VASEK

Circular solutions for the construction sector

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Summary

Finland has set the ambitious goal of becoming one of the pioneering countries in applying circular economy thinking. As buildings and construction consume a significant share of our natural resources and energy, the construction sector has an important role to play in the transition to the circular economy. In addition to this, the construction sector generates large amounts of waste. It is therefore important to promote the reuse and recycling of building materials.

New construction is already regulated in ways that promote the circular economy, but to ensure that the value of materials is preserved we must implement a circular economy approach throughout the life cycle of a building. All construction sector operators must take part in this process. During the construction stage, material choices must be carefully considered in order to maximise the implementation of circular economy principles, but also to ensure that the chosen materials are sustainable and reusable. When a building reaches the end of its lifespan, it should be looked at as a material bank with the aim of identifying how much of its materials could be reused or transformed into new materials.

However, it is important to remember that a circular approach does not automatically guarantee low carbon dioxide emissions. The sensible use of material solutions within the construction sector relies heavily on life cycle thinking and carbon footprinting.

This workbook examines material reuse and recycling from a circular economy perspective. The book provides practical guidance on how a company may apply a circular economy approach in their operations and presents examples of sites and construction products that are in line with circular economic principles.

This book has been edited by Apila Group's experts Maarit Leppänen, Mervi Matilainen and Eetu Pietarinen.

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Glossary

The Finnish Green Building Council (FIGBC) is part of an international network that aims to promote more sustainable construction in Finland and around the world. The now-completed KIRA real estate and construction circular economy competence centre project led by FIGBC compiled circular economy solutions for the real estate and construction sector. As part of the project, a circular economy glossary was created in cooperation with experts and the Ministry of the Environment. The aim of creating the glossary was to harmonise the circular economy terminology used in the construction and real estate sectors. (Finnish Green Building Council, 2022).

At the time of writing, the final glossary has not yet been published. The most important terms related to different materials have been used in line with the contents of the draft glossary, and the terminology has been supplemented by using other sources. The terminology in the English translation has been kept in line with the since-published official glossary, to the extent that this has been possible.

Downcycling	Breaking a valuable product down into less valuable materials or recovering materials that are then used for another, less valuable purpose than the original product.
Environmental Product Declaration (also called EDP or RTS-EPD)	A standardised way of presenting the environmental impacts of a product based on life cycle analysis.
End of Waste (EoW)	If the materials meet the conditions specified in the relevant regulations, they are no longer considered waste.
Recycling	Transforming waste into products, materials or matter, excluding energy, fuels or landfill.
Recycled materials	Materials that are recycled and have been considered waste at some stage of the process.
Material passport	A document that presents information about all materials used in a certain building.
Pre-demolition audit	Assessing the materials and contaminants present in the building to be demolished.
Demolition material	Materials and building elements acquired through demolition.
Upcycling	The processing and use of waste material for the purpose of using it to substitute for otherwise used materials of maximum value.
Reuse	Utilising a discarded product or material for the same purpose that it was originally intended before it became waste.
Materials recovery	Using a discarded matter, object, or other waste as a raw material.
Recovered material	Materials manufactured from recovered raw materials.
Product manufactured from recovered materials	A product made using recovered materials.
Recovered raw materials	Raw material from recyclable waste (e.g. recycled fibre from recycled paper).

1. Why is it important to use recovered materials?

Key points

- It is always better that materials are used for another purpose instead of ending up in a landfill. Construction projects present an opportunity to reuse and recycle materials that are at the end of their life cycle, thus returning them to circulation.
- It is important that the value of the materials is preserved: their technical value should be the same as that of primary materials.
- Both carbon emission calculations and life cycle thinking are essential for utilising recycled material in a sensible way.
- Construction industry operators generally state that they would like to use more recycled materials, but in order to achieve this objective, attitudes throughout the value chain must change. We must all work together towards the shared goal of making use of these materials.

To understand why applying a circular economy approach to the construction industry is important, we interviewed Pekka Vuorinen, Director of Environment and Energy at the Confederation of Finnish Construction Industries RT. Vuorinen is horizontally responsible for environmental matters (sustainable low-carbon construction and circular economy) within his organisation. In addition to this, he is responsible for EU advocacy and EU taxonomy work, and acts as FIEC's representative in the commission's Platform on Sustainable Finance taskforce.

Since construction utilises large volumes of various materials, the sector has significant use potential for recycled materials. If any materials are released at the end of the life cycle, it is always more sensible to make use of them than to simply throw them away. "Construction presents an opportunity to take materials at the end of their life cycle and reintroduce them into circulation. It is important to remember that the circular economy also involves extending the life cycles of buildings. When a new building is constructed well from the get-go, it can serve occupants and users for a very long time," Vuorinen says. Oftentimes, technical improvements can offer a solution for modern challenges related to improving energy efficiency and reducing building emissions. In practice, technical improvements present an opportunity to achieve significant benefits in terms of both energy efficiency and carbon performance with only a small material investment. This, in turn, increases the value of the building. They

can be used to extend the lifespan of buildings and possibly to even reuse entire building elements instead of just materials.

On the other hand, the demand for recycled materials may also be high due to the significant carbon intensity of primary production. Metals, for example, can be recycled very well, and concrete can also be used again. The recycling process should aim to preserve the value of the material. There are also materials that currently end up as waste, such as timber, which is almost always burned. In the future, we must find new innovations to maintain the value of these materials. Vuorinen sees certain proposed solutions, such as biochar and activated carbon, as interesting opportunities. "It is always better that materials are used instead of ending up in a landfill. Through landfill bans, legislation has managed to guide operators towards better materials recovery practices. Utilising bitumen waste for manufacturing asphalt is a good example of this. Industry operators generally want to use glass, plasterboard and wool as materials, and to an extent, already do."

"The difference between recycled and recovered material is that recycled material is only just entering the market, while recovered material is what is currently being used. For this reason, carbon emission calculations and life cycle thinking are essential for utilising recovered materials in a sensible way. Technical improvements are a key tool for the construction industry to improve its carbon performance. They only require a small material investment compared to how much the improvements in energy efficiency will reduce the level of carbon dioxide emissions.

The most significant thing about using recovered materials is not that it contributes to an important goal, but rather that it is simply a sensible choice. Basic materials, such as stone aggregates and timber, have traditionally been readily available. But as the availability of recycled materials improves, it does not make any sense not to use them. Recycling is a natural way of utilising materials. Basic-level solutions already exist, such as the use of blast furnace slag in infrastructure construction and the use of secondary materials and fuels in the cement industry. Standardisation has been a key factor in developing these solutions.

The shift towards a circular economy requires standardising guidelines and updated legislation. Some steps have already been taken: recovered materials have been taken into account in various standards, and the extension of the Government Decree on the Recovery of Certain Wastes in Earth Construction (843/2017) regulation has been an important step forward. However, there is still much to be done in terms of permit and regulatory matters. Creating a new market for materials is crucial for utilising them in accordance with the principles of the circular economy. "The public sector should lead the way and create new solutions to be used in municipal infrastructure, for example."

According to Vuorinen, the circular economy should promote three things: "First, the system must be economically viable. The circular economy market must run smoothly without leaving materials unused due to permit issues and the like." In practice, this means there must be a functioning chain of operators that stretches all the way from planning to permit application processing. There must also be a party who offers the materials up for sale, and another party willing to buy them. "The second issue is legislation. End-of-waste (EOW) does not always promote the recovery of side streams, as the criteria are sometimes too strict. Instead, the possibilities for materials recovery should be considered based on if the overall solution makes sense. In the Netherlands, for example, all materials are tested regardless of whether they are primary

or recovered. After the tests have been concluded, the materials are classified from A to D. Despite the different classifications, you can always find a way to use all materials." Finally, Vuorinen mentions that carbon dioxide emission calculations should be considered as important as the estimated material flow quantities. For example, an analysis of material flow quantities for a densely built area is not comparable with that of a sparsely populated area. Factors such as long transport distances may quickly cancel out any gained benefits. It is important to remember that a circular approach does not automatically guarantee good carbon performance. Therefore, carbon dioxide emissions should always be taken into account when assessing the overall solution.

1.1. Recovered materials are already used in construction

Recovered materials are already widely used in construction. Currently, the most popular of these materials are crushed concrete aggregate, along with various slags and ashes. The UUMA programmes on the use of recovered materials in earth construction have been working for the use of renewable materials for over a decade now. For example, cement production uses a wide range of alternative fuels: the energy component is recovered as energy, while the metal and mineral components remain in the cement. This has also helped to reduce the carbon footprint of cement production. The composition of the end product has been analysed comprehensively, as cement quality is regulated by strict standards. This process produces blended cement. "Cement industry is proof that we have already incorporated recovered materials in many of the basic materials currently in use," Vuorinen says.

