CIRCUIT

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Supporting circular construction with digital tools

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Contents

Acknowledgments

The *Circular Construction in Regenerative Cities* report presents the key learnings, tools, methodologies and recommendations generated by the Circular Construction in Regenerative Cities (CIRCuIT) project from 2019 to 2023 across the cities of Copenhagen, Hamburg, London and Vantaa/ Helsinki region.

This report was produced by members of the 31 partner organisations that were involved throughout. It shares a body of work that was made possible thanks to the time and expertise provided by numerous individuals who helped to support the project across its lifespan. This includes local decision makers and built environment stakeholders from each of the CIRCuIT cities, as well as the European Commission's Horizon 2020 programme.

All of the resources presented in this report, along with the accompanying technical report, are available at circuit-project.eu/post/latest-circuit-reports-and-publications.

Glossary of terms

Adaptive Reuse
The process of reusing a structure or building for a purpose other than the original purpose for which it was built or designed.

Business as Usual (BAU)
Shorthand for the continuation of current conventional construction process practices as if the intervention under consideration were not to happen. Usually used as a benchmark to compare interventions.

Circularity Indicator
A piece of information that can be used to measure performance within the built environment to guide decision making and enable the industry to communicate their circular economy actions in a consistent way.

Design for Adaptability (DfA)
An approach to planning, designing, and constructing a building so it can be easily maintained, modified and used in different ways or for multiple purposes throughout its lifetime, extending its practical and economic life cycle.

Design for Disassembly (DfD)
Approach to the design of a product or constructed asset that facilitates disassembly at the end of its useful life in such a way that enables components, materials, and parts to be reused, recycled or, in some other way, diverted from the waste stream.

Downcycling
A form of recycling that repurposes materials into a substance of lower value than the original.

Life Cycle Assessment (LCA)
A methodology developed to assess the environmental impacts of a building, component or material. The assessment compiles and evaluates the inputs and outputs of the material system throughout its life cycle and assesses the relevant environmental impact.

Life Cycle Cost Analysis (LCC)
An analysis of all the costs that will be incurred during the lifetime of the product, work or service. LCC may also include the cost of externalities such as environmental degradation or greenhouse gas emissions.

Meanwhile Use
A range of strategies to make under-utilised spaces and places productive, both economically and socially, often for a shorter length of time until a long-term use for the space is determined.

Pre-demolition Audits (PDAs)
A systematic and comprehensive assessment conducted before the demolition or deconstruction of a building or structure which results in the inventory of materials and components arising from the building. The reusability and recyclability of the materials can also be assessed during this process.

Pre-redevelopment Audits (PRAs)

A systematic evaluation conducted before the redevelopment or repurposing of a property or site, typically with the aim of assessing and addressing potential environmental contamination and regulatory compliance issues. The potential to reuse or incorporate existing structures on site into the new plans can also be assessed during this process.

Recovery

The process of systematically and intentionally collecting, salvaging and reusing materials from a building or construction site to extend their life cycle and reduce waste.

Recycling

Any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes.

Return on Investment (ROI)

The quantifiable returns and advantages derived from embracing specific construction methods. This encompasses financial gains, environmental benefits and enhanced social value resulting from the project's design choices.

Reuse

The repeated use of a product or component for its intended purpose without significant modification.

Transformation

In architecture transformation is used as an umbrella term to refer to a wide range of potential changes to a building from a subtle change of appearance to a complete change of use.

Upcycling

A form of recycling that repurposes waste, products or materials into a substance of higher value than the original.

Urban Mining

The process of recovering and reusing the raw materials that are already in the environment, cities or everyday products, in the resource cycle.

Introducing the CIRCuIT project

The way we currently build our cities is wasteful and inefficient with resources extracted, manufactured into components, and constructed into buildings only to be demolished and discarded as waste well before the end of their useful life.

Estimates suggest that 11% of global emissions are linked to manufacturing construction materials such as steel, cement and glass[1]. In the EU alone, the built environment accounts for 36% of carbon emissions, 40% of material use and 50% of landfill waste[2].

Accommodating for the expected population growth within cities will mean constructing additional buildings and infrastructure equivalent to a city the size of Milan (1.5 million people) every week until 2050[3]. There is, therefore, an urgent need to transition from a linear construction model to a more sustainable and regenerative one based on circular economy principles.

In a circular model, rather than continuing the traditional take-make-consume-dispose process, building material loops are closed through reuse, sharing, leasing, repair, refurbishment, upcycling or recycling. This radical reimagining of construction considers how the lifespan and reusability of entire buildings can be maximised at the very start of the design process and thereby ensures that usable materials are not discarded as waste.

Cities hold the keys to this transition. Working collaboratively with industry, they can find new ways of confronting the climate impact of construction and develop a new urban agenda. This also gives rise to co-benefits as embedding circular principles also supports wider policy goals such as net zero targets, climate resilience and adaptation in cities.

Further, this regenerative approach has economic and social benefits as more adaptable and flexible cities are better able to serve the changing needs and interests of residents and circular solutions often also bring cost savings over a building's life cycle.

It is, therefore, crucial that cities and their stakeholders have the support, resources and tools needed to create change and drive circular construction practices locally.

