wooden beams may have been treated with wood preservers, but this was not documented.

3. Legal compliance

Evolving standards: Building codes and regulations are typically designed with new materials in mind. Reclaimed materials may not always align perfectly with these standards, requiring careful assessment and potentially necessitating modifications to meet current regulatory requirements.

Example: Windows older than five years normally no longer meet current standards.

4. Insurance and liability

Risk perception: Insurers may perceive the use of reclaimed materials as riskier compared to new materials. This perception can affect insurance coverage and premiums, potentially increasing the overall cost of the project.

Example: A thoroughly checked steel beam can still be considered a risk as there is no history of when and where it was produced.

However, most of these challenges can be effectively addressed through thorough testing and inspection of materials before their installation in the building. The intended use of the material plays a crucial role in this context. For instance, the inherent risk of defects in a server cabinet is incomparable to that of a malfunctioning fire door or porous bricks. Consequently, the extent of inspections required and the evidence necessary for insurance coverage must be determined based on the product group, ensuring that materials can be insured with confidence.

3.4 Future developments

In 2022, the European market for hardware and building materials achieved a substantial revenue of €162.44 billion, demonstrating the significant scale of this sector. This market is on an upward trajectory, with projections suggesting it could reach €233.95 billion by 2030 (Statista Market Insights, 2023). These figures not only highlight the extent of the construction materials market, but also underscore its potential for continued growth in the coming years.

However, amid this growth there is a pressing environmental concern. As of 2022, the reuse rate of construction materials in Europe was disconcertingly low, at approximately 1%. This means that a staggering 99% of these materials ended up being landfilled, incinerated or relegated to low-value applications, according to a report by the United Nations Environment Programme (UNEP, 2022). This stark reality underscores the urgent need for a paradigm shift towards more sustainable practices in the construction industry.

In response to this challenge, the European Commission has set an ambitious target: by 2030, 50% of construction materials should be reclaimed. This goal is not only

environmentally imperative but also economically significant. If this target is met, the revenue generated from reclaimed materials could amount to around €117 billion by 2030, as illustrated in the accompanying graph. Such a development would mark a substantial shift in the industry, steering it towards more sustainable and circular construction practices.

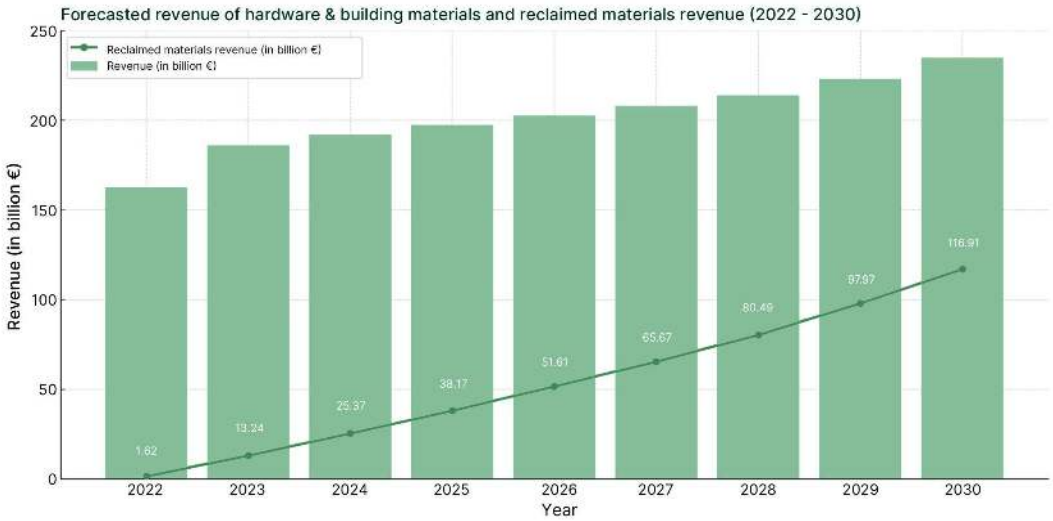

Figure 5. Forecast revenues of hardware, building materials and reclaimed building materials
Source: Authors' own illustration, based on Statista Market Insights, 2023