In traffic route construction, techniques have been developed to circulate the recovered material within the processes themselves, allowing recovered material to be used on-site. Concrete can also be used for garden and infrastructure construction. Recycled plaster, glass and bitumen are also extremely sought after within the overall construction sector. For example, recycled plaster can be transformed into new plasterboard."Some might think that these activities are not enough, that the scale is too small, but the scale does not really matter, since this is simply one model that allows us to operate in a smarter way. The most important thing is that the environmental damages do not exceed the benefits that the efforts bring. The problem with recycling wood residue, and to some extent other construction waste as well, is that the way the materials have been treated (e.g. painted or impregnated) affects the waste management permit of the original product. It is therefore important to consider what type of product these kinds of materials could be used for. "However, this is another matter that is closely tied to the relevant legislation and the question of what we want to achieve by using these materials."

1.2. Demand for recovered construction materials on the rise

Construction industry operators generally state that they would like to use more recovered materials, but in order to achieve this objective, attitudes throughout the value chain must change. We must all work together towards the shared goal of making use of these materials. “The use of recovered materials will not solve the whole problem, but there is no point in leaving perfectly good materials to lie unused in contractors’ yards. We should instead strive to make them available and use them.” The construction products industry has a long tradition of utilising recovered materials. After the wars of the 1940s in particular, a lot of rebuilding was done using recovered materials.

ITo enable the more widespread use of recovered materials, we must ensure they possess the same technical value as primary materials. In addition to this, they must not be classified as waste.” If the products are commercial and have been properly tested, the source should not be of any concern. It is important to remember that not even all primary materials have the same properties as recovered materials.” The public pressure to use more recovered materials is constantly increasing, which in turn creates new markets.

1.3. Key takeaways

Always keep at least these three things in mind when considering the possibility of using recovered materials:

1. Using recovered materials is a matter of choice. Just ignore the material source and concentrate on the material itself.

2. Find out if suitable recovered materials are commercially available.

3. Assess the technical suitability of the recovered material. Keep in mind that not even all primary materials can offer the same technical properties as some recovered materials can.

2. Circular economy in the construction industry

Key points

- The more widespread uptake of circular materials requires guidance, a reasonable distribution of costs, and designing buildings in a way that takes into account their whole life cycle.
- Establishing a well-functioning circular economy in the real estate and construction sector requires action from operators across the value chain.
- The transition to a circular economy can be accelerated by promoting the reuse of building materials and recycling.

Major developers want to make their sustainability efforts seen and heard. For example, one of YIT's sustainability goals is to promote sustainable urban construction through a circular economy approach. The company wants to advance the use of recovered and recycled materials within the construction sector. However, the wider uptake of circular economy materials requires the whole sector to change its mindset. In practice, this means guidance, a reasonable distribution of costs and designing buildings in a way that takes into account their whole life cycle. Operators must also ensure that all materials used in the building retain their value to the highest possible extent. However, to achieve this, the handling and distribution of recycled materials must implemented in accordance with shared rules. (Virolainen, 2021)

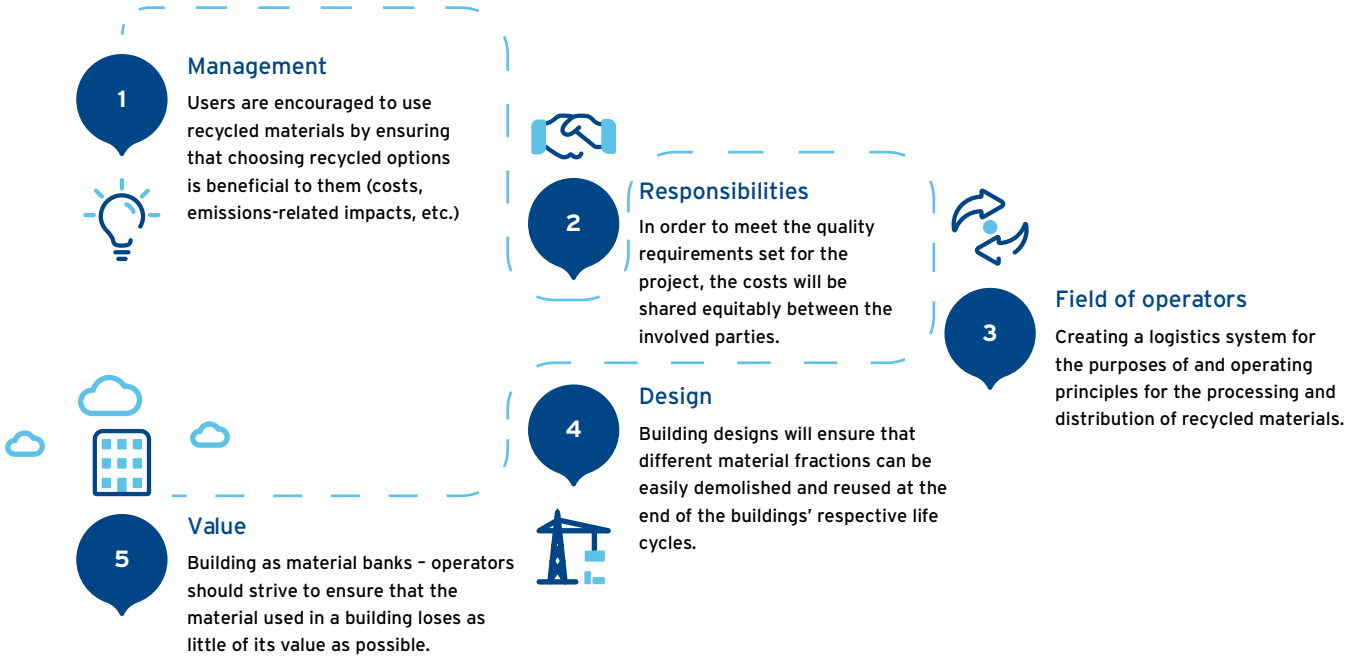

Figure 1. The widespread use of recycled materials in the construction sector requires new ways of thinking. Adapted from Virolainen, E. 2021: Uusio- ja kierrätysmateriaalit rakentamisessa (YIT).

Establishing a well-functioning circular economy in the real estate and construction sector requires action from operators across the value chain. The Finnish Green Building Council (FIGBC) lists how all construction sector operators can contribute to the shift towards circular economy within the construction sector.

- **Construction products are manufactured** from recycled raw materials. Finished products are sustainable, repairable and recyclable, and the EDP (Environmental Product Declaration) label on provides information on the materials used.

- **During the design stage,** designers will assess whether a new building is truly needed and look into the possibility of using existing buildings instead. The design enables a long life cycle, while the right material choices ensure space utilisation efficiency, convertibility and maintainability. Buildings are thought of as material banks, from which materials may be retrieved for reuse later.

- **During the construction stage,** dialogue between the developer and the designer is essential to achieve the objectives set for the project. Site staff aim to minimise waste. Surplus and demolition waste are sorted and assigned to be reused. Transports are optimised and the site will operate with a zero-emission objective. The material passport will be updated as the project progresses. The material passport lists all materials used on the site.

- **The use and maintenance of buildings** can be optimised through shared and jointly used facilities. Waste is sorted, and energy and water expenditure is minimised. Regular maintenance and upkeep of the building will help to ensure that the building achieves the planned life cycle.

- The same rules that apply to design also apply to **renovating buildings:** material choices, space utilisation efficiency, convertibility and maintainability are key. Condition surveys and assessments will indicate if repairs are needed. Updating and completing the material passport promotes more continuous information management.

- **Demolition** should be treated as a last resort, and only resorted to if the building can no longer be preserved by means of repairs or alterations. A pre-demolition audit will help operators to determine which parts of the building could be reused, which materials will be generated in the demolition process, and how these materials could be recycled.

2.1 Impact

Finland aims to be one of the pioneering countries in terms of the shift towards a circular economy. The strategic programme to promote a circular economy is implemented in all key industries. The construction industry is among the most important of these sectors. Globally, buildings and construction consume around 50 per cent of the world's natural resources, and account for 40 per cent of the worldwide expenditure of unrefined energy. The construction sector also produces roughly 35 per cent of all global greenhouse gas emissions, and is responsible for generating 30 per cent of all waste. The land use and raw material consumption associated with construction also have a significant impact on the climate and the environment. (Ministry of the Environment, 2023).

Since the construction industry uses a significant amount of natural resources and produces an equal amount of waste, it also has significant potential to contribute to mitigating climate change and preventing biodiversity loss. The transition to a circular economy can be accelerated by promoting the reuse of building materials and recycling. These actions will save natural resources, reduce emissions and reduce the waste generated bymanufacturing new products. (Ministry of the Environment, 2023).

