Module 1 Speaker Notes: Building Circular Cities - An introduction to the circular economy in the built environment

Please refer to the [how-to guide](https://www.circuit-project.eu/academy) which explains how to use these speakers notes.

Total estimated time: 115mins

Contents

1. Arrival
2. Introductions and CIRCuIT background
3. Introducing Module 1 – Learning Objectives
4. Activity: What is the circular economy?
5. Why apply circular economy principles to the built environment? Why now?
6. What do circular design principles in the built environment look like?
7. What are some benefits of applying circular economy principles to the built environment?
8. Break
9. Activity: Negativity Dump
10. Reviewing Key Barriers
11. Key City Actions: what we can do
12. Backcasting Activity
13. Wrap up
14. Sources
15. Further Resources

# Arrival

# Time: 10 Total time: 0 (not part of full time)

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| Facilitation / Alterations | Script  |
| If in person, get everyone settled into the room. If possible, provide the group with refreshments etc. Review any housekeeping required of the space – fire exits etc. If online, wait a few minutes for everyone to arrive. Run through how you will use the technology, when/how to use the chat box, explain how they should get your attention if they would like to speak or ask a question.  |  |

# Introductions and CIRCuIT Background

**Time:** 10 **Total time**: 10

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| Facilitation / Alterations | Script  |
| Introduce yourself, tell the group how you have worked with circular building issues in the past / why you are the one delivering training. Provide a brief background to the CIRCuIT project (see script) for those who may not be familiar. Invite everyone in the room to briefly introduce themselves. Ask them to share how they have previously worked with circular construction. This is a good way to get to know everyone, but also allows you as the facilitator to get an insight into who has experience with which areas of learning.Thank everyone for attending. | [CIRCuIT](https://www.circuit-project.eu/) is a four-year Horizon 2020 project. This means it is funded by the EU’s Research and Innovation arm. The main purpose of the project is to mainstream circular construction in European cities. The project has run across four cities: Copenhagen, Hamburg, Helsinki, and London, with over 31 partners. With this many people taking part, you can imagine the range of work that has been completed. We work across three themes: urban mining and material reuse, transformation and life cycle extension, and design for disassembly and adaptability. The consortium has developed pilots and assessed best practice across these themes. The findings and results of these are what we want to share with you via training.  |

# Introducing Module 1 – Learning Objectives

**Time:** 5 **Total time**: 15

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| Facilitation / Alterations | Script  |
| Introduce the purpose of the session. Connect the learning objectives of the module with the job descriptions and previous experiences learners shared in their introductions. Highlight how some of the learnings might be particularly relevant for some attendees. The full set of CIRCuIT training sessions can be given as stand-alone sessions or as a series to the same group of learners. Contextualise the module for this group of learners accordingly. Highlight any city policies or initiatives that are related to the learning outcomes of the module. Emphasise how these learning outcomes may be able to help further work on these areas. | Today we will be reviewing the concept of the circular economy and its relevance to how we do things in the built environment. You may or may not be familiar with the circular economy as a concept, we will be reviewing it in detail today.By the end of this module, you will be able to:* Understand the key principles of the circular economy: what it is and how it is different from business as usual
* Learn why the concept was developed and why the built environment in particular needs to be more circular
* Understand how circular economy principles translate to circular design principles for building projects
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# What is the circular economy?

**Time:** 10 **Total time**: 25

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| In this section we will be reviewing the definition of the circular economy and breaking down how it differs from the ‘normal’ economy. Please spend as long as necessary on the provided diagrams to ensure the group understands the concept. If your group of learners already have a deep understanding of this feel free to reduce the length of this section or to recap the concept by posing a series of questions to the group:* Can anyone share a definition of circular economy?
* Can someone name the stages of the waste hierarchy?
* Within the circular economy – how do we treat biological and technical materials differently?
 | To understand how and why the concept of the circular economy developed, we must understand our current economy and its implications. Our current consumption patterns mean we consume the equivalent of [1.75 planet’s worth](https://www.theworldcounts.com/challenges/planet-earth/state-of-the-planet/overuse-of-resources-on-earth) of resources every year, a figure that has only been steadily increasing. This level of consumption drives ecosystem loss, biodiversity loss, and greenhouse gas emissions. This consumption is both excessive and inefficient. The way we currently consume resources can be called the linear economy or the [‘Take – Make – Dispose’ Model.](https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview) New material inputs are harvested and processed into products that are used for a fraction of their actual useful lives before they are disposed in such a way that further degrades natural resources. The circular economy seeks to address excessive consumption and inefficiencies of this system.