Turning theory into practice

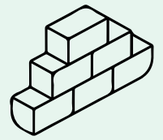
Many circular construction techniques, tools and approaches have been developed and tested around Europe, but circular practices are yet to be scaled up effectively to a city or regional level. To explore how the circular economy can be effectively embedded in cities across Europe, and bridge the gap between theory, practice and policy, CIRCuIT – Circular Construction in Regenerative Cities – was established.

CIRCuIT was a collaborative project funded by the European Commission's Horizon 2020 programme. The project involved 31 partners across the entire built environment supply chain in Copenhagen, Hamburg, Helsinki Region and London.

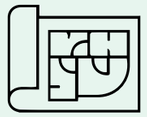
1 Global Status Report for Buildings and Construction 2019 | IEA
2 Internal Market, Industry, Entrepreneurship and SMEs | European Commission
3 Circular economy in cities: Opportunity & benefit factsheets | Ellen Macarthur Foundation

The project's goal was to support the mainstreaming of circular construction practices in the built environment focusing on three key thematic areas:

Transformation and building life cycle extension



Urban mining and material reuse



Design for disassembly and adaptability

Over the course of the project three key results emerged:

1. It is beneficial: Circular practices can improve both the financial and environmental outcomes of construction projects. As part of the project, 36 demonstrators were developed that provide evidence of the carbon and economic implications of adapting conventional construction methods to more circular approaches. The results show that the environmental benefits are great: in all three thematic areas there can be significant carbon emissions reductions and resource savings. Cost benefits are also evident within the context of a circular approach and have been explored in the business cases within chapters 1, 2 and 3. Shifting to circular practices requires use of long-term thinking and seeing buildings as investments to be examined by legislation, integrated collaborations, and new financial models.

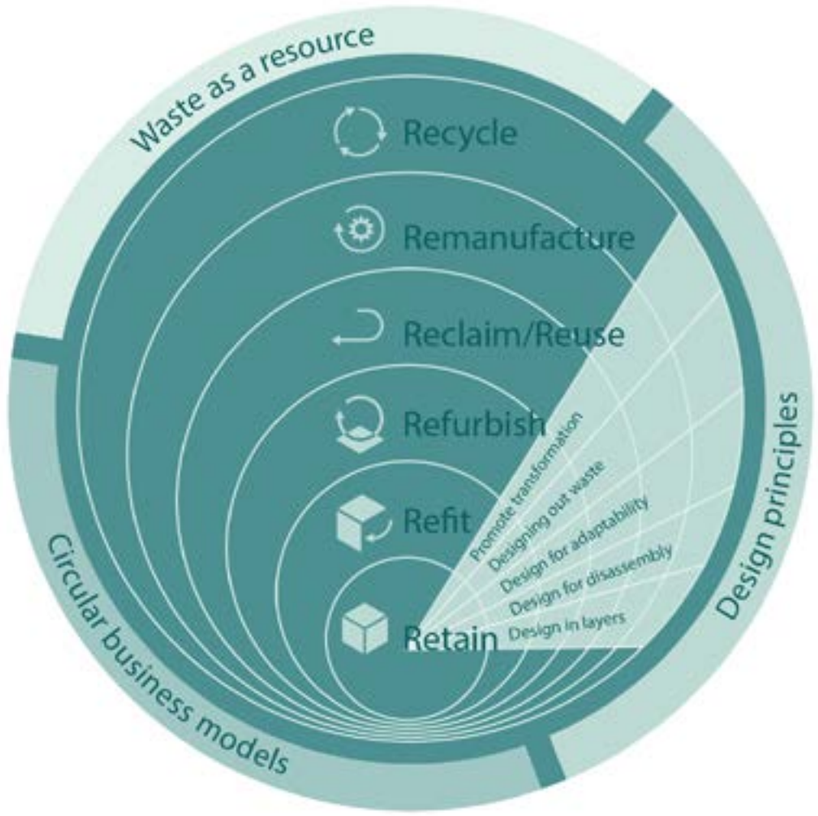
2. It can be done: Real changes are possible by defining a common agenda and applying tools that enable cities to work smarter given the same resources. CIRCuIT has developed tools that can help cities and their stakeholders embed circular economy practices, such as the transformation tool which supports the identification of buildings at risk of demolition, or the dialogue tool which ensures that conversations about circularity start early in the planning process. The CIRCuIT project also developed adaptable procurement requirements in collaboration with the construction industry (see chapter 5). Each of these tools will help to create changes within the landscape, processes, and behaviours.

3. It has scale-up potential: Circular practices are achievable at a building, neighbourhood, city or even country level. To generate the maximum impact of circular construction practices, each of the cities in the CIRCuIT project developed roadmaps that illustrated how best practices could be effectively embedded into city policy (chapters 3 and 5). The project also created working proof of concepts for digital tools such as the Material Reuse Portal that support the delivery of material exchange work and thereby enable increased uptake and the scaling of benefits (see chapter 6).

A call to action

Cities now have the opportunity to connect an ambitious circular economy transition to their sustainability goals. However, to achieve success, cities must also work with professionals from across the entire built environment value chain, from urban planners to material manufacturers, from demolition specialists to residents, and urge them to come together and transform the sector using circular economy principles.

