



Funded by  
the European Union



Halonen et al.

# **Legal and technical requirements in reusing precast concrete**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No958200.

<b>Publisher / project</b>	Reusing precast concrete for a circular economy
<b>Project acronym</b>	ReCreate
<b>deliverable</b>	D8.2 Document on legal and technical requirements for reuse planning and building permits
<b>Lead beneficiary</b>	TAU
<b>Author(s)</b>	Tommi Halonen, Aapo Räsänen, Paul Jonker-Hoffrén and Satu Huuhka (TAU), Tove Malmqvist and Ahmad Al-Najjar (KTH), Marcel Vullings (TNO), Simon Wijte (TU/e), and Jakob Fischer and Christoph Henschel (BTU)
<b>Dissemination level</b>	Public
<b>Cite this document</b>	Halonen, T., Räsänen, A., Jonker-Hoffrén, P., Huuhka, S., Malmqvist, T., Al-Najjar, A., Vullings, M.W.F., Wijte, S.N.M., Fischer, J. & Henschel, C. (2023). <i>Legal and technical requirements in reusing precast concrete</i> . The ReCreate project.
<b>Disclaimer</b>	The content presented herein reflect the authors' views. The European Commission is not responsible for any use that may be made of the information this publication contains.

# Abstract

**This report discusses all the relevant EU, national and local level regulations that must be considered when deconstructing or reusing concrete elements in the ReCreate project countries (Finland, Sweden, the Netherlands, and Germany).**

The results presented in the document are mostly based on desk studies which are, in some sections, complemented with interviews of authorities. The interviews were used particularly in sections that discuss norms whose practical implications contain ambiguities. However, although the interviews clarify some matters, the aim of the report is not *per se* to draw definitive conclusions on all the issues discussed in the document. This will be done in a future report (ReCreate deliverable D8.3.) that will complement theoretical or analytical perspectives of this document with the empirical insights and experiences from the pilots.

The document is divided into two main chapters, which will discuss the most relevant norms on (1) deconstruction of precast concrete elements, and (2) the reuse of such elements. The chapter on deconstruction explores regulations which govern deconstruction permits, waste management, local environmental protection, and occupational safety. The chapter on reuse discusses the requirements set by regulation on technical matters, designer qualifications, product approval, and building permits. In addition, the chapter investigates what impact sustainability policies have on reuse of building components.

All the norms are discussed in the document from the viewpoint of reusing precast concrete elements or, more generally, building components. This way, the goal is to keep observations of the document as practically relevant as possible.

The document ends with a discussion chapter drawing conclusions on the state of re-use norms in different countries. Furthermore, the conclusions examine such crosscutting topics or groups of issues among the countries which hinder the development of reuse in ReCreate countries. The chapter suggests that the following topics should receive attention from developers who aim to overcome the legislative barriers: (1) Interpretation and practical implications of waste legislations, (2) a clarification of technical requirements for reused building components, (3) the product approval of reused components, and (4) concretization of sustainability policies. These issues will be at the hearth of the future ReCreate report (D8.3) as well.

# Acknowledgements

The authors thank Tina Appelqvist from Helsingborgshem for insights regarding the Swedish regulation.

# Contents

1. Introduction.....	1
2. Norms on deconstruction.....	2
2.1. Deconstruction/demolition permits .....	3
2.2. Waste management .....	7
2.3. Local environmental protection .....	16
2.4. Work safety.....	21
3. Norms on reuse.....	31
3.1. Technical requirements.....	32
3.2. Product approval .....	38
3.3. Designer qualifications .....	43
3.4 Building permits.....	47
4. Global environmental pollution and sustainability goals .....	51
5. Discussion.....	61
5.1. Influence of waste regulation.....	61
5.2. Suitable technical requirements.....	63
5.3. Product approval practices.....	63
5.4. Concretisation of sustainability policies .....	64
6. Conclusion .....	66
References.....	67

# Abbreviations

CDW	Construction and Demolition Waste
CE mark	<i>Conformité Européenne</i> mark
CPR	EU Construction Products Regulation
DoP	Declaration of Performance
EC	European Commission
EoW	End of Waste
EPA	Environmental Protection Agency
ETA	European Technical Assessment
GHG	Greenhouse gas(es)
hEN	Harmonised European product standard
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
SDG	UN Sustainable Development Goal
UN	United Nations

# 1. Introduction

**This document is the first of a set of two reports (ReCreate deliverables 8.2 and 8.3) that are linked to necessary public policy change when the construction sector in the EU transitions from linear construction towards circular construction. Together, the reports will provide a comparative legal analysis of the EU, national and local norms that guide the reuse of the precast concrete elements in the ReCreate piloting countries. In addition, the reports will examine whether any regulations, or administrative practices or interpretations constitute barriers for reuse. As a result, an assessment of the need to develop regulation or professional practices will be delivered.**

The current report, which is the first of the two, construes the foundations for achieving these goals. It explores all the relevant EU, national and local level regulations that must be considered when deconstructing or reusing precast concrete elements in the ReCreate piloting countries (Finland, Sweden, the Netherlands, and Germany). Thus, the main aim of the report is to provide a state-of-art analysis of the current legislative regimes from the point of view of the different countries.

The results presented in the document are mostly based on the legal studies, literature reviews and interviews of both internal and external experts (ReCreate consortium members, and authorities, officers and other experts, respectively). The current report is not intended to dive deep into empirical examination, but to document the state-of-the-art and by doing so, lay foundations for further work. An in-depth analysis of the experiences from deconstructing and constructing the ReCreate pilots will be provided in the second report (ReCreate deliverable 8.3). Although the current report already begins the comparative analysis of the aforementioned issues, a deeper analysis will be reported on in the second one. This applies to the barrier analysis and the policy recommendations as well. To sum up, the current document provides an expert study of the regulatory regimes, and the next one will complement these perspectives, which are more theoretical and analytical in nature, with the empirical insights and experiences gained from the pilots.

The next two chapters will discuss firstly, the norms applicable to deconstructing precast concrete elements, and secondly, the norms applicable to reusing them. The subchapters are structured thematically. Within the subchapters, regulation on the EU level is discussed first. Summarising tables listing the relevant norms are also provided, and lastly the relevant norms are discussed country by country. The report ends with a concluding discussion that summarises the key insights. These learnings are key in feeding the second, more empirical, report.

## 2. Norms on deconstruction

Most of the norms governing deconstruction are national and/or local, apart for the matters that fall under the EU's waste management legislation. Therefore, the subchapters of this chapter will mainly focus on discussing the country-specific norms and their practical implications on deconstructing precast concrete elements. The EU level policies are analysed only in the chapters where they are relevant.

Section 2.1. focuses on demolition permits and discusses whether deconstruction of precast concrete elements implies any special requirements in the permit application process. The section concludes that the deconstruction approach, as opposed to a regular demolition, does not generate any additional requirements compared to a normal permit application or notification process in any of the countries. However, although no special requirements were introduced in the permit application processes of the ReCreate pilots, it should be noted that in Finland and Sweden, the regulations do acknowledge deconstruction and reuse, and they lay down some basic principles for considering the issue in permits. In addition, in the Netherlands, a demolition notification is normally enough when dismantling a building. However, if the matter falls under the environmental act, then the more extensive permit needs to be applied for. In theory, this could be the case when deconstructing building components for reuse, even if in ReCreate's Dutch deconstruction pilot, it was not.

Section 2.2. discusses in detail what impact the EU Waste Framework Directive and national waste legislations have on deconstruction of concrete elements. The EU directive lays down guiding norms and principles for legislating waste management in the member states. Although the general waste management principles (the 'waste hierarchy') emphasise waste prevention and reuse over recycling and energy usage of materials – objectives that ReCreate serves as well – no concrete goals are set for the member states to reach and therefore, in practice, they seem to guide societies and industries more towards recycling than reuse. In addition, the EU directive or its national implementations do not set clear rules or practices to follow when reusing materials or components. This has resulted in ambiguities that hinder the dispersal of reuse in given countries, such as Finland and Sweden. One of such issues is, among other things, whether deconstructed building components should be considered as waste or not. If the components are considered as waste, their reuse will be a significantly heavier administrative process.

Section 2.3. focuses on local environmental protection matters and discusses whether they impact the harvesting of reusable materials and components. In Finland and the Netherlands, local environmental regulations impose no special requirements for deconstruction. In fact, in Finland the local authorities considered that deconstruction may even be more favourable to local environment than demolition (less noise, dust pollution etc.). Although the legislations do not lay down very specific rules for deconstruction of building components in Sweden or Germany, a few questions have been raised in these countries that call for clarification. For example in Sweden, a compound called Chromium VI have raised discussions among developers and the issues is now being clarified with the

authorities. In Germany, some uncertainties regarding reuse of concrete elements have been derived from water protection laws. However, an upcoming ordinance should clarify the matter in the course of the year 2023.

Lastly, Section 2.4. investigates deconstruction of the elements from the viewpoint of work and occupational safety. As follows from the longstanding commitment of the EU regarding work safety, visible in a wide range of directives, the contents of the work safety regulation in the four ReCreate piloting countries echo the stipulations of the directives. In all the countries, issues regarding work safety are regulated by giving minimum standards. The regulations cover a variety of issues, ranging from hazardous substances to safety instructions and the responsibility of the employer to provide proper tools. At the practical level, one can observe the impact of national institutional traditions. In Finland and Sweden, the public sector and social partners (i.e. labour unions and employers' representatives) have a strong role. In Germany, the issues have been organised through traditional German sector organisation system. In the Netherlands, although the directives have been implemented in national legislation, a fairly broad palette of private sector certification schemes have been developed to cover risky work. Section 2.4. discusses the most relevant work safety regulations country by country and describes the practical resources and institutional settings.

## 2.1. Deconstruction/demolition permits

The regulations regarding deconstruction or demolition permits, as given in Table 1, falls under national control. How the reuse of building components needs to be considered as a part of deconstruction permits in different ReCreate countries is discussed below.

Table 1. Regulation on deconstruction permits.

<b>EU</b>	<ul style="list-style-type: none"> <li>• No EU-level regulation</li> </ul>
<b>Finland</b>	<ul style="list-style-type: none"> <li>• Land Use and Building Act 132/1999 (Maankäyttö- ja rakennuslaki)<sup>1</sup></li> <li>• Land Use and Building Decree 895/1999 (Maankäyttö- ja rakennusasetus)<sup>2</sup></li> </ul>
<b>Sweden</b>	<ul style="list-style-type: none"> <li>• Planning and Building Act 2010:900 (Plan- och bygglagen)<sup>3</sup></li> <li>• Planning and Building Decree 2011:338 (Plan- och byggförordningen)<sup>4</sup></li> <li>• Swedish National Board of Housing, Building and Planning general recommendations on demolition waste 2013:15 (Boverkets allmänna råd om rivningsavfall)<sup>5</sup></li> </ul>

<sup>1</sup> <https://www.finlex.fi/fi/laki/ajantasa/1999/19990132>

<sup>2</sup> <https://finlex.fi/fi/laki/ajantasa/1999/19990895>

<sup>3</sup> [https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/plan--och-bygglag-2010900\\_sfs-2010-900](https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/plan--och-bygglag-2010900_sfs-2010-900)

<sup>4</sup> Plan- och byggförordning (2011:338) Svensk författningssamling 2011:2011:338 t.o.m. SFS 2023:50 - Riksdagen

<sup>5</sup> Boverkets allmänna råd (2013:15) om rivningsavfall - Boverket

<b>Netherlands</b>	<ul style="list-style-type: none"> <li>• Building Decree 2012 (Bouwbesluit, BWBR0030461)<sup>6</sup></li> <li>• Asbestos Removal Decree 2005 (Asbestverwijderingsbesluit, BWBR0019316)<sup>7</sup></li> <li>• Wet algemene bepalingen omgevingsrecht, BWBR0024779, short Wabo)<sup>8</sup></li> </ul>
<b>Germany</b>	<ul style="list-style-type: none"> <li>• Model building code (2002; last updated 2019) (Musterbauordnung; short MBO)<sup>9</sup></li> <li>• State Building codes of each 16 states (Landesbauordnung)</li> </ul>

## FINLAND

In Finland, the local building supervisors, located in municipalities, grant the demolition permits for buildings (Land Use and Building Act 132/1999, 130§). Section 154 of the act stipulates that the demolition of a building must be arranged so that preconditions for<sup>10</sup> reusing reusable building components are secured.

Section 139 of the Act specifies that a demolition permit application must clarify, among other things, how the generated demolition waste and reusable building parts are handled. Furthermore, section 55 of the Land Use and Building Decree (895/1999) requires that a report on the amount and quality of the generated waste is presented in the application, unless the amount of waste is small. The application must inform separately about the kind of waste that is hazardous to health or the environment and its handling.

Although the act mentions that the demolition permit application must contain an explanation regarding reusable building components, it is the understanding of this report's Finnish authors that this clause is rarely enforced in practice. It had no implications for the permit application to deconstruct ReCreate's Finnish donor building. The ReCreate partner who applied for the permit in 2022 was not asked to clarify any matters regarding the planned reuse of the concrete elements, even if the building inspection officers were aware of the planned reuse. According to the partner's experience, the permit application process was identical to a normal demolition permit application.

Therefore in Finland, reusing concrete elements does not necessarily seem to imply any special considerations when applying for a demolition permit. However, it should be said that each permit application is considered on a case-by-case basis by the municipal authorities in question. It can be expected that deviating interpretations and requirements by authorities based in different municipalities can co-exist, even if the underlying legislation is the same.

## SWEDEN

In Sweden, demolition permits for buildings are granted by the building committee in each municipality. Demolition and building permits are regulated by Planning and Building Act

<sup>6</sup> <https://rijksoverheid.bouwbesluit.com/Inhoud/docs/wet/bb2012>

<sup>7</sup> <https://wetten.overheid.nl/BWBR0019316/2021-05-19>

<sup>8</sup> <https://wetten.overheid.nl/BWBR0024779/2022-10-01>

<sup>9</sup> <https://www.bauministerkonferenz.de/suchen.aspx?id=762&o=7590762&s=musterbauordnung>

<sup>10</sup> The State-level Building Codes are easily found online, for example for North Rhine Westphalia: [https://recht.nrw.de/lmi/owa/br\\_text\\_anzeigen?v\\_id=74820170630142752068](https://recht.nrw.de/lmi/owa/br_text_anzeigen?v_id=74820170630142752068)



(2010:900) and Planning and Building Decree (2011:338). In addition to the demolition permits, the building committee should ascertain a control plan which aims to enhance the condition of the demolition waste and facilitate reuse and recycling. The Planning and Building Act (2010:900) chapter 10 (§§5-6) points out that it is the developer who is responsible for the control plan and the required content of the control plan. According to the last update of the Planning and Building Act (2010:900) Chapter 10 §6, the developer must identify in the control plan for the demolition permit which building products can be reused and how these should be taken care of. No further specifications are given for deconstruction aiming at reuse. Similar to Finland, the demolition permit for the Swedish ReCreate deconstruction pilot did not address the reuse of the precast concrete elements. This is perhaps natural in that at that stage it had not yet been decided if any elements were to be reused, as the permit was applied prior to the ReCreate project.

In summary, the reuse of precast concrete elements does not seem to be acknowledged in demolition permits in Sweden.

### THE NETHERLANDS

Since the Building Decree 2012, a demolition permit is no longer required in the Netherlands. Instead, a notification must be submitted for the (partial) demolition of structures releasing more than 10 m<sup>3</sup> of demolition waste, and for the demolition of asbestos. The demolition notification must be submitted at least 4 weeks before the work starts.

Asbestos demolition is subject to a number of exceptions to the notification obligation, which are in line with exceptions in the Asbestos Removal Decree 2005 (AVB 2005).

Under the General Provisions Environmental Law Act (Wabo, Article 2.1), in some special cases, where other legislation and regulations come into play, an environmental permit for demolition must still be applied for. Examples include the demolition of a monument or demolition in heritage-protected city or village sites. So, in that situation, a permit must be applied for, and a notification must be made for demolition. Unless the object of deconstruction falls under the exceptions that need an environmental permit, a notification of deconstruction suffices. Generally speaking, a permit could be required in a case of deconstruction of building components, if the local zoning plan requires this (Wabo 2.1; Bouwbesluit 2012 § 1.7). However, in the case of the ReCreate deconstruction pilot, a permit was not required.

Circular deconstruction is not yet recognized as a process for which permits are needed, as it consists of dismantling buildings. As such, it is not demolition in a legal sense. In practice however, demolition notifications are issued with a building safety plan as a basis. Dismantling (circular demolition) is part of the transition to a circular construction economy and in the future will likely be part of a demolition permit or demolition notifications. In the Dutch environmental requirements for buildings (MPG) there is an implicit need to apply circular methods to achieve the criteria.<sup>11</sup>

---

<sup>11</sup> <https://circulairebouweconomie.nl/wp-content/uploads/2023/01/Beleidsagenda-normeren-en-stimuleren-circulair-bouwen.pdf>

In addition to these government requirements and regulations, private certificates also can play a role. In demolition and deconstruction work, these certificates relate to process quality. In tenders and contracts, the client may require the contractor to possess a given certificate. An example of such a certificate is that based on assessment guideline 'BRL SVMS-007 Safe and environmentally friendly demolition'. The certificate is a statement about the quality of the contractor's management process. It addresses issues such as how to submit a demolition notification, the registration and disposal of waste, and safety on the construction site. The guideline is published by 'Stichting Veilig en Milieukundig Slopen'<sup>12</sup> (Foundation for Safe and Environmentally Sound Demolition), which audits the contractor and publishes the certificate.

### GERMANY

In Germany, under the building regulations law (In German: 'Bauordnungsrecht'), the demolition of buildings or structures requires the implementation of an administrative procedure. State building codes regulate whether a permit or a notification is required. The type and size of the building slated for demolition, the impairment of the surroundings (sensitive building structures, narrow site conditions, etc.) or restrictions of the deconstruction project (protected areas, monument protection laws, etc.) define whether it is necessary to initiate an administrative procedure and which type (a building permit procedure, a simplified permit procedure, or a notification procedure). The responsibility for this lies with the building owner. According to the state regulations, the object planner (person with the permission of submission, e.g. architect) must sign the necessary building documents and submit them to the building supervision authority.

In the state of Saxony-Anhalt (where the ReCreate German deconstruction pilot is located in the city of Hohenmölsen), according to §60 BauO<sup>13</sup> LSA section 3, '...the intended removal of facilities must be reported to the building supervisory authority at least one month before the removal begins.' Furthermore, 'in the case of buildings that are not freestanding [...] the stability of the building or buildings to which the building to be removed is attached must be assessed by a qualified structural engineer within the meaning of §65 section 2 and demonstrated to the required extent.'

In Saxony-Anhalt, the following construction documents are to be submitted with the notification of the removal of facilities in accordance with § 6 BauVorIVO<sup>14</sup>:

- the site plan (§ 11) showing the location of the facilities to be removed, designating the property according to the real estate cadaster and according to street and house number, and
- the proof of stability (§ 14), insofar as it is required in accordance with § 60 section 3 Sentence 3 of the Building Code of the State of Saxony-Anhalt.

---

<sup>12</sup> <https://www.veiligslopen.nl/nl/>

<sup>13</sup> Bauordnung Land Sachsen-Anhalt (state building code for Saxony-Anhalt)

<sup>14</sup> Bauvorlageverordnung (ordinance on required building documents)

Furthermore, reference is made to the guideline VDI<sup>15</sup> 6210 sheet 1, which gives recommendations for the tasks of the actors and the demolition procedure of structural and technical facilities. Although the VDI guidelines are not legally binding, they do provide valuable guidance for the players involved.

Technically, according to the 'Circular Economy Law' (see Section 2.2), waste prevention should always be the first approach, and reuse the second step. In the procedure of a demolition/deconstruction permit though, there are no dedicated requirements, such as a mandatory levels or percentages for building components to be carefully dismantled and/or reused. However, strict rules apply to handling the demolition waste. These will be described in the following section.

## 2.2. Waste management

The EU Directive 2008/98/EC on waste (Waste Framework Directive) provides the legislative framework and principles for the collection, transport, recovery and disposal of waste in the EU. The directive aims to contribute to the prevention, reuse and recycling of waste. Article 40 obliges EU member States to adapt national laws, regulations and administrative provisions to achieve the objectives of the Directive by 12.12.2010.

In 2018, the Waste Framework Directive was one of six directives that was amended as part of the EU commission's (EC's) Circular Economy Package, the goal of which is to stimulate Europe's transition towards the circular economy (see also Section 3.5). The date of entry into force of the directives was 4 July 2018, and its stipulations needed to be implemented in the national legislation by 5 July 2020. The amendment did not alter the basic principles of the directive. The key objective of the reform was to set new, more ambitious waste recycling targets. (EC 2023a; Finnish Ministry of the Environment 2023b; EC 2015).

From the viewpoint of reused building components, the directive contains three important topics to consider:

1. Quantitative recycling goals for construction and demolition waste (CDW),
2. Establishment of 'waste hierarchy', and
3. Criteria for End-of-Waste procedures.

Regarding (1), the directive sets waste recycling goals for member states. According to the directive, 70% of all the CDW generated must be prepared for reuse, recycling, or other material recovery by 2020. (EC 2023a). It is important to note, that although the goal is ambitious and pointed directly to the construction industry, it does not oblige the member states to introduce solutions explicitly to the reuse of materials – it speaks generally of any type of material reutilisation. Furthermore, the goal does not consider waste prevention, the objective that reuse also serves, but focuses solely on the utilisation of waste that is already generated.

---

<sup>15</sup> Verein Deutscher Ingenieure (Association of German Engineers)

Regarding (2), in addition to the quantitative goals, the directive establishes an order of preference for managing and disposing waste. This is called a five-step 'waste hierarchy' (Figure 1). As a principle, the waste hierarchy should *per se* guide the construction industry to reuse more building components, as waste prevention is its main goal. However, as seen below in the country specific analyses (e.g., in Finland), without more concrete goals and regulations, the waste hierarchy is too vague a norm to strongly guide industrial practices towards more sustainable solutions.



Figure 1. Waste Management Hierarchy. Source: [https://environment.ec.europa.eu/topics/waste-and-recycling/waste-framework-directive\\_en](https://environment.ec.europa.eu/topics/waste-and-recycling/waste-framework-directive_en)

Regarding (3), the directive (articles 6 [1] and [2]) lays down basic criteria for the so-called End-of-Waste -status (EoW). The EoW criteria specify when a certain waste item ceases to be waste and becomes a secondary product or a raw material. (EC 2023a). Generally speaking, the EoW criteria come into play if a construction product, e.g. a deconstructed precast concrete element, receives a waste status at any time during its lifecycle (see e.g. the situation in Finland, as discussed later in the section).

According to the articles (*Ibid.*), a waste item ceases to be waste when it has undergone a recovery operation and complies with specific criteria, in particular when:

- the substance or object is commonly used for specific purposes,
- there is an existing market or demand for the substance or object,
- the use is lawful (the substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products), and
- the use will not lead to overall adverse environmental or human health impacts.

In addition to the general EoW principles, the EC is preparing a more detailed set of EoW criteria for priority waste streams. The aim of this work is to further encourage material reutilization in the EU by creating legal certainty and removing unnecessary administrative burdens for the most significant waste streams, so that every EU country need not establish

their own administrative processes. However, the EC have yet to develop criteria for waste streams where deconstructed concrete elements may occur. Hence, the more detailed implementation of EoW principles falls presently under national control. (*ibid.*)

To sum up, the EU Waste Framework Directive lays down the principles for the waste management in the EU, establishes a waste hierarchy, and sets the general goals for the material reutilisation rate. Furthermore, the directive establishes criteria for the EoW. It is the task of the member states to implement these goals within their respective national legislative frameworks and practices (see Table 2). Next, the implementations of the directive in the different ReCreate countries as well as the practical implications for the reuse of concrete elements are discussed.

Table 2. Waste management regulation.

