

MAYOR OF LONDON

**DESIGN
FOR A
CIRCULAR
ECONOMY**

PRIMER

GOOD GROWTH BY DESIGN

**A
BUILT
ENVIRONMENT**

**FOR
ALL
LONDONERS**

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1 DEPUTY MAYORS FOREWORD

We are proud to be the Deputy Mayors of a city that millions of people can call home. We are a truly global and diverse city. This underpins our success as a city and is the reason why businesses decide to locate and stay here and why our economy is growing.

The Mayor is determined to ensure that London continues to be a vibrant place that offers people living, working and visiting the city a great quality of life. To achieve this, London must be resilient to change and able to address the big challenges all global cities face around resource scarcity and a changing climate.

Transitioning to a circular economy offers significant opportunities for meeting the needs of a growing population and reducing the adverse impacts on the environment, by re-thinking the way that we design our homes and buildings and consume resources. We need to adopt innovative approaches that design out waste, use resources more efficiently, and keep materials and assets in use for as long as possible to retain their value.

Our built environment industry is under pressure to cater for London's growth. The fact is we must build more genuinely affordable, high quality housing alongside good and suitable work space for Londoners. We must also ensure that we provide the clean, green infrastructure that London needs. It is vital that these projects do not exacerbate climate breakdown or worsen our air pollution.

That's why we must make sure that London grows in a way which is both inclusive and sustainable. This is what the Mayor calls 'good growth'.

As part of achieving his vision for good growth, the Mayor's draft London Plan includes measures to help London transition to a circular economy model. We are also investing in the circular economy through projects such as Mercato in Ilford. This new market has been designed to be taken apart and moved as needed. It is a model of how the circular economy can make a temporary asset



more valuable. And through the London Waste and Recycling Board (LWARB) we are supporting over 140 SMEs to develop new products and services that help to design out waste and keep materials and resources circulating in the economy and so reduce reliance on virgin materials.

As part of the Mayor's Good Growth by Design Programme, the Mayor's Design Advocates and other industry experts have been looking at how to embed circular economy principles into built environment practices and adopt less resource-hungry approaches to the delivery of buildings and infrastructure. London's built environment sector must now adopt this approach in its everyday practice.

There are good economic reasons for doing so. The LWARB estimate that moving to a circular economy could add between £3bn and £5bn in value to the built environment sector in London by 2036. It could also create as many as 12,000 jobs over the same period, whilst reducing waste and other environmental impacts.

With our world-leading design and engineering talent, London can use circular economy principles to spur innovation and improve Londoners' lives. This document sets out how you can help us make London a greener, more efficient and more sustainable city. Working together we can achieve the Mayor's aims of making London a zero carbon, zero waste and zero pollution city.

Shirley Rodrigues, Deputy Mayor for Environment and Energy & Jules Pipe, Deputy Mayor for Planning, Regeneration & Skills

ABOUT THIS PRIMER

The Mayor has set out his vision of London transitioning to a circular economy in the draft London Plan and his Environment Strategy. The 'Designing for Circularity Primer' has been written to help support organisations in the built environment sector to understand how they can embed circular economy principles into their projects and design processes.

WHAT IS NEXT?

As part of the Mayor's Good Growth by Design Programme, the GLA Regeneration, Environment and Planning teams have been working with Mayor's Design Advocates and London Waste and Recycling Board to conduct a research inquiry. This has supported the development of technical guidance for the draft London Plan policy SI7, 'Reducing waste and supporting the circular economy'. The Primer outlines the direction of the technical guidance to follow, and is a showcase of exemplar projects.

The GLA Regeneration and Environment teams are interested in engaging with organisations in the built environment sector who are working to embed circular economy principles into projects. The digital version of this primer will be updated to include new additional pioneering case studies over time.