Changing the way that the industry designs, constructs and transforms buildings and infrastructure is critical in the fight against the climate crisis. Thanks to the wide array of tools, case studies and datasets developed by the CIRCuIT project, stakeholders across the value chain are better equipped to turn ideas into reality.



Principles of circular construction

The Handbook to Building a Circular Economy, David Cheshire, AECOM, 2021

Chapter 1: Extending the lives of buildings through transformation and refurbishment

Transformation and refurbishment of existing buildings is the first principle of circular construction. Applying a transformation-first approach will be key to meeting climate targets. Reducing the instances of demolition can keep resources that have already been refined in use for longer, reducing the need for new materials.

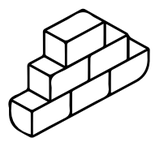
Key findings:

- Methodologies to identify buildings at risk of demolition
- Policy drivers to encourage decision makers and built environment professionals to extend the lives of existing buildings
- 12 demonstrator projects showcasing design transformation strategies.
- 10 business cases for building transformation.

Chapter 2: Increasing the reuse and recycling of building materials

Reusing and recycling building materials is a highly effective way to reduce the resource use and carbon intensity of the built environment by closing material loops. But many challenges are preventing cities from adopting this circular construction approach including issues with cost, adoption and the demolition process.

The CIRCuIT project explored these challenges and suggested ways to embed practical solutions on how cities and the building sector both build and demolish, from policies to Pre-Demolition Audits.

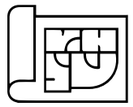


Key findings:

- Recommendations to increase the reuse and recycling of building materials
- Recommendations for embedding pre-demolition audits (PDA) in city policy
- Methodology for developing an optimised PDA
- 12 demonstrators illustrating material reuse and recycling techniques
- 9 business cases for driving the reuse and recycling of building materials.

Chapter 3: Futureproofing cities: designing for disassembly and adaptability

Design for disassembly (DfD) and design for adaptability (DfA) are two construction approaches that can help cities meet their future housing and infrastructure needs while ensuring circular economy principles are adopted. Currently, the technical solutions needed to adopt these approaches exist but take up throughout the construction industry is low. The CIRCuIT project explored what DfD and DfA looks like in practice, how these approaches can be embedded in cities, and how the environmental and economic benefits of DfD and DfA can be calculated to help increase adoption.



Key findings:

- Methodology for assessing the return on investment (ROI) for DfD and DfA across three areas: monetary cost, carbon use and material use
- Methodology to assess whether a DfD or DfA concept is likely to be scaled up across a city
- Roadmaps for DfD and DfA for Copenhagen, Hamburg, London and Vantaa
- 12 DfD and DfA demonstrator projects
- 7 business cases for DfD and DfA approaches.

Chapter 4: Data and indicators for a circular built environment

A consistent and comprehensive approach to data collection, analysis and management is fundamental for a city to accelerate circularity in its built environment. As part of the CIRCuIT project, partners explored the data available in cities, how data capture can be improved and which indicators are key to supporting circularity.

Key findings:

- Two methodologies and template for carrying out a circularity data mapping exercise and assessment of accessible data in a city
- Set of data templates to improve the capture and sharing of data relating to components, spaces, buildings and areas
- Recommendations to help a city address gaps or weaknesses in their data
- Set of 37 indicators that focus on circularity at a city, building and materials level.

Chapter 5: Using policy to power circular construction

Two significant areas where cities can support a transition towards circular construction is through their planning and procurement policies. To help decision makers take effective action in these areas, the CIRCuIT project developed practical guidance on policy interventions, working with developers, criteria for public tenders and city-level circular economy strategies.

Key findings:

- Policy interventions to embed circular approaches in cities
- Checklist to support circular construction dialogue with developers on city projects
- Recommended circular economy criteria for public sector tenders
- Circularity policy roadmaps for Copenhagen, Hamburg, London and Vantaa

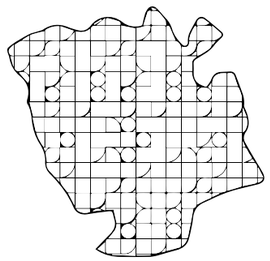
Chapter 6: Supporting circular construction with online tools

If cities are to increasingly transition to circular construction, it's critical that decision makers and built environment professionals have access to tools that can help them turn circular construction theory into practice. As a result, CIRCuIT's project partners developed five online tools to improve professional knowledge, increase acceptance of this way of building and ultimately, accelerate adoption of circular construction.

Key findings:

- Material Reuse Portal
- Circularity Dashboard
- Circularity Atlas
- Citizen Engagement Portal
- Circular Economy Wiki.

Overview of the four CIRCuIT cities

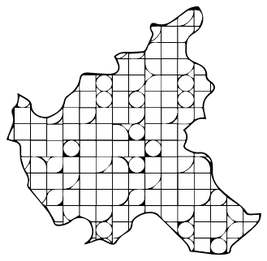


Copenhagen

Copenhagen is internationally renowned for its innovative approach to the climate and the environment. It has a reputation as the world's best city for cyclists. It is a living showcase for Danish architecture. But, most important of all, Copenhagen is a good place to live.

None of this came about by chance. It is the result of years of planning and development based on the needs of Copenhageners – everybody who lives in, uses, visits, works with or runs a business in the city. It is based on the life between the buildings.