These figures are based on assumptions and forecasts and should only be used to give a general impression of the potential market share of reclaimed construction materials. When lowering the target of the EU Action Plan to 50% of construction materials being categorised as circular by 2030, the revenue is slightly lower at $70 billion (~ €65 billion) by 2030, but this still confirms the relevance of the sector (European Commission, 2020; Pulidindi & Bhalerao, 2021). Companies such as Concular are gaining momentum by harnessing the potential for national and international coordination and collaboration, thereby establishing a more extensive network for the supply and demand of reclaimed materials.

4. Insurance market for construction materials

The following chapter includes a comprehensive examination of the current insurance market in Germany. This section aims to analyse different insurance types, presents an overview of the existing landscape and pinpoints challenges and shortcomings within the niche for insurance for reclaimed materials.

4.1 Types of insurance

In general, insurance is a contract between an individual or organisation (the insured) and a company (the insurer) in which the insurer agrees to pay for specified losses or damages in exchange for a premium paid by the insured. Insurance can be used to protect against a wide range of risks. In the construction industry, building insurance and product liability insurance are particularly important, and therefore a clear distinction between them is necessary for the purpose of our analysis.

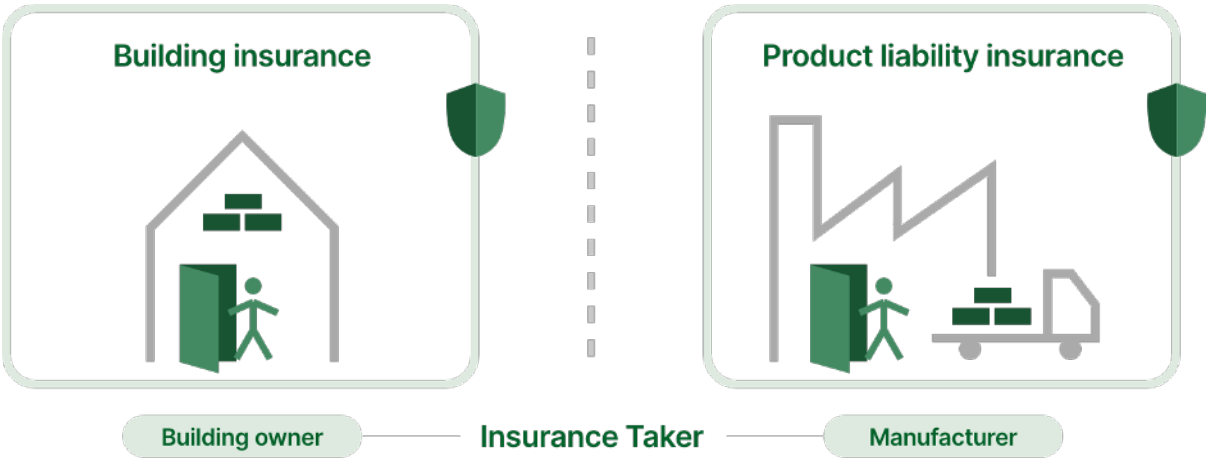

Figure 6. Distinction between building insurance and product liability

Building insurance safeguards against damage to the construction materials of a building. This encompasses protection for the building's components, including walls, roofs, floors and other structural elements. Coverage often extends to damage caused by fire, natural disasters, theft, vandalism, malfunction of materials and other perils. In Germany, every building is required to have building insurance. The policyholder is normally the building owner.

Product liability insurance steps in when the materials or products used in construction projects cause damage or harm. In the construction industry, this type of insurance covers the risks associated with the materials incorporated into the building. For instance, if a construction material fails to meet expected standards and causes damage or injury, product liability insurance provides protection. It ensures that the parties involved, including manufacturers, suppliers and construction companies, are financially safeguarded against legal claims arising from defective construction materials. The policyholder is normally the manufacturer of the product or material.