<b>EU</b>	<ul style="list-style-type: none"> <li>Waste Framework Directive 2008/98/EC<sup>16</sup></li> </ul>
<b>Finland</b>	<ul style="list-style-type: none"> <li>Waste Act 646/2011 (Jätelaki)<sup>17</sup></li> <li>Waste Decree 179/2012 (Jäteasetus)<sup>18</sup></li> <li>Environmental Protection Act 527/2014 (Ympäristönsuojelulaki)<sup>19</sup></li> </ul>
<b>Sweden</b>	<ul style="list-style-type: none"> <li>Environmental Code Chapter 15 and the general consideration rules in Chapter 2 1998:808 (Miljöbalk)<sup>20</sup></li> <li>Planning and Building Act 2010:900 (Plan- och bygglagen)<sup>21</sup></li> <li>Waste decree 2020:614 (Avfallsförordning)<sup>22</sup></li> <li>Swedish National Board of Housing, Building and Planning general recommendations on demolition waste 2013:15 (Boverkets allmänna råd om rivningsavfall)<sup>23</sup></li> </ul>
<b>Netherlands</b>	<ul style="list-style-type: none"> <li>Environmental Management Act (Wet Milieubeheer, BWBR0003245)<sup>24</sup></li> <li>Building Decree (Bouwbesluit 2012, BWBR0030461)<sup>25</sup></li> <li>Regulation on reporting industrial waste and hazardous waste (Regeling melden bedrijfsafvalstoffen en gevaarlijke afvalstoffen)<sup>26</sup></li> <li>Decree on reporting industrial waste and hazardous waste (Besluit melden bedrijfsafvalstoffen en gevaarlijke afvalstoffen)<sup>27</sup></li> </ul>

<sup>16</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008L0098>

<sup>17</sup> <https://www.finlex.fi/fi/laki/ajantasa/2011/20110646>

<sup>18</sup> <https://finlex.fi/fi/laki/alkup/2021/20210978>

<sup>19</sup> <https://www.finlex.fi/fi/laki/ajantasa/2014/20140527>

<sup>20</sup> Miljöbalk (1998:808) Svensk författningssamling 1998:1998:808 t.o.m. SFS 2022:1799 – Riksdagen

<sup>21</sup> [https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/plan--och-bygglag-2010900\\_sfs-2010-900](https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/plan--och-bygglag-2010900_sfs-2010-900)

<sup>22</sup> Avfallsförordning (2020:614) Svensk författningssamling 2020:2020:614 t.o.m. SFS 2023:139 – Riksdagen

<sup>23</sup> <https://www.boverket.se/sv/lag--ratt/forfattningssamling/gallande/riv---bfs-201315/>

<sup>24</sup> <https://wetten.overheid.nl/BWBR0003245/2023-02-13>

<sup>25</sup> <https://rijksoverheid.bouwbesluit.com/Inhoud/docs/wet/bb2012>

<sup>26</sup> <https://wetten.overheid.nl/BWBR0017313/2022-05-04>

<sup>27</sup> <https://wetten.overheid.nl/BWBR0017294/2021-11-06>

<b>Germany</b>	<ul style="list-style-type: none"> <li>• Circular Economy Law (Kreislaufwirtschaftsgesetz [KrWG] 2012, Amended 2020)<sup>28</sup></li> <li>• Secondary Building Material Decree (Ersatzbaustoffverordnung [EBV] 2021)<sup>29</sup></li> <li>• Commercial Waste Ordinance (Gewerbeabfallverordnung 2017)<sup>30</sup></li> </ul>
----------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

## FINLAND

Finnish waste legislation is largely based on EU legislation<sup>31</sup>, but in some cases includes stricter standards and limits than those applied in the EU (Finnish Ministry of the Environment 2023c). However, this is not the case for CDW. As mentioned above, the EU calls for a 70% recycling rate for CDW. In Finland, the goal is the same, but there is still a lot to do to reach the goal. In 2021, the CDW recycling rate waste was only 54% (Lehtonen 2021, 126). Furthermore, the quantitative material recovery goals are calculated and set in Finland exactly the same as in the EU and there are no, for example, any distinct country-specific quantitative targets that would focus on the higher levels of the waste hierarchy than recycling. Therefore, the situation in Finland is the same as it is in the EU: The quantitative recycling goals are focused solely on recycling and they do not emphasise waste prevention. Therefore, the goals do not have a direct policy impact for reusing of building components *per se*.

The case is similar with the waste hierarchy. Although it is the basis of all Finnish waste legislation (see e.g. Finnish Ministry of the Environment 2023c), it does not have direct steering effect towards the industry. It works more like a meta-level norm whose purpose is to guide more detailed action planning and policies<sup>32</sup>.

If the quantitative waste goals and waste hierarchy do not have a direct effect for reusing building components in Finland, the situation is different with the most important Finnish waste legislation, Waste act (646/2011), that lays down the general rules for the waste management. When the act is considered from the point of view of reused building components, the central issue revolves around the following question (see also Lehtonen 2021; Zhu et.al. 2022): *are deconstructed building components, such as concrete elements, considered waste or not?* If the components are considered and labelled as waste, it significantly complicates their utilisation, especially because Finland has not yet established EoW procedures for deconstructed building components. In practice, a waste label means that the component or product must follow all the rules laid down in the Waste act. For example, they cannot be handled without an environmental permission (Environmental protection Act 527/2014 27§), the application process of which is considered

<sup>28</sup> <http://www.gesetze-im-internet.de/krwg/index.html>

<sup>29</sup> [https://www.bgbl.de/xaver/bgbl/start.xav?startbk=Bundesanzeiger\\_BGBl&jumpTo=bgbl12ls2598.pdf](https://www.bgbl.de/xaver/bgbl/start.xav?startbk=Bundesanzeiger_BGBl&jumpTo=bgbl12ls2598.pdf)

<sup>30</sup> [https://www.gesetze-im-internet.de/gewabfv\\_2017/BJNR089600017.html](https://www.gesetze-im-internet.de/gewabfv_2017/BJNR089600017.html)

<sup>31</sup> Finnish waste legislation and policy contains many different types of legislations, acts and decrees (see Finnish Ministry of the Environment 2023c). From the viewpoint of reused building components, the most important is Waste Act (646/2011) that lays down the general rules for the waste management.

<sup>32</sup> Many researchers have also been critical towards the ‘waste hierarchy’ as an enabler of sustainable development and circular economy. For example, van Ewijk and Stegemann (2014) have concluded that the hierarchy is a limited policy tool to reduce consumption of natural resource as its focus is mostly on avoiding waste disposal (see also Gharfalkar et.al 2015).



difficult and heavy (Zhu et.al. 2022, 38; Lehtonen 2021, 129). In practice, this may delimit the handling of such components to large established actors and hinder small start-ups from entering the circular construction business.

At the time of writing this report (Feb 2023) there is no consensus for how to answer this question. The Waste act and its decrees or amendments do not state clearly how to act in the case of deconstructed building components. Some experts argue, by referring to Waste act 5§, that the reused building components should not be considered as waste in a case where their new construction site is known and the components are not modified significantly (see e.g., Lehtonen 2019, 126). However, others point out, also by referring to the Waste act, that a preparation of a component for reuse falls under the Waste act and, therefore, the reused components are considered as waste (see e.g., Zhu et.al. 2022, 38).

It is worth to note that reuse of building components is mentioned in an official explanatory memorandum on the Waste Decree (179/2012), which is based on the Waste Act (Finnish Ministry of the Environment 2021). The memo (*ibid.*) lays down two important statements on the issue:

- General argument for a compliance of waste hierarchy in building projects
- Specific interpretation of the Waste Act from the point of view of reused building components

First, the memo specifies the section 25§ of the Waste Decree, which deals with reducing the amount of CDW. The memo argues that a party undertaking a building project should ensure that the project follows waste hierarchy by recovering and re-utilising all the building components that can be reused to decrease the amount of CDW (*ibid.*, 23–24).

Second, the memo clarifies the section 6§ of the Waste Act, which lays down a definition for reused materials from the point of view of the construction industry. The memo states: *‘for example, utilisation of deconstructed building components as new building products could be considered as re-use’* (*ibid.*, 24, translation by us). Although not stated explicitly, it seems that the memo aims to make an argument that reused building components should not be considered as waste but as reused materials. We have not yet received an answer for an inquiry sent to the authorities about whether the statements of the memo have any practical relevance for the matter at hand. The topic will be discussed in ReCreate deliverable 8.3.

To sum up, in practice, the aforementioned ambiguities regarding the interpretation of the Waste Act have led to a situation where the local environmental protection authorities, who are responsible for enforcing the act, have taken a stance that the deconstructed building components are considered as waste. At the time of writing, this is the decision that ReCreate’s Finnish reuse pilot received as well.

The conclusion has two practical implications for reuse of concrete elements in Finland:

- Since deconstructed elements are considered as waste, their transportation, handling, and processing requires an environmental permit that is granted by a local environmental protection authority (Environmental protection Act 527/2014 27§). At the time of writing this report, it is still unclear what information the permit

application must contain. However, based on preliminary discussions with the authorities, in the case of ReCreate, a so-called 'pilot permission' should suffice. As it is intended for an experimental activity, it is a much lighter process compared to a normal environmental permit application process.

- In addition to the environmental permit, the actor responsible for the refurbishment of concrete elements must apply for an EoW status for the elements. As already mentioned, the role of the EoW is to eliminate the waste status and enable the reuse of the elements as construction products. The EU's Waste Framework Directive does not contain an amendment considering EoW criteria for the deconstructed concrete elements (EC 2023a), and therefore, according to the Finnish Waste Act (5b§), the EoW status is granted by the local environmental authorities. Again, we do not yet have detailed information on how to apply for the EoW but once the empirical experience has been acquired, the practice will be reported as a part of the upcoming report, ReCreate deliverable 8.3. However, according to the interviews with the authorities, the basic principles for the EoW process are the same in Finland as they are in the EU's Waste directive discussed above (see also Waste Act 5b§).

As already mentioned, the ReCreate Finnish cluster is presently collaborating actively with the local authorities and national experts so that the matters above will be clarified. First, we have ongoing discussions related to the environmental permission and the EoW status, and second, we aim to clarify whether the deconstructed building components should receive a waste status even in the first place. The outcomes of these collaborations and processes will be discussed more detailed in ReCreate deliverable 8.3.

## SWEDEN

As in Finland, the EU's common legislation forms a substantial part of the basis for the Swedish waste regulation<sup>33</sup>. Through Chapter 2 Section 5 and Chapter 15 Section 10 of the Environmental Code (Miljöbalken), Sweden's legislation adopts the priority order (waste hierarchy) for waste prevention and management that is outlined in the EU waste framework directive. The following are listed in order of importance: (1). avoidance, and thereafter, a treatment of waste in the best way to protect human health and the environment, that is: (2). preparing for reuse, (3). recycled materials, (4). alternative reutilisation, such energy recovery, and (5). disposal. As in the Finnish case, this is not steering the industry so much than provides an overarching ambition. As stated by the Waste Framework Directive, further ways to support the consideration of the waste hierarchy are given in the national waste plan (see Section 3.5).

The Environmental Code also integrates the four overarching EoW principles from the EU Waste directive in chapter 15, §§ 9 a–c. In 2021, the Swedish Environmental Protection Agency (EPA) (Naturvårdsverket) was commissioned by the government to investigate conditions

---

<sup>33</sup> Quantitatively speaking, the waste 70% reduction target in the EU (and Sweden) by 2020 does not include energy recovery, which means that the recycling rate in Sweden is lower, approximately 50%. However if asphalt recycling is included, the recycling rate is 70%. (Palm et al, 2015). However, Palm et al (2015) state that the statistical basis to quantify CDW fractions is still poor. Mineral waste accounts for circa 80% of the total CDW (Naturvårdsverket, 2012b).



for national EoW criteria. The authority concluded that legal prerequisites for it existed and it could be plausible to implement national EoW criteria, but recommended the government to wait due to other parallel related activities. The investigation by the Swedish EPA provides the starting points for potential continued development of national EoW criteria. Judgement as to when a certain waste ceases to be waste is thus taken on a case-by-case basis. It is the respective industry or business practitioner who is responsible for assessing whether they recycle waste in a way that it ceases to be defined as waste, according to the general principles of the Waste Framework Directive (as integrated in the Environmental Code, chapter 15, §§ 9 a-c). The authority that has the supervision responsibility for such an industry (depending on the size of the industry, the municipality, county council, or the Swedish EPA) can then decide to review the assessment, if they see a need for it. In addition, cases exist where the industry has asked the supervisory authority to take the EoW decision. However according to the Swedish EPA, this is not a role that the supervisory authority commonly should take. Instead, it has issued a guideline for this purpose. These, as well as the regulations, are however targeted at 'industries performing recycling processes'. Since the issue, whether deconstructed concrete elements are to be seen as waste or not, is not yet that clear, ambiguities prevail regarding which regulations to conform with, since reuse is not the same as the production of new products, either.

The Waste Decree (2020:641), situated hierarchically under the Environmental Code, contains provisions on waste. The decree will probably be updated due to the introduction of the EU's 'waste package' (EC 2018), which aims to support circular economy in harmony with the EC's circular economy package (EC 2023d). It contains a further classification of waste types and regulations with regard to sorting, handling, transport and treatment of waste, e.g. a requirement to sort CDW into six fractions, of which mineral materials (incl. concrete) is one. However, any issues regarding reuse are not dealt with.

As already mentioned in Section 2.1, the Planning and Building Act (2010:900) sets the requirements with regard to the control plan needed for a demolition permit, which must contain information about the handling of CDW. It also specifies that reusable building elements should be documented in the control plan, and that it should be elaborated on how these elements should be taken care of.

## THE NETHERLANDS

In the Netherlands, the 'Wet milieubeheer'<sup>34</sup> (Environmental Management Act) contains rules on waste. These rules are further detailed in the following documents:

1. Decree on reporting industrial waste and hazardous waste
2. Regulation on reporting industrial waste and hazardous waste

### **Decree on reporting industrial waste and hazardous waste**

The decree on reporting industrial waste and hazardous waste contains rules on disposing of, transporting, and receiving waste. Companies that demolish or deconstruct are required to keep waste records. The basis for the registration obligation lies in the Environmental

---

<sup>34</sup> <https://wetten.overheid.nl/BWBR0003245/2023-02-13>

Management Act. The decree and regulations on reporting industrial waste and hazardous waste and the Environmental Law Decree specify the registration requirements for each situation in more detail.

### **Regulation on reporting industrial waste and hazardous waste**

The regulation on reporting industrial waste and hazardous waste contains rules on the disposal, transport, and reception of waste. The difference between the decree above and this regulation is that the former states what should be reported, and the latter states how this should be reported. The Regulation deals with a broad variety of materials, but specifically a distinction is made between concrete rubble, masonry rubble and waste of tiles and other ceramic products. Preferably, the last-mentioned waste products should be separated, however it is also allowed, but more costly, to deliver them in a mix.

The Building Decree and the Building Decree Regulation require that during demolition, the following waste materials have to be separated: dangerous substances, tarred roofing, tar asphalt, bituminous roofing, non-tarred asphalt, glass, gypsum, roof gravel, fixtures, and gas discharge lamps. Concrete rubble is not a part of this list.

The dismantling of a precast concrete structure in itself does not create waste. Therefore, the aforementioned rules do not come into play. This is based on the experience of the Dutch cluster's partners, and can be held as factually valid. Precast concrete does not *per se* include any hazardous and/or toxic materials. However, for example precast sandwich façade elements, consisting of a load-bearing concrete inner leaf, insulation and an outer leaf, can in theory have hazardous and/or toxic materials, which must be removed in accordance with the regulations, as was the case in the Dutch pilot project Prinsenhof A. In case the insulation material in the element is toxic, it needs to be removed from the element before reuse. A further reason why precast concrete elements should not contain hazardous substances is the fact that they have been made in a factory. The factory safety and health regulation prohibits or limits the use of such materials. If such materials are nonetheless used in a factory, extreme measures need to be taken to create a safe and healthy environment. The use of hazardous materials is not common practice in the Dutch precast concrete factories.

Obviously, dismantling a building will nevertheless create waste originating from structures other than the deconstructed elements. If asbestos is found when dismantling a building, the Asbestos Removal Decree must be followed. This will generally lead to a considerable delay in the dismantling work. A rare exception is asbestos-containing jointing sealant, which was extensively used in the construction of greenhouses. Deconstruction of these is exempted from the provisions of the Asbestos Removal Decree.<sup>35</sup> However, in general these disposal regulations are not relevant related to the deconstruction of precast concrete structures themselves, only to the other waste and potential hazardous waste materials that may coexist with them.

---

<sup>35</sup> <https://wetten.overheid.nl/BWBR0006006/2005-03-08> Art. 4e

## GERMANY

The implementation of the EU Waste Framework Directive in Germany is the 'circular economy law' (German: 'Kreislaufwirtschaftsgesetz' short: KrWG), which was passed in 2012. The goals of the law are to reduce waste and promote recycling. Both objectives are addressed by focusing on producers. With the so-called 'product responsibility' (§23 KrWG), preference is to be given, among other things, to products and processes that are 'resource-efficient, reusable, technically durable, repairable and suitable after use for proper, harmless and high-quality recycling and environmentally sound disposal.'

The waste hierarchy according to §6 gives the order of priority for prevention and waste management measures based on the Waste Framework Directive:

1. avoidance,
2. preparation for reuse,
3. recycling,
4. other recovery, especially energy recovery and backfilling,
5. disposal.

This hierarchy is substantiated and enforced by the responsible government agency, in this case the waste agencies of individual cities and municipalities. They are responsible for formulating and enforcing instructions for producers and owners of waste as well as municipal waste management providers. If the instructions given based on the requirements of the circular economy law (KrWG) are violated, the agency can hand out fines or administrative offenses.

Since the focus of the waste agencies as enforcers of the circular economy law is mainly on products once they have become waste, the enforcement of the first two steps of the waste hierarchy are often neglected. However according to §33 of the circular economy law (KrWG) the federal and state governments must develop so-called waste prevention programmes (Abfallvermeidungsprogramm – AVP). The federal programme for this was released in 2013 and revised in 2021. In the programme, three main fields of action, which aim to promote waste prevention, are outlined:

1. information and sensitisation,
2. research and development and
3. Legislation and enforcement,

The programme lays out best practice examples on local levels and goals for future marketing strategies, research funding or consulting programmes for companies as immediate actions. The third field of action (legislation and enforcement) is held rather abstract and points to the future for further establishment. This means that at the moment, the avoidance of waste and the preparation for reuse, especially of construction products, are not legally enforced on the federal level in Germany, but should be implemented on state level. The extent to which prevention or preparation for reuse is enforced in practice (i.e. legally required) depends on the 16 states and their municipalities. Each state must set up its own waste prevention programme, which also specifies the goals for handling CDW.

For the reuse of building components, DIN SPEC 91484 (working title 'Assessment of the reusability of building materials prior to demolition and renovation') is currently being developed by an interdisciplinary team. ReCreate German cluster leader Professor Angelika Mettke is a member of the committee. The publication is scheduled for the end of April 2023. The DIN SPEC is intended to deal with the process of handling building components from the built-in status until the reuse phase.

With regard to material recycling, the legislation has recently changed concerning environmentally compatible requirements. The previously state-specific requirements will be replaced by a harmonized 'substitute building materials ordinance' (Ersatzbaustoffverordnung; short 'EBV') on the federal level. The new ordinance will come into force on August 1, 2023. The aim is to ensure the protection of soil and groundwater. At the same time, the circular economy of substitute building materials (including recycled building materials from CDW, slags from metal production, and ashes from thermal processes) is to be promoted and the acceptance of the use of secondary building materials increased. The ordinance lays down legally binding requirements for the production and use of mineral substitute building materials. Up to now, the requirements have been regulated at the state level only, in very general terms. They have been given in legally non-binding and partly outdated technical rules or decrees in the federal states. With the new ordinance (EBV) the use of recycled building materials for structural installations is regulated by means of predefined values (in specific tables for installation cases), so that a permit under the water protection law is no longer required. In terms of CDW the 'EBV' § 24 gives explicit obligations on the separation. The producers and owners of mineral CDW must see that the fractions are collected separately from each other, to be transported and, in accordance with §8 section 1 sentence 1 of the circular economy law (KrWG), to be given priority for preparation for reuse or recycling.

The barriers for using CDW as recycled aggregates in new production lines are diverse. On the one hand the acceptability of 'waste-products' is still very low within the construction sectors. Many builders have no knowledge or experience of the subject. While business as usual is quite common in private construction projects, new public buildings must meet certain sustainability standards. The use of recycled materials is one possible pathway to reach them. Communication and education are the two most important factors to promote recycling and reuse. These topics are understudied even in academia, let alone in vocational training. Nevertheless, the legal and technical framework for recycling and reusing has already existed in Germany for years, albeit with regulatory hurdles.

## 2.3. Local environmental protection

Regulation regarding local environmental pollution (noise, dust, etc.) falls under national control (Table 3). The environmental norms in different ReCreate piloting countries and their impact on reusing concrete elements are discussed next.

Table 3. Regulation on local environmental protection.

<b>EU</b>	<ul style="list-style-type: none"> <li>• No EU-level regulation</li> </ul>
<b>Finland</b>	<ul style="list-style-type: none"> <li>• Environmental Protection Act 527/2014 (Ympäristönsuojelulaki)<sup>36</sup></li> </ul>
<b>Sweden</b>	<ul style="list-style-type: none"> <li>• Environmental Code, Chapter 5 1998:808 (Miljöbalk)<sup>16</sup></li> <li>• Swedish Work Environment Authority's provisions on hygienic limit values AFS 2018:1 (Hygieniska gränsvärden)<sup>37</sup></li> <li>• Work Environment Act 1977:1160 (Arbetsmiljölöag)<sup>38</sup></li> </ul>
<b>Netherlands</b>	<ul style="list-style-type: none"> <li>• The Building Works Environment Decree (Besluit Bouwwerken leefomgeving [Bbl], Staatsblad 2022, 145)<sup>39</sup></li> </ul>
<b>Germany</b>	<ul style="list-style-type: none"> <li>• Water protection law (Gesetz zur Ordnung des Wasserhaushalts [WHG] 2010)<sup>40</sup></li> <li>• Pollution control law (Bundes-Immissionsschutzgesetz [BImSchG] 2013)<sup>41</sup></li> <li>• Soil protection law (Bundes-Bodenschutzgesetz [BBodSchG]1998)<sup>42</sup></li> <li>• Nature protection law (Bundesnaturschutzgesetz [BNatSchG] 2009)<sup>43</sup></li> </ul>

## FINLAND

Environmental Protection Act (527/2014) lays down principles for the control of local environmental issues. Generally speaking, the act has many objectives such as pollution prevention, health and well-being, sustainable use of natural resources, reduction of waste, reduction of polluting activities and empowerment of citizens in environmental matters.

According to local environmental protection officers, who enforce the law, when the environmental protection legislation is approached from the point of view of deconstruction of concrete elements and local environmental protection, the main issues revolve around the following question: *does the deconstruction of concrete elements cause any impacts for local environment around the deconstruction site, such as particularly loud sounds, vibrations, or amounts of dust?*

Based on the interviews of the officers, a preliminary conclusion is that deconstruction of elements does not cause any special impacts to the local environment that would demand a stricter control compared to a normal demolition process. In fact, the authorities believe that a normal demolition process is likely to cause more disturbance, because the concrete

<sup>36</sup> <https://www.finlex.fi/fi/laki/ajantasa/2014/20140527>

<sup>37</sup> [Hygieniska gränsvärden \(AFS 2018:1\), föreskrifter - Arbetsmiljöverket \(av.se\)](https://www.arbetsmiljoverket.se/om-arbetsmiljoverket/hygieniska-gransvar-den-afs-2018-1)

<sup>38</sup> [Arbetsmiljölöag \(1977:1160\) Svensk författningssamling 1977:1977:1160 t.o.m. SFS 2022:1109 - Riksdagen](https://www.sfs.fi/ajantasa/1977/19771160)

<sup>39</sup> <https://zoek.officielebekendmakingen.nl/stb-2018-291.html>

<sup>40</sup> [http://www.gesetze-im-internet.de/whg\\_2009/index.html](http://www.gesetze-im-internet.de/whg_2009/index.html)

<sup>41</sup> <http://www.gesetze-im-internet.de/bimsgg/>

<sup>42</sup> <https://www.gesetze-im-internet.de/bbodschg/>

<sup>43</sup> [https://www.gesetze-im-internet.de/bnatschg\\_2009/](https://www.gesetze-im-internet.de/bnatschg_2009/)

is normally crushed to small pieces. This activity creates much more noise and dust etc. than detaching the elements as whole objects.