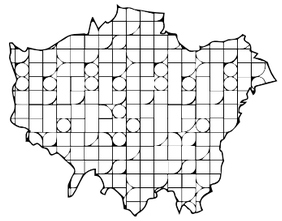
Copenhagen sets ambitious climate goals, aiming to be the world's first carbon neutral capital. It will achieve this through a city-wide transition toward sustainable energy supply, building retrofits, circular waste management, sustainable public infrastructure and mobility, as well as other key initiatives to support the transition.



Hamburg

The Free and Hanseatic City of Hamburg is one of the 16 states of the German federation and the second largest city in Germany. As a member of Eurocities and the City Science Initiative, Hamburg supports European cities and regions, facilitating knowledge sharing across networks, forums and workshops.

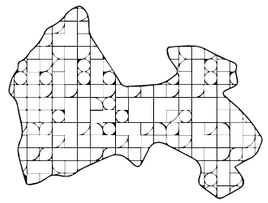
It is currently delivering several EU-funded Interreg and Horizon 2020 projects on urban development, circular economy and smart city elements, harnessing the power of innovation to progress towards its circular goal. In addition, in recent years Hamburg has set up ambitious climate transition targets in line with its industrial composition and socio-economic prospects, and it has introduced sectorial targets, including carbon reduction targets for each sector.



London

London is the engine of the UK economy, accounting for more than a fifth of the country's economic output. Over many centuries London has evolved, resulting in an extraordinary web of distinctive residential streets, squares, markets, parks, offices and industrial and creative spaces.

London aspires to be a zero carbon, zero waste city, and to transition to a low carbon circular economy. This is part of a wider strategy promoting 'Good Growth', which is about working to rebalance development in London towards more genuinely affordable homes, to deliver a more socially integrated and sustainable city.



Vantaa/Helsinki Region

One of three cities in Helsinki metropolitan area, the city of Vantaa is the fourth biggest city in Finland. It has a total area of 240.35 km^2 and a population of 223,000, rising by 2,400 citizens every year. The population is expected to reach over 300,000 by 2050.

Vantaa has a new comprehensive environmental programme called the Roadmap to Resource Wisdom 2030. It focuses on the circular economy and Vantaa's ambition to be carbon neutral by 2030. The circular economy goals consist of reusing materials (including during a demolition), establishing circular economy as part of planning and execution and improving the model for circular economy areas.

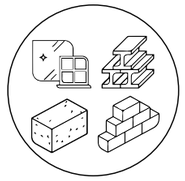
Establishing digital tools to support circular construction

To support the transition to circular construction, decision makers and built environment stakeholders need to have access to tools that can help turn theory into practice. This includes tools that provide real time data on material availability, illustrate city level planning impacts, or detail project case studies. High quality and user-friendly digital tools can support professional knowledge and expedite acceptance and adoption of circular construction.

To help meet this need, CIRCuIT's project partners developed five online tools, hosted on their Circularity Hub, to support the mainstreaming and adoption of circular construction practices. These tools are the Material Reuse Portal, Circularity Dashboard, Circularity Atlas, Citizen Engagement Portal and Circular Economy Wiki.

The five tools enable stakeholders across the value chain to extract knowledge and insights at the city-level. These insights support dialogues, collaboration and market mechanisms across the supply chain in the city. Tools can also be a novel way for cities to increase engagement on circular construction issues with a wider audience, introducing the benefits of circular construction to city residents.

Overview of the tools on the Circularity Hub



Material Reuse Portal

The Material Reuse Portal brings together listings of surplus construction materials from a range of online material marketplaces onto one platform – making them simpler to source.

Circularity Dashboard

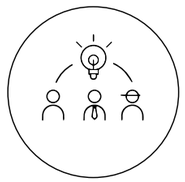
Using circularity indicators, the Dashboard introduces a framework to capture a city's, region's or country's circular economy capability and performance so professionals can compare and contrast.

Circularity Atlas

The Atlas is an interactive map that allows policy makers and urban planners to easily view and analyse circular economy data and other relevant data for a whole city.

Citizen Engagement Portal

This website and augmented reality app showcases circular construction in existing buildings and makes circular construction approaches more accessible to the public. This can support dialogues in the city around the benefits of adopting circular economy principles.