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| How would you define the Circular Economy?What do you think a fully functional circular economy would look like in your city, in your department?Take a few minutes to answer these questions for yourself then we will share them with the group |

The Ellen MacArthur foundation defines the circular economy as: “A circular economy decouples economic activity from the consumption of finite resources. It eliminates waste and pollution, circulates products and materials (at their highest value) and regenerates nature. It is underpinned by a transition to renewable energy and materials.”A resource is introduced only when truly needed, is used for as long as possible at its highest possible value, and recovered or regenerated at the end of its life. Practically, this means material value is considered at all stages across all sectors. This is counter to the framing the circular economy has been given in some cases, while it is related it is not just a way to manage waste. Let us unpack the concept of using a material ‘at the highest possible value’ for as long as possible. This means we follow the waste hierarchy when faced with any material decisions from most to least preferable:* Prevention – avoiding the need for a new material in the first place through smart design and strategy
* Reuse/Repair – using an item for its original purpose as long as possible, treating it with care and regular maintenance or reusing it at a different location
* Remanufacture – Recovering, disassembling, and reassembling the material in a new product similar to the original
* Recycling – downgrading, breaking the material apart and reprocessing into a new product at a lower value than the original
* Recovery – Recovery of energy from the materials using them as fuel
* Disposal – Occasional disposal of residual waste

A great way to illustrate the flow of materials in a circular economy is [the butterfly diagram.](https://ellenmacarthurfoundation.org/circular-economy-diagram) It illustrates the continuous flow of materials in a circular economy. There are two cycles – the technical cycle and the biological cycle. In the technical cycle, products and materials are kept in circulation through processes such as reuse, repair, remanufacture and recycling. The biological cycle describes the processes that return nutrients to the soil and help regenerate nature.At a macro level if the circular economy is applied to the built environment we will see:* The amount of new materials required for construction decrease
* The use of reused and recycled materials increase
* The life span of the average building increase
* The waste from construction and demolition projects decrease
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# Why apply circular economy principles to the built environment? Why now?

**Time:** 5 **Total time**: 30

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| Facilitation / Alterations | Script  |
| In this section we will review the environmental impact of the built environment and understand why applying circular economy principles may be beneficial. If you have relevant statistics about the share of waste in your city/nation that is due to construction and demolition waste, please do include this in the impact section here. | The built environment generates nearly [50% of annual global CO2 emissions.](https://architecture2030.org/why-the-building-sector/) Of those total emissions, building operations are responsible for 27% annually, while building materials and construction are responsible for an additional 20% annually. This measure of GHG emissions related to the production of building materials and construction is called embodied carbon.The [Carbon Leadership Forum](https://carbonleadershipforum.org/embodied-carbon-101/) defines embodied carbon as ‘the greenhouse gas emissions arising from the manufacturing, transportation, installation, maintenance, and disposal of building materials.’In order to quantify greenhouse gas emissions and their potential effects on climate change, scientists use a method called life cycle assessment (LCA) to track the emissions produced over the full life cycle of a product or process. These emissions are converted into metrics that reflect their potential effects on the environment. One of these metrics is global warming potential (GWP), which is quantified in kilograms of CO2 equivalent (kg CO2e). This quantity is also commonly referred to as a carbon footprint.Embodied carbon measures and circularity measures are not the same, but the two are closely related. One of the main ways to reduce the embodied carbon emissions from materials is to apply circular economy principles. Common construction materials, such as concrete and steel, are high in carbon. The production of cement, a key ingredient in concrete, is alone responsible for [8% of all global CO2 emissions.](https://www.chathamhouse.org/2018/06/making-concrete-change-innovation-low-carbon-cement-and-concrete) It also consumes vast amounts of water, as well as sand and gravel, the mining of which destroys ecosystems. If the cement industry were a country, it would be the world’s third-largest emitter. Buildings and infrastructure are often designed with more materials than they need; many steel-framed buildings in the United Kingdom, for instance, use [twice as much](https://royalsocietypublishing.org/doi/full/10.1098/rspa.2014.0170) steel than is structurally necessary. Emissions from the production of new materials in buildings are upfront emissions – that means they happen before a building is even in use at the very beginning of a building’s life cycle. You can see the embodied emissions and the operational emissions for one building represented in the [graph](https://carbonleadershipforum.org/embodied-carbon-101/) on the slide. The buildings and infrastructure we are designing and constructing right now are locking in emissions due to their material and design choices for years to come. Tackling these emissions will be key to avoiding the most catastrophic outcomes of the climate crisis. Circular economy strategies can help tackle these emissions by reducing the use of new materials and reusing existing materials.  |

# What do circular design principles in the built environment look like?

**Time:** 15 **Total time**: 45

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| Facilitation / Alterations | Script  |
| In this section we will review how circular design thinking translates to work in the built environment space. If your city has developed and uses a slightly different circular design framework you may substitute or add it here for comparison.Many different circular design frameworks exist that share the same concepts with slightly different emphasis.  | Now that we have reviewed the principles of the circular economy in general, we can think about how we might apply these to the built environment.In current Business as usual (BAU) * Our extraction of natural resources depletes reserves, damages ecosystems, and produces enormous amounts of GHG emissions from processing and transportation.
* The waste outputs from the system are overwhelming landfill, damage the environment when disposed.