Understanding and selecting the right combination of these insurance types is paramount for stakeholders in the construction industry. Building insurance secures the assets, while product liability insurance shields against potential risks associated with the materials used, creating a comprehensive safety net for construction projects.

4.2 Current status of insurance for reclaimed materials

The use of reclaimed materials in the construction industry in Germany is growing, as there is a growing awareness of the environmental and economic benefits of this approach. However, one of the challenges of using reclaimed materials is that they may not be covered by traditional insurance policies. New insurance products are needed to close the gap between new and reclaimed materials regarding insurability.

As an example, if a building owner uses reclaimed bricks for the construction of their new house and the bricks turn out to be porous, causing water to get into the building, the building owner may not be able to file a claim with their building insurance company. This is because building insurance policies typically only cover damage caused by defects in new materials, but not damage caused by defects in reclaimed materials. There are a few reasons for this. First, reclaimed materials may have been used in a variety of structures

and conditions before they were reclaimed, making it difficult to assess their condition and potential for defects. Second, reclaimed materials may have been improperly stored or handled, which could have exacerbated any existing defects or created new ones. Because of this, building owners who use reclaimed materials in their buildings may want to consider purchasing additional insurance coverage that specifically addresses the risks associated with these materials. This type of insurance would cover the cost of replacing defective reclaimed materials as well as the cost of repairing the damage caused by these defects. However, no such insurance currently exists in Germany, and building owners may be responsible for repairs and cover all costs by themselves.

Cycle Up's insurance policy

Elsewhere in the EU, the necessary insurance concept has already been implemented: Cycle Up, the French counterpart to Concular, introduced its insurance product in January 2023. This insurance, known as Cycle Secure, focuses specifically on materials purchased through the Cycle Up platform, and comes at no cost to the buyers of these materials. It provides coverage within the first 12 months after purchase and insures all inherent defects which make the material useless for its intended purpose. It does not typically cover damage caused by transport and installation. Additionally, Cycle Up offers Cycle Protect, an optional paid extension that goes beyond the basic protection provided by Cycle Secure, providing buyers with an extra 12 months of coverage, active support from Cycle Up in handling claims, and reimbursement of damages resulting from product defects (Cycle Up, 2023). These insurance policies provide security for buyers and consequently can improve the position of sellers of reclaimed materials, since their buyers' risk is minimised. However, there are some shortcomings. First, both insurance policies only cover interior and exterior materials that are not used for structural purposes, not used as part of a façade, are not electrical and will not come into contact with rain. Second, they exclude the coverage of several consequential damages and arising costs even when they clearly result from the purchased material. Therefore, this insurance can be compared to a limited product liability insurance policy that will not cover large parts of the materials nor any huge damage arising from defects.

Statutory warranty

Insurance is not the only way to reduce risks. Warranties can also step in and avert the costs of damage to the contractor. The German Civil Code (Bürgerliches Gesetzbuch, BGB) defines a statutory warranty that covers defects that occur within five years of the completion of works. This includes defects in the materials used, in workmanship and in design. If a defect occurs within the warranty period, the contractor is required to repair or replace the defective work at their own expense (PlanRadar, 2023).
The point of note here is that for products, a warranty of two years from the purchase date generally applies. However, construction materials are subject to an exception, extending their warranty period by an additional three years (Bundesministerium der Justiz, 2023). This difference in warranty periods reflects the understanding that construction materials are expected to have a longer lifespan and, therefore, should be covered for a more extended period to ensure their quality and performance.

The statutory warranty holds significant value and importance for end consumers. However, it also presents a challenge for construction companies and acts as a hindrance to the growth of the reclaimed construction materials market. Usually, the company that

installs the construction materials bears the risk of damage and must, in the event of construction defects and damage, rectify them at their own expense. This is why many construction firms may find it unappealing to use reclaimed construction materials, as they carry a higher risk of potential defects compared to new materials. Therefore, for the first five years, insurance essentially acts as a safety net for construction companies. It provides a financial cushion to cover the costs associated with addressing defects or damages that may arise from using reclaimed materials. After the warranty period has ended, insurance covering potential damage to the building is of high relevance for the owner since it is the only security the building has.