As a part of the European Union, Finland is committed to recovering or utilising 70 per cent of all construction and demolition waste by 2020. However, the recovery rate is currently still below 60 per cent. (Ministry of the Environment, 2023).

2.2 Circular material economy

Currently, new construction is already regulated in ways that promote the circular economy. Developers and designers aim to make new buildings durable, versatile, convertible and easy to maintain and repair. In order to ensure that the building materials retain their value, operators must take the principles of the circular economy into account at all stages of the building's life cycle. This, in turn, requires commitment from the whole construction sector.

In terms of materials, the best opportunities for promoting a circular economy can be found at the beginning and the end of the building's life cycle. During the construction stage, operators should assess which recycled materials could be utilised and to which extent. Once a building has reached the end of its lifespan, it is important to assess what percentage of the building components and materials, as well as the construction and demolition waste, could be reused or recycled. (Ministry of the Environment, 2023). However, operators must ensure that the materials are safe and healthy to use and that they are not contaminated or damaged and contain no harmful substances or hazardous compounds. (Lautamo, 2020).

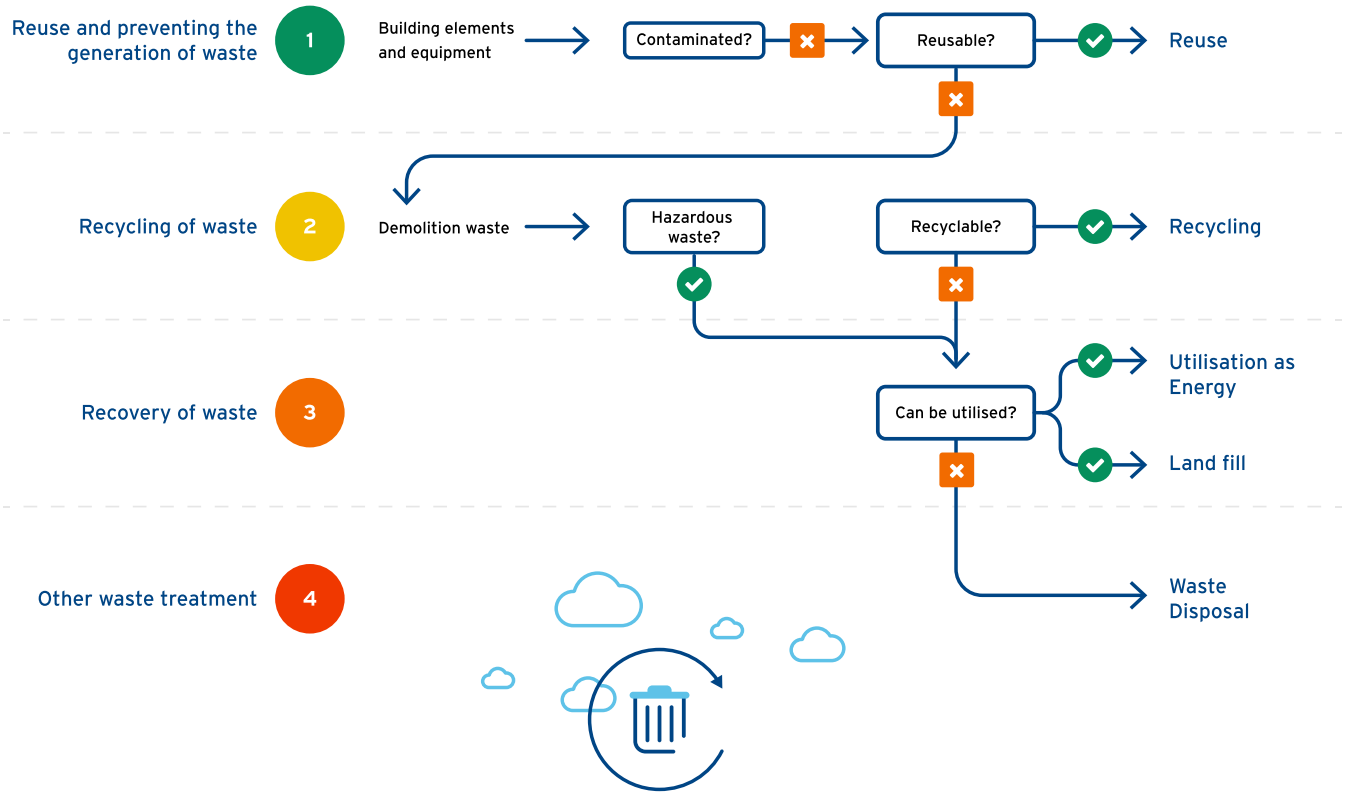

Figure 2. Taking into account the order of priority for waste management of construction and demolition waste. (Adapted from Lehtonen, 2019: Purkutyöt – opas tekijöille ja teettäjille. Ympäristöministeriön julkaisuja 2019:29.)

3. Circular construction in practice

Key points

- The construction industry has a great deal of potential to reduce its emissions through the manufacture of building materials and by improving recycling.
- The reuse of demolition materials requires planned measures. Operators should therefore conduct an inventory of usable materials already when the demolition is being planned.
- If the materials resulting from the demolition are to be reused or otherwise utilised, the operator must prepare clear instructions indicating that the demolition will be carried out as a disassembly and make these instructions available early on.
- Circular construction requires attention to material choices, networking, careful planning and collaboration. At best, a circular approach may even result in new business opportunities.

The construction industry has a great deal of potential to reduce its emissions through the manufacture of building materials and by improving recycling. However, the circular economy is not a new trend in the construction industry. For example, for centuries log buildings have been disassembled, moved from one location to another and rebuilt (Sipiläinen 2022). There are of course more modern examples as well. The Finnish Innovation Fund Sitra carried out a project to promote a circular economy among real estate and construction operators. The project was called Sprint towards a circular economy, and it ran from 2018 to 2021. It included activities such as creating a list of circular economy references in the built environment. More recently, sites completed in accordance with the principles of the circular economy have been listed on the rakennakiertotaloutta.fi website, which is maintained by the FIGBC. The website presents different projects ranging from regional planning to new construction.

3.1 Utilisation of materials in construction products

The Sprint towards a circular economy project produced a list of suggestions for actions to integrate circular economy into the culture of the real estate and construction sector. The list highlighted the importance of material banks to recycle building materials from demolished buildings, as well as the significance of increasing the use of recovered materials. To achieve these goals, recycled and recovered materials and products must have a market that spurs innovation and circulates the materials themselves. (Finnish Green Building Council, 2018)

At present, the value and demand for disassembled building components are still weak, limiting business development. To make more widespread use of demolition materials a profitable business, legislation and regulations should be adjusted to support these activities. The reuse of building components and materials, as well as the use of recovered components and materials, could be promoted through digital solutions. One example of a solution that promotes information management is the material passport, which allows the value of materials to be preserved (Tihinen et al., 2022).

There are three possible destinations for surplus or disassembled materials: they may either be reused as such, reused as recovered materials, or end up as waste. The ease and profitability of materials recovery and reuse depends on many factors, such as whether the material is easy to disassemble and sort, if its purity can be readily assessed, and whether logistics and treatment can be carried out cost-effectively.

The Finnish legislation defines an order of priority for waste management. This order is based on a five-tier waste hierarchy. The most important thing is to prevent creating waste in the first place. Utilising the waste as energy and disposal of waste are listed at the bottom of the pyramid as last resort options.

Efforts to recycle materials must be developed from simply disposing of the materials or utilising them as energy towards a more direct ways to make use of them. At present, construction materials are utilised by repurposing, but in the future, upcycling, i.e. adding value to materials by processing them, will have an increasingly important role. We can only reach a truly circular economy once the materials and products we use can be reused as they are. (Virolainen, 2021).