We can apply the following CE strategies to each of the three stages – inputs, buildings stock and waste outputs.Building stock:* Existing building stock should be kept in use for as long as possible, use intensified if possible

Natural resource inputs:* Use new resources sparingly and efficiently
* Use renewable resources where possible
* Avoid future waste by designing for adaptability avoiding early redundancy, deconstruction and reusability to ensure materials can be cycled

Waste outputs:* Outputs given value by designing with reused secondary market components
* Increase supply by deconstructing thoughtfully, making materials available to others

Most of [CIRCuIT’s work](https://www.circuit-project.eu/focus-areas) has centred around the following three strategies which you can see reflect the key strategies listed in the previous diagrams: * Urban mining, improving material reuse
	+ Ensuring materials from deconstructed or demolished buildings remain usable, requiring the inclusion of more reused materials
* Transformation and life cycle extension
	+ Transforming existing buildings to extend their life cycle and avoid early demolition
* Designing for adaptability and design for disassembly
	+ Designing in such a way that buildings are easily adapted and deconstructed into useable components in the future when the useful life at this site has ended

These three strategies are an intentional sub section of the broader list of circular design strategies to allow for focused work during CIRCuIT. To fully understand how we can further circularity in construction we will briefly review a more complete list of strategies that align with the waste hierarchy we reviewed previously. We will be using [ARUP’s circular design framework](https://ce-toolkit.dhub.arup.com/framework). Please note, there are many ways to organise circular design strategies which may all be slightly different from each other, this does not mean one is superior to the rest. These frameworks also continue to evolve as we learn what to emphasise within circular economy. 1. **Build Nothing**
	1. Refuse unnecessary construction: This strategy aims at avoiding the intensive material use linked to the construction of a new building by, first, reassessing if a physical building is necessary for the envisioned requirements, and if so, assessing if an existing building can be used to meet them.

**What this looks like in practice:** From the client or procurement side, asking whether the need that is being sought to be fulfilled by this project could be delivered with existing assets, being open to small clever alterations to existing assets that deliver the brief without new construction. From the designer/builder side: questioning the brief, looking for the lowest intervention solution possible to meet the brief.1. **Build for long term use**
	1. Increase building utilisation: This strategy aims at the reduction of upfront resource consumption by maximizing the utilization of spaces and avoiding use-free periods in the building programme.
	2. Design for Longevity: This strategy aims at maximizing the value of the building and its components over time, optimising value retention and value recovery potential.
	3. Design for Adaptability: This strategy aims at enabling the adaptability potential during the use stage. Functional life span of buildings are short and it is important that buildings have the ability to adapt to new functions to retain their value.
	4. Design for Disassembly: This strategy aims at enabling the disassembly potential at end of service life. The useful life of some components in buildings outlast their service life as part of a system.

**What this looks like in practice:** Designing a building or space against obsolescence both from a technical perspective and from a socio-economic perspective. This means building to ensure the right elements are high quality and durable, but also that the intended use of the space is as well. For example, designing for increased utilisation and adaptability could mean building in multi-use spaces that can service various activities, and building for adaptability – e.g. a student block can be transformed into family units as demographics shift.**2.1 Case Study:** [**The Hithe**](https://www.ifdo.co/projects/the-hithe)* A low-cost demountable business incubator space in Rotherhithe
* The Hithe is an exciting example of ‘circular’ building innovation. Designed to be taken apart and refabricated on new sites, this “meanwhile space” can be used again and again – radically reducing its environmental footprint.
* The building is constructed of lower-carbon materials including lightweight steel and a timber frame made with bespoke and prefabricated components and structural insulated panels (SIP). Building onto the site’s existing foundations largely eliminated the need for new concrete, helping reduce the overall CO2e emissions associated with the building’s construction.
* It is one of nine circular economy demonstrator projects in London for [CIRCuIT](https://www.circuit-project.eu/).

**2.2 Case Study:** [**Town Hall Brummen**](https://ellenmacarthurfoundation.org/circular-examples/brummen-town-hall)* Capturing components and materials at the end of a building’s use phase requires a conscious decision at the design stage, so that the building is seen not only as an aesthetic and functional entity, but also a future material store.
* In Brummen in the Netherlands, a new town hall was needed, but there was concern that, due to shifting district boundaries, the building could become redundant in the foreseeable future. The municipality therefore decided to commission a building with a ﬁxed service life of 20 years.
* The architect, Thomas Rau, responded to the municipality’s needs by designing a Lego-like structure where 90% of the materials could be dismantled and reused after 20 years. To achieve this ambitious target, difﬁcult-to-recycle concrete was avoided, and instead the construction favoured high quality prefabricated timber elements allowing for maximisation of future reuse.