ReCreate deliverable 8.3. will discuss this matter in more detail, in case the empirical experiences of the Finnish deconstruction pilot will prove to differ from the aforementioned preliminary conclusion of the officers.

## SWEDEN

The Environmental Code Chapter 5, Environmental quality norms, contains framework regulations to protect the local environment in general. Nothing specific regarding constraints on demolition activities is mentioned in the code.

However, the Swedish Work Environment Authority's provisions on hygienic limit values (AFS 2018:1) include requirements related to air pollution in the work environment, as well as limit values for pollutants. Employers are who responsible for adhering to the regulation. The provisions include a specific note for construction works, stipulating that also developers and work environment coordinators have a responsibility to act on work environment risks pertaining to air quality. In relation to this, a specific issue raised by the developer in the Swedish country cluster is whether the risk to exposure to the chemical compound Chromium VI may exist when precast concrete elements are deconstructed or refurbished. The limit value to Chromium VI is mg/m<sup>3</sup> air, and the compound was detected in the testing of concrete elements used in the Swedish pilot. The issue arose because the tests displayed a Chromium VI content (mg per kg dry substance concrete) well above the limit value of cement according to the REACH legislation (of 2 mg per kg dry substance cement) (ECHA 2023). After discussions with the Swedish Chemical Agency, a clarification was however provided that the requirement is only applicable for chemical products, e.g. cement, and does not apply on reused concrete elements which, according to the authority, are to be defined as goods.

## THE NETHERLANDS

The Building Works Environment Decree<sup>28</sup> contains rules for construction and demolition work on structures. Among other things, the rules deal with limiting noise, vibration and dust nuisance. The same rules apply to demolition, deconstruction, and construction.

### Noise nuisance

Article 7.17 of the Bbl deals with noise nuisance. The article regulates when and how often commercial construction and demolition activities may take place. Such works may not exceed the daily noise values and associated maximum exposure duration. This means that commercial construction and demolition activities can only take place between 7:00 and 19:00 hours, at every day of the week, except for Sunday. In addition to this rule article 7.17 also states that the daily noise levels, introduced by the construction and demolition activities should not exceed certain levels. For example the duration of a noise level higher than 60 dB(A) should not exceed 50 days and a level higher than 75 dB(A) should not exceed 5 days. Noise levels of 80 dB(A) and higher are not allowed. Noise levels up to 60 dB(A) are unlimited.

Municipalities can also set policy rules for noise nuisance during construction and demolition activities. As a rule, the best available silent techniques are always mandatory



(Article 7.23[2] Bbl).<sup>44</sup> A made-to-measure regulation (see the paragraph 'Bespoke regulation' below) is not necessary if the work complies with the policy rules. For construction and demolition works, the initiator must inform the municipality at least 2 working days before commencement (Article 7.17(3) Bbl).

### **Vibration nuisance**

According to Article 7.18 of the Bbl, vibrations may not exceed the vibration strength given in Table 4 of the Measuring and Assessment Guideline, Part B 'Nuisance to Persons in Buildings 2006' of the Rotterdam Building Research Foundation.<sup>45</sup> This applies to a domestic area of a residential function, a meeting function for child day care, a healthcare function and an education function. For more information, see Vibration nuisance in general government regulations for construction and demolition work.<sup>33</sup>

### **Dust nuisance**

There are no standards for dust nuisance in the Bbl. However, it is mandatory to undertake necessary measures to limit visually perceptible dust spread outside the construction or demolition site (Article 7.19 Bbl). Examples of such measures include a cover, the construction of windbreak screens, keeping the site wet or clean, and/or spraying during demolition. This is especially important when breaking stony material into smaller fractions, therefore somewhat relevant for deconstruction, but even more so for conventional demolition. See also 'Mobile crushing of construction and demolition waste'.<sup>46</sup>

### **Bespoke regulation**

The municipalities can deviate from the rules (Article 7.5 Bbl) in individual cases with a made-to-measure regulation, for example if the rule is not clear enough in its expectations towards the permit applicant. A bespoke provision can only relax the rules on noise and vibrations, but not make them stricter (Articles 7.5[2] and 7.23[1] Bbl).

### **Other**

Other Bbl rules also apply to building and demolition activities, regarding e.g. safety, or the specific duty of care. In particular, calculation of nitrogen emissions during the construction or demolition project must be performed using the AERIUS model.<sup>47</sup> AERIUS helps to identify the maximum nitrogen emissions in the location for which an environmental permit is applied. The model shows the simulated nitrogen deposit in the area around the construction site.

All the Bbl regulations are specifically for construction and demolition work. Deconstruction or dismantling is not yet specifically classified in the regulations as a process, but it will be considered as a form of demolition work. It is not expected that the actual requirements will change when deconstruction and dismantling work will become described as a process

---

<sup>44</sup> <https://open.overheid.nl/documenten/ronl-1a2b0036-d4b1-4f7d-89b8-149fb26976c2/pdf>

<sup>45</sup> <https://www.infomil.nl/onderwerpen/ruimte/omgevingsthema/trillingen/tril-beleid-w/>

<sup>46</sup> <https://wetten.overheid.nl/BWBR0016292/2021-07-01>

<sup>47</sup> <https://www.rivm.nl/aerius>

within these regulations in the future, as the pending renewed Environmental Law from 2016 does not contain additional requirements.<sup>48</sup>

## GERMANY

In Germany, there are four different federal laws for the protection of the environment.

### **Law on the order of the water resources (Wasserhaushaltsgesetz [WHG] 2010, last amended on Jan 4 2023)**

The aim is to create the legal conditions for the proper management of surface and subsurface waters and to control the impact of man on the water resources. Until the release of the 'substitute building materials ordinance' (Ersatzbaustoffverordnung) on August 01, 2023, a special permit for the use of recycled building materials had to be applied for from the local authority in charge of water protection, since the use of recycled building materials can harm the groundwater, if the material contains harmful substances. With the new ordinance, the law on the order of the water resources (WHG) is no longer relevant for the use of secondary building materials. In general, the legal conditions of water protection only apply to construction work that is in direct contact with the soil (and therefore relevant to the groundwater). The reuse of concrete elements above the ground is not subject to the water protection laws.

### **Act for the protection against harmful effects on the environment caused by air pollution, noise, vibrations and similar processes (Bundes-Immissionsschutzgesetz [BImSchG] 2013, last amended on Oct 19 2022)**

The objectives are the protection of humans, animals, plants, soil, water, atmosphere, cultural and material assets against harmful effects on the environment and the prevention and reduction of harmful effects on the environment caused by emissions into the air, water and soil, including waste management. Construction sites are facilities not requiring a permit under the act. Nevertheless, they must be established and operated so that all potential harm to the environment is prevented that is preventable according to the current state of technology. Environmental harm that is not preventable must be restricted to the absolute necessary minimum. The act makes no difference between demolition, deconstruction or construction sites, which means the reuse of concrete elements has to adhere to the same regulations as a construction measure for a conventional new building.

### **Act for the Protection against Harmful Soil Changes and for the Remediation of Contaminated Sites (Bundes-Bodenschutzgesetz [BbodSchG] 1998, last amended on Feb 25 2021)**

The objectives are the sustainable protection of soil functions, the prevention of harmful soil changes, the remediation of contaminated sites and precautionary measures against adverse effects on the soil. According to §4 of the act, every party who engages with the soil needs to act in a way to prevent harmful changes to the soil. This means that construction

---

<sup>48</sup> <https://www.rijksoverheid.nl/onderwerpen/omgevingswet>. Currently entry into force is delayed until 1 January 2024. This law will consolidate all the laws discussed in this document relating to construction, environment etc. into one law and a new administrative service design.



sites need to be established and operated in such a way that the soil is not harmed. This applies for a conventional construction as well as for the reuse of concrete elements.

### Nature Conservation and Landscape Management Act (Bundesnaturschutzgesetz [BnatSchG] 2009, last amended Dec 8 2022)

The objectives are the declaration of the goals and principles of nature conservation and landscape management and the designation of nature reserves. In the context of construction work, the act regulates the preservation of biotopes, the general protection of wildlife and plants, as well as specially protected animals and plants. Before the start of any activities the site has to be inspected by an expert. A report on the wildlife and plant stock as well as potentially protected species has to be handed in to the local nature protection authority, together with a concept for ecological compensation in case of planned vegetation removal. These obligations apply for a conventional construction as well as for the reuse of concrete elements.

## 2.4. Work safety

Over the years, the EU has issued several directives that focus on occupational safety and health. The directives listed in Table 4 represent a non-exhaustive selection of the most relevant EU regulations relating to the construction sector. The distinctive characteristic of the directives is that they bind EU member states, but they are not directly applicable law within them. Member states must transpose the directives' stipulations into national laws. Directives are often implemented in many different laws, depending on a member state's original legal codification of work safety issues. The EU's website on European legislation on safety and health at work<sup>49</sup> provides an overview of all relevant EU regulations and how they are implemented in national laws. It also provides up-to-date EU frameworks, guidelines, regulations, standards and other relevant documents.

Table 4. Work safety regulation.

EU	<ul style="list-style-type: none"> <li>• Directive 2009/148/EC Protection of workers from the risks related to exposure to asbestos at work<sup>50</sup></li> <li>• Directive 92/57/EEC – temporary or mobile construction sites<sup>51</sup></li> <li>• Directive 89/391/EEC – ‘Framework Directive’<sup>52</sup></li> <li>• Directive 2009/104/EC – use of work equipment<sup>53</sup></li> <li>• Directive 92/58/EEC – safety and/or health signs<sup>54</sup></li> <li>• Directive 89/656/EEC – use of personal protective equipment<sup>55</sup></li> </ul>
----	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

<sup>49</sup> <https://osha.europa.eu/en/safety-and-health-legislation/european-directives>

<sup>50</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32009L0148>

<sup>51</sup> <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A31992L0057>

<sup>52</sup> <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A31989L0391>

<sup>53</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32009L0104>

<sup>54</sup> <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A31992L0058>

<sup>55</sup> <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A31989L0656>

	<ul style="list-style-type: none"> <li>• Directive 89/654/EEC – workplace requirements<sup>56</sup></li> </ul>
<b>Finland</b>	<ul style="list-style-type: none"> <li>• Work Safety Act 738/2002 (Työturvallisuuslaki)</li> <li>• Asbestos Work Safety Decree 798/2015 (Valtioneuvoston asetus asbestityön turvallisuudesta)</li> <li>• Decision of the Ministry of Labour on Personnel Spaces of Construction Sites 977/1994 (Työministeriön päätös rakennustyömaiden henkilöstötiloista)</li> <li>• Implementation: Decrees 408/2008 and 1101/20100 on the Safe Use of Work Equipment (Valtioneuvoston asetus työvälineiden turvallisesta käytöstä)</li> </ul>
<b>Sweden</b>	<ul style="list-style-type: none"> <li>• Work Environment Act 1977:1160 (Arbetsmiljölöag)</li> <li>• The Swedish Work Environment Authority's Statute Book (AFS) containing all The Swedish Work Environment Authority's provisions (Arbetsmiljöverkets författningssamling)<sup>57</sup></li> <li>• The Environmental Code 1998:808 (Miljöbalk)<sup>16</sup></li> </ul>
<b>Netherlands</b>	<ul style="list-style-type: none"> <li>• ARBO-wet (Working Conditions Act, BWBR0010346)<sup>58</sup></li> <li>• Building Decree 2012 (Bouwbesluit 2012, BWBR0030461)<sup>59</sup></li> </ul>
<b>Germany</b>	<ul style="list-style-type: none"> <li>• Work safety law (Arbeitsschutzgesetz [ArbSchG] 1996)<sup>60</sup></li> <li>• Workplace decree (ArbStättV, 2004)<sup>61</sup></li> <li>• Construction Site decree (BaustellV, 1998)<sup>62</sup></li> <li>• Industrial Safety decree (BetrSichV, 2002)<sup>63</sup></li> <li>• Noise and vibration occupational health and safety decree (LärmVibrationsArbSchV, 2007)<sup>64</sup></li> <li>• Load Handling decree (LasthandhabV, 1996)<sup>65</sup></li> <li>• PPE Use decree (PSA-BV, 1996)<sup>66</sup></li> </ul>

## FINLAND

The best source for knowledge on practical occupational health and work safety regulations, guidelines and institutions for Finland is the website of the Occupational Health and Safety Administration<sup>67</sup> which provides all the current legislation, specific themes and contact information to the relevant institutions. The Occupational Health and Safety

<sup>56</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A31989L0654>

<sup>57</sup> [Föreskrifter – Arbetsmiljöverket \(av.se\)](https://www.arbetsmiljoverket.se/foreskrifter)

<sup>58</sup> <https://wetten.overheid.nl/BWBR0010346/2022-05-20>

<sup>59</sup> <https://rijksoverheid.bouwbesluit.com/Inhoud/docs/wet/bb2012>

<sup>60</sup> <https://www.gesetze-im-internet.de/arbSchG/>

<sup>61</sup> [https://www.gesetze-im-internet.de/arbSttV\\_2004/](https://www.gesetze-im-internet.de/arbSttV_2004/)

<sup>62</sup> <https://www.gesetze-im-internet.de/baustellV/>

<sup>63</sup> [https://www.gesetze-im-internet.de/betrSichV\\_2015/](https://www.gesetze-im-internet.de/betrSichV_2015/)

<sup>64</sup> <https://www.gesetze-im-internet.de/lrmvibrationsarbSchV/>

<sup>65</sup> <https://www.gesetze-im-internet.de/lasthandhabV/>

<sup>66</sup> <https://www.gesetze-im-internet.de/psa-bv/>

<sup>67</sup> <https://www.tyosuojelu.fi/web/en>

Administration is part of the system of Regional State Administrative Agencies (*Aluehallintovirasto*, short AVI) and as such, also responsible for enforcement of current law.

In Finland, the Work Safety Act (738/2002) is the backbone of work safety law. The act has been changed or updated many times, reflecting changes in and through European legislation. The most recent significant change is from 2021, in which several issues deriving from the General Data Protection Regulation have been implemented. Changes in this act also often show the relevance of the so-called social partners (labour unions, employers' representatives) in the Finnish legislative processes. In general, it can be said that the sphere of work safety is anchored by laws, but the social partners and the Regional State Administrative Agencies (*Aluehallintovirasto*) have a significant role in supervision and monitoring work safety. Based on the Work Safety Supervision Act (*Laki työsuojelun valvonnasta ja työpaikan työsuojeluyhteistoiminnasta* 2006/44), workplaces (with a minimum workforce of ten employees) must have a Work Safety Officer.

The act prescribes the role of the Work Safety Officer, whose main duty is to represent the local workforce regarding work safety issues. Often a representative of a labour union, the Work Safety Officer is nonetheless representative of all employees. They are often a liaison to the Regional State Administrative Agency (see below). The Work Safety Officer also works with the employer to improve work safety and occupational health. They have an important function in information provision both at the local level and to the so-called social partners, who can use their findings in developing work safety issues in collective agreements.

The Work Safety Act deals with responsibilities of employers and employees regarding work safety in a practical sense. Employer duties relate to work orientation, work equipment, instructions, risk assessment, and other issues. The employer selects the work equipment and instructs how to use it, but it is the employee's duty to comply with the instructions. The employee must also immediately inform the employer and Work Safety Officer of situations in which the work environment is not safe or has defects. The employee must, considering their knowledge, skills and possibilities, attempt to remedy these defects. After that, the employer must inform which actions will or have been taken regarding the issue.

The Regional State Administrative Agency is responsible for enforcing work safety regulation, which is done through work site inspections. The agency concentrates its work on sectors with higher risks, such as the construction sector. It often works in close cooperation with the police, tax office and migration services, as its findings may lead to criminal law consequences or have effects regarding taxation or residency permits.

### **Work safety at the construction site**

Before work at a construction site can start, safety issues must be legally complied with. This section reviews as an example three best practice documents, which are essentially checklists that help to fulfil the legally stipulated requirements. The current requirements, as well as other forms and checklists useful for (de)construction projects can be found on

the website of the Confederation of Finnish Construction Industries RT<sup>68</sup>. Unfortunately, the information seems to be available only in Finnish.

The first work safety checklist is *'Turvallisuusasiat purkutöiden suunnittelussa'* (Safety issues in demolition planning), which is also useful for deconstruction. The checklist is an overview of all issues relevant for work safety, as it first deals with basic information about demolition, such as maps and inventories. Furthermore, it pays attention to hazardous materials and requirements pertaining to them in demolition. The checklist deals with the physical characteristics of the demolition (demolition order/sequencing, supporting walls, pipes and electrical systems, and the use of equipment). Beyond this, it pays attention to demolition waste and its logistics, the demolition site itself, and various personnel instructions. Finally, it deals with cleaning up the demolition site.

The second work safety checklist is *'Turvallisuusasiat nostotöiden suunnittelussa'* (Safety issues in the planning of crane work). The checklist aims to help with all aspects of crane work in construction projects. It is intended for new construction, as cranes are not normally used in demolition, but it is useful in considering crane-assisted deconstruction. The document is anchored in the regulation for crane work (e.g. relating to operator certification/education). It emphasises issues of logistics and communication: the planning of heavy lifting is recommended to be in written form, routes and movements are to be described in detail, and there should be clear rules for visual communications (hand signals etc.). Finally, the checklist also pays attention to information exchange with the construction engineers, to double check the lifting plans.

Related to this more general checklist is *'Nostotyösuunnitelma'* (planning checklist for specific lifting work). It focuses on physical aspects of lifting, such as its weight, place and equipment. Especially relevant is the attention paid to the lifting circumstances, as wind conditions or other weather phenomena can make a huge difference for lifting safety. Finally, there is emphasis on the necessary instructions and responsibilities to the personnel involved, including safety areas and need to warn of electrical wires.

## SWEDEN

The Swedish Work Environment Authority's Statute book (AFS) contains all provisions regarding the specific regulations on work safety<sup>69</sup>. The Environmental Code and the Work Environment Act (1977:1160), which represent the highest level of Swedish regulation, contain also general statutes regarding work safety. Relevant provisions from the Swedish Work Environment Act include e.g. requirements with regard to responsibilities, precautions and recommended values with regard to noise in the work environment (AFS 2005:16), use of lifting equipment (AFS 2006:6), inspection of lifting equipment (AFS 2003:6), scaffolding (AFS 2013:4), and chemical hazards in the working environment (AFS 2011:19), the purpose which is to stipulate how ill-health or accidents caused by chemical hazards in an activity shall be prevented. The last-mentioned statute also contains the Swedish specifications of the

<sup>68</sup> <https://www.rt.fi/Toimialat/Talonrakennusteollisuus/Hyoty tietoa-tyomaille/Laatu-ymparisto-tyoturvallisuus/Tyomaan-tyoturvallisuus/Tyoturvallisuuskansio-pk-rakennusyrityksille/Malliasiakirjat/>

<sup>69</sup> <https://www.av.se/produktion-industri-och-logistik/bygg/>

EU REACH regulation, with regard to chemical hazards in manufacturing processes of products.

The provision for building and civil engineering works (AFS 1999: 3)<sup>70</sup> is also relevant, as it gives requirements for construction sites and construction works. According to it, a 'construction environment coordinator' must be appointed by the developer (or delegated to the contractor to appoint), both for the design and planning stage and for the construction stage. The developer must ensure that these persons have the education, competence, and experience needed for the type of construction works, but no specific educational degree is required. The provision only contains suggestions for the contents of the education. The construction environment coordinator is responsible for making sure that a work environment plan is developed for the project, and that the planning and design ensures that the construction work can be accomplished without work environment risks. Their task is also to develop documentation for the construction and design ensuring that future maintenance, operation and demolition can take place in a secure way. Finally, it is stipulated that the developer (or the contractor, if the developer has delegated this responsibility) needs to hand in a pre-registration about the planned construction works to the Swedish Work Environment authority, for works over a certain size. The authority has the right to supervise the works i.a. by making inspections at the construction site.

There are no specific regulations concerning the work safety of working with deconstruction or reuse in general, let alone with precast concrete elements. For deconstruction works, the provision for building and civil engineering works is applicable.<sup>71</sup> It states that the planning and initiation of demolition works must be led by a competent person, who also follows and monitors the work.

## THE NETHERLANDS

Under Working Conditions Act<sup>72</sup> every employer must have an active policy to ensure the safety and health of the workers in respect to all aspects connected with work. To this end, employers shall pursue a policy aimed at ensuring the best possible working conditions, taking into account the state of science and professional services. This includes physical and mental health.

Construction and demolition (including deconstruction) companies must follow this law and provide a safe and healthy environment at construction sites (which include demolition and deconstruction sites). This is supervised by a special government organisation, the Labour Authority (*Arbeidsinspectie*).<sup>73</sup> Its website provides current information on safe and healthy work environments, with a special focus on construction sites. Contractors have their own safety officers at construction sites. These officers are construction workers with the additional special task of checking and looking at safety issues at the construction site. At larger sites there is a dedicated safety officer. The work of

---

<sup>70</sup> [Byggnads- och anläggningsarbete \(AFS 1999:3\), föreskrifter - Arbetsmiljöverket \(av.se\)](https://www.arbetsmiljoverket.se/om-arbetsmiljoverket/afsa/afsa-1999-3)

<sup>71</sup> See footnote 69.

<sup>72</sup> <https://wetten.overheid.nl/BWBR0010346/2022-05-20>

<sup>73</sup> <https://www.bouwendnederland.nl/actueel/onderwerpen-a-z/arbeidsomstandigheden/controle-naleving-arboregelgeving>

the safety officer and the construction site itself is checked (with spot checks) by the labour authority and certification bodies, like KIWA<sup>74</sup> and SKG IKOB<sup>75</sup>.

A national guideline for work safety in building and demolition work also exists<sup>76</sup>. The guideline outlines the current developments in work safety and the goals they aim to achieve. It focuses on the legal (and other) responsibilities of employers and employees, in addition to those of contractors. The guidelines specify the division of roles between actors. Primarily the focus is on the project developer, the architect, the contractor, municipality and the state. The context for this guideline is the findings by Dutch Safety Board reports that parties to construction projects are not sufficiently versed in work safety.<sup>77</sup> The guideline focuses on existing regulation, practical implementation (e.g. crane work, construction site safety zones) as well as communication. A website exists to perform a self-check of the status of the work safety measures at the site.<sup>78</sup>

The Working Conditions Act addresses several issues regarding working conditions. It defines the elements of a company's working conditions policies<sup>79</sup>. Within the general working conditions policy, an employer must pursue a policy aimed at preventing and, if this is not possible, limiting psychosocial workload. These obligations can be fulfilled by enlisting the services of a so-called *arbodienst* (working conditions service firm), which is obligatory. This private firm offers four core experts to the firm: the occupational health doctor (responsible for occupational health issues, absenteeism monitoring etc.), the workplace hygiene expert, the workplace safety expert, and the work- and organisation expert. Through the contract with the *arbodienst*, the employer has more resources to fulfil its legal obligations regarding work safety.

Additionally, the need for collaboration between the employer and employees is addressed<sup>80</sup>. When employees are united in a work council the employer must collaborate with the work council to develop the best policies to create and secure a safe and healthy work environment. Also, in the Working Condition Act it is described how the Labour Authority can verify whether the employer and the employees comply with the rules and how sanctions can be given. The work council's input is required in developing the working conditions policy of the firm, in particular regarding risk assessment of work. The risk assessment and other aspects of work safety rules are expanded in the collective agreement of the construction sector.<sup>81</sup>

Private certification bodies can certify the process of developing, checking, maintaining and improving the work condition policies in the construction sector. Based on an assessment guideline (*Beoordelingsrichtlijn*, BRL), the private certificate SVMS-007 is

<sup>74</sup> <https://www.kiwa.com/nl/en/>

<sup>75</sup> <https://www.skgikob.nl/>

<sup>76</sup> <https://lokaleregelgeving.overheid.nl/CVDR637966/1?>

<sup>77</sup> <https://www.onderzoeksraad.nl/en/page/1465/ingestorte-betonvloer-rotterdam-21-oktober-2010>

and others by the Dutch Safety Board.