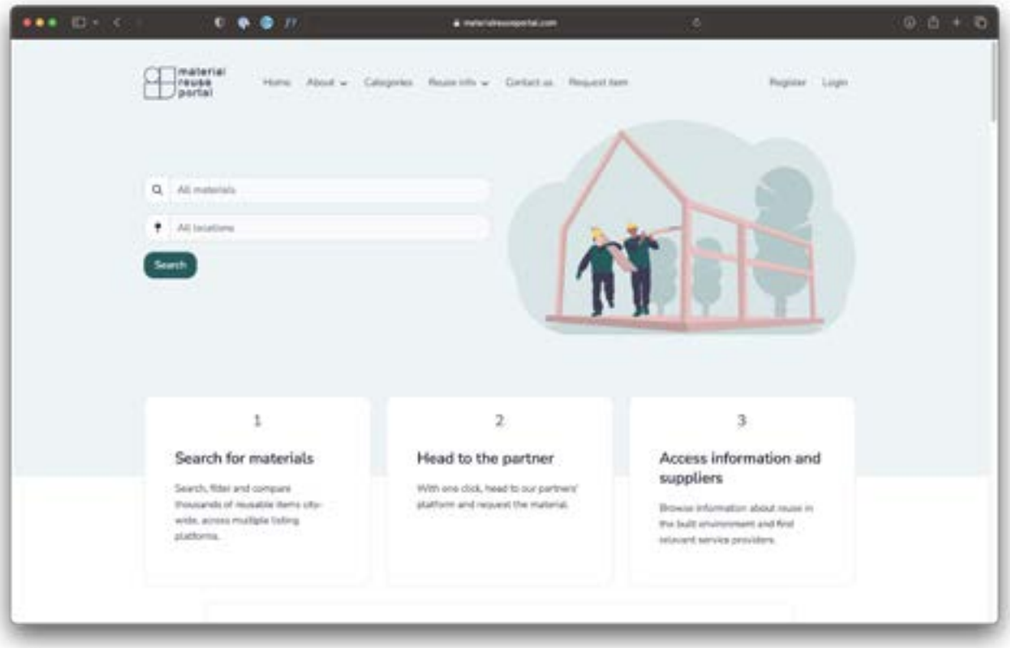
Circular Economy Wiki

This website for built environment stakeholders features articles, guidance and definitions for circular construction, with the aim of building a common understanding and spreading awareness of circular economy practices in the construction industry.

A close look at the digital tools

Material Reuse Portal

materialreuseportal.com



The current construction process is wasteful. Construction projects usually require large amounts of new materials that are downcycled or landfilled long before the end of their technical life span when the building is retrofitted or demolished. Removing materials from buildings in such a way that they can be reused is possible and there is growing interest in applying reused construction materials to new buildings. However, due to the long timelines of construction projects to reuse materials effectively and at scale there must be a way to see the future demand for reused construction materials alongside the future supply of reusable construction materials.

In most cities, material marketplaces do exist . These marketplaces show the materials that are currently readily available for use, and they do not usually operate at the scale necessary to mainstream secondary material use. Cities can help tackle this problem by establishing a platform that makes it easier for built environment stakeholders to view, buy and sell reusable or recycled building materials from across many different platforms, aggregating data from across the region.

About the tool

The Material Reuse Portal (MRP) is an online tool that features listings of surplus or reusable construction materials from multiple marketplaces to create a single place where reusable materials can be found. It's free to use and brings together useful information from different sources in one site.

The prototype was designed and built for London and select surrounding regions. But it can be easily adjusted to incorporate data from material exchange platforms in any city.

The MRP collects data about the types of items that are being searched for and listed on exchange platforms. It also provides useful advice and information on the circular economy and the reuse of construction materials.

How the tool supports circular construction

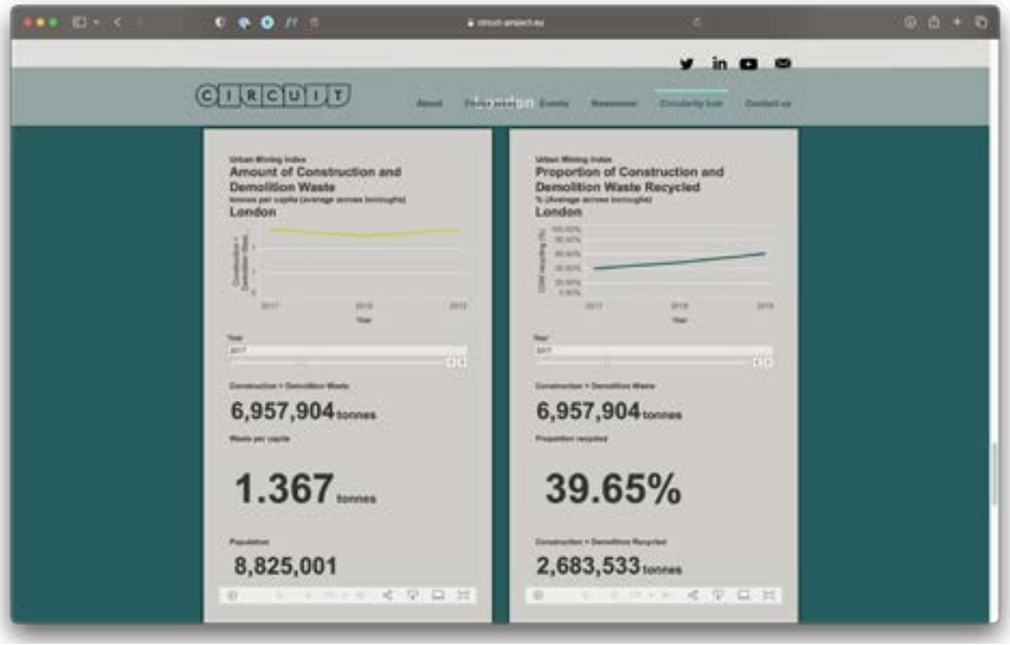
- Provides users of the MRP with comprehensive information about the reusable materials currently available in their city.
- Gives users who wish to sell or donate reusable materials the opportunity to reach a wider audience.
- Increases awareness and use of existing construction material marketplaces available in a city.
- Increases understanding of the availability and demand for reusable materials by collecting data on the types of items being searched for and listed on material exchange platforms.