**2.3 Case Study: Rightsizer*** The RightSizer concept emerged as a support framework to enable the construction industry to design circuar, net-zero buildings using a new construction ecosystem through the standardisation of component sizes, and MMC’s.
* The RightSizer team has expanded the functionality of the system to become a universal and adaptable construction solution to support flexible multi-generational living and other uses including office, light industrial, parking and meanwhile use.
* RightSizer offers a ‘how-to’ guide to designing buildings for 2030 and beyond, heralding a low carbon built environment. The designs concept is based around design for manufacture, assembly, flexible layouts, adaptive reuse and disassembly at end of life. The system comprises a long term ‘support’ layer, the superstructure that can be disassembled and reassesmbled, allowing layout reconfiguration and optionality.
1. **Build Efficiently**
	1. Refuse unnecessary components: This strategy aims at meeting the project requirements with minimal material consumption.
	2. Increased material efficiency: At all levels, it aims for an efficient use of materials at a maximum level of performance.
	3. Reduce the use of virgin and non-renewable materials: This strategy aims at the prevention of virgin abiotic material consumption (particularly critical raw materials) and promotion of secondary products and materials.

**What this looks like in practice:** During the design stage aiming to build a building that is as light and lean as possible, embracing design strategies that reduce the need for materials, especially non-renewable ones. **3.1 Case Study:** [**Triton Square**](https://www.arup.com/projects/1-triton-square)* Triton Square was originally designed by Arup for British Land in the 1990s – with future regeneration in mind. Twenty years later, with the needs of customers having evolved over time, British Land saw the potential to increase the building’s size and transform it for today’s workstyles – opting for refurbishment to save time, money and carbon.
* Team Triton chipped away at every aspect to save carbon, cut waste and deliver the best working environment possible.
* Through this marginal gains approach, the team has refined and optimised dozens of systems, components and strategies to deliver a highly sustainable building.
* The work on Triton’s façade represents one of the largest examples of circular economy practices in the industry to date. It required the removal, refurbishment and reinstallation of over 3,000m2 of façade, comprising over 25,000 separate parts. This approach alone saved over 19,000 tons of carbon and represented a 66% cost saving when compared to a new façade.

**3.2 Case Study:** [**The Velodrome**](https://www.hopkins.co.uk/projects/sport/london-2012-velodrome/)* The Velodrome was constructed as part of the London 2012 Olympics. The Olympics had set itself up to be ‘the greenest ever’. The Velodrome design team was keen to deliver sustainable design through a building based around true low energy and low carbon design rather than renewable technologies. A lean design was adopted for the roof, a cable structure as opposed to a more traditional structure. This alone reduced embodied carbon of the structure by 27% compared to BAU.
1. **Build with the right materials**
	1. Reduce the use of carbon intensive materials: In the building industry, embodied carbon can be responsible for more than half of the total life cycle carbon emissions of a new construction project. This is critical to address urgently as embodied carbon is upfront carbon and thus immediately cuts into our remaining carbon budget to stay below the agreed 2°C temperature rise by 2050.
	2. Design out hazardous/pollutant materials: This strategy aims at preventing the use of materials that have a negative impact on other planetary boundaries – acidification etc - other than the Global Warming Potential.

**What this means in practice:** Selecting the right materials for the right elements during the design process. Life cycle carbon assessments can help assess where the most carbon intensive materials are in the building. These can potentially be replaced with reused, biogenic, or lower carbon options where possible. **4.1 Case Study:** [**Dalston Works**](https://www.dalston-works.co.uk/)Dalston works in London is a ten-storey 121 unit development made entirely from CLT. The residential building is clad in brick making it look like a BAU building. Using CLT meant the building was light enough to accommodate 10 storeys while situated over existing train connections – permitting 35% more homes to be built. The use of CLT also reduced deliveries during construction by 80%.Using almost exclusively timber saved over 1,700 tonnes of carbon. Another useful way to think of circularity from a design perspective is in terms of [‘layers’,](https://www.london.gov.uk/publications/circular-economy-statement-guidance) where each layer has its own life cycle, life span, and relevant CE design approaches. To support reuse and recycling, the different layers should be independent, accessible, and removable whilst maintaining their value, where possible. This is especially important for layers that may need more frequent replacement, such as building services and internal fit-outs. The years shown in the diagram below are just indicative.  |

# What are some benefits of applying circular economy principles to the built environment?

**Time:** 5 **Total time**: 55

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| Facilitation / Alterations | Script  |
| In this section you will review some of the benefits surrounding a shift to a circular economy. If  | When making the case for circularity in the built environment in your city it is important to consider what the benefits might be for the city directly. **Social** Building sites that are designed with circularity in mind often include more innovation but also more considerate design elements. This leads to more liveable spaces and liveable cities. Revenue from circularity initiatives (e.g. empty homes tax) can be reinvested in community initiatives. **Environmental** Potentially the most obvious area of benefit, applying circular economy principles will be beneficial for the environment. If your city has an environmental target or a climate action plan consider how you can link the reduction in material use and embodied carbon values to these city-wide carbon reduction goals. This relationship is most obvious if your city uses consumption-based emission measurements or climate budgeting. Please see [C40 website](https://www.c40.org/) for more information on these governance systems. There can also be environmental benefits beyond carbon. For example, when buildings are prefabricated in pieces offsite the waste involved in the construction process is reduced dramatically, as does the total construction time on site. This reduces vehicle trips to the site and idling reducing air quality impacts of construction.**Economic** Building with circular methods has the potential to increase the number of skilled green jobs to the city. For example, it takes a skilled crew of 8 to deconstruct a building and carefully sort materials for reuse for every 1 crew member needed to demolish a building.Circular design strategies often call for reused materials – these need to be harvested and remanufactured locally for the best environmental benefit. This means cities can establish local circularity hubs where construction materials are processed – another avenue for good green jobs.  |