<sup>78</sup> <https://www.zelfinspectie.nl/>

<sup>79</sup> <https://wetten.overheid.nl/BWBR0010346/2022-05-20#Hoofdstuk2>

<sup>80</sup> <https://wetten.overheid.nl/BWBR0010346/2022-05-20#Hoofdstuk3>

<sup>81</sup> <https://www.bouwendnederland.nl/media/16127/cao-bouw-infra-2023-nov-2022.pdf>



available<sup>82</sup>. When a company has such a certificate, it is an indication that the processes within the company are suitable to ensuring work safety. Demolition companies that want to distinguish themselves by demonstrating that they demolish/deconstruct in a circular way and commit to high-quality reuse of secondary materials can, in addition to the BRL SVMS-007, qualify for the Verification Scheme Circular Demolition Project.

Almost all larger clients and (main) contractors require 'VCA' certification as a minimum requirement in the specifications. VCA stands for Safety, Health and Environment Checklist for Contractors<sup>83</sup>. The VCA certification has been developed especially for industry with high risk, including the construction sector. The certification allows companies to demonstrate that they comply with obligations under the Working Conditions Act. There are VCA certificates for several classes of employees (e.g. a general certificate, a dedicated certificate for supervisors, a certificate for temporary workers, and a certificate for the project's principal contractor).<sup>84</sup>

In article 2.28 of the Working Conditions Act it is stated that a Safety and Health plan (V+G plan), must be made for a construction projects. The principal is responsible for preparing such a plan. Normally the principal instructs the contractor of the project to provide a complete Safety and Health plan. Each project has its own plan. This includes demolition projects as well.

In the Safety and Health plan, the contractor asks all design partners involved in the project to provide a part of the Safety and Health plan. Each partner needs to look at its own part in the project and determine what can be done to improve safety and health from its own perspective. For example, a precast concrete engineer can incorporate special anchor systems in the precast concrete elements to safely connect fall protection at the edge of the building during construction. Or they can point out that protruding starter bars will be present in some precast concrete elements, which need to be covered to protect workers from being accidentally skewered by falling into the starter bars. Another example is protection of floor recesses and shafts, so workers cannot fall into them. Also, the use of chemicals, solvents, the probability of the presence of hazardous materials, such as asbestos, is included in the plan. In the design phase of a project, all parties are obligated to provide the best possible safe and health working environment at the construction site. If necessary, adjustments must be made to the design of the building to accommodate work safety obligations.

For ReCreate's Dutch deconstruction pilot, Prinsenhof in Arnhem, the deconstruction company project partner Lagemaat wrote several documents, which reflect their policies regarding the working conditions, safety procedures and occupational health issues on the deconstruction site. These documents show a translation of the company policies to a specific application on a site. The documents consist of:

---

<sup>82</sup> <https://www.veiligislopen.nl/nl/>

<sup>83</sup> <https://www.vca.nl/home/diplomas-certificates/scc>

<sup>84</sup> <https://www.vca.nl/home/diplomas-certificates/scp>

- The deconstruction plan, which provides a detailed description of the deconstruction process itself, and the different tasks and aspects of the process. This includes the order of deconstruction, the detailed description of the deconstruction of specific precast concrete elements, and safety measures.
- A review of the documents by a third party. An external review is not mandatory, but to ensure that they did everything according to their policies and regulations, Lagemaat opted for an external review.
- A hoisting plan with the information about the crane used and the location of the crane. The information includes specifications of the crane itself, such as the maximum capacity and site plan.
- A structural deconstruction plan based on structural analyses by the structural engineer (ReCreate project partner IMd), including product information (guidelines) of products used in the deconstruction process. Figure 2 shows a few examples of the graphic support part of the structural deconstruction plan, which show safety measures, such as anchors.
- A detailed overview of how to safely store the hollow-core slabs.

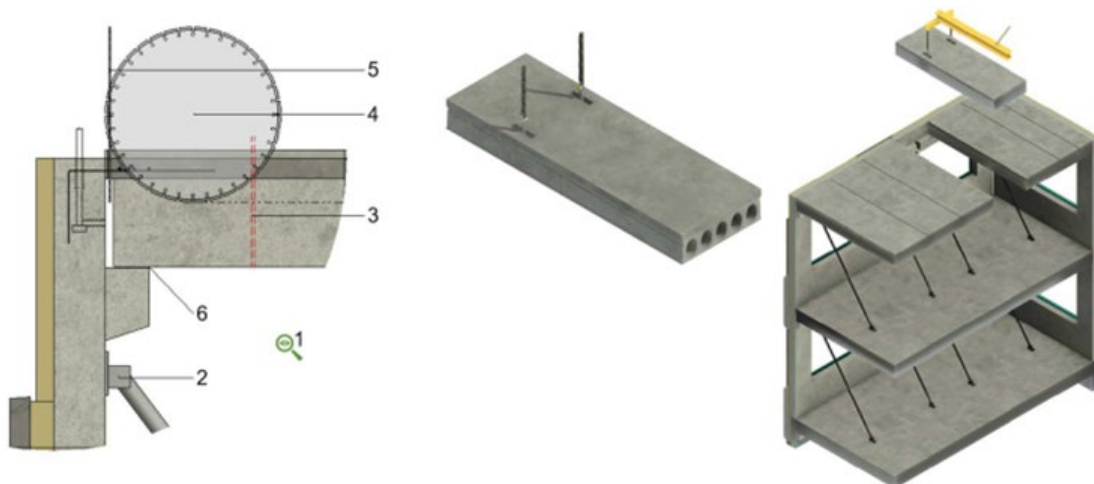


Figure 2. Overview of the deconstruction of the hollow core slabs from the Structural Deconstruction Plan of Prinsenhof by Lagemaat.

## GERMANY

There is one federal law in Germany for work safety: the work safety law (*Arbeitsschutzgesetz* [ArbSchG]) from 1996, which is the implementation of the EU directives 89/391/EWG and 91/383/EWG. Its goal is to safeguard and improve the health of all employees through occupational health and safety measures.

There is a number of additional work safety decrees in Germany that are directed at specific work or workplace related issues: the Workplace Decree (2004), the Construction Site Decree (1998), the Industrial Safety Decree (2002), the Noise and vibration occupational health and safety Decree (2007), the Load Handling Decree (1996) and the PPE Use Decree (1996).



### **Construction Site Decree 1998**

The Construction Site Decree (*Baustellenverordnung* [BaustellV], 1998) defines obligations for safety and health protection measures for the building owner to implement on their construction site. Firstly, the common safety and health protection measures according to Work Safety Law (ArbSchg) §4 are to be implemented. They define that the work has to be organized so that potential danger is avoided as much as possible, and state of the art technology, occupational medicine and hygiene measures are to be implemented. Additionally, all workers should receive instructions on safety measures.

What is more, starting from a specific size of the construction (e.g. more than one company involved, longer than 30 days, but also according to level of danger of the work), the project has to be registered at the supervisory authority for occupational health and safety. Also, according to the size of the project, a Safety and Health Protection Coordinator (SiGeKo) has to be appointed and a Safety and Health Protection Plan (SiGe-Plan) has to be established (see below). In some cases, a documentation of the project and the safety measures must be archived by the building owner for future works.

### **Safety and Health Protection Coordinator (SiGeKo)**

According to §3 of the Construction Site Decree (*Baustellenverordnung* [BaustellV] 1998), the developer has to appoint a Safety and Health Protection Coordinator (*Sicherheits- und Gesundheitsschutzkoordinator* - SiGeKo) if there is more than one company or profession working on the construction site. The coordinator (SiGeKo) is responsible for making sure that the construction process is executed in a safe way according to a safety and health protection plan (SiGe-Plan), which must be established by the coordinator and shared with all involved parties before the construction starts. The goal of the plan is mainly to avoid that two or more companies endanger each other while working parallelly on the construction site. Therefore, the safety and health protection plan should allocate timeframes and specific work locations for the involved parties to prevent overlapping.

### **Load Handling Decree 1996**

The Load Handling Decree (*Lastenhandhabungsverordnung* [LasthandhabV], 1996) defines measures to prevent health dangers from manual load handling. One central measure according to §2 is that the employer must provide appropriate tools, machinery or other technical equipment to prevent manual load handling. If this is not possible, the employer must assess the circumstances of the work (load handling) according to §5 ArbSchG (assessment for safety and health protection measures) and decide on appropriate safety and health protection measures.

Additionally, the German Legal Accident Insurance (*Deutsche Gesetzliche Unfallversicherung* [DGUV]) has the responsibility to prevent occupational accidents, occupational diseases and work-related health hazards according to § 14 of the Code of Social Law (*Sozialgesetzbuch* [SGB VII] 1996). Therefore, the DGUV releases ordinances for work safety that are more detailed for specific trades, works or technical equipment. Some

of these ordinances with relevance for (de)construction work are: DGUV ordinances No. 38 and 39 'Construction Work', and No. 52 and 53 'Cranes'<sup>85</sup>.

**DGUV Ordinance No. 38 'Construction Work', 2019<sup>86</sup>**

In this ordinance, the measures for accident prevention on construction sites and during construction work are laid out. Construction work includes (among others) construction, demolition, (partial) deconstruction and disassembly. There are regulations on stability and load-bearing capacity of materials, scaffolding, etc. as well as the driving of vehicles on construction sites or the prevention of falling from heights, among other things.

**DGUV Ordinance No. 53 'Cranes', 2001**

In this ordinance, the measures for accident prevention for and during the use of cranes are laid out. Amongst others there are regulations on load bearing, access of steering facilities, safety zones, and the appropriate cables. In addition to construction, the given regulations are relevant to crane-aided deconstruction.

---

<sup>85</sup> These and others can be found at <https://www.dguv.de/fb-bauwesen/index.jsp>.

<sup>86</sup> [https://www.bgbau.de/fileadmin/Medien-Objekte/Medien/DGUV-Vorschriften/38\\_BGV\\_C22\\_/38.pdf](https://www.bgbau.de/fileadmin/Medien-Objekte/Medien/DGUV-Vorschriften/38_BGV_C22_/38.pdf)

### 3. Norms on reuse

Similar to the deconstruction norms, many of the norms governing the reuse of concrete elements are in national control. However, matters related to product approval are an exception, as their control is very much based on EU-level regulation.

The following sections are organized in a similar manner to Chapter 2. As before, the sections examine the norms in the different ReCreate countries and discuss what practical implications they may have for the reuse of concrete elements. EU-level policies are analysed only in the sections where they are relevant.

Section 3.1. assesses the significance of the Eurocodes and their national variations for structural design when reusing precast concrete components. Relevant EU regulation (CEN TC 250/ WG2/SC2) is gathered and systemised in respect to their normative status. As a result, an analysis of the legal basis for key design guidelines is provided.

Section 3.2. includes an in-depth discussion on the legislation and norms concerning product approval. In the common EU market, construction products are usually approved by the CE mark. However, products already on the market (such as reused products) are exempted from it. Moreover, applying the CE mark on reused building components can be challenging, as the technical requirements have been written from the perspective of new production. The section concludes that the product approval of reused building components belongs, as a rule, to national control. The national practices related to product approval are variable. In Finland, product approval of reused products falls in the hands of municipal building supervisors. Although it is clear *who* is responsible of the matter, currently, there is no consensus among stakeholders *how* the products should be approved. In Sweden, although there are alternative practices available for product approval, the procedures require clarification. The responsibility of the product approval vests in the developer in Sweden, but authorities' advice is very limited when it comes to what the process should be like for reused building components, and how e.g. hazardous substances should be measured and controlled. In Germany and in the Netherlands, the matter is already more institutionalised than in the Nordics. There are established procedures and/or certifications (some in making) for demonstrating the suitability of the reused building products when CE marking is not feasible.

Section 3.3. focuses on designer qualifications and finds out whether there are any special qualification requirements for the designers responsible for reuse planning. These requirements vary from country to country. In Sweden, there are no strict requirements for designers at all, whereas in Finland, regulations clearly lay down requirements for of design tasks of different difficulty levels. It is highly likely that reuse of building components will be interpreted as a very challenging design task, which requires the designers to be highly trained and experienced. The Netherlands and Germany are located somewhere in-between Finland and Sweden in terms of the designer qualifications. These countries utilise registers, so-called state chamber systems, to ensure the proficiency of designers.

Section 3.4. focuses on building permits and investigates whether reusing concrete elements raises any special requirements for permit applications. Regarding permits, the situation is quite similar in every ReCreate country. Reuse of building components contains at least some ambiguities in each country, and practices are not yet very established or institutionalised. Thus, permit application processes take a hands-on approach, where a grassroot-level collaboration between the authorities and the party undertaking a building project is emphasised to provide sufficient evidence that all legal requirements are met, and the building is safe for users.

Lastly, Section 3.5. analyses how sustainable development norms may influence the reuse of building components. Many of the norms can be considered as a ‘softer’ form of regulation. Thus, they do not have a direct impact for reuse. Nevertheless, they have a significant role in the big picture, as they construct legitimations for circular policies, and public and industrial practices.

## 3.1. Technical requirements

In construction, both European and national legislation is followed (Table 5). In general, the technical requirements in the legislation are fulfilled by using construction products suitable for the intended purpose and by following technical standards for construction products. The purpose of these standards is to enable the definition and evaluation of products, structures and buildings in a comparable manner. In terms of technical properties, European standards guide design and thus also the required technical properties of building components and products. The design standards for load-bearing structures are called the Eurocodes. The Eurocodes have national annexes, which guide their application in different countries. In general, a building’s design and the Eurocodes set the requirements for building components and products, too.

However for building products, there are also European harmonised product standards for given categories of products. These standards deal with terms and definitions, properties, test methods, sampling, and durability requirements of such building components and materials. The standards’ purpose is to define how the properties of such products must be communicated in order to enter the EU single market and receive the CE mark. They include the basis (Annex Z) for CE-marking and provide a framework for manufacturers, making it easy to produce products complying with EU single market regulations. The standards are not fully applicable to or compatible with salvaged building components, as they generally deal with the product manufacturing process, which reused products do not undergo (see Section 3.2.).

Table 5. Technical standards and regulations

<b>EU level</b>	<ul style="list-style-type: none"> <li>• Eurocodes<sup>87</sup></li> <li>• European harmonised product standards for various precast concrete (see Table 6)</li> </ul>
-----------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------

<sup>87</sup> <https://www.en-standard.eu/eurocodes/>

<b>Finland</b>	<ul style="list-style-type: none"> <li>Land Use and Building Act 132/1999 (Maankäyttö- ja rakennuslaki)<sup>88</sup></li> <li>National Annexes to Eurocodes<sup>89</sup></li> <li>SFS 7508:2021 Betonin puristuslujuuden arviointi rakenteista ja rakenneosista. Standardin SFS-EN 13791 käyttö Suomessa. (Assessment of in-situ compressive strength in structures and precast concrete components. Application of standard SFS-EN 13791 in Finland.)<sup>90</sup></li> </ul>
<b>Sweden</b>	<ul style="list-style-type: none"> <li>Planning and Building Act 2010:900 (Plan- och bygglagen)<sup>91</sup></li> <li>Boverket's Application of the European construction standards (Boverkets konstruktionsregler, EKS)<sup>92</sup></li> <li>Boverket's building regulations 2011:6 (Boverkets byggregler, BBR)<sup>93</sup></li> </ul>
<b>Netherlands</b>	<ul style="list-style-type: none"> <li>Building Decree 2012 (Bouwbesluit 2012, BWBR0030461)<sup>94</sup></li> <li>National Annexes to Eurocodes<sup>95</sup></li> <li>NEN EN-1990 – Eurocode – Basis of structural design (Grondslagen van het constructief ontwerp)<sup>96</sup></li> <li>NEN 8700:2011+A1 Assessment of existing structures in case of reconstruction and disapproval – Basic rules (Beoordeling van de constructieve veiligheid van een bestaand bouwwerk bij verbouw en afkeuren – Grondslagen)<sup>97</sup></li> <li>NEN 8701+A1 Assessment of existing structures in case of reconstruction and disapproval – Actions (Beoordeling van de constructieve veiligheid van een bestaand bouwwerk bij verbouwen en afkeuren – Belastingen)<sup>98</sup></li> <li>NEN 8702 Assessment of an existing structure in case of reconstruction and disapproval – Concrete structures (Beoordeling van de constructieve veiligheid van een bestaand bouwwerk bij verbouw en afkeur – Betonconstructies)<sup>99</sup></li> </ul>
<b>Germany</b>	<ul style="list-style-type: none"> <li>National Annexes to Eurocodes<sup>100</sup></li> <li>DIN 1045-4:2012-02 (for prefabricated concrete elements)<sup>101</sup></li> </ul>

<sup>88</sup> <https://www.finlex.fi/fi/laki/ajantasa/1999/19990132>

<sup>89</sup> <https://ym.fi/en/the-national-building-code-of-finland>

<sup>90</sup> <https://sales.sfs.fi/en/index/tuotteet/SFS/SFS/ID2/7/1065259.html.stx>

<sup>91</sup> [https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/plan--och-bygglag-2010900\\_sfs-2010-900](https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/plan--och-bygglag-2010900_sfs-2010-900)

<sup>92</sup> [Om Boverkets konstruktionsregler, EKS – PBL kunskapsbanken – Boverket](#)

<sup>93</sup> [Boverkets byggregler – PBL kunskapsbanken – Boverket](#)

<sup>94</sup> See footnote 6.

<sup>95</sup> <https://www.nen.nl/en/nen-en-1990-a1-a1-c2-2019-nb-2019-nl-252522>; <https://www.nen.nl/en/nen-en-1991-1-1-cl-cl1-2019-nb-2019-nl-252521>; <https://www.nen.nl/en/nen-en-1992-1-1-c2-2011-nb-2016-a1-2020-nl-267151>; <https://www.nen.nl/en/nen-en-1992-1-2-cl-2011-nb-2011-nl-158497>

<sup>96</sup> <https://www.nen.nl/en/nen-en-1990-2002-en-37350>

<sup>97</sup> <https://www.nen.nl/en/nen-8700-2011-a1-2020-nl-258528>

<sup>98</sup> <https://connect.nen.nl/Standard/Detail/3635718?compId=0&collectionId=0>

<sup>99</sup> <https://www.nen.nl/en/nen-8702-2018-ontw-nl-239123>

<sup>100</sup> <https://www.en-standard.eu/din-en-1992-1-1-na-a1-national-annex-nationally-determined-parameters-eurocode-2-design-of-concrete-structures-part-1-1-general-rules-and-rules-for-buildings-amendment-a1/>; <https://www.en-standard.eu/din-en-1990-na-a1-national-annex-nationally-determined-parameters-eurocode-basis-of-structural-design-amendment-a1/>; <https://www.en-standard.eu/din-en-1992-1-2/na/a1-national-annex-nationally-determined-parameters-eurocode-2-design-of-concrete-structures-part-1-2-general-rules-structural-fire-design-amendment-a1/>

<sup>101</sup> <https://www.en-standard.eu/din-1045-4-tragwerke-aus-beton-stahlbeton-und-spannbeton-teil-4-erganzende-regeln-fur-die-herstellung-und-die-konformitat-von-fertigteilen/>

The European harmonised product standards for various precast concrete products (Table 6) give technical requirements. Even if all aspects and processes contained in them are not directly applicable to reused components, the underlying technical requirements are nonetheless relevant to the reuse of precast concrete structures, as the technical properties of salvaged components need to be described in similar technical terms.

Table 6. European harmonised product standards for various precast concrete products.

EN 1168:2005 <sup>102</sup>	Precast concrete products – Hollow core slabs
EN 13224:2011 <sup>103</sup>	Precast concrete products – Ribbed floor elements
EN 13225:2013 <sup>104</sup>	Precast concrete products – Linear structural elements
EN 13369:2018 <sup>105</sup>	Common rules for precast concrete products
EN 13693:2004 <sup>106</sup>	Precast concrete products – Special roof elements
EN 13747:2005 <sup>107</sup>	Precast concrete products – Floor plates for floor systems
EN 14843:2007 <sup>108</sup>	Precast concrete products – Stairs
EN 14991:2007 <sup>109</sup>	Precast concrete products – Foundation elements
EN 14992:2007 <sup>110</sup>	Precast concrete products – Wall elements

## FINLAND

Finland has issued several different national annexes on the application of the European standards. Finland's Nordic environmental conditions set requirements for structures and the design thereof that differ from the general recommendations in Eurocodes. The Finnish Land Use and Building Act 132/1999 lays down a building's technical requirements on a general level.

Regarding precast concrete structures, whether virgin or reused, the act's technical requirements concern strength, stability, service life, fire safety, health, operational safety, acoustic conditions, and energy efficiency. The properties are normally demonstrated by following European harmonised standards for concrete products, which do not however

<sup>102</sup>[https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP\\_PROJECT,FSP\\_ORG\\_ID:37331,6210&cs=124258B701499C0EAFACBDB660E65371](https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP_PROJECT,FSP_ORG_ID:37331,6210&cs=124258B701499C0EAFACBDB660E65371)

<sup>103</sup>[https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP\\_PROJECT,FSP\\_ORG\\_ID:35485,6210&cs=1B0380FD46862FID430211B5784874EAF](https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP_PROJECT,FSP_ORG_ID:35485,6210&cs=1B0380FD46862FID430211B5784874EAF)

<sup>104</sup>[https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP\\_PROJECT,FSP\\_ORG\\_ID:33537,6210&cs=17F860DF4DD95D64D2D0B6241F96CE031](https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP_PROJECT,FSP_ORG_ID:33537,6210&cs=17F860DF4DD95D64D2D0B6241F96CE031)

<sup>105</sup>[https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP\\_PROJECT,FSP\\_ORG\\_ID:63545,6210&cs=10B3498E10A9AA4C1078128825092615A](https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP_PROJECT,FSP_ORG_ID:63545,6210&cs=10B3498E10A9AA4C1078128825092615A)

<sup>106</sup>[https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP\\_PROJECT,FSP\\_ORG\\_ID:33289,6210&cs=1A09CA84014D7ADF633A6537DDE9934F1](https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP_PROJECT,FSP_ORG_ID:33289,6210&cs=1A09CA84014D7ADF633A6537DDE9934F1)

<sup>107</sup>[https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP\\_PROJECT,FSP\\_ORG\\_ID:34716,6210&cs=159F5730A82E63586EED72164F60A1090](https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP_PROJECT,FSP_ORG_ID:34716,6210&cs=159F5730A82E63586EED72164F60A1090)

<sup>108</sup>[https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP\\_PROJECT,FSP\\_ORG\\_ID:10901,6210&cs=129654137CC95454F6B5D14B1DDAA716E](https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP_PROJECT,FSP_ORG_ID:10901,6210&cs=129654137CC95454F6B5D14B1DDAA716E)

<sup>109</sup>[https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP\\_PROJECT,FSP\\_ORG\\_ID:10913,6210&cs=1832AC80E2B86FE10536F9EA1C32C8606](https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP_PROJECT,FSP_ORG_ID:10913,6210&cs=1832AC80E2B86FE10536F9EA1C32C8606)

<sup>110</sup>[https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP\\_PROJECT,FSP\\_ORG\\_ID:38345,6210&cs=1296E4E8BDB68501B31BD9B26C8634D8D](https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP_PROJECT,FSP_ORG_ID:38345,6210&cs=1296E4E8BDB68501B31BD9B26C8634D8D)

consider reuse. For reused building parts, the required properties can be determined through various experiments or tests (Lahdensivu et al. 2019; SFS-EN 13791:2019; SFS 7508:2021), which have been developed for the condition investigation of existing buildings ahead of refurbishment or renovation. The applicable test methods will be studied and discussed in ReCreate's Work Package 4 and discussed in the upcoming ReCreate deliverable 8.3.

Demonstrating the legal compliance of an entire building requires a theoretical and experimental examination. In this way, the legal compliance of the entire building in Finland regarding technical requirements can be demonstrated. Section 3.2. discusses the product approval in more detail.

