

Waste management

Construction and demolition waste: challenges and opportunities in a circular economy



Construction and demolition waste (C&DW) comprises the largest waste stream in the EU, with relatively stable amounts produced over time and high recovery rates. Although this may suggest that the construction sector is highly circular, scrutiny of waste management practices reveals that C&DW recovery is largely based on backfilling operations and low-grade recovery, such as using recycled aggregates in road sub-bases. This briefing examines how circular economy-inspired actions can help achieve waste policy objectives, namely waste prevention and increase both the quantity and the quality of recycling for C&DW while reducing hazardous materials in the waste.

Key messages

- EU countries are on track to fulfil the 70 % recovery target of 2020, with most countries already exceeding the target in 2016.
- The high recovery rates of C&DW in Europe are mostly achieved by using recovered waste for practices such as backfilling and low-grade recovery applications, reducing the potential to move towards truly circular waste management.
- Increased waste prevention and higher and better quality recycling can be achieved by overcoming uncompetitive pricing, lack of trust in the quality of secondary materials, lack of information on the composition of materials used in existing buildings and the long delay between implementing actions on new buildings and their effect on waste management several decades later.
- Circular economy-inspired actions, facilitated by measures such as standardising secondary raw materials and sharing information among stakeholders, have a high potential to contribute to increased waste prevention and to higher and better quality recycling.

Resource efficiency and waste

This briefing provides an overview of the links between circular economy and construction and demolition waste management and builds on a report compiled by the EEA and the European Topic Centre on Waste and Materials in a Green Economy (ETC/WMGE). For further details and underpinning references, read the ETC report. The EEA will continue to investigate the effects of circular economy actions on the construction sector. An additional briefing is expected to be published this spring and will explore the potential reduction of greenhouse gas emissions through circular actions in the construction sector.

To what extent is European C&DW management circular?

C&DW is the largest waste stream in the EU in terms of mass (374 million tonnes in the EU-28, in 2016, excluding excavated soil). Data on C&DW generation, although not entirely credible, show that it has been relatively stable in recent years at the European level but that large variations in per capita generation exist across countries.

Box 1. Linear versus circular economy

A circular economy represents a fundamental alternative to the linear ‘take-make-consume-dispose’ economic model that still predominates. This linear model is based on the assumption that natural resources are available, abundant, easy to source and cheap to dispose of. However, the linear model is not sustainable, as the world is moving towards (and is in some cases exceeding) planetary boundaries.

The circular economy is restorative in nature, and it aims to maintain the utility of products, components and materials for as long as possible while also retaining their value. It thus minimises the need for new inputs of virgin materials and energy, while reducing environmental pressures linked to resource extraction, emissions and waste management. This goes beyond just waste and requires natural resources to be managed efficiently and sustainably throughout their life cycles ([EEA, 2016](#)).

Driven by the recovery target of 70 % by 2020 (set by the 2008 Waste Framework Directive and defined as including all recycling and other recovery operations such as backfilling), countries report increasingly high recovery rates. Most of them exceeded the 2020 target in 2016.

Many EU countries have succeeded in establishing markets for recovered C&D materials. This may suggest that the European construction sector is highly circular, as it manages to reintroduce