4.3 Insurance for reclaimed materials: challenges and gaps

The current status of insurance for reclaimed construction materials presents several notable challenges and gaps, which we aim to outline and clarify below.

A significant hurdle is the absence of a comparable insurance product in the market. Creating insurance coverage specifically designed for reclaimed construction materials implies starting from scratch. Unlike established types of insurance, where a wealth of historical data informs policy structures, pricing and risk assessments, reclaimed materials insurance lacks this important historical background.

It is worth noting that even existing models, such as Cycle Up's insurance in France, do not align entirely with our vision of insurance for reclaimed construction materials. Cycle Up's offering leans more towards a product warranty, which differs from our more comprehensive insurance idea. In Germany, a statutory warranty of two to five years already applies, making standalone product liability insurance less relevant or effective. The absence of a fitting insurance model in the market demands a unique approach to creating an insurance solution for reclaimed materials.

Another substantial challenge revolves around the lack of comprehensive market data and experiences on reclaimed construction materials. For traditional building materials, data is widely available, not only on demand and price ranges but also on practical experiences, but for reclaimed materials there is a notable gap in the available information. This absence of critical market insights makes it challenging to develop a finely tuned insurance product that aligns with the unique dynamics of this emerging sector.

Navigating these challenges and gaps is central to our project. Although the field might be mostly unexplored, it is through addressing these issues that we can pave the way for RCMI, aligning with the vision of a sustainable and environmentally conscious construction industry.

5. Reclaimed Construction Material Insurance (RCMI)

In the previous chapters, we comprehensively examined the current state of the insurance market in Germany and the market for reclaimed construction materials, along with the legal basics and the existing challenges in this domain. Going forward from there, we have started to create a new insurance product, as there is no general solution on the market yet. The result of it, RCMI, is introduced in this chapter. We will focus on the development process, its features and its legal compliance.

5.1 Development process of RCMI

The development of RCMI started with grouping those materials that take up 80% of Concular's material sales into different categories to better understand the different requirements of the insurance product. These categories are intended to form the base for different grades of insurance coverage and its costs. For the insurance company, it makes sense to consider not only a material's insurance risk but also the expenditure involved in testing it for quality and stability. The insurance risk is defined as the financial risk of the various eventualities – cases of potential damage – that need to be covered. The second criterion, shown on the y-axis on the chart below, relates to the time and effort it takes to test the material, which should also be covered by insurance. Based on these criteria, we have created a matrix for the most popular reclaimed materials from Concular by assessing insurance risk and testing expenditure.