Lessons learned during development

- The platform aggregation model, where multiple platforms are combined, is of great interest to the built environment industry.
- There is interest in further integrating real-time demand signals to the platform to build the material supply pipeline into the future to reduce the time spent searching for a buyer or storage.
- Not all material portals are easy to connect to an aggregator model because of technical reasons. Some smaller platforms also have few staff members. Additional support is needed to ensure all types of platforms can be linked up with an aggregator reuse portal such as the Material Reuse Portal.

Circularity Dashboard

circuit-project.eu/circularity-dashboard



Currently, there is no standardised tool for visualising data that allows cities to easily showcase how they are performing in key areas relating to circularity within the built environment.

As a result, decision makers and built environment stakeholders such as urban planners lack accessible information that could help them make decisions and set targets that would accelerate circular activities.

In addition, a lack of accessible, visual data may be hampering circular construction because the supply chain and the public are unable to easily understand the environmental and economic benefits this approach delivers.

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About the tool

The Circularity Dashboard is an online tool that visualises city-level indicators. A circularity indicator is a piece of information that can be used to measure performance within the built environment to guide decision making and enable the industry to communicate their circular economy actions in a consistent way. The indicators developed for this tool relate specifically to the circular economy within the built environment.

After carrying out comprehensive research on existing indicators and the needs of the stakeholders that will use them, five indicators were selected to feature on the Circularity Dashboard:

- The amount of construction and demolition waste being generated within a city
- The recycling rate of construction and demolition waste
- The amount of refurbishment and transformation taking place relative to new construction
- The overall demolition rate
- The average age of demolished buildings

Another consideration that was central to selecting these indicators was the availability of data in a city, as this often determined whether it would be feasible to create an indicator.

This issue highlights the strong need to improve and standardise the collection and classification of data relating to circularity within the built environment. You can read more about this issue and potential solutions in the report titled Data and indicators for a circular built environment.

How the tool supports circular construction

- Provides urban planners and policymakers with a quick overview of circular construction indicators in a city.
- Offers a standardised method for benchmarking the circular economy performance of a city.
- Helps urban planners and policy makers to highlight the benefits of circular construction.
- Helps a city to set targets to reduce construction and demolition waste and increase the refurbishment or transformation of buildings.
- Circularity indicators that feature on the Circularity Dashboard could be integrated into governance and development processes, helping to increase transparency and accountability.

Lessons learned during development

- It can be difficult to illustrate the same indicator across different cities because of differences in data collection.
- Dashboards need to be located in a place where decision makers already go to collect data to help ensure they see and use the overview provided.
- Use circularity indicators in the monitoring of policies so city officials understand their application. This will also ensure dashboards remain helpful, active tools.

Circularity Atlas

circuit-project.eu/circularity-atlas

To combat the climate crisis, it is vital to include environmental factors in urban planning and decision making. Analysing and synthesising information like waste and demolition data can be an effective way to achieve this, as it can help built environment professionals understand a wider context and inform where actions will have the greatest impact.

About the tool

The Circularity Atlas is an interactive map of a city that combines circular economy data with satellite imagery provided by Copernicus, the Earth observation component of the EU's space programme.

The Atlas allows users to click on buildings and locations on the map to instantly access circular economy information. For example, a Circularity Atlas was created for Copenhagen that provides information on demolition taking place across the city at a building-by-building level.

The Circularity Atlas may also combine geographical data, such as land use or land surface temperature, with other information such as social or health data. This can help professionals find potential connections between datasets that may help with evaluating materials' usefulness or potential.

The Circularity Atlas is intended to supplement the data and information visualised on the Circularity Dashboard (see page 6-6).

How the tool supports circular construction

- A Circularity Atlas allows stakeholders such as policy makers and urban planners to easily view and analyse circular economy data and other relevant data for a whole city.
- With increased uptake of Circularity Atlases, it will be possible to easily compare circularity data across different cities.

Lessons learned during development

- Similar to the C ircularity Dashboard, it can be difficult to illustrate the same data across different cities because of differences in data collection.
- Circularity Atlas maps need to be located in a place where decision makers already go to collect data to help ensure they see and use the overview provided.
- How useful a Circularity Atlas is to a user is directly linked to the quality of the data that's inputted into it. To collect better data inputs, communicate the value of spatially displaying data.