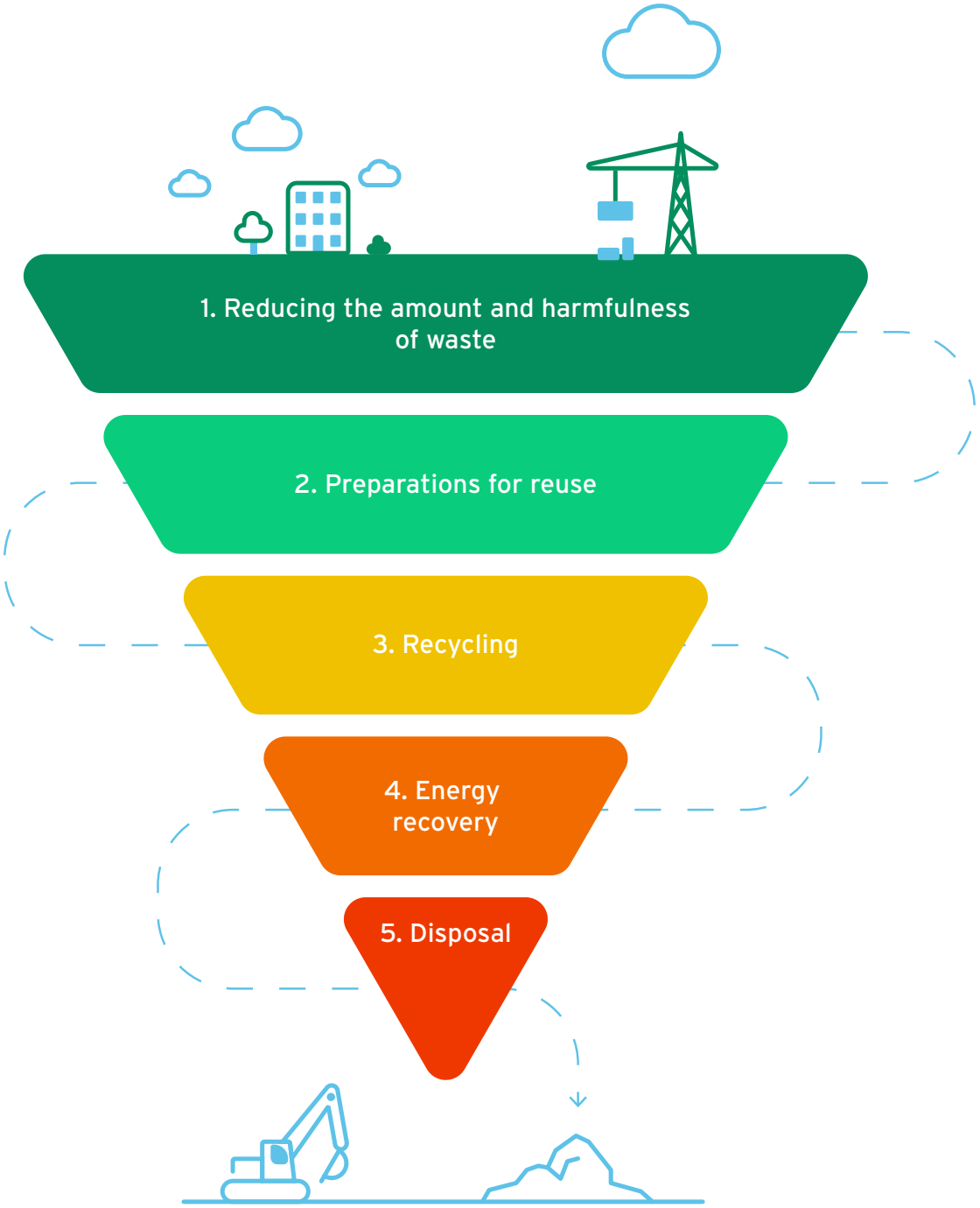

Figure 3. Waste hierarchy (Adapted from Mäensalo, J. 2018: Kiertotalouden mukaiset materiaalivalinnat rakentamisessa: case: Topinpuiston vierailukeskus.)

3.1.1 Reuse - Usable virgin materials

Reuse refers to utilising a discarded product or material for the same purpose it was originally intended for before it became waste. Reuse reduces the consumption of materials needed for new products. (Mäensalo, 2018).

The reuse of demolition materials requires planned measures. Operators should therefore conduct an inventory of usable materials already when the demolition is being planned. This will help to identify reusable building components, recyclable and recoverable materials, as well as any materials containing harmful substances. (Zhu et al., 2022). Larger-scale reuse of building components would require the demolition project operator to take increasing responsibility for identifying the reusable components. (Häkämies et al., 2019).

3.1.2 Reuse - Circular materials and recovered raw materials

If a demolished or disassembled building element or product cannot be reused as such, it becomes construction or demolition waste. Recyclable waste can be recovered as raw material fornew products. Materials recovery means reusing the material as a raw material for another purpose. (Mäensalo, 2018). Using recovered materials and products prepared from these materials saves natural resources and reduces emissions and waste. By opting for these products instead of virgin products, industry operators can contribute to developing a market for them, therefore also improving their supply. (Lautamo, 2020)

Construction and demolition waste is subject to the demands and obligations laid down in the Finnish waste legislation, and processing these materials does not automatically mean that they are no longer considered waste. End of Waste (EoW) criteria currently exist for iron, steel, copper and aluminium scrap, as well as for crushed glass and concrete aggregate. If the materials meet the conditions specified in the relevant regulations, they are no longer considered waste. (Zhu et al., 2022).

3.1.3 Materials from demolition sites and their recovery

Concrete and brick

By mass, concrete is the most significant waste fraction generated in the demolition process. Once crushed, concrete and brick waste may be used to replace virgin stone aggregates in earth construction work, for example. Crushed concrete aggregate can also be used for manufacturing new concrete. The reuse rate of brick is currently low, even though there is demand for old bricks that have been cleaned. Usually, the problem is that the availability of cleaned bricks is low, as very few brick buildings are demolished, and during this process, the bricks are usually crushed. (Lautamo, 2020)

Wood

Wood is a versatile material with great potential for recycling. Wood also acts as a carbon sink, as the carbon stored in it is retained throughout the lifespan of the material. (Mäensalo, 2018). Wood demolition waste consists mainly of untreated wood waste (logs, roof trusses, etc.), treated and mixed wood waste (painted or coated wood, plywood, glued laminated timber etc.) and impregnated wood waste. For this reason, identifying the quality of the wood and any contaminants is important when planning the further use of the material.

From a reuse perspective, untreated timber is the most potential wood material due to its homogeneity. The main obstacle to its use is the mismatch between supply and demand. Untreated and mixed wood waste is a very mixed bag of materials, and the chemicals used to treat the materials are not always known. Impregnated wood waste, on the other hand, is considered hazardous waste and must thus be delivered to an operator qualified to manage such waste. (Häkämies et al., 2019).

In Finland, the use of wood as energy is in direct competition with the use of wood as a recovered material. There is little demand for waste wood, as the timber industry already generates a large amount of clean wood material as a byproduct. In southern Europe, waste wood is used for manufacturing wood fibre boards. (Lautamo, 2020). Finnish operators have also explored and developed methods to utilise wood waste in material composites, such as wood and plastic composites.

Metal

Metal can always be recycled without fear of the material losing its properties. Currently, all generated metal waste is recycled almost entirely. Recycling metal waste helps to avoid using virgin raw materials, and recy-

cling consumes much less energy than manufacturing new materials. It is also often much easier to disassemble metal structures and sort metal than other types of waste.

Plaster

Plasterboards could be reused as such, but they are also fragile, makingdisassembling the elements very difficult. Plasterboard can be crushed and used to manufacture new plasterboard, but as sites do not generally produce a lot of plasterboard waste, it unfortunately often ends up in mixed waste. (Lautamo, 2020)

Glass

Glass used in windows and other flat surfaces may be reused, but the energy efficiency properties of recycled windows may not be up to par. Glass waste can be used to manufacture new glass, glass wool or foam glass. (Lautamo, 2020) At the waste collection stage, waste should be separated according to the type of glass: window glass, float glass, i.e., ordinary building glass, heat-tempered safety glass, laminated safety glass, insulating glass elements and wood-aluminium windows. Refractory glass cannot be recycled. (Zhu et al., 2022).

Plastic

The total amount of plastic waste generated at demolition sites is generally low compared to other types of waste. In addition to this, plastic waste usually contains a wide range of different types of plastic. Even though certain types of plastic could be used to manufacture new products or materials, it usually ends up as mixed construction waste. Using plastic waste as a recovered material would require more effective sorting practices. (Zhu et al., 2022).

Insulation materials

The reuse of insulation materials is not economically viable due to their low cost. Older insulation materials may also contain substances that have since been declared unfit for use in buildings. (Zhu et al., 2022). Many insulation materials are suitable for reuse as raw materials. Glass fibre and rock wool can be used to make mineral wool loose materials. Wood fibre insulation materials can be used to manufacture mineral wool loose materials, but may also be utilised for soil improvement. Mineral wool can be recycled and used as raw material for concrete and wood-plastic composites. (Lautamo, 2020)

Other building elements and components

Many smaller building components also have the potential for reuse. For example, certain flooring materials, stone ovens, kilns, tubs and sinks, lighting fixtures, natural stone and stone tiles could very well be reused. Mineral wool loose materials can be reused as such. (Poutiainen, 2013).