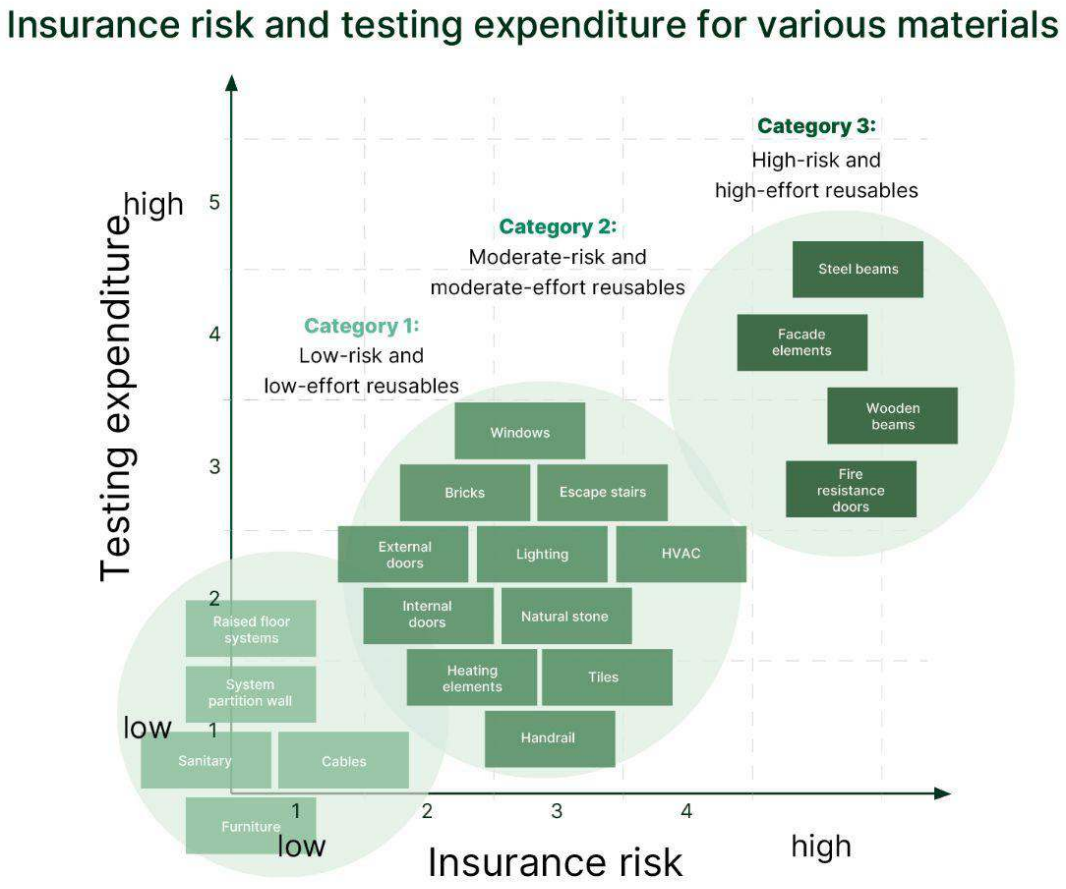

Figure 7. Insurance risk and testing expenditure for various materials

Overall, it is noticeable that three distinct categories emerge due to varying testing requirements and insurance risk levels: low-risk and low-effort reusables, moderate-risk and moderate-effort reusables and high-risk and high-effort reusables.

These categories and their different use cases need to be tested and reviewed and can then be developed into a standardised solution. The goal is to define these categories in a way that ensures each reclaimed material can be allocated to one of them, simplifying the process for the insurance company.

In our discussions with various experts from the insurance sector in the development phase, we learned that insurance is quite complex in terms of what is insurable under which circumstances. There are different conceivable insurance products depending on actual transactions and states of ownership of the material. In an industry as fragmented and diverse as the construction industry, the stakeholders vary drastically, too. It is important to be aware of different scenarios regarding potential stakeholders. The following types of stakeholders were considered in the development of our insurance for reclaimed construction materials:

- building owner
- construction/demolition company
- testing facility
- seller of reclaimed construction materials
- insurance company
- buyer of the materials

The next step was to hold six intensive workshops with VHV Versicherungen to discuss the current approach and go through different scenarios regarding different stakeholder groups and material categories as well as types of damage. The findings of the workshop will provide the basis for the structure of the final insurance product.

Risk assessment

Effective risk assessment is a cornerstone for insurers, enabling comprehensive customer coverage while ensuring financial stability. The development of a risk assessment methodology was a key topic right from the first meeting with insurance companies. Two major focus points emerged: methodologies relevant to the reclaimed materials industry, and factors affecting insurance options.

The adoption of reclaimed materials offers significant benefits, but it is vital to acknowledge and address potential risks. Insurance companies play a pivotal role in mitigating these risks through tailored insurance products and risk-premium calculations. However, discussions with insurance agents revealed a lack of standardised products for reclaimed materials. This highlights the need to build an insurance product that addresses both customer needs and insurer risks, and that can be adapted based on the insurance framework. Risks can range from minimal (covering guarantee cases only) to substantial (encompassing personal injuries from damaged reclaimed materials). In the course of the discussions, it became clear that the insurer needs proof that the reclaimed material is in good condition, especially regarding safety concerns, since the risk assessment is based on the material's quality and possible damage. Uncertainty around quality and therefore risk levels potentially leads to a higher premium. Hence, a reliable and predetermined test procedure or certification must be established. One option could be to assume a limited

version of the DIN certifications by the German Institute for Standardisation or to use them as a guideline for defining the minimum requirements of the material for a quality certificate. This is one of the main topics that will be discussed and defined within the upcoming workshops.