# Break

**Time:** 15 **Total time**: 70

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| Facilitation / Alterations | Script |
| This is the transition between two main topics of this session. Share that we will be moving on, and that now is the time for any remaining questions on the last section. Take your time answering these if time allows, if not tell the learners you will follow up on the session with responses to the questions. Before you move on to the next section, allow for a comfort break. | To recap, we have defined what the circular economy is and how its principles can be applied to the built environment. We have learned about some examples as to what it looks like implementing these strategies in practice, and what the wide benefits of thinking about building in this way could be.We will now take a break, when we come back we will kick off with an activity.  |

# Activity: Negativity Dump

**Time:** 15 **Total time**: 70

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| Facilitation / Alterations | Script  |
| If in person, have the groups write the barriers they can think of to achieve a fully circular economy in the built environment in their city on post it notes. Once everyone is done have the group stand around the wall of post it notes and group these into themes. You can guide the group as much or as little as you wish.Once the posits have been grouped, name the themes that the groups are based on and determine as a group the three (or more) they see as key for their city. If online, please complete this exercise on a shared workspace such as Miro. | Now that we have heard a lot about the circular economy it is time to ground this thinking in reality. Take 5 minutes and write down all the barriers you believe might stand in the way between the potential of circularity in the built environment that we have painted and the current reality in your city. Put them all up on the wall when you are ready. Once everyone has posted their notes, let’s group these barriers and see which themes start to form. Which three themes do you think are priorities for your city to tackle before being able to take on the next circular economy steps? |

# Reviewing Key Barriers

**Time:** 10 **Total time**: 80

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| The intention of this section is not to add to a large list of barriers to applying the circular economy for the participants but to emphasise that the barriers have been defined and see that they are workable problems.  | We’ve just reviewed all the barriers to potentially applying these circular activities yourself. The CIRCuIT project also identified the following existing barriers to the implementation of circular economy principles. As we review them, think about how they align with the barriers we described for the city. **Regulatory Failures**Poorly defined legal frameworks * Hierarchical systems of decision making where national or municipal requirements override local ones make it difficult to alter priorities. There can be a lack of guidance or definition of the circular economy and an overemphasis on operational energy, making circular strategies difficult to implement.

On a material or product level * Reused and recycled products do not have any CE labelling and do not necessarily fulfil existing reuse requirements even if they are usable. Obtaining the necessary permits can also be time limiting and consuming, so they limit reuse/recycling.

On a building level * Building permits and designations don’t reflect circular economy principles or are not enforced properly. There is a serious lack of protection of buildings from demolition for reasons other than cultural value. Cities’ development plans can get in the way of proposed buildings with changing intended use. Regulation such as demolition permits are not always enforced in the correct way.

**Economic barriers** Lack of financial incentives    * Current business models and costs/valuation processes do not show circular investments as profitable. There is a lack of carbon taxation and a lack of tax benefits for sustainable projects.

Costs * Decisions on planning and design are all based on cost. The value of land makes it more economical to build larger, new buildings instead of refurbishing an old space. Often if the cost of repair/refurbishment is equal/almost equal to building new, then there is usually a preference for the latter.
* In terms of collecting or reusing materials, it is more expensive to undergo deconstruction processes that ensure products are suitable for reuse and not damaged. There is also a fear that CE solutions might increase costs due to problems with the schedule. It is easier and cheaper to use new materials instead of recycled materials or storing reused materials for extended periods.

Lack of resources   * Resources aimed at learning/testing new ways of constructing are often lacking. Testing and ensuring all reused and recycled materials are adequate is resource-consuming.

 Management/processes  * Designer’s fees aren’t high enough for the special designs needed for inner transformability.
* Construction and demolition are often done with too little margin of both time and economic resources, which makes it difficult to plan for reuse and recycling possibilities.

**Market failures**   Incentives * Any profit from waste reduction is not split equally between the parties involved, reducing shared incentives.
* It is common to build quickly and sell on buildings, the lack of ownership of the building reduces incentive for sustainable product.

Procurement criteria  * Price is usually the only criterion while other criteria are only given minor importance. More complicated criteria can be more difficult to formulate.

Lack of data * Lack of data to aid decision making, both live resource data mapping and data in policy submissions.

Lack of standards and procedures  * Using reused and recycled materials is seen as risky due to concerns around obtaining warranties.
* Quality of virgin materials is believed to be better and more consistent than that of reused materials.