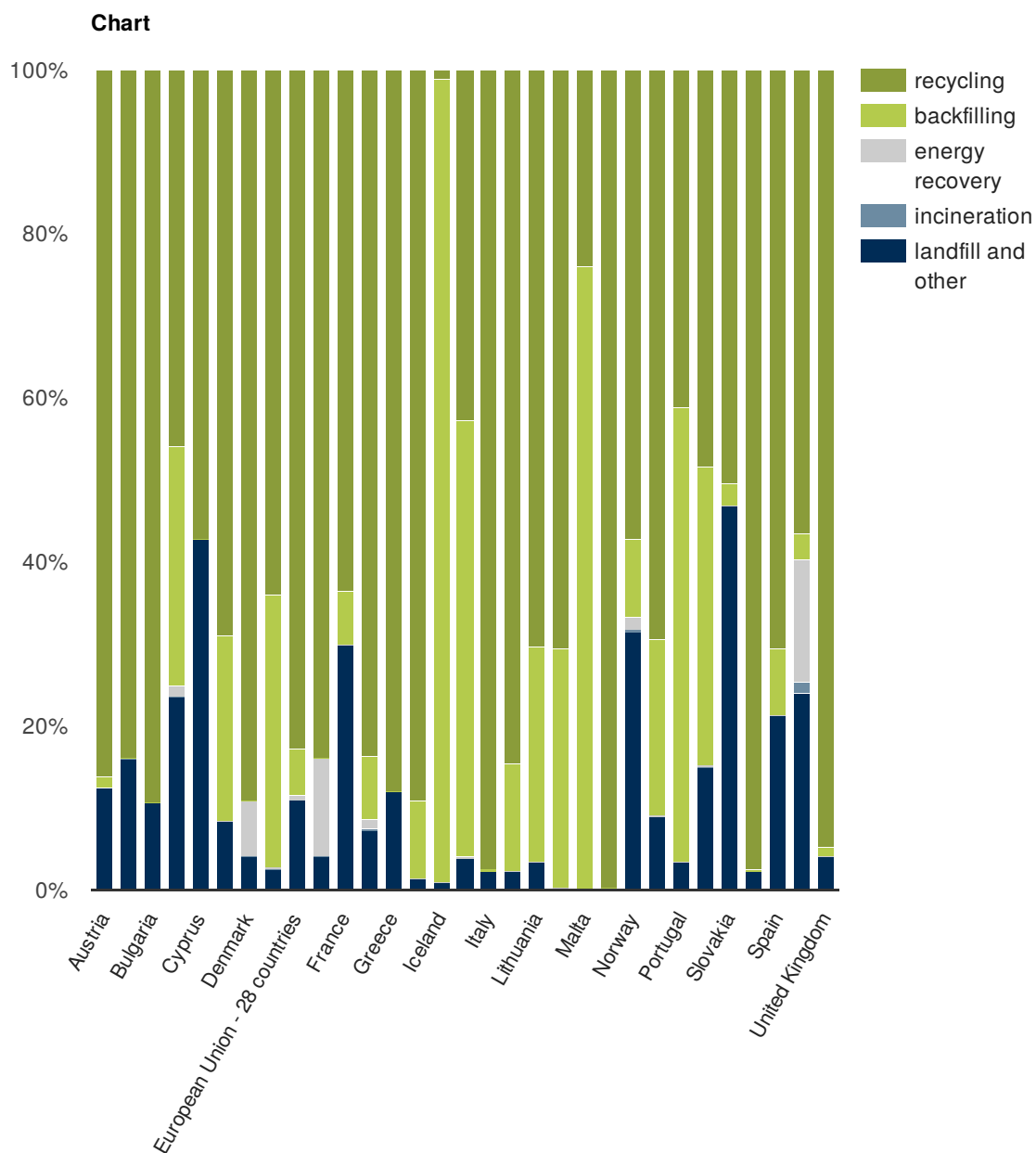
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large quantities of its waste into the economy by avoiding disposal options such as incineration and landfilling. However, as a result of building practices in the past and the lack of generation of high-purity materials during demolition, currently the material streams arising from demolition and renovation works are not suitable for reuse or closed-loop recycling. This hampers full implementation of circular economy objectives.

In fact, closer scrutiny of the data reveals that the high recovery of C&DW is based, to a large extent, on backfilling (Figure 1) or on low-grade recovery, e.g. using recycled aggregates from the mineral part of C&DW on applications such as road sub-bases. Therefore, the inherent value of the materials composing C&DW is eroded, qualitative aspects of recycling are not systematically addressed and recycling is not performed in closed loops. The latter would help preserve the value of recycled materials.