5.2 Product features

After extensive discussions with the project team of VHV Versicherungen on how to best establish such insurance, we have concluded that contrary to the initial idea of offering product liability through Concular, it would be more effective to set up an additional insurance module that works as part of general building insurance. This new module, called RCMI, can be taken out by new and existing customers in addition to their general building insurance.

The module can be illustrated as follows:

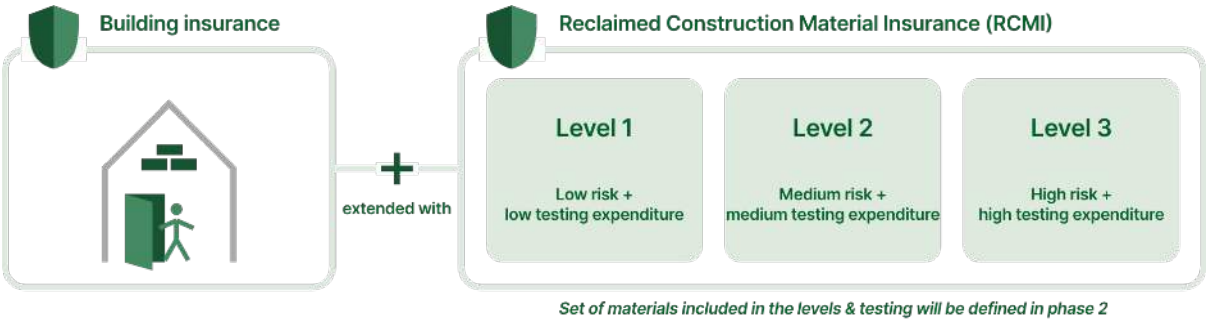

Figure 8. Illustration of the functionality of the insurance

Customers can add the RCMI extension to their regular insurance product, choosing the appropriate level. The lowest level includes construction material categories with the least testing requirements and the lowest risk. The highest level includes construction material categories with the most intense testing requirements and the highest risk. This is adapted to the categories identified in Figure 7 in Chapter 5.1.

The finalised construction material categories and testing requirements are to be defined during the upcoming workshops. While initial proposals have been developed, they have not yet been authorised for publication. Our primary aim is to establish testing requirements that prioritise safety while minimising unnecessary burdens.

To achieve this, we are taking a pragmatic approach by drawing upon existing standards such as the DIN requirements. From these established standards, we will utilise only the essential testing requirements necessary for ensuring the safety and quality of reclaimed construction materials. This approach aligns with our goal to strike a balance between stringent safety standards and the practicality of implementation.

This approach facilitates the use of multiple reused products and materials, encouraging customers to incorporate various reused materials, since when concluding RCMI there is no difference between using new or reclaimed materials from an insurance perspective. Additionally, RCMI simplifies not only the customer journey but also the administrative effort, since there is no need to insure every kind of reclaimed material separately. Instead, one insurance policy will apply to the entire building, covering all kinds of

materials of the corresponding material category. Within this structure, Concular is not a contracting partner but takes the role of an intermediary, suggesting taking out RCMI to its customers when buying materials from them. Concular supports the development of the insurance product with insights from its extensive network in the construction industry and its own business by providing essential market data, information on material testing, and quality certifications. By mitigating the risks associated with reclaimed materials, usage of these materials becomes more accessible to a wider range of customers. Furthermore, obtaining the insurance requires only a single contract, whether for insuring a single material or an entire building constructed mostly with reclaimed materials. This streamlined process could lead to an increase in the sales volume of reclaimed materials.

Once the additional RCMI module is activated, there will be no discernible difference for customers in the event of a claim, regardless of whether the affected material was new or reclaimed. The claims processing, extent of coverage and cost coverage will be the same as it would be with new materials, ensuring a seamless and consistent experience for customers as well as the insurer. This means that no new processes need to be established – RCMI simply expands the scope and coverage of current insurance products, making it a versatile and user-friendly solution for the large majority of customers.
This approach brings us one step closer to the goal of making reused materials the standard in construction, rather than an exception.