### SWEDEN

The Swedish system for buildings' structural design is comprised of the Eurocodes together with the Swedish National Board of Housing, Building and Planning's Series of Provision on the Application of European Construction Standards (EKS). These provide the Swedish rules for the verification of load-bearing capacity, stability and durability. They are regulated by the Planning and Building Act (2010:900) Chapter 8 § 4 Paragraph 1 and Chapter 3 § 7. The latter states that: *'A construction work must be designed and executed in such a way that the impact that the construction work is likely to be exposed to when it is built or used does not lead to that the structure completely or partially collapses, unacceptable major deformations, damage to other parts of the building, its installations or fixed equipment as a result of major deformations in the supporting structure, or damage that is disproportionate to the event that caused the damage.'*

The EKS specifies which of the Eurocodes have been incorporated into the Swedish regulatory framework. It also gives the national choices of various parameters for the Eurocodes. The national choices are based on e.g. different conditions regarding geology, climate, lifestyle, and level of security. The choices have been introduced successively in the EKS. Furthermore, the Swedish National Board of Housing, Building and Planning's building regulations/norms (BBR) contain general rules about issues such as materials and products, economically reasonable lifespan, planning, execution, and verification. In addition, the BBR provides more specific rules and norms with respect to e.g. fire safety, energy efficiency, moisture safety, content of hazardous substances and acoustic conditions. As in the Finnish case, neither the EKS nor the BBR consider reused components specifically.

### THE NETHERLANDS

According to the introduction to the Dutch Building Decree 2021, 'A building must not pose any danger to occupants, users and its surrounding environment.'<sup>111</sup> Therefore, the decree gives regulations intended to guarantee buildings' safety, health, usability, energy efficiency and environmental aspects. It regulates new buildings, renovations, existing buildings, and the demolition of buildings. It addresses different types of building-related

---

<sup>111</sup> <https://www.rijksoverheid.nl/onderwerpen/bouwregelgeving/bouwbesluit-2012>



aspects, such as safety, health, usability and accessibility, energy, environment, demolition, installations, and open areas and terrain.

The decree's purpose is also to ensure structural reliability. The decree states that structures should be able to withstand the effect of the basic load combination and the accidental load combination. For design, these combinations are described in NEN-EN 1990 'Basis of structural design'<sup>112</sup>. Whether structures can withstand the effect should be determined using the relevant part of the Eurocodes. It should be noted that these requirements are limited to the ultimate limit state only.

Requirements related to the serviceability limit state, which are also provided in the Eurocodes, are only enforced through private law, e.g. when a specification or a contract states that the design should be done according to the Eurocodes. According to the Building Decree 2012 §3, the principal contractor, designer or builder of a new building and the owner of a current building are primarily responsible for the quality of the building. The Decree sets minimum requirements for quality, and it is the responsibility of aforementioned actors to conclude contracts which comply with these minimum standards.

When existing structures are assessed or reconstruction work is to be performed, the NEN 8700 series<sup>113</sup> should be used:

- NEN 8700:2011 Assessment of existing structures in case of reconstruction and disapproval – Basic rules (Dutch)
- NEN 8701:2011 Assessment of existing structures in case of reconstruction and disapproval – Actions (Dutch)
- NEN 8702:2018 Assessment of existing structures in case of reconstruction and disapproval – Concrete structures (Dutch)

They should be used beside NEN-EN 1990. Compared to NEN-EN 1990, NEN 8700 series allow a lower level of structural reliability for the assessment of an existing structure. This is done by reducing the partial safety factors for loading. On the resistance side, the relevant Eurocode should be used in combination with the partial factors for material properties as described in the national annex. Additionally, guidance for the several structural materials can be given in additional codes, such as the NEN 8702 for concrete. It guides the interpretation of former concrete and reinforcement class indications.

The aforementioned distinction between design and assessment in the Dutch standards is somewhat impractical in reuse, where an existing precast concrete element is applied on a new structure. Therefore, research is being performed – partly within ReCreate – to formulate methods that integrate these standards, so that reused elements can more easily be used in the creation of new designs.

---

<sup>112</sup> see footnote 96.

<sup>113</sup> <https://www.nen.nl/bouw/constructieve-veiligheid/constructieve-veiligheid-bestaande-bouw>



## GERMANY

In general, technical requirements for reusing concrete elements in Germany are the same as for new concrete elements. Dimensioning and calculation are subject to the Eurocodes (e.g. DIN EN 1992-1-1 'Design and construction of reinforced and prestressed concrete structures – Part 1-1: General design rules and rules for building construction'), the affiliated national annexes (NA) and the applicable national standards (e.g. for precast concrete elements DIN 1045-4:2012-02 'Concrete, reinforced concrete and prestressed concrete structures – Part 4: Supplementary rules for the manufacture and conformity of precast elements'). The requirements for the concrete itself are subject to the applicable standards (DIN EN 206-1 and DIN 1045-2).

An extensive overview of all legally binding technical requirements can be found in the 'Model Administrative Provisions [for] Technical Building Rules' (*Muster-Verwaltungsvorschrift [für] Technische Baubestimmungen* [MVV TB]) published by the German Institute for building technology (DIBt). It specifies the 'model building code' (*Musterbauordnung* [MBO]), which, despite not being a law, provides standardised requirements for the building sector. Together the MVV TB and MBO function as a template for state building codes (*Landesbauordnung*) of the 16 states in Germany. During the 2016 revision of the MBOs, the technical rules for the design, dimensioning and execution of buildings, for types of construction and for building products were brought together in the above mentioned MVV TB. It is divided into four sections.

Parts A and B contain fundamental regulations for the planning, dimensioning, construction, and operation of buildings. Part C summarises the regulations for the use of construction products that do not bear the CE mark according to the Construction Products Regulation (see Section 3.2.). In addition, it contains specifications for building products and types for which a 'general building authority test certificate' (*Allgemeines Bauaufsichtliches Prüfzeugnis*) is provided. Part D gives information on construction products for which no 'building authority usability certificate' (*Bauaufsichtlicher Verwendbarkeitsnachweis*) is required. It also regulates how to deal with voluntary manufacturer information in relation to the essential characteristics of harmonised construction products that are not covered by the CE marking of the technical specification on which they are based.<sup>114</sup>

Although the mentioned standards and norms must be applied when reusing concrete elements, the MVV TB does not have any explicit rules for the reuse of concrete elements. Therefore, reuse needs special permits, which will be discussed in Section 3.4. To simplify this procedure, our aim as part of ReCreate is to have reused concrete elements incorporated in the MVV TB.

In Germany, the guideline 'Reuse of precast elements made of concrete, steel and reinforced concrete' from 2012 (LBV 2012), published by the Brandenburg State Office for Construction and Transport (*Landesamt für Bauen und Verkehr*), can be used as a basis for the required approval in individual cases of reuse. It gives the procedure for decision-making on reuse as well as test criteria for quality assessment. The guideline is based on

<sup>114</sup> <https://www.dibt.de/en/we-offer/technical-building-rules>

the doctoral thesis of professor Angelika Mettke (1995), ReCreate's German country cluster leader.

## 3.2. Product approval

Construction products refer to products intended to become a permanent part of a building structure, such as precast concrete elements. Construction products must be safe, be in accordance with the principles of sustainable development, and not be harmful to health. Construction products are fit for construction purposes when they meet the essential technical requirements defined in the current regulations concerning the strength and stability of structures, fire safety, health, safety in use, accessibility, acoustic conditions, and energy efficiency. (EC 2023b).

The performance of construction products must always be confirmed for the intended use. In the European market, there are different ways to confirm the performance and the hierarchy between the ways must be taken into account.

The EU Construction Products Regulation (CPR) (EU N:o 305/2011) lays the foundations for the legislative hierarchy, stating that the performance of any type of construction product must be confirmed with the CE marking if (1) the product in question falls within the scope of a harmonised European product standard (hEN) or (2) its manufacturer has applied a voluntary European Technical Assessment (ETA) status for the product. (EC 2023c).

Thus, when attached to a construction product, the CE mark proves that the product has been tested using a method compliant with the relevant hEN standard, and that the product attains the reported level of performance. However on construction products, the CE mark does not signify quality and is not *per se* sufficient to guarantee the product's fitness for use in construction projects. That is the reason why in obtaining the CE mark for a construction product, a Declaration of Performance (DoP) is also required. The DoP must list all values regarding product properties that are required to meet the official regulations. (*ibid.*)

Although the CE mark is clearly the most common way to approve products for the EU single market, challenges arise when the CPR, the hEN standards and the CE mark are considered from the viewpoint of reused construction products, such as salvaged concrete elements. Zhu and Tähtinen (2022, 4), who the Finnish Ministry of the Environment commissioned to examine legislative conditions for reuse of building components in Finland, state: *'The Construction Products Regulation was enacted from the point of view of the manufacture of new construction products, and the harmonised standards are not directly applicable to assessing the performance and durability of reusable building components, as they contain requirements for quality control during manufacture that are not possible for reusable building components. In addition, the testing of the characteristics of reusable building components must consider the impact of the previous use on the characteristics of the building components, which is not considered in the harmonised standards for new product'*.

Indeed, the current CPR does not specify what practices must be followed when reusing products. Many EU member states, as well as ReCreate members, have been confused as

to whether the CPR mandates the CE mark from all reused building components, or if such products are rather covered by national regulations, and if so, in what respects (see also Zhu & Tähtinen 2022, 5).

However, a recent elaboration on the matter provided by the EC has brought some clarification to the issue (The Finnish Ministry of Environment 2022a; Zhu & Tähtinen 2022, 5). The EC states that as a rule, reuse of building components falls under national legislative regime: *‘Reuse of construction products already placed on the market in the EU/EEA is falling under national competence, not covered by CPR. If however, such reuse amounts to a new placing on the market (since the product has been modified (performance has changed) and/or the product is marketed under a different name or trademark (see Article 15 of the CPR), the CPR applies again and its requirements need to be fulfilled’* (The Finnish Ministry of Environment 2022a).

To sum up, the CPR does not apply to reused building components because, first, the regulation is meant for products that enter to the EU market for the first time. Second, the harmonised standards are not directly applicable to assessing the performance of reused components. Hence, reused construction products cannot normally be CE-marked, and their product approval falls under national legislation and control (see also the Finnish Ministry of the Environment 2022b). However, as per an example set by reused bricks<sup>115</sup>, acquiring the CE mark through the voluntary ETA procedure may be possible. This may be particularly relevant in the cases where, as referred by the EC in the quotation above, the product is substantially modified and marketed as a different product to the degree that it corresponds to a new entry to the EU single market.

As the control of the issues mainly vest in national legislation (Table 7), the country-specific legislative regimes and practices for reusing concrete elements are discussed next.

Table 7. Regulation on product approval.

<b>EU</b>	• Construction Products Regulation (EU N:o 305/2011) <sup>116</sup>
<b>Finland</b>	• The Act on the Type Approval of Certain Construction Products 954/2012 (Laki eräiden rakennustuotteiden tuotehyväksynnästä) <sup>117</sup>
<b>Sweden</b>	• Planning and Building Act 2010:900 (Plan- och bygglag) <sup>118</sup> • Boverket’s building regulations 2011:6 (Boverkets byggregler, BBR) <sup>119</sup>
<b>Netherlands</b>	• Building Decree 2012 paragraph 1.3 (Bouwbeluit 2012) <sup>6</sup>

<sup>115</sup> A Danish company selling reused bricks, Gamle Mursten, has acquired an ETA and respectively, CE mark, for their product. See <https://www.eota.eu/etassessments/8066> and <https://gamlemurstentech.dk/en/urban-mining-2/ce-marking-of-old-bricks/>

<sup>116</sup> [https://single-market-economy.ec.europa.eu/sectors/construction/construction-products-regulation-cpr\\_en](https://single-market-economy.ec.europa.eu/sectors/construction/construction-products-regulation-cpr_en)

<sup>117</sup> <https://www.finlex.fi/fi/laki/ajantasa/2012/20120954>

<sup>118</sup> [https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/plan--och-bygglag-2010900\\_sfs-2010-900](https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/plan--och-bygglag-2010900_sfs-2010-900)

<sup>119</sup> <https://www.boverket.se/sv/lag--ratt/forfattningssamling/gallande/bbr---bfs-20116/>

	<ul style="list-style-type: none"> <li>• Voluntary private approval e.g. KIWA/KOMO product/application certificate</li> </ul>
<b>Germany</b>	<ul style="list-style-type: none"> <li>• No federal or state legislation</li> </ul>

## FINLAND

In Finland, products on which the CE marking cannot be used can undergo a voluntary approval procedure. These procedures are based on the Act on the Type Approval of Certain Construction Products (*Laki eräiden rakennustuotteiden tuotehyväksynnästä 954/2012*), which entered into force on 1 July 2013. There are three alternative, voluntary procedures (*Ibid.*, see also Finnish Ministry of the Environment 2023): (1) Type approval, (2) Verification certificate, and (3) Certification of production quality control. However, just like the hEN standards and CE marking procedure, these have also been developed with new production in mind, so their suitability for application on reused products requires further scrutiny.

In addition, a local building supervision authority can require that the performance of a construction product is certified on a one-off basis for use in a specific building project. The process is called 'construction site specific approval' (*rakennuspaikkakohtainen hyväksyntä*) which is conducted in conjunction with the building inspection process. It comes into play if the fitness of a construction product for its intended use has not been certified in any other way, and there is reason to suspect that the product may not fulfil the essential technical requirements set for it. (*ibid.*). The Finnish Ministry of the Environment has stated that the construction site specific approval conducted by a local building supervision authority can be used on reused products (Finnish Ministry of the Environment 2022b).

Therefore, the product approval of reused products vests in municipal building supervisors. However, although at the time of writing this report (Feb 2023) it is clear *who* approves the reused products in Finland, still there is no consensus among different parties that *how* the actual approval process should be conducted and how the performance of the products should be verified. The ReCreate Finnish cluster currently participates to the discussion actively on different forums where different stakeholders negotiate the approval process for reused concrete elements. The leader and vice-leader of the ReCreate work package focusing on elements' quality management, Jukka Lahdensivu and Aapo Räsänen, have presented ReCreate's proposal of the approval process (Figure 3) to the national collaborative organ of municipal building supervisors to which most of the Finnish authorities are involved. The association is the main forum where the consensus is being built for the Finnish product approval process for reused components.



Figure 3. Main phases of the ReCreate-proposed quality management process for reused elements.

## SWEDEN

In Sweden, the Swedish National Board of Housing, Building and Planning (Boverket) is the authority that informs about and monitors compliance with the CPR. When products cannot be CE marked, as is for reused products, Boverket's regulations advise how the developer can evaluate the performance to assess the suitability of the construction product for the intended use. For instance, an accredited laboratory can test (and certify) the product by e.g. determining the performance based on a relevant hEN. Therefore, no requirements exist as to how the performance of a reused product should be assessed and reported, apart from the notion that it should be deemed suitable.

In ReCreate's Swedish country cluster, questions have been raised by the participating developer concerning product approval with regard to presence of hazardous substances in reused concrete elements. So far, there has been no elaboration by the authorities on potential requirements regarding substances to analyse, or test procedures for their determination. The question concerns primarily potential analyses of importance for the developer to be confident that a reused element does not cause health risks for the users of the building, based on the responsibility of the developer as set in the Planning and Building Act. Specific requirements on hazardous substance content exist only for restricting the concentration of formaldehyde in timber-based construction boards according to the Swedish Chemical Agency's provisions (KIFS 2017:7) on chemical products and biotechnical organisms. Related to this, the EU REACH legislation also contains rules for producers' responsibilities and obligations. Any REACH-listed hazardous substances in a product must be reported. According to REACH, the producer who places the product on the market is responsible for compliance. Thus, the question has arisen, whether a developer who reuses components from a building it owns or sells them may be seen as a producer? However, as REACH targets new products and their production, does it consider reuse? According to appendix XVII in the REACH legislation, exceptions are also possible.

## THE NETHERLANDS

In general, the Dutch Building Decree sets requirements for a building or parts thereof, but not for products. However, it does state that it is prohibited to market non-CE-marked building products that fall within the scope of hEN. Whether reuse products should be considered as such products is currently being discussed in various standards committees in consultation with the government. In practice, reuse is presently allowed.

Certificates are available to bridge the gap between product characteristics and the Building Decree. The so-called Building Decree Connection Document (*BB-Aansluitdocument*) is a certificate which proves that the building material (e.g. hollow core slabs) comply with the Building Decree 2012. These certificates are applied for by a producer.<sup>120</sup> Some products are assembled into a larger building part, such as a wall, retaining wall or floor. The Building Decree Connection Document includes a table with the requirements of the Building Decree it relates to. The table also specifies the required limit

---

<sup>120</sup> e.g. <https://www.kiwa.com/492fd7/globalassets/dam/kiwa-netherlands/downloads/rab-7502-vloerconstructies-d.d.-13-09-2018.pdf> for floor construction.

value and how the requirement is met. A description of each included Building Decree provision is also included, along with the manner in which the provision is complied with. This way, the requirements are linked with the essential characteristics of the product. This kind of certificates are available for e.g. new hollow-core slabs. These certificates are generally accepted as sufficient proof that a product and/or a process meets the requirements of the Building Decree. The certificates are issued by certifying body, such as KOMO, Kiwa or SKB-IKOB.<sup>121</sup> They are based on assessment guidelines developed by the Dutch Harmonization Committee for the Construction sector (*Harmonisatie Commissie Bouw*), which is appointed as the certifying body by the Dutch state, the Dutch Association for Building Quality (*Stichting Bouwkwiteit*) and the Dutch Accreditation Council (*Raad voor Accreditatie*).<sup>122</sup> In terms of product certificates, the producer is responsible for the quality control of its new product and thus for the properties described in the certificate. The certifying body regularly assesses whether the producer is performing the quality control adequately.

Neither assessment guidelines for deconstructed precast concrete elements nor derivative certificates are yet available. At the moment, the Dutch knowledge platform for infrastructure and transport sector CROW is working on an assessment guideline for reused precast beams and hollow core slabs in collaboration with ReCreate's Dutch partners and other stakeholders.

## GERMANY

As follows from the CPR (in German *EU-Bauproduktenverordnung* [BauPVO]), only CE-marked products are to be used in Germany. If a construction product or material without CE-marking is to be used, a special permit has to be applied for (see Section 3.4). Reused products must fulfill the same technical requirements as new products.

Normally, the building materials or elements generated through deconstruction or demolition are considered as CDW. If, however, the following requirements according to the circular economy law (KrWG, especially §2, 3 and 4) apply, the waste status can be prevented:

- actions must have been taken immediately at the point of time when demolition or deconstruction occurs,
- the main purpose of further handling must be, in the first place, that the components to be reused can be used again as a product with the same properties and the same purpose as in the previous installation (repair and refurbishment of the elements may be necessary according to technical requirements; see Section 3.1),
- the necessary further purpose of use of the construction products to be reused must be determined before the end of the first use,
- in no point of time shall the purpose be dropped, and

---

<sup>121</sup> [https://www.bouwkwiteit.nl/imgcms/HCB\\_100\\_2017\\_definitief\\_bindend\\_verklaard\\_2016\\_12\\_14.pdf](https://www.bouwkwiteit.nl/imgcms/HCB_100_2017_definitief_bindend_verklaard_2016_12_14.pdf)

<sup>122</sup> <https://www.bouwkwiteit.nl/index2.php?id=4>



- there are clear and legally binding contracts between those responsible for the deconstruction site and those responsible for further use, or
- there must be corresponding market or third-party demand for the materials or objects.

If a deconstructed building component is being handled as a building product it must meet all current product regulations, such as technical, environmental and health requirements. No harmful substances or other harmful effects to humans or the environment can be allowed.

### 3.3. Designer qualifications

This section discusses whether there are any special qualification requirements for the designers responsible for the reuse planning. Designer qualification norms fall under national control (Table 8).

Table 8. Regulations on designer qualifications.

<b>EU</b>	<ul style="list-style-type: none"> <li>• No EU-level legislation<sup>123</sup></li> </ul>
<b>Finland</b>	<ul style="list-style-type: none"> <li>• Land Use and Building Act 132/1999 (Maankäyttö- ja rakennuslaki)<sup>124</sup></li> <li>• The National Building Code of Finland (Suomen rakentamismääräyskokoelma [RakMK])<sup>125</sup></li> <li>• Government Decree on the determination of difficulty classes of building design task (Valtioneuvoston asetus rakentamisen suunnittelutehtävien vaativuusluokkien määrittämisestä)<sup>126</sup></li> <li>• Ministry of the Environment guidelines on the difficulty classes of design tasks YM1/601/2015 (Ympäristöministeriön ohje rakentamisen suunnittelutehtävien vaativuusluokista)<sup>127</sup></li> <li>• Ministry of the Environment guidelines on the qualification of building designers YM2/601/2015 (Ympäristöministeriön ohje rakennusten suunnittelijoiden kelpoisuudesta)<sup>128</sup></li> </ul>

<sup>123</sup> However, for regulated professions – in the construction sector, only architects – the EU Professional Qualifications Directive applies. The directive guarantees that a professional qualification acquired in one member state is automatically recognised in another. The purpose is to enable workforce mobility within the EU.

<http://data.europa.eu/eli/dir/2005/36/oj>

<sup>124</sup> <https://www.finlex.fi/fi/laki/ajantasa/1999/19990132>

<sup>125</sup> <https://ym.fi/rakentamismaaraykset>

<sup>126</sup> <https://www.finlex.fi/fi/laki/alkup/2015/20150214>

<sup>127</sup> [https://ym.fi/documents/1410903/38439968/Ymparistoministerion-ohje-rakentamisen-suunnittelutehtavien-vaativuusluokista-A7E116C5\\_7DAE\\_430D\\_8924\\_A6155D78B461-109187.pdf/5f086d96-51a5-a0e3-8e35-486e62251c60/Ymparistoministerion-ohje-rakentamisen-suunnittelutehtavien-vaativuusluokista-A7E116C5\\_7DAE\\_430D\\_8924\\_A6155D78B461-109187.pdf?t=1600745630090](https://ym.fi/documents/1410903/38439968/Ymparistoministerion-ohje-rakentamisen-suunnittelutehtavien-vaativuusluokista-A7E116C5_7DAE_430D_8924_A6155D78B461-109187.pdf/5f086d96-51a5-a0e3-8e35-486e62251c60/Ymparistoministerion-ohje-rakentamisen-suunnittelutehtavien-vaativuusluokista-A7E116C5_7DAE_430D_8924_A6155D78B461-109187.pdf?t=1600745630090)

<sup>128</sup> [https://ym.fi/documents/1410903/38439968/YM-ohje-rakennusten-suunnittelijoiden-kelpoisuudesta\\_paiv01042015-5E62D05B\\_5376\\_4191\\_A7B8\\_3EFCF33F5918-109133.pdf/a1366bc9-664a-dd96-bb74-2e62e2e89378/YM-ohje-rakennusten-suunnittelijoiden-kelpoisuudesta\\_paiv01042015-5E62D05B\\_5376\\_4191\\_A7B8\\_3EFCF33F5918-109133.pdf?t=1600745630861](https://ym.fi/documents/1410903/38439968/YM-ohje-rakennusten-suunnittelijoiden-kelpoisuudesta_paiv01042015-5E62D05B_5376_4191_A7B8_3EFCF33F5918-109133.pdf/a1366bc9-664a-dd96-bb74-2e62e2e89378/YM-ohje-rakennusten-suunnittelijoiden-kelpoisuudesta_paiv01042015-5E62D05B_5376_4191_A7B8_3EFCF33F5918-109133.pdf?t=1600745630861)



<b>Sweden</b>	<ul style="list-style-type: none"> <li>• No national legislation</li> </ul>
<b>Netherlands</b>	<ul style="list-style-type: none"> <li>• No national legislation</li> </ul>
<b>Germany</b>	<ul style="list-style-type: none"> <li>• State-based building codes (For Brandenburg: § 65 BbgBO – Bauvorlage-berechtigung)<sup>129</sup></li> </ul>

## FINLAND

The Land Use and Building Act (132/1999) lays down the general rules for the construction industry. It specifies the general conditions concerning design and construction, essential technical requirements, building permit procedure and building supervision. The Act is amended by the National Building Code of Finland which provides further guidelines. (Finnish Ministry of The Environment 2023d).