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Figure 1. Treatment of the mineral part of C&DW (% of treated waste) in European countries in 2016. Energy recovery indicates using the energy content of the waste, while incineration aims only at thermal treatment of the waste.



Note: Recycling, backfilling, energy recovery, incineration and landfilling of the mineral part of construction and demolition waste presented as percentage of total treated waste.

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There is a big potential for making C&DW management truly circular. This is consistent with the objectives of the 2015 circular economy action plan, which includes C&DW among the 'priority' waste streams.

Circular economy-inspired interventions focus not only on increasing recycling quantitatively but also on:

- keeping materials in the economy as long as possible
- maintaining their intrinsic value/quality as high as possible
- reducing hazardous substances in products and waste

This would result in greater prevention of C&DW (as materials are kept in the economy as long as possible) and in a reduction in the (less circular) recovery of low-grade material.

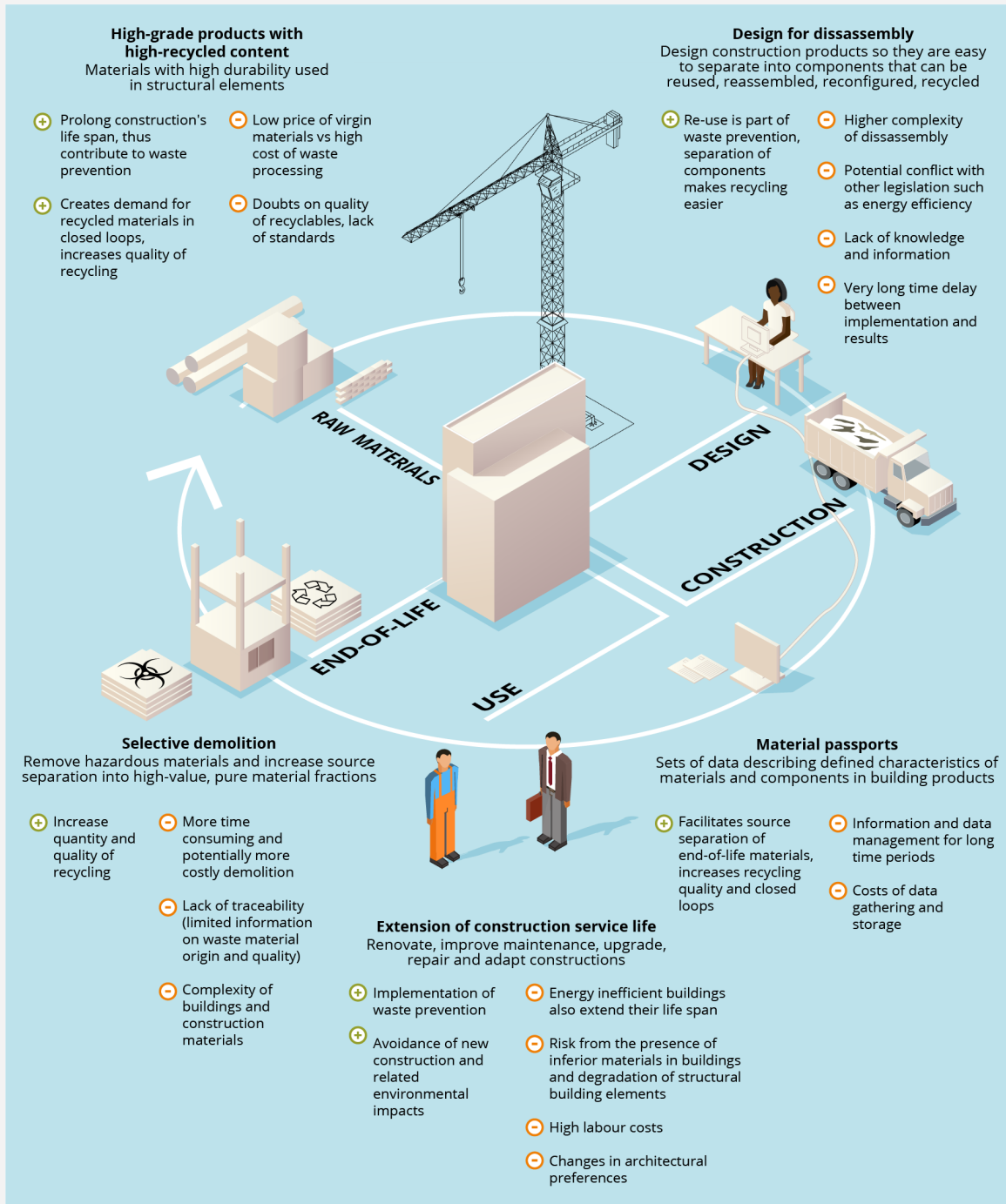
Box 2. Backfilling

Commission Decision 2011/753/EU defines backfilling as 'a recovery operation where suitable waste is used for reclamation purposes in excavated areas or for engineering purposes in landscaping and where the waste is a substitute for non-waste materials'.

In the revised Waste Framework Directive of 2018, the definition of backfilling is strengthened as 'waste used for backfilling must ... be limited to the amount strictly necessary to achieve those purposes', which might limit the amount of material that will be reported as being backfilled in the future.

Backfilling can be considered low-quality recovery, as it replaces a natural resource (soil) that is abundant without high environmental impacts from its production.

Examples of circular actions that improve the management of C&DW



Barriers to improving circularity

The analysis of the examples presented above reveals that many have common barriers, preventing their implementation. New policy actions would be more effective if these barriers were taken into account. Removing these barriers would also have a direct effect in fulfilling the waste policy objectives and in adopting circular economy thinking by the sector.

Table 1. Causes of the main barriers to the uptake of circular economy actions relevant for the management of C&DW and potential solutions

What?	Why?	Potential