Regulatory compliance

After the product has been designed, due diligence regarding regulatory compliance has to be followed, with a special focus on the legal constraints within the regulations governing both the construction and the insurance sector.

In the upcoming workshops with VHV Versicherungen, the conditions will be defined, the risk assessment carried out and the next steps prepared. The product design proposed by us will also be adapted, based on VHV's experience and regulations. The findings and learnings from these discussions will form the basis for further workshops and additional prototype projects.

With the publication of a letter of intent to develop RCMI with VHV Versicherungen, we demonstrate our keen interest in continuing to collaborate with them. The letter of intent furthers our professional relationship and lays the foundation for transparent communication, mutual understanding and coordinated efforts towards the project's success.

6. Diffusion of RCMI and next steps

In this chapter, we present our diffusion plan for the insurance initiative, outlining the core impact outcomes, stakeholder involvement and our next steps. Our initiative seeks to create a bespoke insurance solution that encourages the use of reclaimed materials in construction. By bridging the gap between reclaimed materials and insurance coverage, we aim to enable widespread adoption of reclaimed materials, reducing waste, saving resources and having a positive environmental impact.

In the upcoming months, we aim to:

1. Develop and test a tailored insurance product.
2. Establish partnerships with key stakeholders, including major customers, VHV Versicherungen and regulatory bodies.
3. Initiate a pilot construction project to refine the insurance offering.
4. Introducing the product to the market.
5. Raise awareness of the new insurance product among our target group.

Our diffusion plan prioritises comprehensive outreach and collaboration. The focus lies on the collaboration with insurance companies and regulatory bodies to align our product with industry standards. To reach potential customers and other interested parties, we will attend and speak at conferences, publish articles and keep our customer base updated. To ensure practical implementation, a pilot project with one of our customers is the key component for the feedback phase.

Developing this initiative has taught us that insurance is a complex domain but there is readiness for change in the market. This underscores the importance of innovation, collaboration and passion in overcoming challenges.

6.1 Main actors and actions taken

The successful diffusion of the RCMI initiative relies on active engagement with various key stakeholders. In this section, we identify and discuss the primary actors in the diffusion process and outline the actions and initiatives taken to promote the adoption of our insurance product.

3. Insurance providers

Insurance providers such as VHV Versicherungen, Gothaer, AIG and Flaxman Partners play a pivotal role in the development and diffusion of RCMI. Collaborative efforts have been initiated to align the RCMI offering with industry standards and demands. These engagements include workshops, discussions and in-kind services from VHV Versicherungen which significantly aid in the refinement and development of the insurance solution. VHV's commitment was bolstered by signing a letter of intent that legally commits VHV Versicherungen to providing the agreed-upon work and developing the RCMI product.

2. Construction companies and architecture firms

Companies from the construction sector represent our core user group for RCMI. To thoroughly understand their needs and encourage adoption, we have discussed their customer journey when supplying reclaimed materials and identified the pain points. Additionally, we will conduct a pilot project with an architecture firm to test RCMI in real-world

scenarios and for different cases of damage; the feedback will be incorporated and used to refine the final insurance product. A pilot project has already been identified and a letter of intent was signed ensuring that RCMI will be applied to the project. The building owner of the construction project is already in talks with VHV Versicherungen to ensure swift progress.

3. Regulatory bodies

Regulatory bodies are essential to ensuring compliance and alignment with legal and industry standards. Discussions and collaborations with different insurers as well as with official regulatory bodies such as the DIN Institute or the regional organisation BLB NRW have been initiated to address legal questions, risk mitigation and necessary regulatory adjustments. These interactions are crucial in navigating the complex regulatory landscape and ensuring the insurance product's legitimacy.

Incorporating these stakeholders ensures that our insurance product is a collaborative effort, adapted to the demands of the construction industry.