3.2 Practical use of recovered materials

For this book's section on recovered materials we interviewed Spolia Design's Mikko Piitulainen. Spolia Design provides modern project design services, specialising in the reuse of demolition materials. Piitulainen is responsible for the company's research and product development projects and has 26 years of experience in structural design, design management, construction and project management.

Currently, Spolia Design is working on a housing project set in the Kissanmaa district of Tampere. Pohjola Building wants to introduce a circular economy situation picture concept that could be used to set objectives, criteria and indicators related to circularity, and to monitor projects. Spolia Design will draw up a site manual for the project based on the selected circular economy concept. The manual will take into account possibilities for reuse, shared use and creating convertible energy solutions, as well as the use of new products. It will also aim to minimise waste. The resulting site manual can also be used as a guide for future projects.

3.2.1 What kind of recovered materials can be used?

Piitulainen lists a few examples from the projects Spolia is involved in: "During the concept stage of one project, the developer had decided to use old bricks from a demolition site. These bricks would be cleaned after disassembly. However, at the moment, reusing bricks is not an organised process. There are no commercial products available, and all processes are set up on a project-specific basis." Once disassembled, glued laminated timber structures can also be used for new purposes. On such sites, Spolia acts as the operator, ensures product quality, oversees testing and selects the right contractors. Upcoming experiments include removing precast concrete elements from structures without breaking them down first. If preserved intact, these elements could be used to construct storage buildings, for example.

The demolition sites will also be used to produce so-called upcycled products, i.e. products that will be put to more valuable use in their future location. These may include, for example, pipes from industrial sites. Spolia wants to foster activities that could secure the commercial supply of demolition products in the future.

3.2.2 Practical use of demolition materials

There is already a demand for demolition materials within the construction sector. “Especially demolition contractors are already very interested in putting the materials to good use,” Piitulainen says. If the materials resulting from the demolition are to be reused or otherwise utilised, the operator must prepare clear instructions indicating that the demolition will be carried out as a disassembly and make these instructions available early on. “This way, the contractor will be already prepared for disassembly work, the work is correctly priced during the demolition procurement process, and the operator will receive the right price for the demolition straight away.”

Piitulainen stresses the importance of realistic targets and a systematic approach for operators who want to get started using demolition materials. “You have to find the suitable demolition sites and ensure that they are disassembled correctly. It is also important to prepare the process well in advance and store the goods properly. This will also help with scheduling.”

“Getting product approvals for demolition products is fairly easy. The current European interpretation is in line with the guidance from the Finnish Ministry of the Environment, which defines reusable products as requiring site-specific certifications. The local building supervision authority will determine how the characteristics of material are validated.”

Once the requirements have been assessed and the objectives have been set, it is important to draw up a testing programme in good time. Sampling and tests to assess material characteristics can help to select which materials should be saved and used. Operators can acquire an official approval for the materials only after they have obtained a building permit, as a permit number is required for site-specific validation. Building control authorities should be brought into the loop as early on as possible, and the dialogue should continue throughout the project.

3.2.3 Recovered materials are the future

"Many operators do not yet have a ton of references, so customers are often uncertain about how to find an operator with the right expertise. But as long as the operator is committed to the goal, there is always more information available. It is important to get the whole design team excited about what they are doing. Projects should have a dedicated coordinator to manage the circular and sustainability aspects of the project. This coordinator will, in turn, be able to highlight more sustainable and circular options.

Clients play a key role in increasing the use of recovered materials. They make the key decisions regarding guidance and set the requirements that designers must be able to meet. Land use planning may also be used to guide clients towards these goals through carbon targets, for instance. To avoid revisions to the designs, targets for using recovered materials should be set at the very start of the project.

In the future, the use of recovered materials will increase significantly in the construction industry. "There are just not enough resources. Our planet simply cannot take it. We need proper sustainability ambassadors from either the business or public sector, and they also need to be ready to raise their voices instead of risking that their message goes unheard."

3.2.4 Key takeaways

1. Reuse is set to become a standard construction industry practice in the future, so it makes sense to start implementing it now. An early start will help your company to gain a foothold in the new market.

2. Start small: try it out with small quantities and easily reusable parts first. Implementing sustainable construction practices will help your company to secure more projects in the future.

3. Remember that in Finland, there is always relevant expertise and support available, and do not hesitate to seek out these resources.

The following chapter presents materials and ready-made products that use recycled materials or even a circular approach. The purpose of the material and product listing is to help operators to pick out solutions directly for their construction sites.

3.3 Recovered raw materials

Recovered raw materials are raw materials acquired through circular practices and can be used for manufacturing new products.

Blast furnace slag

Sources: The steel industry

Processing: Crushing, grinding, sieving

Use and availability:

- Used as a substitute for cement in concrete products
- Used in AAC products during the testing phase
- Available separately and pre-mixed in commercial binders (e.g. Finnsementti)

Crushed concrete aggregate

Sources: Concrete industry and demolition sites

Processing: Crushing and sieving

Use and availability:

- In earth construction in accordance with the Government Decree on the Recovery of Certain Wastes in Earth Construction (843/2017)
- Methods for using crushed concrete aggregate in concrete production are currently being developed

Combustion plant fly ash

Sources: Energy production

Processing: No processing required

Use and availability:

- In concrete products as a substitute for cement in certain low-load applications
- Fly ash from coal is already available as a commercial product (Ecofax M20) and has been approved for use in the relevant concrete standards
- Bio power plant fly ash

Tailings

Sources: Extractive industries

Processing: Drying, sieving (grinding of lumps)

Use and availability:

- Used as filler in concrete and AAC products
- Commercially available under several trade names, such as Nordkalk

Bottom ash from waste incineration plants

Sources: Waste incineration plants

Processing: Metal removal, sieving

Use and availability:

- Used to replace sand or aggregate for example in infrastructure construction and concrete industry products.
- Can be used to construct the lower structural layers of pedestrian and bicycle routes, parking areas and areas used for storing products or materials.
- Artificial stone aggregate under the trade name Scanwas

Recycled plastics

Sources: Consumer and industry sources

Processing: A multi-step process, including granulation

Use and availability:

- Various plastic products are already commercially available

3.4 Products manufactured from recovered materials

Products manufactured from recycled and recovered materials are both often called recycled products. Choosing products manufactured from recovered materials over products manufactured from virgin materials saves natural resources and reduces climate emissions and waste. When products manufactured from recovered materials are used in the construction industry, this also contributes to market development and increases the supply of these products. (Lautamo, 2020).

Below, you will find a list of commercially available construction products made from recovered materials. If you have any questions regarding the availability of these products, please contact the retailers. Links to each manufacturer's website are provided at the end of this workbook..

Concrete products

- Finnsementti: Kolmossementti (contains blast furnace slag).
- JA-KO Betoni concrete: Geoprime® (manufactured using industrial side streams, e.g. blast furnace slag).
- Rudus: CEVO concrete (low-emission) and Uuma concrete (contains recycled stone aggregates).
- Elkem AS: Microsilica, a fly ash product obtained from the production of metallic silicone, a CE-marked concrete admixture.

Excavation and landscaping products

- Outokumpu Oy: OKTO crushed aggregate and OKTO insulation material (ferrochrome slag-based products).
- SSAB Europe Oy: Blast furnace sand (a steel production byproduct).
- Rudus: Betoroc (aggregate recovered from concrete and brick waste).
- Bark chip, several manufacturers: bark residue from the pulp industry.

Insulation materials

- BEWI EPS insulation materials: Contain recycled materials, recyclable.
- Ecoup Ekovilla: Made from recycled wood fibre.
- Finnfoam insulation materials: Ceramic-based tiles made partially from recycled plastic insulation materials.

- Foamglas: Cellular insulation materials manufactured entirely of recycled glass.
- Foamit: crushed foam glass made entirely from recycled glass.
- Greenbau foam glass sheet: 100% recycled glass, recyclable.
- PAROC stone wool insulation products: Reusable if intact, contain recycled fibres
- Termex Green+ cellulose wool: Mineral wool loose materials made from recycled paper.
- Armacell International S.A.: Arma-PET insulation materials (recycled as PET-based products).

Bathroom and kitchen furniture

- DURAT: Bathroom and kitchen furniture made from a solid material that utilises 30% recycled plastic.

Plastic products

- Sauplast recycled plastic products: Protective and covering films, sheets, hoods, sacks and bags.
- Uusiomaterialit Recycling Oy's recycled plastic products: Wells, drainage pipes, plinth panels and protective plastic products.

Doors and windows

- PURSO doors and windows: Made from 100% recycled aluminium.

Timber

- UPM-Profi: wood plastic composite terrace board made from 55–95% recycled materials, recyclable.