Price competition with virgin alternatives	Stakeholders tend to favour cheaper and credible solutions, and virgin ^(a) minerals are in many cases cheaper than secondary materials due to the latter's processing costs	A competitive secondary materials market would create demand for both quantity and quality of waste material, thus directly increasing circularity
Confidence in quality and structural properties of secondary materials (traceability)	Stakeholders tend to choose virgin materials that are quality assured through warranties and standards	Engaging in the development of standards for secondary raw materials would increase the trust in their properties and quality
Hazardous substances content	Polluted materials are not suitable for recycling, and removal of the hazardous content is costly	Develop technology for efficient removal of hazardous substances and eliminate use of hazardous materials in new construction
Lack of sufficient and reliable data on (historical) buildings	The composition of material streams from demolition activities cannot always be predicted	Pre-demolition audits and, in the future, material passports help register the type and volume of materials in the existing building stock
Time delay	The time delay between implementing a circular action and its benefits due to the long life spans of buildings may discourage stakeholders	Not applicable

^(a) Virgin materials are raw materials that originate from nature as opposed to secondary materials originating from waste processing.

Considerations for policymakers

A range of interventions are available to policymakers to facilitate the uptake of circular economy actions that will improve C&DW management. The following are examples of generic options that can be further specified as robust policy instruments and they broadly address all the barriers identified above.

- Secondary materials need to be competitively priced, e.g. by using instruments such as green taxes. They also need to be taken up by fully functioning markets, supported by measures such as green public procurement, to create demand for them.
- Standardisation of secondary raw materials at EU, but mainly at national, level would help alleviate the lack of credibility of these materials.
- Communication among stakeholders and sharing and keeping information facilitate selective demolition, renovation and retrofitting.
- Research and development of technological solutions with a focus on developing circular construction products has the potential to increase the re-use of construction components and prevent waste by increasing construction life spans.
- More ambitious waste management policy objectives with a focus on management quality, such as the introduction of requirements for re-use of C&DW, would reorient current waste management practices to a more circular approach

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