Lack of collaboration   * Lack of strategic collaboration with other industries that can ‘buy’ materials.

Unequal market access  * Material manufacturers do not have equal access to the market, making it hard for smaller manufacturers to reach the designers/contractors.

Time considerations  * Demolition projects often have tight schedules usually making it impossible to find out the circular alternatives.

Lack of space and infrastructure  * Many demolition sites are in highly urbanized areas with limited space causing logistical challenges.
* Maintaining storage areas for materials that don’t have an immediate purpose (and are to be reused) requires resources, and municipalities have limited possibilities for storage.

**Social factors**  Lack of knowledge and awareness  * Lack of knowledge creates myths and risk. No access to good and functional examples makes it easier to continue with current business models.
* Using reused products and materials requires additional familiarisation and figuring out how to combine old and new building parts and materials.

Cultural   * Demolition instead of transformation is seen as the starting point of a project. Lack of political message that circular economy in construction is important and positive and of value for existing buildings.
* The construction and building fields are considered conservative and hard to change.

Lack of sharing and collaborating  * Collaboration is needed throughout the whole process, from planning phase to the demolition part. Finding partners for this process is difficult.
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# Key City Actions: what we can do

**Time:** 15 **Total time**: 95

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| Facilitation / Alterations | Script  |
| In this section you will be countering the barriers with some straightforward answers to what cities can do. Each action comes with an example of implementation in practice. If you have an example you would rather share in this section please do add it in.  | To successfully move towards a circular built environment sector in your city the right policies and the right infrastructure – both physical and virtual – must be in place. There are some key regulatory and non-regulatory actions that your city can start taking to make a circular built environment a reality. **Regulatory Actions** * Establish circularity goals for the city with relevant strategies and roadmaps.
* Analyse and update planning policy
* Align public procurement policy.
* Embed economic Incentives.

**Non-Regulatory Actions** * Support development of physical and digital infrastructure.
* Find or establish knowledge sharing networks.
* Establish a skills pipeline.

**Regulatory Action**Establish circularity goals for the city with relevant strategies and roadmapsDefine the circularity vision for your city or local authority. The circular economy can remain too high level a concept for effective implementation if it is not related directly to work that is happening on the ground. Setting out a clear strategy supported by high level decision makers also gives the market and other relevant stakeholders confidence in the direction of changes to come. * **Case Study:** [**Amsterdam Circular Strategy**](https://www.amsterdam.nl/en/policy/sustainability/circular-economy/)
	+ In 2020, Amsterdam launched the ‘Amsterdam Circular Strategy 2020 – 2025’. The strategy is based on the Amsterdam City Doughnut, analysis based on the work of British economist [Kate Raworth](https://www.kateraworth.com/doughnut/) describing how societies and business can contribute to economic development while still respecting the limits of the planet and our society. This strategy document outline how the city would significantly reduce the use of new raw materials across key sectors including construction. It formulates the steps that the city will be taking as well as the expectations of the private sector creating one cohesive vision. Progress is measured using the monitor which was shared at the same time.

Analyse and update planning policyThe planning approval process is critical time where the city has the most influence on the developing construction plans. The planning process can be used systematically to collect relevant data, or can be leveraged to test more ambitious requests on large well-resourced developers. How to leverage planning policy is unpacked further in Module 3 of the CIRCuIT Training Pack. * **Case Study:** [**London Plan Circular Economy Statement**](https://www.london.gov.uk/programmes-strategies/planning/london-plan/new-london-plan/london-plan-2021)
	+ The new ‘London Plan’ was published in 2021. It includes sustainability standards to make London’s buildings net-zero carbon by 2030, as well as the city's first embodied carbon regulations on new buildings. All schemes referable to the mayor - these are projects that meet a certain size threshold, or are in specially designated areas - will have to provide a whole life carbon assessment and a circular economy statement to demonstrate how they have taken action to reduce the building's life cycle impact. Read the ‘London Plan’ [here.](https://www.london.gov.uk/programmes-strategies/planning/london-plan/new-london-plan/london-plan-2021)
* **Case Study:** [**Los Angeles Adaptive Reuse Ordinance**](https://www.ladbs.org/services/core-services/plan-check-permit/plan-check-permit-special-assistance/adaptive-reuse-projects)
	+ The Los Angeles Adaptive Reuse Ordinance (ARO) was adopted in 1999. It encouraged the conversion of historic and other older and often under-used, under-appreciated or even abandoned office buildings in the downtown area, into residences. This accelerated the creation of much needed housing, and ensured the preservation of existing structures. It did this by providing certain exemptions from the new building code, including reducing the minimum parking spaces requirement, for those existing buildings that would be developed into housing. Thanks to the ARO housing in downtown LA grew from around 11,000 units to 46,000 units in 2019. ARO was expanded in 2003 into various other parts of the city.