One of the matters addressed in the Act (132/1999 120e §) and specified in the Building Codes (Finnish Ministry of The Environment 2023d), concerns qualification requirements for designers in a construction project. The Act and the Codes lay down the requirements for six types of design tasks: (1) building design (i.e. architectural design), (2) design of load-bearing structures, (3) design of foundation structures, (4) ventilation design, (5) water supply and sewage design, and (6) building physics design and the design of repair work to remediate moisture damage. In addition to these design tasks, the Finnish regulation recognises the so-called ‘principal designer’, a uniquely Finnish actor/role, who is responsible for ensuring that different types of design form a coherent whole. The role is usually assigned to the architect, but if the project is of a technical nature (such as a technically complex production facility), other types of designers can also take it on. In other countries, similar duties typically belong to the architect.

All the design types can exhibit (1) minor design tasks, (2) conventional design tasks, (3) difficult design tasks, or (4) exceptionally difficult design tasks, for which the designer in question must possess sufficient qualifications. A designer’s qualifications are composed of their education and prior experience. The principal designer must meet the qualification requirements at the highest level of difficulty of the design tasks included in the construction project. The party undertaking the building project, i.e. the client, must be ready to prove the qualifications of the designers to the municipal building supervision authority. (*ibid.*)

The Building Codes offer guidelines for defining the difficulty level of design tasks, too<sup>130,131</sup>. Based on the guidelines, it is highly likely that the design tasks concerning reuse of concrete

<sup>129</sup> [https://bravors.brandenburg.de/gesetze/bbgbo\\_2016](https://bravors.brandenburg.de/gesetze/bbgbo_2016)

<sup>130</sup> [https://ym.fi/documents/1410903/38439968/Ymparistoministerion-ohje-rakentamisen-suunnittelutehtavien-vaativuusluokista-A7E116C5\\_7DAE\\_430D\\_8924\\_A6155D78B461-109187.pdf/5f086d96-51a5-a0e3-8e35-486e62251c60/Ymparistoministerion-ohje-rakentamisen-suunnittelutehtavien-vaativuusluokista-A7E116C5\\_7DAE\\_430D\\_8924\\_A6155D78B461-109187.pdf?t=1600745630090](https://ym.fi/documents/1410903/38439968/Ymparistoministerion-ohje-rakentamisen-suunnittelutehtavien-vaativuusluokista-A7E116C5_7DAE_430D_8924_A6155D78B461-109187.pdf/5f086d96-51a5-a0e3-8e35-486e62251c60/Ymparistoministerion-ohje-rakentamisen-suunnittelutehtavien-vaativuusluokista-A7E116C5_7DAE_430D_8924_A6155D78B461-109187.pdf?t=1600745630090)

<sup>131</sup> [https://ym.fi/documents/1410903/38439968/YM-ohje-rakennusten-suunnittelijoiden-kelpoisuudesta\\_paiv01042015-5E62D05B\\_5376\\_4191\\_A7B8\\_3EFCF33F5918-109133.pdf/a1366bc9-664a-dd96-bb74-2e62e2e89378/YM-ohje-rakennusten-suunnittelijoiden-kelpoisuudesta\\_paiv01042015-5E62D05B\\_5376\\_4191\\_A7B8\\_3EFCF33F5918-109133.pdf?t=1600745630861](https://ym.fi/documents/1410903/38439968/YM-ohje-rakennusten-suunnittelijoiden-kelpoisuudesta_paiv01042015-5E62D05B_5376_4191_A7B8_3EFCF33F5918-109133.pdf/a1366bc9-664a-dd96-bb74-2e62e2e89378/YM-ohje-rakennusten-suunnittelijoiden-kelpoisuudesta_paiv01042015-5E62D05B_5376_4191_A7B8_3EFCF33F5918-109133.pdf?t=1600745630861)

elements are considered as an exceptionally difficult design task. The guideline states: A building design task is exceptionally difficult if *'[t]he design work requires the use of novel or otherwise highly demanding design, calculation or dimensioning methods in an approach which is experimental or unique in other ways, and on which there is no experiential knowledge available. Examples: experimentations with construction materials, such as innovative timber construction; experimental zero or plus energy buildings.'*<sup>132</sup>

One could argue that reusing the concrete elements falls under experimental building design, and therefore, demands qualifications for the highest difficulty level from the structural designer (assuming they are used as load-bearing structures). Assuming that the architectural designer will nevertheless act as the principal designer, what this means in practice is that they must have the degree of an architect or equivalent, and the degree or the supplementary studies must have included at least 150 credit units of studies in building design and architecture. In addition, they must have at least six years of experience of difficult design tasks, and this experience must have been obtained after their graduation.

This evaluation of the difficulty level is ours, and not yet empirically validated. The evaluation is not conclusive, and the matter will be discussed further in the ReCreate deliverable 8.3. Moreover, the next deliverable will investigate whether deconstruction of the elements will set any particular qualification requirements for designers.

## SWEDEN

There is no regulation in Sweden setting strict requirements on the competence and qualifications of designers. Instead, it is the developer who is fully responsible for the construction work and must ensure, by hiring the required expertise, that the building has technical properties in accordance with the requirements specified in the building regulations of the Swedish National Board of Housing, Building and Planning (Boverket). From this follows that the developer is responsible for determining that properties of individual construction products are fulfilled in relation to the building regulations and the EKS provisions of Boverket<sup>133</sup>. The EKS states that the developer is responsible for determining if a product is appropriate for the intended usage, regardless of being CE-marked or not. According to EKS, '[a]cceptance testing must always be performed. The developer must ensure that building materials and products have the kinds of qualities that, when properly employed in construction projects, allow for the achievement of the constitutionally required qualities'. The regulation can be interpreted to signify that whether reused or new, all these requirements should be fulfilled.

## THE NETHERLANDS

In the Netherlands, the architect is a regulated profession, but the structural engineer is not. Architects need to have a master's degree from a university (in architecture) or an

<sup>132</sup> [https://ym.fi/documents/1410903/38439968/Ymparistoministerion-ohje-rakentamisen-suunnittelutehtavien-vaativuusluokista-A7E116C5\\_7DAE\\_430D\\_8924\\_A6155D78B461-109187.pdf/5f086d96-51a5-a0e3-8e35-486e62251c60/Ymparistoministerion-ohje-rakentamisen-suunnittelutehtavien-vaativuusluokista-A7E116C5\\_7DAE\\_430D\\_8924\\_A6155D78B461-109187.pdf?t=1600745630090](https://ym.fi/documents/1410903/38439968/Ymparistoministerion-ohje-rakentamisen-suunnittelutehtavien-vaativuusluokista-A7E116C5_7DAE_430D_8924_A6155D78B461-109187.pdf/5f086d96-51a5-a0e3-8e35-486e62251c60/Ymparistoministerion-ohje-rakentamisen-suunnittelutehtavien-vaativuusluokista-A7E116C5_7DAE_430D_8924_A6155D78B461-109187.pdf?t=1600745630090)

<sup>133</sup> [Om Boverkets konstruktionsregler, EKS - PBL kunskapsbanken - Boverket](#)

education by the architects' association (*Branchevereniging Nederlandse Architectenbureaus*, BNA). For structural engineers, there are no formal requirements in the law. The only classification in this respect is the qualification scheme by [Constructeurs Register](#), an organisation where VNconstructeurs, an association for structural engineers, and associations for steel and concrete structures (*Bouwen met Staal* and *Betonvereniging*) work together to improve and monitor the quality of structural engineers and designers. The titles assigned by this organisation are 'register constructeur' for structural engineers and 'register ontwerper' for structural designers. The first title can be acquired by attending relevant annual courses. The second title is based more on demonstrated skills and experience.<sup>134</sup>

## GERMANY

In Germany, according to the model building code (MBO) and the consequent state building codes, a person is authorised to submit building documents (i.e. allowed to apply for a building permit) if they are entitled to use the professional title of an 'architect' or 'interior architect', or are registered as having the status '*Bauvorlageberechtigung*' (entitlement to submission of building documents) in the list maintained by the State Chamber of Engineers. To carry the protected professional title of an 'architect' a person needs to be enlisted in the State Chamber of Architects. The requirements are detailed in the state architects law (e.g. for the state of Brandenburg *BbgArchG*). Requirements for the enlistment are at least 4 years of study in the field of architecture at a university or college and graduation with a degree. Additionally, the person must attest two years of full-time practical experience in all the 9 service phases (*Leistungsphasen*) defined by the ordinance on the "fee structure for architects and engineers" (HOAI) as well as 70 hours of advanced training classes offered by the state chambers or other institutes. For engineers, the requirement to become enlisted in the State Chamber of Engineers with the status '*Bauvorlageberechtigung*' (see above) are detailed in the state engineer law (e.g. for the state of Brandenburg *BbgIngG*). They include a degree from studies in the field of civil engineering at a university or college and an attestation of two years of practical experience.

According to state building codes, building projects are classified into building classes (*Gebäudeklassen*) according to their size, height, use, or complexity. The classes range from 1 to 5, where 1 is the least complex and 5 is the most complex. For the building classes 4 and 5, an engineer authorised by the state (*Prüfstatiker*) must verify the structural design and calculation by the original project engineer. In some special cases this is also mandatory for building classes 1-3, e.g. if special building materials are used, such as clay, prestressed concrete or aluminium constructions. Whether this also applies to the reuse of concrete elements needs to be discussed case by case with the building inspection authorities. Additionally for building classes 4 and 5, as well as some special cases, the fire safety plan has to be verified by an engineer authorised by the state (*Brandschutzprüfer*).

---

<sup>134</sup> <https://www.constructeursregister.nl/info/toelatingseisen>

## 3.4 Building permits

How reuse of building components needs to be considered as part of building permits in different ReCreate countries is discussed below. Regulation on building permits falls under national control (Table 9).

Table 9. Regulations on building permits.

<b>EU</b>	<ul style="list-style-type: none"> <li>• No EU-level regulation</li> </ul>
<b>Finland</b>	<ul style="list-style-type: none"> <li>• Land Use and Building Act 132/1999 (Maankäyttö- ja rakennuslaki)<sup>135</sup></li> </ul>
<b>Sweden</b>	<ul style="list-style-type: none"> <li>• Planning and Building Act 2010:900 (Plan- och bygglag)<sup>136</sup></li> <li>• Planning and Building Decree 2011:338 (Plan- och byggförordning)<sup>137</sup></li> </ul>
<b>Netherlands</b>	<ul style="list-style-type: none"> <li>• Housing Law (Woningwet, BWBR0005181)<sup>138</sup></li> </ul>
<b>Germany</b>	<ul style="list-style-type: none"> <li>• State-based building codes (e.g. for the state of Brandenburg, <i>Brandenburgische Bauordnung [BbgBO]</i>)<sup>139</sup></li> </ul>

### FINLAND

In Finland, municipal building supervisors grant building permits (Land Use and Building Act 132/1999 130§). Section 131 of the act specifies that building permit applications must include a proof that the applicant is the titleholder of the building site, and the master drawings signed by the designer. Furthermore, the act states that if a local building supervisor considers it necessary given the nature of the project, the applicant must provide additional information needed to decide on the application, such as energy or waste management reports.

As discussed in Section 3.2., the product approval of reused building components is granted as part of the building permit process. Nevertheless, this is one of the matters that demands additional clarification. According to interviews of the local authorities, in practice the party undertaking the building project must provide information about the reused products as a part of their building permit application and reach an agreement with the authorities about the quality assurance process of the components. As mentioned in Section 3.2., so far there are no established approval processes in Finland for reused concrete elements and thus,

<sup>135</sup> <https://www.finlex.fi/fi/laki/ajantasa/1999/19990132>

<sup>136</sup> [https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/plan--och-bygglag-2010900\\_sfs-2010-900](https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/plan--och-bygglag-2010900_sfs-2010-900)

<sup>137</sup> [https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/plan--och-byggforordning-2011338\\_sfs-2011-338](https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/plan--och-byggforordning-2011338_sfs-2011-338)

<sup>138</sup> <https://wetten.overheid.nl/BWBR0005181/2023-03-01>

<sup>139</sup> [https://bravors.brandenburg.de/gesetze/bbgbo\\_2016](https://bravors.brandenburg.de/gesetze/bbgbo_2016)

the authorities have emphasised the importance of preliminary discussions and close collaboration between them and the party undertaking the building project.

Another matter worth of noting is that, as part of building permit application, the party undertaking the building project must show to the building supervision authority that the engaged design team is qualified for the job (see Section 3.3.). As already discussed, it is likely that the design tasks concerning reuse of concrete elements are considered as an 'exceptionally difficult'. This brings about the highest qualification requirements, not only for the structural engineer, but also for the principal designer (assumingly, the architect).

Finally, it is good to note that as part of the permit process, the building supervision authority can ask for expert statements from other authorities too, and in some cases, these hearings can lengthen the duration of the process.

ReCreate's deliverable 8.3. will discuss the building permit process in more detail, based on the empirical experience acquired from the reuse pilot.

## SWEDEN

Similar to demolition permits, building permits in Sweden are granted by the building committee in each municipality. Both types of permits are regulated by the Planning and Building Act (2010:900) and Planning and Building Decree (2011:338). According to ReCreate's Swedish cluster's experience in acquiring the permit for the Swedish reuse pilot, the building permit process was smooth. However, the reuse pilot was a temporary exhibition pavilion for the H22 city fair in Helsingborg in 2022. Therefore, it was not representative of a building permit process for a permanent building, also considering that the elements of the pavilion could be regarded as being 'waste'.

As discussed in sections 3.2 and 3.3, for a permanent building the developer would also need to prove to the building committee that the regulatory requirements with regard to long term performance are fulfilled, and that the required control plan (see Section 2.1) ensures the performance during the deconstruction process.

## THE NETHERLANDS

In the Netherlands, the Housing Law (*Woningwet*) requires that a building permit must be acquired prior to the start of construction activities. The permit is granted by the municipality after it has been proven by the principal contractor that all requirements of the Building Decree (see Section 3.1.) are met.

In practice, not all verification calculations are performed when a project is submitted for a permit. A lot of the (structural) calculations are done by product engineers (e.g. for hollow-core slabs, other precast concrete elements, foundation piles, etc.). The product engineers start working when the products are purchased in the course of the construction process. The legal requirement is that the calculations must be submitted to the municipality six weeks before installation in the building. The principal contractor is responsible for submitting the calculations to the municipality and the municipal authority performs its usual checks. If additional questions occur, the principal contractor must answer them before the product is installed in the building. Sometimes this can result in last minute

changes to the design and/or product. If this is not done in time, the municipality has the legal mandate to stop construction until the matter is resolved.

The Housing Law (*Woningwet*) does not address the use of reused elements. In practice, municipalities, engineers and manufacturers have taken a hands-on approach and applied common (engineering) sense. Requirements in the Building Decree, Eurocodes and National Annexes are interpreted, and sufficient proof is acquired through applied engineering to show all legal requirements are met. From a structural point of view, the reused elements are regarded and assessed as if they were new. However, regulations that do not fit are addressed through common sense. Generally, conservative partial safety factors are used together with conservative material properties. The discussion between the principal constructor, manufacturer and engineer at one hand, and the municipality at the other hand will concern 'what is conservative enough'? Until regulation for reused elements is issued, this process will be used, unless it proves as problematic. As long as regulation on the use of reused elements is missing, this form of assessment slows down the process of reusing structural elements and will deter many partners and companies from engaging with reused structural elements altogether. Projects like ReCreate are therefore vital in demonstrating the need for regulation and offering knowledge about necessary and acceptable assessment through the reuse pilots.

In 2024, the Construction Quality Assurance Act (*Wet kwaliteitsborging op de bouw*)<sup>140</sup> will become in force and thereafter, the requirements for a building permit will be based on it. The new act will transfer permit-related checks (both desk studies and on-site inspections) from municipal authorities to certified engineers, who will report to the municipality. If all the requirements are met, a building permit will be granted by the municipality. The engineers will be certified by Dutch certifying bodies, and the certification focuses more on the process and less on engineering skills.

The new law will not change or help the implementation of reused concrete elements in the Dutch building sector *per se*. It only addresses the process of verifying compliance with the requirements of the Building Decree and Eurocodes. However, the engineers who will be responsible for performing the (structural) verifications, may have more knowledge of new developments than the municipal authorities, access to more knowledge through their companies and partners, and they may be more inclined to acquire additional knowledge.

## GERMANY

In the case of building permits in Germany, the differences in procedure resulting from the use of reused components are expressed at the level of construction product regulations. If a building product or its usage is not regulated under the EU CPR, a special permit has to be applied for from the building authorities. There are two possible special permits:

1. approval for an individual case (*Zustimmung im Einzelfall* [ZiE]) and
2. project-related design approval (*Vorhabenbezogene Bauartgenehmigung* [VBG]).

---

<sup>140</sup> <https://www.rijksoverheid.nl/onderwerpen/bouwregelgeving/meer-toezicht-in-de-bouw-via-de-wet-kwaliteitsborging-voor-het-bouwen-wkb>



The two permits refer to building products (ZiE) or a hybrid construction (vBG), as follows.

If there are no technical building regulations or generally recognised technology rules for the construction product in question, their usage will require a 'proof of usability' (*Verwendbarkeitsnachweis*). A 'proof of usability' is also required if the building elements or products deviate significantly from technical building regulation (MVV TB, see Chapter 3.1). 'Proofs of usability' are usually either 'general building authority approvals' (*Allgemeine Bauaufsichtliche Zulassung*) or general building authority test certificates (*Allgemeine Bauaufsichtliche Prüfzeugnisse*). If the 'proof of usability' is not issued or if there is a significant deviation from a regulated product, a ZiE may be required for a specific construction project.

A vBG is usually required when the type of construction is hybrid construction. According to the model building code (MBO, see Chapter 3.1), hybrid construction is defined in §2 section 11 as the assembly of building products into structures or parts of structures. The type of construction includes the planning, dimensioning and execution of a physical structure.

For both special permits ZiE and vBG, the individual states declare an institute that supervises the control and testing of the product or building material in question. Both permits are case-specific and have no generic content and form. The declared institute reports to the building authorities whether the product can be permitted. In the state of Saxony-Anhalt, where ReCreate's German reuse pilot is planned, the following documents and information need to be provided if demanded by the 'supreme building authority' (*Oberste Bauaufsichtsbehörde*):

- description of the subject of the application
  - precise description of the construction product
  - clearly marked and complete overview, detail and work plans, descriptions of construction and use, and essential information on the construction work
- building permits and deviation decisions by the building control authority
- structural evidence

Further documents may become necessary during consultation with the building control authority, such as test reports and expert opinions acquired by the applicant from external expert parties.

Estimated costs between 200 € and 8.000 € may apply, depending on the necessary administrative effort, the urgency of the application, and the economic benefit and other interests of the applicant.

In the case of ReCreate's German reuse pilot, a 'ZiE' may need to be applied for.



## 4. Global environmental pollution and sustainability goals

Due to the global environmental crisis, different countries and international institutions have committed to global sustainability goals and issued policies to address the problem. The built environment is a focus area in many of such policies, as it accounts for 42 % of final energy consumption, more than 50 % of all extracted raw materials, and 35 % of greenhouse gas (GHG) emissions in Europe (EC 2007, 2011).

The discussion in this section will demonstrate that from the viewpoint of reused building components, many of the policies can be considered as a 'softer' form of regulation, as they issue the matter only indirectly. However, they still have a significant role in the big picture, as they construe legitimation for more concrete policies and public and industrial practices, including the ones discussed in this report.

The aim of the chapter is not to cover the current sustainability policies exhaustively but to discuss the most relevant ones, which concern matters related to the reuse of building components. In the EU or the international level, the most relevant policies are:

- The United Nations (UN) sustainability goals / the 2030 Agenda for Sustainable Development (UN 2023).
- The Paris Agreement on climate change (UNFCCC 2023) and the European Climate Law (EU 2021/1119)
- The new EU circular economy action plan and Green Deal (EC 2023d).
- The EU taxonomy (EU 2020/852)

All the UN member states have committed to the 2030 Agenda for Sustainable Development. It includes 17 Sustainable Development Goals (SDGs), which are an urgent call for action for the countries. SDGs 11, 12, and 13 are the most relevant from the viewpoint of reused building components, as they concern matters related to sustainable cities and communities (SDG 11), responsible consumption and production (SDG 12), and climate action (SDG 13). (UN 2023). The SDGs emphasise the importance of the built environment in combating sustainability matters, and although they do not speak explicitly of reused building components, the principles they lay down strongly support and encourage the development of such solutions.

Although the mitigation of climate change is a major subgoal of the UN 2030 Agenda, the Paris Agreement on climate change sets much more specific and legally binding objectives for the international community and different nations to achieve. It aims to limit the rise in global average temperature to well below 2°C relative to the pre-industrial levels and to pursue efforts by which global warming could be limited to below 1.5°C. In the EU, these goals became legally binding with the passing of the European Climate Law (EU 2021/1119) in 2021.

The climate policies are too general to directly mention the reuse of concrete elements, but solutions such as reuse that decrease usage of concrete and, thus, GHG generation, serve the ultimate goals of these policies.<sup>141</sup>

If the aforementioned international sustainability and climate policies represent general agenda setting, the EU policies discussed next intend to put them in action. The new EU circular economy action plan (EC 2023d) and the EU taxonomy (EU 2020/852) are examples of policies that concern reuse of building components more directly.

The EC adopted the new circular economy action plan in March 2020 as a part of the European Green Deal that represents Europe's agenda for sustainable growth (EC 2023e). First circular economy action plan ended in 2019 and delivered 54 actions to promote the circular economy. The new action plan includes initiatives along the entire life cycle of products and introduces measures targeting the industrial sectors that use most resources and where the potential for circularity is high, such as construction and buildings (EC 2023d).

The new action plan lists 35 actions that the EC will implement. Most importantly from the viewpoint of reused building components, the EC will (1) address the sustainability performance of construction products in the context of the revision of the CPR, (2) promote measures to improve the durability and adaptability of built assets in in line with the circular economy principles for buildings design, (3) integrate life cycle assessment in public procurement and the EU sustainable finance framework by using the Level(s) framework (see EC 2023f), and (4) consider a revision of the EU's material recovery targets for CDW (EC 2020a).

First, as discussed in more detail in Section 3.2, the current CPR does not promote circular economy transition in the construction sector. On March 2022, the EC launched a process to clarify the CPR from the viewpoint of reused building components (EC 2022). This initiative is important because in a large scale, it is not cost-efficient to conduct product approval processes of reused building components locally by the authorities (see also the discussion in Section 3.2).

Second, although the action plan mentions the promotion of circular economy principles in building design, it is unclear what concrete measures it will contain. The EC (2020b) has produced a document concerning circularity principles in building design, but the aim of the document is only to inform and support design, not to set any strong and obligatory policy goals. Nevertheless, the main topics discussed in the document, such as reuse of building components, resource recovery, and waste prevention, are at the very core of ReCreate reuse solution, too. This policy action and its practical implication for reuse of building components will be discussed in more depth in ReCreate's upcoming deliverable 8.3, given that the action's implementation has progressed further than it is at the time of writing the current report.

---

<sup>141</sup> The carbon footprint of a reused concrete element is only 2–7% in comparison to that of a new one (Asam, 2006; Mettke, 2010; see also Zhu et. Al 2022, 16).

Third, Level(s) are a common EU framework for assessing and reporting the sustainability performance of buildings (EC 2023f). Although mentioned in the EU circular economy action plan, at the time of writing this report, there is no public information that would explain when or how Level(s) will be integrated as part of public procurements or the sustainable finance framework. In principle, when implemented, this may have a major impact for reuse of building components, too. The matter will be investigated further in the deliverable 8.3.

Four and last, as part of the action plan, the EU intends to consider revising the material recovery targets set in the EU waste legislation (see also Section 2.2). No further information about this action is yet available and therefore, its impacts for reuse cannot be evaluated as of now. However, it seems that the action will still focus solely on material recovery and not on prevention. If so, as discussed in Section 2.2, it will likely not promote reuse *per se*.