Fireplaces

- Tiileri: Lämpökivi brick, made of 85% circular materials
- Tulikivi: The pourable heat-storing compound product of the Kermansavi product family (includes recycled porcelain fracture).

3.5 How to start implementing circularity in the construction industry

This chapter presents the main steps to promote a circular economy in the construction sector. At the end of the workbook, you will find links and sources for up-to-date information on the circular economy in the context of the construction sector.

Material choices

With the right choices, all operators can promote the circular economy throughout the life cycle of buildings they own or construct. One of the key solutions to promote a circular economy is related to material choices. In the design phase, care should be taken to use recycled or recyclable materials as much as possible, while at the demolition stage, it is crucial to think carefully about how valuable materials can be recycled. Remember to use a material passport!

There is also an order of priority for material choices. First and foremost, operators should opt to reuse materials, and if that is not possible, they should use recovered materials. The use of virgin materials should be avoided.

Business opportunities

Introducing circularity to the construction sector presents many challenges, but also many opportunities. Operators who start to incorporate the circular practices into their business now will have an advantage over those who start later. However, increasing the circularity of a company's operations may also produce cost savings by preventing usable goods and materials from going to waste. Remember to make your circular economy skills seen and heard!

Getting started

Introducing circularity into the construction industry requires action across the industry, so networking is important. Dialogue between the different actors will ensure that the materials contained in buildings can be recycled even after the building has reached the end of its life cycle. The most important thing is to bring operators, services and materials together. Contact your region's circular economy cluster: https://www.renergi.fi/etusivu/

Design

Good design and planning are important in all real estate and construction-related operations. Options should be assessed and considered before each working stage. Circularity should be considered in all project stages, from land use and urban planning to

the choice of materials for the finished building. Demolition activities and recycling of demolition materials must also be carefully planned. A pre-demolition audit can help to identify which materials could be used and how. Remember that dialogue within the market is also important: the circular economy is constantly evolving, and conversations between clients and service providers will help to find the best possible solution.

Collaboration

Clients have a big role in making the circular economy a reality in the construction sector. However, each operator can promote sustainability through their own actions. It is also important that information is passed on between different operators, so that each operator can find what they need and all services and materials are utilised. We also warmly recommend visiting Materiaalitori. Materiaalitori is a free service that connects those in need of materials with waste, side streams, surplus materials and related services.

Software and digitalisation

There is a clear need for more information management in construction, as currently information is scattered and difficult to access. Extensive reforms to improve the management and use of information are underway in the Finnish public administration. You can read more about their progress of these reforms on the website of the Ministry of the Environment: https://ym.fi/en/digital-built-environment.

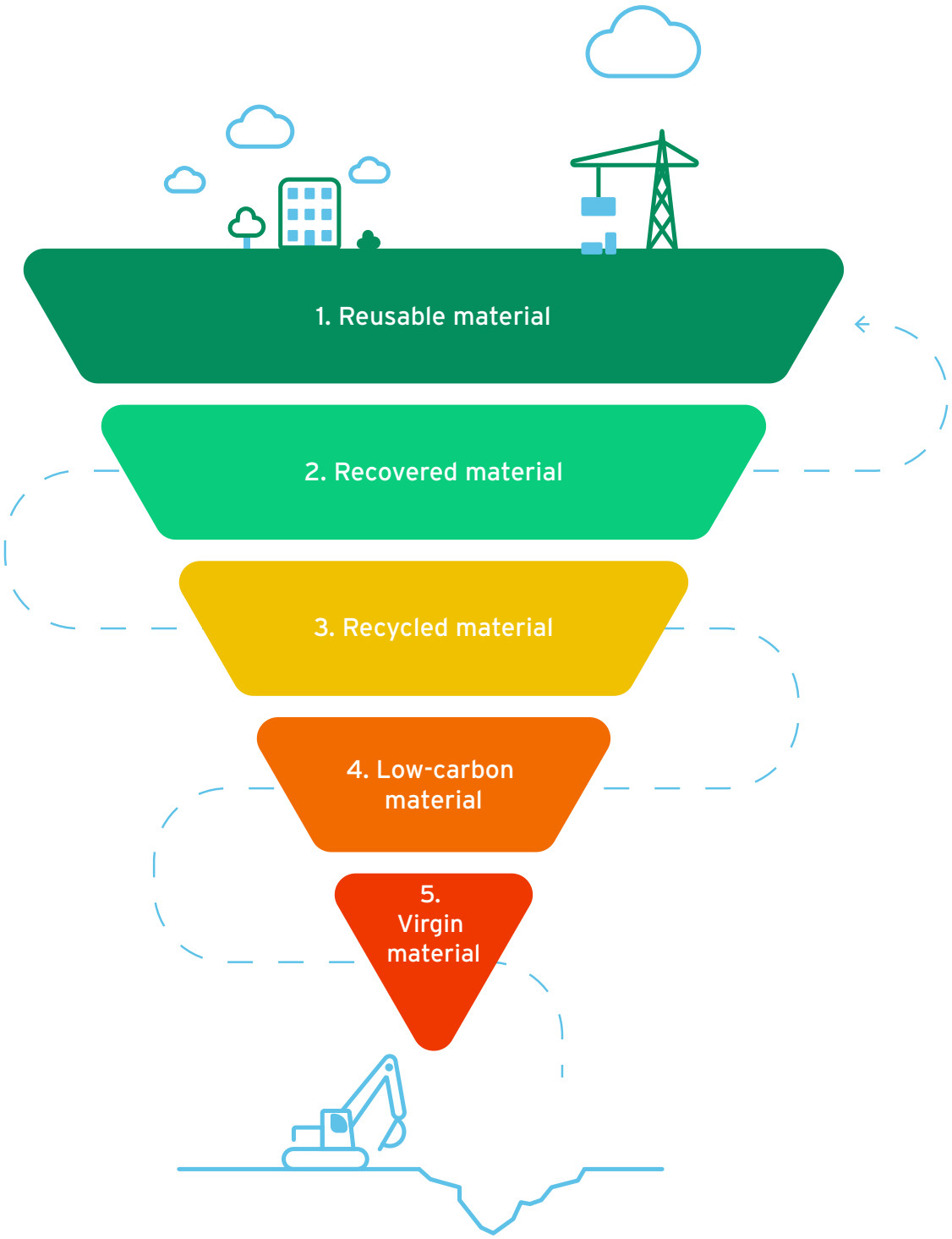

Figure 4. Priority order of material choices. (Adapted from Mäensalo, J. 2018:Kiertotalouden mukaiset materiaalivalinnat rakentamisessa: case: Topinpuiston vierailukeskus.)

6. Examples of circular buildings

There are plenty of buildings in Finland that have been built using circular products and a circular approach.

In addition to the buildings presented below, you can find examples of these buildings on the following websites:

Rakennakiertotaloutta.fi – Completed circular economy projects (in Finnish): https://rakennakiertotaloutta.fi/

Kiertotalouden potentiaali rakentamisessa Lounais-Suomessa – final rapport (in Finnish): https://varsinais-suomi.fi/wp-content/uploads/2021/09/Rakentamisen_kiertotalous_VALMIS_SELVITYS-1.pdf

4.1 Circular building in Kissanmaa, Tampere

The City of Tampere used circular economy criteria in choosing which operator the plot would be awarded to. The city wanted to encourage construction operators to use and develop business-driven circular economy solutions. (Peltola, 2022). The city received a total of 18 applications for the plot. In the end, Pohjola Rakennus Oy Suomi was chosen to receive the plot. The choice was influenced, among other things, by the fact that the materials described in the designs could be acquired from Pohjola Rakennus' own existing construction sites that were mainly located in the Tampere region, and the percentage of reused building components. The buildings will make extensive use of recycled materials and reusable building products. For example, the facades will be built using recycled wood and bricks. (Pohjola Rakennus, 2022). Spolia Design, the company that was interviewed earlier on in the workbook, will also implement site guidance based on a circular economy concept. This guidance will take into account reuse, shared use, convertibility in terms of energy and new products, and aim to minimise waste.

4.2 Renovation of an apartment building area in the Kummatti district of Raahe

Housing Finance and Development Centre of Finland organised a competition for project proposals to improve the occupancy rate of Kummatti houses built between the 1960s and 1980s, to reduce the number of apartments, to ensure the apartment size better met potential occupant demand, and to improve the living comfort in the area. Harri Hagan and Petri Kontukoski won the competition with their proposal called Palapeli (jigsaw puzzle in English). The renovation was carried out by demolishing the large apartments that had become redundant. The demolition work was carried out with the help of a robot, which demolished concrete partitions and intermediate floors. The façade elements were removed as intact. Some of the elements were crushed, while some were recovered for use in new buildings and structures, such as courtyard buildings and carports. The project also improved the energy efficiency of the houses with renewable energy production and by installing heat recovery equipment. (Takala, 2008).