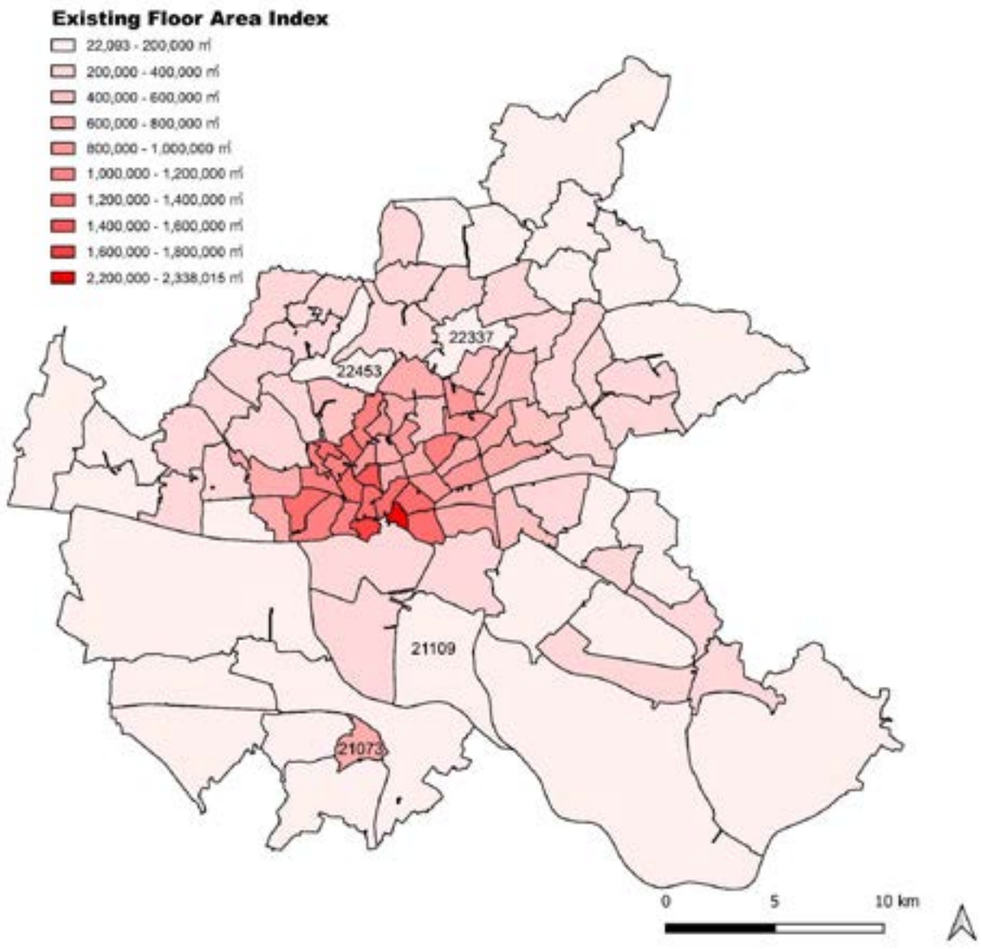
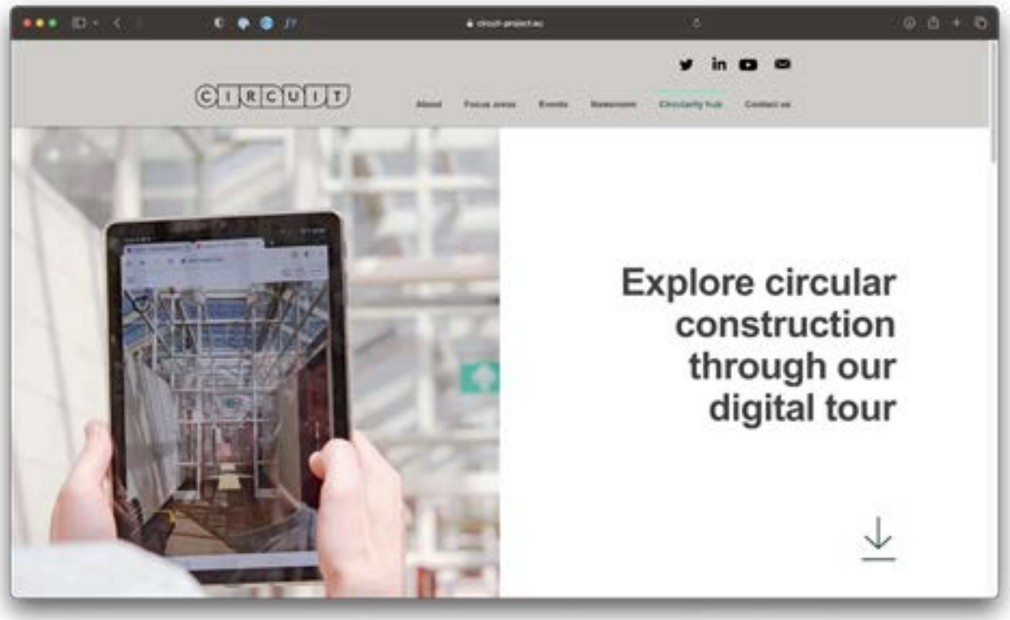


Figure 6.1: 2020 floor area index per postcode in Hamburg

Citizen Engagement Portal

circuit-project.eu/citizen-engagement-portal



Residents typically have limited access to easy-to-understand examples of what circular construction looks like in practice, which can prevent understanding and buy-in.

As a result, it's important that best practices which showcase local circular construction projects are collected and shared to increase residents' knowledge of circular construction.

Subsequently, this could lead to people becoming more involved with decisions about their local built environment and starting to champion circular construction by sharing their knowledge and best practice examples.

It's important that best practices which showcase local circular construction projects are collected and shared to increase residents' knowledge of circular construction.

About the tool

Augmented reality (AR) is an interactive experience that combines the real-world and computer-generated content. Virtual reality (VR) is solely a computer-generated 3D environment with scenes and objects that appear to be real.