Align public procurement policy. Public procurement drives a significant portion of construction works in many cities by value. It is also an indication of city’s ambitions on circularity and a guiding force of the private sector to follow suit. How to leverage planning policy is unpacked further in Module 2 of the CIRCuIT Training Pack. * **Case Study:** [**Portland Low Carbon Concrete Initiative**](https://www.portland.gov/omf/brfs/procurement/sustainable-procurement-program/sp-initiatives)
	+ In 2016, a supply chain analysis showed the city of Portland that construction services were the largest contributor to their supply chain GHG emissions, and that concrete is one of the most GHG intensive materials typically used in city construction processes. Portland’s Low Carbon Concrete Initiative was set up to target concrete that is used in city projects. Starting in January 2020, all concrete mixes in all city projects were required to provide an Environmental Product Declaration. In May 2022 the city announced its maximum Embodied Carbon Thresholds for concrete mixes used on city construction projects which will go into effect January 2023. The thresholds were based on recommendations from a multi-stakeholder workgroup convened to advise the city on establishing such thresholds. In order to understand how lower-carbon concrete mixes perform compared to traditional 100% cement mixes, the city has also been conducting pilot tests of different lower-carbon concrete mixes.

Embed economic incentives It is not always possible to embed economic benefits or penalties in regulations but where possible this is an effective way of communicating the values and priorities of the city when it comes to embodied carbon. * **Case Study:** [**Vancouver Empty Homes Tax**](https://vancouver.ca/home-property-development/empty-homes-tax.aspx)
	+ Vancouver instituted an Empty Homes Tax to help return empty and under-utilized properties to the market as long-term rental homes for people who live and work in Vancouver. This is one of many actions in the city’s 10-year Housing Vancouver Strategy. In November 2020, an increase from 1.25% to 3% was approved for the upcoming year. This is relevant because the tax has reduced vacant properties in the city by 25% since 2017 helping move thousands of homes back into the rental market. The CAD $61 million (US$48 million) in net revenues from the tax has been used to support affordable housing initiatives.

**Non-Regulatory Actions** Support development of physical and digital infrastructureThe majority of CE strategies are easier to implement if they are carried out at scale locally, e.g. reusing materials through material exchange with other projects. To support regulations that may require or encourage these actions cities should consider how they can establish or support the necessary physical and/or digital infrastructure that will make adhering to new regulation and more stringent regulation in the future easier. * Some examples include: circular construction hubs, city wide data sets, online material exchanges
* **Case Study:** [**Excess Materials Exchange**](https://app.excessmaterialsexchange.com/mqUFWBvNwawg/7dlcKxtDyliQ)
	+ Enfield Council in London is undertaking a regeneration project called Meridian Water project, a £6bn regeneration scheme which will provide 10,000 homes and 6,000 jobs in the borough. On this regeneration project the council is piloting the Excess Materials Exchange (EME) which allows materials that would normally go to waste, such as bricks and steel, to be given a new lease of life on a different project. This will help keep the value of these materials in the local economy, and we welcome Enfield businesses to get involved. The platform will be widened to include all Council projects to allow for materials to be exchanged and reused across the borough.

Find or establish knowledge sharing networks. Transitioning to a circular way of doing construction requires cultural shifts as much as it requires the correct regulation and infrastructure. Participating in regular collaboration with other cities or local authorities tackling the same issues has the benefit of introducing you to new solutions as well as exposing staff to a welcoming social learning space where they can ask questions and feel like they are part of a team. * **Examples**
	+ There are many existing knowledge sharing networks which address the topic of circularity in construction. At the international level, organisations such as [Climate Neutral Cities Alliance](https://carbonneutralcities.org/) and [C40 Cities](https://www.c40.org/) lead discussions with cities across continents on best practice policies. At the EU level, the [Big Buyers Initiative](https://bigbuyers.eu/) led by [Euro Cities](https://eurocities.eu/) and [ICLEI](https://iclei-europe.org/) for the commission brings interested cities together to further bolster their market power. At the regional level:

Establish a skill pipelineTransitioning to a circular way of constructing also requires that the construction industry understands how to apply circular strategies at the building level. This may be easier for larger organisations who have the resources to dedicate to training. To ensure new regulations do not disadvantage SMEs, establish or support an upskilling programme that tackles the priorities and needs in your city.  |

# Backcasting Activity

**Time:** 15 **Total time**: 110

|  |  |
| --- | --- |
| Facilitation / Alterations | Script  |
| In this section you will be leading an activity designed to help participants envision what successful application of these strategies could look like in their city. This activity can be completed in pairs or in small groups depending on the size of the trainee group.   | I hope that it is now very clear to you what applying the circular economy to the built environment could look like, and what additional benefits it could bring to your city. We are now going to complete an activity that will hopefully bring that thinking out of the abstract and slightly closer to reality. With the person next to you or in a group, write out the headline of a press release few years in the future articulating circular success for your department. Imagine you’ve achieved your departments goals by applying circular strategies, what does the press release say? Please share your headlines with the group. Now that we have our end goals defined, plot out a simple timeline of actions that should be taken on the path to achieving this goal. What circular principles are you using? Who are you involving in the process? |