4.3 Competitive tendering for the demolition of the Vuorintaka residential home for the elderly in Hämeenlinna

The competitive tendering process, prepared in cooperation between the City of Hämeenlinna and Häme University of Applied Sciences (HAMK) for the circular economy project HYPPY, managed to cut the estimated costs of the project by almost 50 per cent and promoted circularity. New demolition and procurement guides were also utilised. The softstripping process allowed the operators to reuse furniture and building components, and all the materials offered for sale were sold. The concrete and brick waste from the demolition site was processed and recycled in a nearby location, which also reduced the carbon footprint of the material chain. (Turku University of Applied Sciences, 2021).

5. Legislation and guidelines

The Finnish parliament is currently preparing a reform of the Land Use and Building Act. The reformed act will:

- aim to steer operators towards lower-carbon new construction and ensure that they take the building's life cycle emissions into account, especially in material choices
- include requirements for the longevity, convertibility, reparability and demolition potential of new buildings
- require building and demolition permit applicants to identify all materials released during the demolition process
- promote the digitalisation of construction project data, which in turn facilitates the reuse and recycling of materials.

Up-to-date information on the reform process can be found on the website of the Ministry of the Environment: https://ym.fi/en/circular-economy-in-the-construction-sector

The parts of the Waste Act regulating the management of construction and demolition waste were revised in 2021. The reform aimed to reduce the amount and harmfulness of construction and demolition waste, as well as to improve the efficiency of separate waste collection efforts. The official aim is to ensure that 70 per cent of all construction and demolition waste is either prepared for reuse, recycled or otherwise used for new purposes.

Up-to-date information on Finnish legislation regarding waste is available on the website of the Ministry of the Environment (only available in Finnish): https://ym.fi/jatteet/jatelaki

The legislation in force at the time of writing is presented in Table 1.

Table 1. For the key obligations arising from the Land Use and Building Act and the Waste Act, please review the amended versions of the Acts.

Land Use and Building Act (132/1999)	
Section 125	Building permit. A building permit is required for the construction of a building.
Section 127	Permit to demolish a building. In an area covered by a local detailed plan or where a building prohibition for the purpose of drawing up a local detailed plan, as referred to in section 53, is in force, a building or part thereof may not be demolished without a permit. A permit is also needed if so required in the local master plan. Unless the demolition requires a permit, the local building supervision authority shall be notified in writing of the demolition of a building or part thereof 30 days before the demolition work begins (demolition notification).
Section 139	Preconditions for a demolition permit. The permit application must explain how the demolition work is to be organised and describe the operator's capacities for managing the construction waste generated, as well as how any useful building components are to be utilised.
Section 154	Organizing the demolition of a building. The demolition of a building or part thereof must be organized so as to make it possible to recycle usable parts of the building and process any building waste.
Land Use and Building Decree (895/1999)	
Section 48	The role of the principal designer. The principal designer (in collaboration with the developer) shall be responsible for the following duties relating to the project: - preparing and submitting required permit documents and special designs to the building supervision authority - assessing the building's construction history, its characteristics and condition, earlier repairs or alterations to the extent required by the alteration or repair project at hand - assessing the significance of any information that comes to light as structures are opened or dismantled in terms of the designs.
Section 55	Ecological considerations in building. When a building is designed, the environmental load caused by building materials and supplies during the building's life cycle shall be investigated as required. Special attention shall be paid to the repairability and replaceability of building elements and technical systems. Permit applications and notifications concerning the construction or demolition of a building or part of a building shall include an account of the amount and type of construction waste and how it will be sorted, unless the amount of waste is minor. Applications and notifications shall report separately any construction and demolition waste that is harmful to health or the environment, and how it will be disposed of.

Waste Act (646/2011)	
Section 8	General obligation to comply with the order of priority. First priority shall be given to reducing the quantity and harmfulness of waste generated. If waste is, however, generated, the waste holder shall first and foremost prepare the waste for reuse or, secondarily, recycle it. An operator whose production generates waste, or who collects waste on a professional basis or treats waste on a professional basis or at an installation, as well as other operators participating in waste management on a professional basis, shall comply with the order of priority as a binding obligation so that, when assessed as a whole, the best result is achieved in terms of the objectives of this Act.
Section 12	Duty to know and disclosure obligation. Producers, manufacturers and importers of products shall know the waste generated from their production or from their product, its environmental and health impacts and waste management as well as the possibilities of developing their production or product so as to reduce the quantity and harmfulness of waste. The waste holder shall know the origin, quantity, type, nature and other properties of the waste relevant to organising waste management as well as of the impacts on health and the environment of the waste and waste management and shall, if necessary, disclose the information regarding these to other waste management operators.
Section 15	Obligation for the separate collection of waste. To implement the order of priority, waste of different types and nature shall be collected separately from each other and shall not be mixed with other waste or materials. Exemptions from the obligation for separate collection of waste may only be made if at least one of the following conditions is met: 1) collecting different kinds of waste together does not reduce their quality or adversely affect their potential to undergo preparing for reuse, recycling or other recovery in accordance with the order of priority; 2) separate collection does not deliver the best overall outcome when considering the overall environmental impacts of the waste management of the waste; 3) separate collection is not technically feasible taking into consideration good practices in waste collection; 4) separate collection would entail disproportionate costs taking into consideration the potential for improvements in the cost efficiency of separate collection, revenues from sales of separately collected waste and secondary raw materials processed from it, as well as the costs arising from the adverse environmental and health impacts of the collection and treatment of unsorted waste.
Section 94	Application for acceptance of an activity into the waste management register. Anyone intending to carry out professional waste transport or act as a waste broker shall submit an application for acceptance of the activity into the waste management register referred to in section 142, subsection 1, paragraph 2.

Section 118	Record-keeping and disclosure obligation. The operator shall keep records of waste if the activity is: 1) activity that generates a minimum of 100 tonnes of waste per year; 2) activity that generates hazardous waste or POP waste; 3) treatment of waste on a professional basis or at an installation referred to in Annex 1, Table 1, paragraph 13 and Table 2, paragraph 13 of the Environmental Protection Act but not, however, treatment referred to in section 32, subsection 1, paragraphs 1–3 of the said Act; 4) activity subject to a permit under the Environmental Protection Act; 5) food industry activity that is subject to notification under the Environmental Protection Act; 6) transport of waste, waste brokerage and waste collection. In addition, the operator shall keep records of the products and materials created in preparing for reuse, recycling or other recovery of waste if the activity is an activity referred to in subsection 1, paragraph 3.
Section 120	Operator's monitoring and control obligation. The operator of an activity referred to in section 118, subsection 1 shall regularly and systematically monitor and control the waste management organised by it to ensure that the activity fulfils the requirements laid down for it in provisions and regulations issued in and under this Act and that the information necessary for the supervision of the activity can be submitted to the supervisory authority.
Section 121	Obligation to draw up a transfer document. Before commencing a movement of waste, the waste holder shall draw up a transfer document for hazardous waste, POP waste, septic tank and cesspool sludge, sludge in sand and grease interceptors, contaminated soil and construction and demolition waste other than uncontaminated soil that is moved and transferred to a transferee referred to in section 29. The transfer document shall contain the information necessary for supervision and monitoring on the type, nature, quantity, origin, delivery site and date, treatment method on the delivery site as well as the carrier of the waste.

Government Decree on Waste 978/2021	
Section 25	Reducing the quantity and harmfulness of construction and demolition waste. Those undertaking a construction project shall ensure that the project is planned and implemented so that, in accordance with section 8 of the Waste Act, all usable construction components and materials are reclaimed and re-used and that the activity generates as little construction and demolition waste as possible and that this waste is as harmless as possible.
Section 26	Separate collection of construction and demolition waste. The holder of construction and demolition waste shall organise separate collection for at least the following waste types: 1) concrete, bricks, mineral tiles and ceramics sorted, where possible, by waste type; 2) asphalt; 3) bitumen and roofing felt; 4) gypsum; 5) unimpregnated wood; 6) metal; 7) glass; 8) plastic; 9) paper and cardboard; 10) mineral wool insulation; 11) soil and stones. Separately collected waste shall be delivered for treatment where as large a proportion of the waste as possible can be prepared for reuse or otherwise recycled or recovered as material in a manner maximising quality. Provisions on keeping hazardous waste separate and a ban on the mixing of hazardous waste are laid down in section 17 of the Waste Act. Provisions on keeping POP waste separate and waste management of POP waste are laid down in Regulation (EU) 2019/1021 of the European Parliament and of the Council on persistent organic pollutant (the POP Regulation).
Section 33	Waste producer's obligation to keep records and disclose information. Records of waste generated from activities referred to in section 118 shall contain the following information: 1) the quantity of the waste; 2) the list-of-waste entry and a description of the waste type; 3) the character of the waste; 4) the activity from which the waste was generated; 5) for hazardous waste, the hazardous properties and, for POP waste, the persistent organic compounds it contains; 6) the identifying information of the transferee and carrier of the waste, the waste treatment site and the waste treatment method if the waste is delivered elsewhere for treatment.