CIRCuIT partners identified that 3D technologies such as AR and VR offer cities a novel way to engage people, introduce circular construction best practices and increase their knowledge of this approach.

After considering the needs of potential users and available 3D technologies, a Citizen Engagement Portal was developed featuring two key elements:

- A website portal that takes users on an online tour of buildings that have used circular construction approaches.
- An augmented reality app that enables interactive experiences for users within buildings that have used circular construction approaches. This involves embedding QR codes at particular locations within a building and encouraging people to scan them on their phone or other mobile device.

Taking this action connects a user with building-specific circular construction information that' s displayed over their real-world environment. This allows the user to see and interact with this information on their phone or mobile device.

For the CIRCuIT project, online tours and augmented reality experiences were created for the following buildings:

Konstabelskolen, Copenhagen
Konstabelskolen is a former school building that has been transformed into youth housing. It showcases how a clear design strategy can preserve the cultural importance and materials of a listed building while transforming it for different uses and modern specifications.

CRCLR House, Berlin
The CRCLR House is a former brewery that has been turned into a co-working and living space. The ambition for CRCLR House was to create a zero-waste building through the reuse and refurbishment of existing building materials.

Sortti Mini Station, Vantaa
The Helsinki Region Environmental Services authority (HSY) built a new information centre (Sortti Mini Station) in Koivukylä, Vantaa. The new centre showcases two aspects of circular construction: how to reuse existing building materials and how to design a building that is fully transferable and can easily be moved to another location in the future.

Hackney Depot, London
Hackney Depot is former derelict building that was transformed into a light industrial space for London's creative community. It's a stunning example of how a building can be refurbished in a way that meets the needs of a local population and preserves the rich history of the original building.

How the tool supports circular construction

- Showcases circular construction best practice in existing or soon to be constructed buildings.
- Creates a unique circular construction learning experience for users.
- Helps to make circular construction approaches more accessible to a wide range of people.
- Helps to increase demand for reusable materials by allaying concerns about the aesthetics of these materials.
- Helps to bring to life projects that have transformed existing buildings by providing before and after 3D visualisations.

Lessons learned during development

- Augmented (AR) and virtual reality (VR) apps are great ways to engage with the general public about circular construction. They draw interest and curiosity about a topic some people may not have previously known about or been interested in.
- While AR and VR are exciting ways to bring circular construction to life, CIRCuIT partners found they worked best as a supplement to an in-person event, for example they could serve as a visual aid to an engaging talk. Partners also felt people were unlikely to try out AR or VR systems as a standalone experience .
- There is great potential for AR and VR use in the professional sphere to illustrate circular concepts of upcoming building works.

Circular Economy Wiki

designingbuildings.co.uk/Circular_economy_wiki

Built environment stakeholders, such as architects and urban planners, are becoming increasingly interested in circular construction and the environmental and economic benefits it can deliver.

However, professionals need a common understanding of circular economy concepts to be able collaborate effectively and adapt at pace across the value chain.

As a result, cities need to provide their local built environment stakeholders with easy access to reliable information about all areas of circular construction and case studies that can help to bring this approach to life.

Cities need to provide their local built environment stakeholders with easy access to reliable information about all areas of circular construction and case studies that can help to bring this approach to life.

About the tool

The Circular Economy Wiki is a website that aims to inform and inspire stakeholders from the whole construction value chain.

The platform features guidance on implementing circular economy in construction, outlines definitions and lists of materials and products, and shares case studies that feature exciting examples of circular construction in practice.

Information on the site primarily focuses on:

- data collection, analysis and sharing of built environment materials
- reuse and recycling of building materials
- transformation and refurbishment of buildings
- design for disassembly and adaptability construction
- circular construction in urban planning policy

The Circular Economy Wiki also provides the opportunity for users to create their own articles so they can share their circular construction experiences and best practice.

How the tool supports circular construction

- Centralised platform where built environment stakeholders can easily find information about circular construction.
- Excellent opportunity for parties involved in circular construction to share their knowledge and experiences with other stakeholders.
- Search capability of the site allows users to quickly find the circular construction information they're interested in.
- Promotes circular construction best practice and what not to do when starting a circular construction project.

Lessons learnt during development

- A Circular Economy Wiki is a great way to introduce the basics of circular construction to people who have little or no knowledge about the practice.
- Regional wikis with specific entries about local policies and practices are necessary to transition built environment professionals from beginners to competent practitioners in circular construction. A general wiki approach will not capture the nuances necessary for achieving this transition in all cities.

Further reading

For further information about these outputs and the work behind them, please read the following reports, which were published by members of CIRCuIT partner organisations during the lifetime of the project.

- D8.1 Report on the set up of Circularity Hub
- D8.3 Report on using 3D for citizen engagement
- D8.4 Report on the establishment of the Circularity Dashboard
- D8.5 Materials Exchange Portal
- D8.6 Public report on business model for the Circularity Hub

> **All these reports can be downloaded at circuit-project.eu/post/latest-circuit-reports-and-publications**

Please note that the Circularity Hub referenced in the title of some of these reports is the platform on which all the tools were housed when the CIRCuIT project was live.

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