# Wrap up

**Time:** 5 **Total time**: 115

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| --- | --- |
| Facilitation / Alterations | Script  |
| Thank everyone for attending, ensure everyone knows how to reach you if they have any questions. If relevant ensure the right connections are made between participants.  |  |

# Sources

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| --- | --- |
| ‘Our current consumption patterns mean we consume the equivalent of 1.75 planet’s worth of resources every year’ | <https://www.theworldcounts.com/challenges/planet-earth/state-of-the-planet/overuse-of-resources-on-earth>  |
| The ‘Take-Make-Dispose' Model | <https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview>  |
| EMF Circular Economy Definition | <https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview> |
| The Butterfly Diagram - EMF | <https://ellenmacarthurfoundation.org/circular-economy-diagram>  |
| ‘The built environment generates nearly 50% of annual global CO2 emissions’ – Architecture 2030 | <https://architecture2030.org/why-the-building-sector/>  |
| The Carbon Leadership Forum | <https://carbonleadershipforum.org/embodied-carbon-101/>  |
| ‘Cement is responsible for 8% of all global CO2 emissions’ | <https://www.chathamhouse.org/2018/06/making-concrete-change-innovation-low-carbon-cement-and-concrete>  |
| ‘Many steel-framed buildings in the UK use twice as much steel than is structurally necessary’ | <https://royalsocietypublishing.org/doi/full/10.1098/rspa.2014.0170>  |
| What CE means in construction | Rose, C.M., Stegemann, J.A., 2018. From Waste Management to Component Management in the Construction Industry. Sustainability. <https://www.mdpi.com/2071-1050/10/1/229>Rose, C.M., Stegemann, J.A., 2018. Characterising Existing Buildings as Material Banks (E-BAMB) to Enable Component Reuse. Proceedings of the Institution of Civil Engineers: Engineering Sustainability. 00074, 1–42. <https://www.icevirtuallibrary.com/doi/pdf/10.1680/jensu.17.00074>Rose, C.M., 2019. Systems for reuse, repurposing and upcycling of existing building components. Doctoral thesis, UCL. <https://discovery.ucl.ac.uk/id/eprint/10072754/> van Hinte, E., Peeren, C., Jongert, J., 2007. Superuse: Constructing New Architecture by Shortcutting Material Flows. 010 Publishers. <https://books.google.co.uk/books/about/Superuse.html?id=QnI1m8-Mku4C&redir_esc=y> |
| CIRCuIT Key Focus Areas | <https://www.circuit-project.eu/focus-areas>  |
| ARUP’s Circular Design Framework | <https://ce-toolkit.dhub.arup.com/framework>  |
| Case Study 2.1 ‘The Hithe’  | <https://www.ifdo.co/projects/the-hithe> |
| Case Study 2.2 ‘Town Hall Brummen’ | <https://ellenmacarthurfoundation.org/circular-examples/brummen-town-hall> |
| Case Study 3.1 ‘Triton Square’  | <https://www.arup.com/projects/1-triton-square> |
| Case Study 3.2 ‘The Velodrome’ | <https://www.hopkins.co.uk/projects/sport/london-2012-velodrome/> |
| Case Study 4.1 ‘Dalston Works’ | <https://www.dalston-works.co.uk/> |
| Circular Design in Layers | <https://www.london.gov.uk/publications/circular-economy-statement-guidance> |
| C40 Cities Website | <https://www.c40.org/> |
| Amsterdam Circular Strategy | <https://www.amsterdam.nl/en/policy/sustainability/circular-economy/> |
| Kate Raworth Donut Economics | <https://www.kateraworth.com/doughnut/> |
| London Plan Circular Economy Statement | <https://www.london.gov.uk/programmes-strategies/planning/london-plan/new-london-plan/london-plan-2021> |
| Los Angeles Adaptive Reuse Ordinance | <https://www.ladbs.org/services/core-services/plan-check-permit/plan-check-permit-special-assistance/adaptive-reuse-projects> |
| Portland Low Carbon Concrete Initiative  | <https://www.portland.gov/omf/brfs/procurement/sustainable-procurement-program/sp-initiatives> |
| Empty Homes Tax | <https://vancouver.ca/home-property-development/empty-homes-tax.aspx>  |
| Excess Materials Exchange | <https://app.excessmaterialsexchange.com/mqUFWBvNwawg/7dlcKxtDyliQ> |
| Climate Neutral Cities Alliance | <https://carbonneutralcities.org/> |
| C40 Cities | <https://www.c40.org/> |
| Big Buyers Initiative | <https://bigbuyers.eu/>  |
| Euro Cities | <https://eurocities.eu/> |
| ICLEI | <https://iclei-europe.org/> |

# Further Resources

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| --- | --- |
| Minimal intervention webinar | <https://www.istructe.org/resources/training/minimal-intervention-less-is-more/> |
| Circular construction skills Europe | <https://busgocircular.eu/developing-a-circular-construction-skills-qualification-framework/> |