Section 40	Information to be entered in the transfer document. The transfer document referred to in section 121 of the Waste Act shall contain the following information: 1) the name and contact details of the waste producer or other waste holder, the waste carrier and the transferee of the waste; 2) the time of movement of the waste and the origin and destination of the movement; 3) the list-of-waste entry and a description of the waste type; 4) the quantity of the waste; 5) the character of the waste; 6) the activity from which the waste was generated; 7) where possible, the registration number of the vehicle; 8) the waste treatment method at the delivery site; 9) confirmation by the waste holder of the accuracy of the information provided; 10) confirmation of the waste carrier of the reception of the waste for carriage; 11) when the movement of waste has ended, confirmation by the waste transferee of the acceptance of the waste, including information on the quantity of waste accepted. Besides the provisions of subsection 1, the transfer document shall contain the following information: 1) for hazardous waste, the composition, physical state and hazardous properties of the waste as well as the packaging and transport method of the waste; 2) for POP waste, the persistent organic compounds contained in the waste as well as the packaging and transport method of the waste; 3) for waste oil, the type of the waste oil.

6. Links

6.1 Legislation and criteria

Betoninormit (Concrete standards, in Finnish):
https://www.rakennustietokauppa.fi/sivu/tuote/by-65-betoninormit-2021/4746389

CE marking and harmonised product standards
https://ym.fi/en/ce-marking

Waste Act (Ministry of the Environment, in Finnish):
https://ym.fi/jatteet/jatelaki

Recovery of Certain Wastes in Earth Construction:
https://www.finlex.fi/en/laki/kaannokset/2017/en20170843

Circular economy criteria for built environment projects (in Finnish):
https://rakennakiertotaloutta.fi/julkaisu/kiertotalouskriteerit-rakennetun-ympariston-hankkeille/

Circular economy in the construction sector (Ministry of the Environment):
https://ym.fi/en/circular-economy-in-the-construction-sector

General quality requirements for construction (in Finnish):
https://www.rakennustieto.fi/palvelut/tietoa-rakentamiseen/ryl

The National Building Code of Finland:
https://ym.fi/en/the-national-building-code-of-finland

Environmental classifications (in Finnish):
https://figbc.fi/ymparistoluokitukset/

6.2 Guides

Sustainable growth from circular economy business models: a handbook for businesses

AVAILABLE IN FINNISH AT:

The handbook is a practical guide that contains information, examples and practical tools to make the shift to circular practices within a company's day-to-day operations.

The handbook is aimed at companies that want to stand out from the competition, better fulfil customer and stakeholder expectations, and deliver more value with fewer resources. This can be achieved by utilising the five business models of the circular economy. The handbook is suitable for companies of all sectors.

Circular economy in public demolition projects – Procurement guide

AVAILABLE IN FINNISH AT:

The publication describes the criteria for public procurement of demolition work. The purpose of the criteria is to create possibilities to operate according to the principles of the circular economy and the waste hierarchy.

The guide presents separate criteria for pre-demolition audits and demolition work. It also includes material-specific criteria. The majority of the criteria are minimum requirements for procurement. In addition to demolition projects, contracting entities can use the criteria for renovation projects that generate significant amounts of construction and demolition waste.

The guide has been prepared in cooperation with sector operators. It is intended to complement the Ministry of the Environment's pre-demolition audit guide (2019: 30) and demolition guide (2019: 29).

Pre-demolition Audit: a Guide for Authors

AVAILABLE IN FINNISH AT:

Utilising demolition materials is one of the key factors of circular construction. As much as 85 per cent of construction and demolition waste is generated by the renovation and demolition of entire buildings, and more attention should be paid to managing demolition processes. For example, more emphasis should be placed on the role of demolition as a project preceding new builds.

Pre-demolition audits are a new, voluntary measure for mapping out the materials and hazardous substances in buildings to be demolished. The purpose of the audit is to create good conditions for the appropriate use of demolition materials while preventing environmental and health risks and ensuring a high-quality demolition process in all demolition projects. The Finnish pre-demolition audit is based on an EU-initiated audit procedure.

This guide is part of a series of three guides aimed at improving the quality of demolition projects. The other two guides deal with the procurement of demolition work and the implementation of the demolition process as a whole.

Demolition work – a guide for operators and contractors

AVAILABLE AT:

The guide has been drafted as an instructive tool for the high-quality implementation of demolition projects. The aim is to improve and develop the planning, contracting and commissioning practices related to demolition projects, as well as the carrying out of the demolition work itself. Special attention has been paid to increasing the effectiveness of the reuse and recycling of demolition materials and to removing harmful substances from circulation.

The guide is part of a series of three guides designed to bring demolition activities to a new, higher-quality level. This guide covers the realisation of the entire demolition process.

6.3 Services

Circular Economy Finland

Circular Economy Finland is a knowledge and expertise hub that connects operators who seek solutions with those who provide them.
https://kiertotaloussuomi.fi/en/

Materiaalitori – Materials Marketplace

Materiaalitori (materials marketplace in English) is a platform that connects organisations and companies that produce waste, surplus materials or side streams to operators who want to utilise them.
http://www.materiaalitori.fi/

Rakennakiertotaloutta.fi

The Centre of Excellence for the Circular Economy brings together training, publications and research projects on the circular economy in the context of the real estate and construction sector. The Centre distributes knowledge to the sector at large and is always willing to help operators to take the next steps on their circular economy journey.
https://rakennakiertotaloutta.fi/ (in Finnish)

Database of old building materials

This database provides information on the properties, use, recovery and potential harmfulness of old building materials and components. The website is aimed at anyone renovating a building or dealing with an old house.
https://www.ymparisto.fi/fi-fi/rakentaminen/korjaustieto/Rakennusmateriaalien_tietopankki (only available in Finnish)

6.4 References

Kiertotalouden potentiaali rakentamisessa Lounais-Suomessa – final rapport (In Finnish):
https://varsinais-suomi.fi/wp-content/uploads/2021/09/Rakentamisen_kiertotalous_VALMIS_SELVITYS-1.pdf

Sustainability leap – A database of impressive solutions
https://kestavyysloikka.ymparisto.fi/en/

Rakennakiertotaloutta.fi – Completed circular economy projects(In Finnish):
https://rakennakiertotaloutta.fi/

6.5 Manufacturers products made from recovered materials

Concrete products

- https://finnsementti.fi/kolmossementti/
- https://www.jakobetoni.fi/geoprime
- https://www.rudus.fi/tuotteet/betoni/cevo-betoni
- https://www.rudus.fi/tuotteet/betoni/uuma-betoni
- https://www.elkem.com/silicon-products/refractories/microsilica/

Excavation and landscaping products

- https://www.destia.fi/en/services/aggregates-and-circular-economy/okto-construction-products/
- https://www.ssab.com/en
- https://www.rudus.fi/tuotteet/kierratys/betonimurske

Insulation materials

- https://bewi.com/
- https://ekovilla.com/en/
- https://finnfoam.fi/tuotteet/ff-eps/ (in Finnish)
- https://www.foamglas.com/en-gb
- https://foamit.fi/en/
- https://www.paroc.fi/
- https://termex.fi/en/home
- https://local.armacell.com/en/armacell-finland/

Bathroom and kitchen furniture

- https://durat.fi/en

Plastic products

- https://www.sauplast.fi/en/home/
- https://uusiomateriaalit.com/ (only available in Finnish)

Doors and windows

- https://purso.fi/en/

Timber

- https://www.upmprofi.com/fi/

Fireplaces

- https://tiileri.fi/tuote/lampokivi/ (in Finnish)
- https://tulikivi.fi/takat/kermansavi/

6.6 Networks

- https://figbc.fi/
- https://kiertotaloussuomi.fi/en/
- https://www.materiaalitkiertoon.fi/
- https://materiaalitori.fi
- https://rakennakiertotaloutta.fi

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Finnish Green Building Council. (2022). Kommentoi kiertotalouden sanakirjan luonnosta. https://figbc.fi/kommentoi-kiertotalouden-sanakirjan-luonnosta/

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