In addition to the circular economy action plan, the EU Taxonomy Regulation (EU 2020/852) is another important building block of the EU Green Deal. It entered into force on 12 July 2020. The taxonomy's goal is to set out the general principles for economic activities that are considered to contribute to sustainable development. It should direct investments towards sustainable projects and activities. It, together with the upcoming additional delegated acts containing classifications – the actual taxonomies, will provide companies, investors, and policymakers with appropriate definitions concerning which economic activities can be considered environmentally sustainable. More specifically, the taxonomy establishes six environmental objectives (EC 2023g). Reuse contributes to all of them, though most significantly to 'climate change mitigation' and 'the transition to a circular economy'.

Currently, the taxonomy does not lay down direct criteria on the construction industry that would directly encourage reuse. The current objectives concern issues such as energy efficiency of building and waste recycling goals (see more EC 2021, 167). However, according to the interviews of experts of Finnish Green Building Council, it is highly likely that the upcoming revisions of the taxonomy will have a stronger impact for reuse.

In addition to the international policies, countries have set their own specific strategies and policies (Table 10). They are intended to ensure that a country achieves its international commitments or, in some cases, even exceeds the international goals. The country-specific policies that have the most significant impact on reusing building components are discussed next.

Table 10. Regulations and other norms on sustainable development.

<b>EU / International</b>	<ul style="list-style-type: none"> <li>• The European Climate Law EU 2021/1119<sup>142</sup></li> <li>• EU Taxonomy EU 2020/852<sup>143</sup></li> <li>• The new EU circular economy action plan and Green Deal<sup>144</sup></li> <li>• The Paris Agreement on climate change<sup>145</sup></li> </ul>
---------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

<sup>142</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R1119>

<sup>143</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32020R0852>

<sup>144</sup> [https://environment.ec.europa.eu/strategy/circular-economy-action-plan\\_en](https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en)

<sup>145</sup> [https://climate.ec.europa.eu/eu-action/international-action-climate-change/climate-negotiations/paris-agreement\\_en](https://climate.ec.europa.eu/eu-action/international-action-climate-change/climate-negotiations/paris-agreement_en)

	<ul style="list-style-type: none"> <li>• UN sustainable development goals<sup>146</sup></li> </ul>
<b>Finland</b>	<ul style="list-style-type: none"> <li>• The Climate Act 423/2022 (Ilmastolaki)<sup>147</sup></li> <li>• Construction Act HE 139/2022 vp (Rakentamislaki)<sup>148</sup></li> <li>• The national circular economy strategy<sup>149</sup></li> <li>• The national waste plan<sup>150</sup></li> <li>• Municipalities' sustainability strategies and programmes</li> </ul>
<b>Sweden</b>	<ul style="list-style-type: none"> <li>• The Climate Act 2017:720 (Klimatlag)<sup>151</sup></li> <li>• The climate declaration for buildings Act 2021: 787 (Lag om klimatdeklaration för byggnader)<sup>152</sup></li> <li>• Circular economy – Action plan for the transformation of Sweden (Cirkulär ekonomi. Handlingsplan för omställningen i Sverige)</li> <li>• Circular economy – Strategy for the transformation in Sweden (Strategi för omställningen i Sverige)</li> <li>• Municipalities' sustainability strategies and programmes, e.g. Circular Gothenburg<sup>153</sup> and Action plan for circular construction – with a focus on reduced construction waste 2021 – 2024 (Handlingsplan för cirkulärt byggande. Stockholm)<sup>154</sup></li> <li>• National waste plan and waste prevention programme 2018-2023 (Nationell avfallsplan och avfallsförebyggande program)<sup>155</sup></li> </ul>
<b>Netherlands</b>	<ul style="list-style-type: none"> <li>• Building Decree (Bouwbesluit 2012, BWBR0030461)<sup>156</sup></li> </ul>
<b>Germany</b>	<ul style="list-style-type: none"> <li>• Federal Climate Law (Bundes-Klimaschutzgesetz 2021)<sup>157</sup></li> </ul>

## FINLAND

The most important current norms in Finland which have an impact on reuse are the Climate Act (423/2022), the national circular economy strategy, and sustainability strategies and programmes of municipalities. All these norms are quite general but are nevertheless significant, as they build foundations and legitimations for more detailed action plans. In addition to the existing norms, the upcoming new Construction Act (HE 139/2022 vp) will have a very concrete impact for the industry and circular economy.

<sup>146</sup> <https://sdgs.un.org/goals>

<sup>147</sup> <https://www.finlex.fi/fi/laki/alkup/2022/20220423>

<sup>148</sup> <https://valtioneuvosto.fi/paatokset/paatos?decisionId=0900908f807d311e>

<sup>149</sup> <https://ym.fi/en/strategic-programme-to-promote-a-circular-economy>

<sup>150</sup> <https://julkaisut.valtioneuvosto.fi/handle/10024/163978>

<sup>151</sup> [Klimatlag \(2017:720\) Svensk författningssamling 2017:2017:720 – Riksdagen](#)

<sup>152</sup> [Lag \(2021:787\) om klimatdeklaration för byggnader Svensk författningssamling 2021:2021:787 – Riksdagen](#)

<sup>153</sup> [Cirkulära Göteborg – Göteborgs Stad \(goteborg.se\)](#)

<sup>154</sup> [Handlingsplan för cirkulärt byggande 2021-2024 \(start.stockholm\)](#)

<sup>155</sup> [Att göra mer med mindre \(naturvardsverket.se\)](#)

<sup>156</sup> <https://rijksoverheid.bouwbesluit.com/inhoud/docs/wet/bb2012>

<sup>157</sup> <https://www.gesetze-im-internet.de/ksg/BJNR251310019.html>

Although the Act do not come into force before Jan 1 2024, it is good to address here as it lays down concrete new practices for the industry to follow.

The Climate Act lays down the objectives and framework for Finland's climate policy planning and monitoring its implementation. The act's main goal is to ensure that Finland will achieve the international climate goals. As it operates on the national level and does not contain specific objectives, it does not directly impact reuse of building components. However, it forces the authorities to prepare more detailed action plans and strategies towards meeting the goals. From the viewpoint of reuse, the most important action plans are the national circular economy strategy and the national waste management plan.

The national circular economy strategy sets objectives, defines the necessary measures, and allocates the resources for the development of circular economy and achieving systemic change. Currently, the strategy is being implemented by different ministries of Finland. (Finnish Ministry of The Environment 2023e). It emphasises the importance of the construction industry in achieving the circular economy objectives but still discusses the matters on a general level only. The national waste management plan, however, takes a more practical approach and complements the aforementioned strategies with a specific action plan for circular economy transition (Finnish Ministry of The Environment 2022c).

The waste management plan includes a section for construction industry and lays down, for being a strategic document, fairly concrete objectives and action lists. Many of the objectives have a direct or indirect impact for reuse of building components, for example:

- Objective 8.2.: Promotion of sustainable deconstruction practices, 2021-
  - The objective directly mentions promotion of reuse of building materials.
- Objective 8.3.: Development of national product approval processes, 2021-
  - The ministries commit to continuing the development of product approval processes that were discussed in Section 3.2.
- Objective 8.4.: Preparation of instructions to promote circular economy in the construction industry, 2022-
  - The instructions are meant to promote circular economy especially in public procurements, which are seen as a significant policy instrument for circular economy transition. Reused building components are emphasised.
- Objective 8.5.: Inclusion of circular economy to vocational and higher education, ongoing
  - Emphasis on the education of planners.
- Objective 8.6.: Promotion of life-cycle management of buildings, 2021-
  - The objective is to find ways to improve public policies and practices in order to manage the life-cycles of buildings better, e.g. to ensure smoother reuse processes for building components.
- Objective 8.8: Utilisation of reused building components in municipalities, ongoing
  - The aim is to develop public building projects so that they would reuse more building components.

As can be seen, reuse of building components is recognised as significant in Finnish national policy making. How the implementation of the policies will impact the Finnish construction industry remains to be seen in near future. This will be discussed in the upcoming ReCreate deliverable 8.3.

Lastly, in the Finnish context, the sustainability strategies and programmes of municipalities play a major role in the big picture of circular economy transition. Therefore, they could encourage to reuse building components, too. Although not yet demanded by the Climate Act<sup>158</sup>, most cities have taken initiative and launched local circular economy and sustainability policy processes and established roadmaps for the transition. These strategies guide local decision-making and development of public practices, which influence the 'playing field' of local industries by laying down different rules and economic incentives for industries. In a nutshell, these policies are a prerequisite for more concrete actions. Only when the local strategies recognise and include circular economy goals, rules and economic incentives to address them will be devised as well.

To give an example, the ReCreate project partner City of Tampere prepared a circular economy plan in 2021, which was adopted in the beginning of 2022 (City of Tampere 2022). The plan recognised, among other things, the importance of local land policies and plot competitions in supporting the circular economy transition in the construction industry. The strategic commitment led to more concrete actions in July 2022, when the City of Tampere launched a plot competition that for the first time in Finland utilised circular economy criteria specifically focused on reused and recycled building components and materials. As a result of the competition, one new circular economy-based building will get built in Tampere (YLE 2022). Construction companies have also recognised the significance of the competition; for instance, the winning firm acknowledged that it would not have proposed circular construction without the incentives the city set in the competition (Kuntalehti 2022).

The example illustrates how impactful local strategies can be in guiding the circular economy transition. Of course, one case is not yet enough to initiate an industrial change, but it is a start. Importantly, most major cities in Finland have been interested in to replicate the plot competition in their city. If implemented as planned, this kind of scaling up holds potential to have an effect on the development of reuse of building components, too. The upcoming deliverable 8.3. will discuss in more detail the impact of local policies, such as these competitions, on the reuse of concrete elements.

As already mentioned, also the upcoming Construction Act (HE 139/2022 vp) will lay down novel rules and practices for the industry, which will have a direct impact on the circular economy. The Act is an overall reform of the 'building' part of the current Land Use and Building Act (the 'land use' part of the current act will remain in force), and its main objective is to better steer the construction industry towards carbon neutrality and sustainability.

---

<sup>158</sup> At the time of writing this report, the Climate Act is being amended. The goal of the amendment is to force all municipalities to establish detailed and concrete strategic roadmaps for sustainable development and to follow-up on their progress. (Parliament of Finland 2022).



From the viewpoint of circular economy, two points stand out from the Act. First, in future, the building permit should be accompanied by a climate report, which would report on the carbon footprint and carbon handprint of the building (38§). The main goal of the Act is not require only reporting but to set carbon limits for new buildings, too. Carbon thresholds are aimed to come into force for new buildings in 2025 at latest. Currently, the Finnish Ministry of the Environment is preparing a decree of which will lay down methodologies for the carbon calculation. (Finnish Ministry of the Environment 2023f). When the Act comes into force, it will have a very direct and concrete impact for circular economy as it will encourage to develop solutions that decrease the carbon footprint of buildings. However, it is noteworthy that the focus of the policy is indeed only on the circular economy solutions that decrease the carbon footprint – it will not support the development of such solutions, for example, that decrease the usage of natural resources but do not have a significant impact on the carbon footprint.

Second, the Act (39§) will require that a party undertaking a building project must ensure that the whole lifecycle of a building is planned and built ecologically. In practice, a party must put focus on issues such as sustainable and long-lasting building products, improved building maintenance, and, also importantly from the viewpoint of this document, reusable building components. There are still lots of uncertainties about the practical implications of the section. As above with the carbon calculations, the Ministry will amend the Act with more specific decrees later. Again, the matter will be discussed more detailed in deliverable 8.3. as until then it is fairly likely that an additional information will be available.

## SWEDEN

The Swedish regulations to mention in this context are the Climate Act and the Climate Declaration for Buildings Act. The first, similar to Finland, covers the objectives and framework for planning Sweden's climate policy and monitoring its implementation. The second has been in effect since January 2022. It made mandatory the climate declaration covering the embodied GHG emissions of main building components of new buildings. The aim is to increase knowledge about the climate impact of buildings during construction and how the impact can be reduced. The climate impact linked to raw material extraction and production of building materials, their transport to the construction site, and energy-consuming processes and waste materials on the construction site (i.e. modules A1-A5 as per the standard EN 15978 [European Standards, 2011]), must be declared. A limit for the maximum permitted climate impact has been proposed to be introduced in 2027 at the latest, along with the expansion of the declaration to the other phases of a building's life cycle (Boverket, 2020). In relation to reuse, this regulation implies a possible incentive, as reused products have a lower climate impact than virgin ones. If limits become introduced, the incentive increases. The developed can choose to use either Environmental Product Declaration (EPD) data of actual products procured or generic climate data from Boverket's climate database. The current database version sets the emission value of reused components at 0 kgCO<sub>2</sub>e/kg, thereby stimulating reuse of products.

Unlike its Finnish counterpart, the Swedish national waste plan does not specify any goals towards reuse. The goals are general, and they have been discussed in Section 2.2. Also, in early 2021 the Swedish government launched its Action Plan for a Circular Economy. It



covers four focal areas: (1) sustainable production and product design, (2) sustainable consumption and use materials, products, and services, (3) non-toxic and circular cycles, and (4) Driving business and stakeholders through measures that promote innovation and circular business models. The action plan is still very general and there are no specific goals or activities targeting construction in more detail, let alone reuse. In addition, a growing body of circularity strategies and programmes are being developed by municipalities. The City of Stockholm, for one, launched a strategy for circular construction. It, too, is still quite general, but represents an ambition to advance circular construction and reuse practices.

### THE NETHERLANDS

With the Climate Policy (*Klimaatbeleid*), the Dutch government takes measures to protect the Netherlands from the effects of the climate change. The aim is to reduce global warming by limiting GHG emissions. National and international targets have been set and are converted into policies in different areas of the Dutch society, including the building and construction sector. However, partly this work is ongoing, and partly it is not the Dutch government's intention to do this on a national level only, but to negotiate and encourage joint European and international policies instead.

Chapter 5 of the Building Decree 2012 (*Bouwbesluit 2012*) addresses the energy and environmental aspect of construction and new buildings. Paragraphs 5.8 and 5.9 give requirements for the environmental aspects of buildings. The main requirement is that a structure must be built in a manner that minimises the environmental impact of the materials used. To achieve this, requirements are given for the environmental performance (*Milieuprestatie*) of the building. Paragraph 5.2 Almost Energy Neutral (*Bijna energieneutraal*) addresses the operational energy of heating, cooling etc. It also gives regulations on thermal insulation and ventilation. The environmental impact of the construction of a building must be determined based on LCA calculations. In the LCA, reused materials should be taken into account, but the LCA rules pertaining to them are still being determined.

The impact of the EU Natura 2000 regulation on construction is a uniquely Dutch question. Like other EU countries, the Netherlands has assigned protected areas to safeguard threatened species and habitats. However unlike many other countries, Dutch Natura 2000 areas are on average very small and scattered throughout the country, which means there is always human activity in the vicinity (roads, cities, agriculture). In the recent years, rather strict limits have been issued to nitrogen emissions near the Natura 2000 areas, limiting the possibility to construct new buildings. In certain regions, this has meant ceasing all new building projects, which continues until a solution is found. The regulations de facto mean that a rapid transition to at least electric heavy machinery must take place to be able to build in this kind of locations.

The Decree on Soil Quality (*Besluit bodemkwaliteit*) is a national regulation which controls leaching of hazardous substances from (building) structures and (building) materials that come in contact with soil to safeguard soil and (drinking) water. It must be taken into account in reuse if there is a risk that the reused building materials may leach contaminants to groundwater.

Moreover, the concrete industry has developed a voluntary plan to support the Netherlands in meeting climate goals. It is called the Concrete Agreement (*Betonakkoord*), and it contains a step-by-step plan to reduce the carbon emissions of concrete, including precast and in-situ cast structures. Its suggestions to reduce carbon emissions through circularity include (1) reuse of resources, (2) reducing the use of cement in concrete products, (3) using alternative binders in concrete, and (4) reuse of concrete elements. The aim of the Concrete Agreement is to reduce the CO<sub>2</sub> emissions of the concrete industry by at least 30% by 2030 and 100% by 2050. Reuse of concrete is a solution of great potential, but also the use of electric heavy machinery and reduced use of cement through replacement with alternative binders.<sup>159</sup> The Concrete Agreement's main focus is on alternative binders, but TU/e and TNO together with ReCreate's other Dutch partners are making an effort to also promote reuse.

## GERMANY

The sustainability goals for Germany are laid down in the Federal Climate Protection Law (*Bundesklimaschutzgesetz, KSG*) of 2021. These include the climate neutrality of Germany by 2045, limiting the global warming to 1.5 degrees, strengthening natural GHG sinks (moors, forests, etc.) and determining the Germany's annual GHG emissions and their budgeting according to 6 sectors (energy, industry, transport, buildings, agriculture, waste and other). These sectors' current emissions are known, and annual budget goals are set to reach net-zero by 2045.

As opposed to its Swedish counterpart, the German law's stipulations for the building sector focus exclusively on the use phase (LCA module B), mainly the combustion of fossil fuels and gas for heating and the use of electric energy for building services. The goals are to reduce GHG emissions from 118 million tCO<sub>2</sub>e in 2020 to 67 million tonnes in 2030 and to continue towards net neutrality in 2045. The goal of 113 million tonnes by 2021 was missed by 2 million tonnes, so the Federal Ministry for Housing, Urban Development and Construction (BMWSB), together with the Federal Ministry for Economy and Climate Protection issued a so-called immediate programme (*Sofort-Programm*) in July 2022 with several new measures to ensure further reduction of emissions. The measures include, among others:

- Revising the Building Energy Law (*Gebäudeenergiegesetz, GEG*) to mandate the use of at least 65% renewable energy for every new heating system installed.
- Updating the federal funding for efficient buildings (*Bundesförderung für effiziente Gebäude, BEG*) to include the new standard of 65% renewable energy for heating.
- An initiative to step up the refurbishment of publicly owned buildings.
- Increased research funding for promising solutions for a sustainable building sector.

---

<sup>159</sup> [https://www.betonakkoord.nl/wp-content/uploads/sites/43/166796/road\\_map\\_co2\\_januari\\_2021\\_versie\\_1\\_2.pdf](https://www.betonakkoord.nl/wp-content/uploads/sites/43/166796/road_map_co2_januari_2021_versie_1_2.pdf)

The measures only work towards reducing fossil fuel and gas consumption in buildings. Embodied emissions from materials production or construction itself are not considered.

The law's aims for the waste sector deal with the impact of solid waste disposal, biological treatment of solid waste, incineration of waste, and wastewater treatment. Effective contributions to climate protection for the construction sector are mentioned; this discussion has been summarised in Section 2.2 of the current report. Especially the avoidance of CDW and the reuse of building elements are identified as key factors in saving resources and significantly reducing GHG emissions.

Furthermore, Germany agreed to adopt the UN climate change targets laid out in the 17 Sustainable Development Goals (SDGs) as part of the '2030 Agenda for Sustainable Development'. For the building sector notably the SDGs 'Sustainable cities and communities' (No. 11), 'Responsible consumption and production' (No. 12) and 'Climate action' (No. 13) apply, which could lead to wider implementation of reuse practices.

## 5. Discussion

This report reviewed the most significant EU-level and country-specific norms governing deconstruction and reuse of construction products, in particular precast concrete elements. Although many of the norms presented in the report have been set by the EU, most of the regulation is national. The EU norms relevant to the topic have usually been given as directives rather than as regulations, meaning that the member states will have implemented them by issuing national legislation. As a result of the fact that the matter's governance is very much under national control, the legislative or normative regimes that guide deconstruction and reuse of building components differ from one country to another.

Although the countries' norms exhibit country-specific features, which should be taken into account in reuse projects, it is nevertheless possible to identify categories of issues and topics that have raised debate in most of the countries. The current chapter will identify and discuss such topics. The focus is on the issues and barriers that hinder or slow down the deployment of reuse in the four ReCreate countries. The identified topic categories are:

- (1) influence of waste regulation,
- (2) suitable technical requirements,
- (3) product approval practices, and
- (4) concretisation of sustainability policies.

The chapter has two goals. First, an analysis of the barriers is provided to help practitioners identify issues worthwhile paying attention to when initiating a building project utilising reused building components. Second, the analysis is intended to help ReCreate and other developers of reuse to clarify obstacles necessary to address in order to scale up the piloted ReCreate reuse solutions and speed up the circular economy transition in the construction industry. These matters will also be at the hearth of the upcoming ReCreate deliverable 8.3, which will complement the insights of the current report with empirical experiences from ReCreate's pilots.

### 5.1. Influence of waste regulation

There are two distinctive matters related to waste regulation that crosscut most of the countries: the waste/EoW statuses as well as the waste hierarchy and its enforcement.

First, it is unclear how the EU Waste Framework Directive and its national implementations should be interpreted when it comes to the waste status of deconstructed components intended for reuse: are they waste or not? Some actors consider such components as waste, others argue the opposite, and there is no consensus.

In Sweden, it is still ambiguous whether deconstructed concrete elements are to be seen as waste or not, and thus needs to follow the waste regulations or not. That is, national

authorities are currently not clearly advising how and under what conditions the responsible owner of the deconstructed elements is to judge the waste status.

In Finland, the environmental protection authorities have considered deconstructed building components as waste. Such an interpretation also ensures that they retain the right to supervise the legality of the reuse process. The interpretation still calls for elaboration because the arguments that it is based on do not seem fully clear or consistent. The waste status has significant practical implications for reuse, as the handling and refurbishment of the components will require the involved actors to hold an environmental permit, and an EoW status must be acquired for the components before they can be reused. The bureaucracy associated with these permits will not be an issue to large actors, many of which already hold an environmental permit, the conditions of which can be revised accordingly. However, it may hinder small or medium-sized enterprises from entering the reuse market and so slow down the circular economy transition of the whole sector. Therefore, it is important that the regulation and/or its interpretation are clarified. If reused components are to be assigned with a waste status, this status should be based on the presence of genuine environmental risks that warrant the authorities' supervision.

The topic is discussed in Germany, too. As opposed to Finland and Sweden, in Germany explicit legal options for the avoidance of the waste status already exist. However, as in other two countries, in Germany there are debates whether the current regulations are as conducive to circulation as they could be. Contrary to the present practices, the goal should be that building components could remain building products after deconstruction, without the requirement to specifically prove that they are not waste. Indeed, ideally the regulations should be inverted: a product would become waste only if it could not be reused.

The Netherlands differs from the other ReCreate countries in that deconstructed precast concrete components are not considered as waste, given that they do not contain hazardous substances. These differences are noteworthy in that all the countries' waste legislation is based on the same EU Waste Framework Directive. The ReCreate country clusters are currently participating actively in the national discussions in their respective countries to clarify the issues where needed. The outcomes of these discussions will be reported in ReCreate's upcoming deliverable 8.3.

The second matter related to waste regulation concerns the waste hierarchy and its practical implications in different countries. Presently the regulatory focus in all ReCreate piloting countries lies in the stages 3-5 of the waste hierarchy (recycling, recovery, disposal). The higher goals of waste prevention and reuse are only addressed in terms of research funding and marketing towards voluntary behavioural changes on local levels, but not addressed in legislation. In the building industry, this strategy does not seem to suffice to drive any substantial change. Many more building products could be reused but end up as waste because there are virtually no incentives or structures in place to push towards truly circular an industry.

The attention placed on recycling and provision of secondary building materials may even have adverse effects on reuse of precast concrete. The regulations and market structures are incentivising the building industry towards recycling, rather than reuse. Therefore, the

EU and its member states should clarify their priorities in terms of the waste hierarchy and revise their policies to reflect those priorities.

## 5.2. Suitable technical requirements

Technical requirements for reused elements are presently the same as for new elements. Structural design is based on the Eurocodes regardless of the nature of material (virgin or reused). When it comes to stability, safety, and health, the same level of standard should be required from both reused and new materials. However, the test methods for identifying reused elements' material properties, necessary for the design process, call for guidelines.

In the design process of new elements, these properties are set and controlled during manufacture and construction. For reused elements, the properties have been set in the original production, but documentation about the original manufacture is rarely available. Moreover, some properties may have changed during use as a result of e.g. weather-induced degradation. Therefore, information on the material properties must be acquired by researching the existing structure. As a rule, the properties cannot be influenced retrospectively, though if necessary, strengthening can be achieved by adding new external materials.