6.2 Next steps

As previously mentioned, the development of RCMI is scheduled to occur during several in-person workshops in spring 2024. The primary objective of these workshops is to gain a comprehensive understanding of the customer journey, identify pain points and draft an initial insurance product framework. Furthermore, it will play a pivotal role in addressing legal considerations and providing clear definitions.
This workshop will take place at different locations, facilitating the inclusion of other experts if necessary.

To ensure the workshop's effectiveness, all participants, including our insurance partner and other stakeholders, will engage in scenario-based exercises. These simulations will explore various needs, insurance cases and potential outcomes, grounding our discussions in real-world scenarios. In addition to the February workshops, we have planned further workshops throughout the year. Their purpose is to refine and develop RCMI effectively.

Following this, we will fine-tune the insurance product's structure in close collaboration with relevant stakeholders and expand its coverage to include other product categories. We have already identified a construction project that is willing to apply RCMI to the project. It involves a renowned architectural firm that is planning to utilise a variety of materials from one of our dismantling projects and incorporate them into its project in Stuttgart. The material focus of the reclaimed construction materials for this project is on façade elements. Given the size and timing of the project as well as the diverse range of materials involved, this serves as an ideal pilot project that will yield valuable insights and critical feedback. A letter of intent has already been signed and talks between the building owner and VHV Versicherungen have been initiated.

Once we have incorporated this feedback and finalised RCMI, we will work towards the product launch which will take place in the course of 2024. After the launch, our focus will be twofold: inviting feedback and promoting RCMI. We intend to achieve this by delivering speeches at conferences, publishing articles in relevant journals, contacting our existing customer base and utilising Concular's and VHV's communication channels. Furthermore, as we progress to the project's second phase, we plan to proactively disseminate the

concept. Although the product may not be available on the market at this point, we aim to notify potential customers and serve as an inspirational lighthouse project through articles and engagements with stakeholders.

Throughout the process, continuous improvement remains a fundamental principle, with the ultimate goal of standardising our approach and products to gain widespread acceptance within the insurance landscape. From a legal perspective, the letter of intent by VHV plays a pivotal role as it establishes the groundwork for transparent communication, mutual understanding and coordinated efforts to ensure the project's success. We are therefore delighted that VHV Versicherungen has taken the significant step of signing it.

This iterative approach, including ongoing workshops and collaborative development processes, will be instrumental in achieving our goals and will pave the way for a successful product launch.

7. Conclusion and outlook

The market for reclaimed construction materials is in an early phase but it is growing. Currently, a small percentage of buildings are already being planned according to circular principles. In the future (as indicated by the efforts of the EU, the German federal government, the German states and the CBC) regulatory measures and the growth of supply and demand for reclaimed materials coupled with a decrease in the supply of primary raw materials will significantly increase the market share of reclaimed materials. While our project currently focuses on Germany, an interest in this type of insurance has been expressed across Europe, demonstrating that insurance is one of the major hurdles for usage of reclaimed materials in construction. This also implies that the market for this type of insurance is substantial and subject to growth.

In the broader scope, we aim to create insurance coverage for reclaimed materials by tailoring solutions initially for specific needs, proving market value and demand. The phased approach allows for testing and refinement, and the goal is to achieve a point at which both new and secondary materials are equally insurable, following standardised rules of warranty, insurance and security. Continuous improvement, efficiency benefits and scalability are expected post-launch, contributing to the overall growth and acceptance of RCMI in the construction industry.

In conclusion, while the use of reclaimed construction materials offers opportunities for sustainable construction, it requires careful risk assessment and management to address the unique challenges associated with the quality, history and regulatory considerations of these materials. Collaborative efforts between stakeholders, including architects, construction companies and regulatory bodies, are essential to successfully navigate these challenges and unlock the full potential of reclaimed materials in construction.

Our initiative is critical for the construction industry, as it addresses a crucial gap in the market. It promotes the sustainable use of reclaimed materials, contributing to environmental goals. This initiative is unique and pioneering, emphasising its importance and relevance in the industry.

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