Since the material properties of existing structures cannot be revised, it is vital to assess the properties as accurately as possible. The current standards for assessing material properties of existing structures are intended to evaluate the durability and capacity in the present use in the existing building. The minimum required testing methods and sample sizes have been determined from this perspective. The standards have not been devised to consider the reuse of a building's parts in a new kind of assembly. The results of such tests can act as input data for structural design, but when reuse is the goal, the tests should likely be conducted on a much wider scale, i.e. on a larger number of individual elements. Therefore, new kind of standards are required for assessing the properties for redesign of reusable elements, as the current methods may not be safe enough.

In Germany, providing customised technical requirements for reused concrete elements has been discussed. As elsewhere, now such elements are assessed against standards designed for new elements, which the reused elements are nevertheless not. This results in a bureaucratically heavy approval process with excessive testing. Considering reused concrete elements as a product category of their own could be helpful, so that suitable technical requirements could be given out that ensure their safe usage. Presently, the necessary sample size for testing it is still the authorities' case-by-case decision.

## 5.3. Product approval practices

Product approval practices of reused building components calls for clarifications in many countries, more so in some countries than in others. Until the EU CPR is revised so that it takes reused products into account as product categories of their own – potentially a long process – the product approval of reused building components is conducted nationally.

In Finland, the matter has been debated extensively on the national level during the last two years. The Ministry of the Environment clarified in June 2022 that the product approval is conducted by local building supervisors as part of a building permit process (the so-called construction site-specific approval). Although the clarification was helpful in that it established *who* grants the product approval, at the time of writing this report (March 2023) it is still unclear *how* the approval process is conducted for different reused building components – including precast concrete elements. Further clarifications can be expected as the outcome of ongoing collaborations and negotiations with authorities and other national experts, and they will be reported in ReCreate’s deliverable 8.3.

The situation in Sweden has similarities to Finland: the absence of established procedures for product approval, accepted by authorities, assigns a heavy responsibility on developers when it comes to proving the technical properties. It is not always clear how the technical properties can be proved in practice. Regarding product approval, a Swedish sister project Återhus (‘Re-houses’) has devised potential methods for reused concrete elements (Brander et al. 2021, Gabrielsson & Brander 2021), which form a good basis for further development.

A particular concern for ReCreate’s developer partner in Sweden has been to get further clarification about the legal responsibilities connected to the potential presence of hazardous substances in deconstructed elements, and the best practices for the detection thereof to be confident about the safety and healthiness of reuse. So far, the authorities have not elaborated on which substances should be analysed or which test procedures should be used, so further discussions are needed. The existence of standardised testing schedules for certain hazardous substances of concern would also support the reporting of material properties through material/circularity passports. Moreover, there is a need to clarify if and when the EU REACH requirements could potentially apply to concrete elements’ refurbishment works, which may create dust containing hazardous substances such as Chromium VI, or the reused products themselves. Even if this question has arisen in ReCreate’s Swedish cluster, it is of course a EU-level issue.

In comparison to Finland and Sweden, in Germany there are more detailed and institutionalised alternative product approval procedures for reused concrete components. Nevertheless, also in Germany the special requirements for reused building components add complexity to the planning and approval process and therefore increase the costs of the project, also in the form of time expenditure. To scale up reuse, the approval processes should be made faster and more standardised, i.e. less complicated.

The situation in the Netherlands is similar to Germany: there are established alternative product approval processes for products not covered by hEN. The Netherlands takes advantage of product certificates, which are based on assessment guidelines devised by a certified body. Currently, the Dutch ReCreate partners are working together with other stakeholders on a guideline for the assessment of reused precast concrete beams and hollow core slabs.

## 5.4. Concretisation of sustainability policies



Sustainable development policies are currently undergoing a transformation internationally as well as in many countries. Many of the policies are still very general and hardly have any tangible impact on reuse of building components. However, in recent times it has been possible to observe a slight change. Similar to the EU sustainability policies which are starting to have direct implications for different industries (e.g. the taxonomy regulation, eco-design directive), the policies in different countries seems to be developing in the same direction.

In Finland, an example of this type of a development is the circular construction plot competition by the City of Tampere, discussed in Section 3.5. Until now, Finnish cities' circular economy policies have been quite abstract, but the competition showcased how the vague strategic goals can be translated to concrete actions that directly impact the construction industry. As more and more cities deploy circular criteria in their land policies, the more significant the incentive will be for the industry. This is because in Finland, cities typically own major parts of the land in their urban areas, so they have leverage towards the industry as landowners.

Similarly, in many countries, climate and sustainability goals are starting to transition from abstract strategic goals to tangible regulations. In the Netherlands, Finland and Sweden, climate policies are being incorporated in construction regulations. For example in Sweden, the recent Climate Declarations of Building Act (in effect since 2022) mandates the climate declaration from new buildings, covering the embodied GHG emissions of the main building components. By doing so, it aims to increase knowledge about the climate impact of buildings during construction and how it can be reduced.

These are a few examples of many similar developments. Nevertheless, it is too early to declare that a regulatory paradigm shift towards circular economy-supporting policymaking would exist in the ReCreate piloting countries. Impactful and tangible policies are still marginal, but their number is increasing. It can be assumed that if the number reaches a critical mass, the policies will impact the construction industry, as they create economic incentives for construction and other relevant value chain companies. This transition may now have begun, but it is still highly incomplete and susceptible to changes in the political climate. Thus, ReCreate will keep an eye on the policies and their development, and return to the topic in the upcoming deliverable 8.3.

Another sustainability goals-related matter worth highlighting is the fact that the legal framework to reach climate goals focuses too much on buildings' operational energy efficiency and too little on the embodied GHG of construction materials and products, as highlighted by the German example. Operational energy reduction is of course crucial, but already well regulated. The embodied GHG is largely neglected, even if low-carbon products such as reused elements have significant untapped potential to reduce emissions in the near future. The German federal government, for one, offers financial incentives (e.g. low interest rate loans) that consider the product stages, but the conditions are fairly complex and difficult to reach. Simplifying these requirements or regulating this issue more strictly could be a big lever to increase the reuse of building components.

## 6. Conclusion

This report shows that, on a general level, the main norms guiding reuse of building components are quite similar in the different ReCreate piloting countries – Finland, Sweden, the Netherlands, and Germany. In other words, the matters the different norms aim to govern in relation to reuse are shared between countries. This is not surprising *per se*, as they are all EU member states, and a lot of the regulation is derived from the EU level in one way or another. The most important thing that distinguishes one country from another seems not to be the norms themselves, but the development phase of the norms vis-à-vis reuse of building components. The key challenge is not to develop completely foundations for norms or significantly modify the existing ones, but to ensure that reuse of building components is appropriately acknowledged in the existing regulations. The first measures can include, for example, the authorities issuing public clarifications for the intended interpretations of relevant statutes, stakeholder discussions and negotiations to stimulate the formation of new (administrative) practices, developing certificates for reused products, etc.

There are clear differences between the ReCreate piloting countries in terms of which development stage they are with regard to norms allowing and encouraging the deployment of reused components. Consequently, there are opportunities for mutual collaboration and learning. The observations made in this report suggest that Finland and Sweden are still in an early stage of development. The product approval of reused components is a prime example. Finnish authorities, for one, reached a consensus about the use of an alternative product approval process for reused components (the so-called construction site-specific approval) less than a year ago (June 2022). Currently, the Finnish stakeholders are co-developing the process.

In the Netherlands and Germany, different kind of certificates or other established practices already exist to handle the approval of reused components. Thus, their legislative regimes are clearly more progressive when it comes to reuse. However, being advanced does not mean that nothing can be learned from the other countries. Exchange of information related to product approval and other matters discussed in the report can benefit all the countries. The current report as well as its upcoming sister report, the ReCreate deliverable 8.3, are a tool for this.

Overcoming normative barriers can demand diving deep in the details of the regulation. Such barriers can rarely be overcome through a desk study. Rather, active participation to discussions with different stakeholders as well as empirical development projects are needed. The aim of the current report was to establish the regulatory baseline set in the current legislation and to identify key issues to address in future work. This report's sister report, ReCreate deliverable 8.3., will complement the insights provided herein with empirical experiences from ReCreate reuse pilots. In doing so, it will contribute tangible ideas to the development of reuse practices and norms in different countries as well as in the whole of the EU.

# References

- Asam, C. (2006) Recycling prefabricated building components for future generations. IEMB Info 1/2006. Berlin. Institute for Preservation and Modernisation of Buildings at the TU Berlin. [https://www.bbsr.bund.de/BBSR/EN/publications/CompletedSeries/IEMB/2006\\_2007/DL\\_3\\_2007.pdf?\\_\\_blob=publicationFile&v=1](https://www.bbsr.bund.de/BBSR/EN/publications/CompletedSeries/IEMB/2006_2007/DL_3_2007.pdf?__blob=publicationFile&v=1)
- Brander, L; Boubitsas, D; Gabrielsson, I. (2021). Återhus. Rivningsobjekt – från kostnad till resurs: Pilotstudie återbrukspotential för tunga stomdelar i två rivningsobjekt. RISE Rapport 2021:58. RISE Research Institutes of Sweden. [Forskningsrapport, foSP-Rapport \(diva-portal.org\)](https://portal.org/Forskningsrapport_foSP-Rapport)
- City of Tampere (2022). Tampereen kaupungin kiertotaloussuunnitelma. [https://www.tampere.fi/sites/default/files/2022-09/tampereen\\_kiertotaloussuunnitelma\\_2022.pdf](https://www.tampere.fi/sites/default/files/2022-09/tampereen_kiertotaloussuunnitelma_2022.pdf)
- ECHA (2023). REACH Legislation. <https://echa.europa.eu/regulations/reach/legislation>
- EN 1168:2005 + A3:2011. (2011). Precast concrete products. Hollow core slabs. European Committee for Standardization. [https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP\\_PROJECT,FSP\\_ORG\\_ID:37331,6210&cs=124258B701499C0EAFACBDB660E65371](https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP_PROJECT,FSP_ORG_ID:37331,6210&cs=124258B701499C0EAFACBDB660E65371)
- EN 13224:2011. (2011). Precast concrete products. Ribbed floor elements. European Committee for Standardization. [https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP\\_PROJECT,FSP\\_ORG\\_ID:35485,6210&cs=1B0380FD46862FID430211B5784874EAF](https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP_PROJECT,FSP_ORG_ID:35485,6210&cs=1B0380FD46862FID430211B5784874EAF)
- EN 13225:2013. (2013). Precast concrete products. Linear structural elements. European Committee for Standardization. [https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP\\_PROJECT,FSP\\_ORG\\_ID:33537,6210&cs=17F860DF4DD95D64D2D0B6241F96CE031](https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP_PROJECT,FSP_ORG_ID:33537,6210&cs=17F860DF4DD95D64D2D0B6241F96CE031)
- EN 13369:2018. 2018. Common rules for precast concrete products. European Committee for Standardization. [https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP\\_PROJECT,FSP\\_ORG\\_ID:63545,6210&cs=10B3498E10A9AA4C1078128825092615A](https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP_PROJECT,FSP_ORG_ID:63545,6210&cs=10B3498E10A9AA4C1078128825092615A)
- EN 13693:2004 + A1:2009. 2009. Precast concrete products. Special roof elements. European Committee for Standardization. [https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP\\_PROJECT,FSP\\_ORG\\_ID:33289,6210&cs=1A09CA84014D7ADF633A6537DDE9934F1](https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP_PROJECT,FSP_ORG_ID:33289,6210&cs=1A09CA84014D7ADF633A6537DDE9934F1)
- EN 13747:2005 + A2:2010. 2010. Precast concrete products. Floor plates for floor systems. European Committee for Standardization. [https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP\\_PROJECT,FSP\\_ORG\\_ID:34716,6210&cs=159F5730A82E63586EED72164F60A1090](https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP_PROJECT,FSP_ORG_ID:34716,6210&cs=159F5730A82E63586EED72164F60A1090)

EN 14843:2007. 2007. Precast concrete products. Stairs. European Committee for Standardization.

[https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP\\_PROJECT,FSP\\_ORG\\_ID:10901,6210&cs=129654137CC95454F6B5D14B1DDAA716E](https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP_PROJECT,FSP_ORG_ID:10901,6210&cs=129654137CC95454F6B5D14B1DDAA716E)

EN 14991:2007. 2007. Precast concrete products. Foundation elements. European Committee for Standardization.

[https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP\\_PROJECT,FSP\\_ORG\\_ID:10913,6210&cs=1832AC80E2B86FE10536F9EA1C32C8606](https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP_PROJECT,FSP_ORG_ID:10913,6210&cs=1832AC80E2B86FE10536F9EA1C32C8606)

EN 14992:2007 + A1:2012. 2012. Precast concrete products. Wall elements. European Committee for Standardization.

[https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP\\_PROJECT,FSP\\_ORG\\_ID:38345,6210&cs=1296E4E8BDB68501B31BD9B26C8634D8D](https://standards.cencenelec.eu/dyn/www/f?p=CEN:110:0:::FSP_PROJECT,FSP_ORG_ID:38345,6210&cs=1296E4E8BDB68501B31BD9B26C8634D8D)

EC (2007) Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions A lead market initiative for Europe – COM (2007)860. <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0860:FIN:en:PDF>

EC (2011) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Roadmap to a Resource Efficient Europe – COM (2011)571. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52011DC0571>

EC (2015) Circular Economy Package: Questions & Answers.

[https://ec.europa.eu/commission/presscorner/detail/en/MEMO\\_15\\_6204](https://ec.europa.eu/commission/presscorner/detail/en/MEMO_15_6204)

EC (2018) Revised legislative framework on waste. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:L:2018:150:TOC>

EC (2020a) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions A new Circular Economy Action Plan For a cleaner and more competitive Europe – COM/2020/98. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2020%3A98%3AFIN>

EC (2020b) Circular economy principles for buildings design.

<https://ec.europa.eu/docsroom/documents/39984>

EC (2021) Annex to the Commission Delegated Regulation (EU) .../... supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives.

[https://ec.europa.eu/finance/docs/level-2-measures/taxonomy-regulation-delegated-act-2021-2800-annex-1\\_en.pdf](https://ec.europa.eu/finance/docs/level-2-measures/taxonomy-regulation-delegated-act-2021-2800-annex-1_en.pdf)

EC (2022) Proposal for a Regulation laying down harmonised conditions for the marketing of construction products, amending Regulation (EU) 2019/1020 and repealing Regulation (EU) 305/2011. <https://ec.europa.eu/docsroom/documents/49315>

EC (2023a) Waste Framework Directive. [https://environment.ec.europa.eu/topics/waste-and-recycling/waste-framework-directive\\_en](https://environment.ec.europa.eu/topics/waste-and-recycling/waste-framework-directive_en)

EC (2023b) Policies and legislation for the construction sector. <https://eurocodes.jrc.ec.europa.eu/policies-standards/policies-and-legislation-construction-sector>

EC (2023c) Construction Products Regulation (CPR). [https://single-market-economy.ec.europa.eu/sectors/construction/construction-products-regulation-cpr\\_en](https://single-market-economy.ec.europa.eu/sectors/construction/construction-products-regulation-cpr_en)

EC (2023d) Circular economy action plan. [https://environment.ec.europa.eu/strategy/circular-economy-action-plan\\_en](https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en)

EC (2023e) European Green Deal. [https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal\\_en](https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en)

EC (2023f) Level(s): European framework for sustainable buildings. [https://environment.ec.europa.eu/topics/circular-economy/levels\\_en](https://environment.ec.europa.eu/topics/circular-economy/levels_en)

EC (2023g) EU taxonomy for sustainable activities. [https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities\\_en](https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en)

Finnish Ministry of The Environment (2021) Ehdotus valtioneuvoston asetuksiksi jätteistä, ympäristönsuojelusta annetun valtioneuvoston asetuksen muuttamisesta, PCB-laitteistojen käytön rajoittamisesta ja PCB-jätteen käsittelystä annetun valtioneuvoston asetuksen 2 ja 7 §:n muuttamisesta sekä viranomaisten suunnitelmien ja ohjelmien ympäristövaikutusten arvioinnista annetun valtioneuvoston asetuksen 1 §:n muuttamisesta. [https://ym.fi/documents/1410903/38678498/Perustelumuistio\\_VNAt\\_j%C3%A4tteet\\_YSA\\_PCB\\_SOVA.pdf/0b83ccf1-de32-b278-98f4-ac5b3236d19b/Perustelumuistio\\_VNAt\\_j%C3%A4tteet\\_YSA\\_PCB\\_SOVA.pdf?t=1656394101682](https://ym.fi/documents/1410903/38678498/Perustelumuistio_VNAt_j%C3%A4tteet_YSA_PCB_SOVA.pdf/0b83ccf1-de32-b278-98f4-ac5b3236d19b/Perustelumuistio_VNAt_j%C3%A4tteet_YSA_PCB_SOVA.pdf?t=1656394101682)

Finnish Ministry of The Environment (2022a) Mikko Koskela's presentation: Uudelleenkäytettävien rakennustuotteiden tuotehyväksynnästä – alustus Round Table 19.5.2022. Not publicly available.

Finnish Ministry of The Environment (2022b) Rakennustuotteiden uudelleenkäyttö on Suomessa mahdollista rakennuspaikkakohtaista varmentamista käyttäen. <https://ym.fi/-/rakennustuotteiden-uudelleen kaytto-on-suomessa-mahdollista-rakennuspaikkakohtaista-varmentamista-kayttaen>

Finnish Ministry of The Environment (2022c) Kierrätyksestä kiertotalouteen: Valtakunnallinen jättesuunnitelma vuoteen 2027. <https://julkaisut.valtioneuvosto.fi/handle/10024/163978>

Finnish Ministry of The Environment (2023a) Building products. <https://ym.fi/en/building-products>

Finnish Ministry of The Environment (2023b) Waste management – international cooperation. <https://ym.fi/en/international-cooperation-and-eu-affairs1>

Finnish Ministry of The Environment (2023c) Waste legislation. <https://ym.fi/en/waste-legislation>

Finnish Ministry of The Environment (2023d) The National Building Code of Finland. <https://ym.fi/en/the-national-building-code-of-finland>

Finnish Ministry of The Environment (2023e) Strategic programme to promote a circular economy. <https://ym.fi/en/strategic-programme-to-promote-a-circular-economy>

Finnish Ministry of The Environment (2023f) Vähähiilisen rakentamisen tiekartta. <https://ym.fi/vahahiilisen-rakentamisen-tiekartta>

Gabrielsson, I, Brander, L. (2021). Återhus. Rivningsobjekt – från kostnad till resurs: Omvärldsanalys. RISE Rapport 2021:57. RISE Research Institutes of Sweden. [Forskningsrapport, fd SP-Rapport \(diva-portal.org\)](https://diva-portal.org/Forskningsrapport,fd-SP-Rapport)

Gharfalkar, M., Court, R., Campbell, C., Ali, Z., & Hillier, G. (2015). Analysis of waste hierarchy in the European waste directive 2008/98/EC. Waste management, 39, 305–313. <https://doi.org/10.1016/j.wasman.2015.02.007>

Kuittinen, Matti (2019). Kiertotalous julkisissa purkuhankkeissa: Hankintaopas. YM 2019:31. <https://julkaisut.valtioneuvosto.fi/handle/10024/161882>

Kuntalehti (2022) Tampereen Kissanmaalle rakennetaan Suomen ensimmäinen kiertotaloustalo. <https://kuntalehti.fi/uutiset/tekniikka/tampereen-kissanmaalle-rakennetaan-suomen-ensimmainen-kiertotaloustalo/>

Lahdensivu, J., Weijo, I., Ruuska-Jauhijärvi, K. & Pyy, H. (2019) Betonijulkisivun kuntotutkimus (Condition assessment of concrete facade). In Finnish. 4<sup>th</sup> edition. Concrete Association of Finland.

LBV (2012) Wiederverwendung von Fertigteilen aus Beton, Stahl- und Spannbeton. [https://lbv.brandenburg.de/download/Bautechnik/bautechnik\\_Merkblatt\\_Fertigteile.pdf](https://lbv.brandenburg.de/download/Bautechnik/bautechnik_Merkblatt_Fertigteile.pdf)

Lehtonen, K. (2021) Purkuhankkeen toteutus kiertotaloutta tukien. In Huttunen, Eeva (edit.). Kiertotalous rakennetussa ympäristössä. Helsinki: Rakennustieto Oy, pp. 124–133.

Mettke, A. (1995) Wiederverwendung von Bauelementen des Fertigteilbaus. (UmweltWissenschaften BV035363192 5).

Mettke, A. (2010). Material- und Produktrecycling – am Beispiel von Plattenbaubauten. Zusammenfassende Arbeit von 66 eigenen Veröffentlichungen, Cottbus, Techn. Univ., Habil.-Schr. 371 p. <https://opus4.kobv.de/opus4-btu/frontdoor/index/index/year/2019/docId/4613>



Parliament of Finland (2022) Hallituksen esitys eduskunnalle laiksi ilmastolain muuttamisesta – HE 239/2022 vp.

[https://www.eduskunta.fi/FI/vaski/HallituksenEsitys/Sivut/HE\\_239+2022.aspx](https://www.eduskunta.fi/FI/vaski/HallituksenEsitys/Sivut/HE_239+2022.aspx)

SFS-EN 13791:2019. 2019. Assessment of in-situ compressive strength in structures and precast concrete components. Finnish Standards Association SFS. Helsinki, Finland. 42 p.

<https://sales.sfs.fi/fi/index/tuotteet/SFS/CEN/ID2/1/806484.html.stx>

SFS 7508:2021. 2021. Assessment of in-situ compressive strength in structures and precast concrete components. Application of standard SFS-EN 13791 in Finland. Finnish Standards Association SFS. Helsinki, Finland. 63 p.

<https://sales.sfs.fi/en/index/tuotteet/SFS/SFS/ID2/7/1065259.html.stx>

United Nations (2023) 17 Sustainable Development Goals. <https://sdgs.un.org/goals>

UNEP (2021). Global Status Report for Buildings and Construction: towards a Zero Emission, Efficient and Resilient Buildings and Construction Sector.

[https://globalabc.org/sites/default/files/2021-10/GABC\\_Buildings-GSR-2021\\_BOOK.pdf](https://globalabc.org/sites/default/files/2021-10/GABC_Buildings-GSR-2021_BOOK.pdf)

UNFCCC (2023) The paris agreement. Available: <https://unfccc.int/process-and-meetings/the-paris-agreement> [Accessed 11.4.2023]

Van Ewijk, S., & Stegemann, J. A. (2016). Limitations of the waste hierarchy for achieving absolute reductions in material throughput. Journal of Cleaner Production, 132, 122–128.

<https://doi.org/10.1016/j.jclepro.2014.11.051>

YLE (2022) Tampereelle rakennetaan Suomen ensimmäinen "kierrätyskerrostalo" – ikkunoita irrotetaan seurakuntatalosta ja tiiliä tulitikkutehtaasta. <https://yle.fi/a/74-20001347>

Zhu, Y., Lonka, H., Tähtinen, K., Anttonen, M., Isokääntä, P., Knuutila, A., Lahdensivu, J., Mahiout, S., Mäntylä, A.-M., Raimovaara, M., Rantio, T., Santonen, T. & Teittinen, T. (2022)

Purkumateriaalin kelpoisuus eri käyttökohteisiin turvallisuuden ja terveellisyyden näkökulmasta. Valtioneuvoston selvitys- ja tutkimustoiminnan julkaisusarja 2022:15.

[https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/163832/VN\\_Teas\\_2022\\_15.pdf?sequence=1&isAllowed=y](https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/163832/VN_Teas_2022_15.pdf?sequence=1&isAllowed=y)

Zhu, Y. & Tähtinen, K. (2022) Conditions for reuse of building components in Finland.

<https://tietokayttoon.fi/documents/113169639/113170760/20-2022-Conditions+for+reuse+of+building+components+in+Finland.pdf/ba5ec3cd-49b2-9961-e724-474a66d20e70/20-2022-Conditions+for+reuse+of+building+components+in+Finland.pdf?version=1.0&t=1668505869688>