If you are working on a circular economy project, please get in touch at: goodgrowthbydesign@london.gov.uk



Waterloo City Farm, Feilden Fowles
(Photography: David Grandorge)

CALL TO ACTION

Sunand Prasad, Mayor's Design Advocate
Chair of the Circular Economy Sounding Board

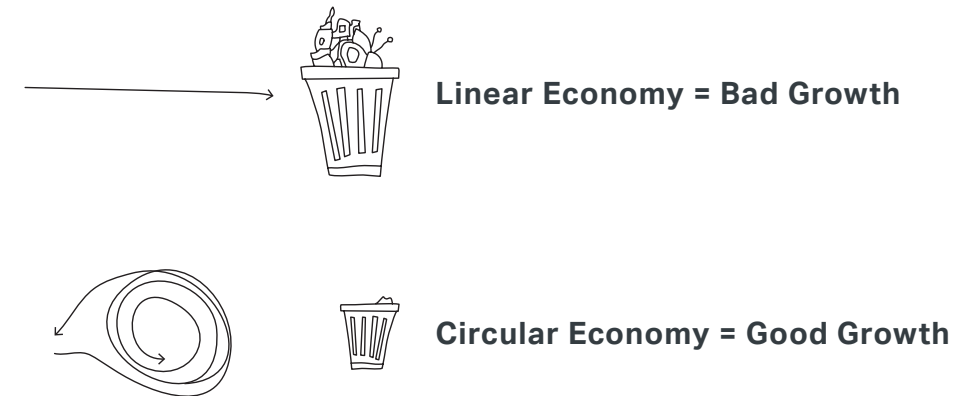
We can only achieve Good Growth, through the circular economy

The climate emergency has moved from scientists' forecasts to present reality. The majority of Londoners see that global heating and an unstable climate are just one aspect of wider environmental breakdown that threatens to make the world inhospitable to us, as it already is to the 150 species that become extinct every day.

The built environment has a big role to play in addressing the challenge of the climate emergency. A powerful way to do that is to transition to a circular economy, making a radical change in the way we think about constructing, equipping, using, maintaining, altering and renewing our built environment. As Mayor's Design Advocates (MDAs) we believe that such a model is the only way we can achieve the Good Growth that the London Plan commits to. The Plan also sets the city on course to the circular economy.

We can no longer ignore the impact our individual and collective behaviours have on our environment or society. We are now seeing the consequences of our economic system, whether that is record high temperatures, fuel poverty, or air pollution in our city. This is a call to action to everyone in the design, construction and property sectors to start embracing circular economy principles as standard practice.

The built environment sector uses more resources and throws away more waste than any other. But where is 'away'? We only have this one earth. The developed world has prospered through using the take, make and throw away economy – a linear economy, blind to its harmful consequences. It has led to amazing growth but of a kind that increasingly looks like the opposite of the Good Growth that



we want for London, to provide the homes, workplaces and other facilities that are badly needed. In contrast to a linear economy, the circular economy creates and maintains value by using materials for much longer and then reusing, repurposing or recycling them, just as nature does. There is no real waste in nature because waste products become the basis of new materials and life.

The circular economy as an idea is easy to understand – it is all there in the name, and the parallel with nature makes it very compelling. However genuinely rethinking the use of the thousands of different materials of an industrial economy is a massively complex task.

Many synthetic materials are difficult to recycle let alone re-use. Recycling can be so energy intensive as to defeat its purpose. Many modern construction products are composites of different materials – reusing and recycling these presents additional challenges. Yet people are finding ingenious ways. Innovation abounds in the circular economy. Interface Flor collects and recycles old carpets in making new ones. Harvestmap.org positions itself as the 'marketplace for professional up-cyclers' and is an open-source online tool created by Superuse Studio in the Netherlands. Visitors to the site can identify pools of plastics, textiles, wood, metal, chemicals and a range of other resources available to collect nearby.

Blockchain technology is being developed by several people to put into practice the idea that buildings can be seen as 'material banks', that every piece of building material from extraction through processing, assembly and installation can be tracked: sometimes called a 'material passport'.

Equally promising are emergent business models that incentivise circularity. For example, 'products as service': instead of an occupier owning, say the carpets, the carpets are owned by the manufacturer and the occupier pays a rent for their use. The manufacturer would have an incentive to make the carpets last as long as possible and then recycle them. At Schipol airport the light fittings are owned by Phillips which charges for every lux of light provided.

At a more fundamental level the circular economy requires that buildings are used for as long as possible, designed for adaptability and repurposing. That is hardly new. Huge numbers of buildings in London, as in other historic cities, find a series of new uses. There is much to learn from them. Recycling is also nothing new. So, our economy is partially circular – the challenge is to make it truly circular.

Sunand Prasad, Mayor's Design Advocate, Chair of the Circular Economy Sounding Board



WHAT IS THE CIRCULAR ECONOMY?

A Circular Economy is defined in draft London Plan Policy SI7 'Reducing waste and supporting the Circular Economy'¹ as one where materials are retained in use at their highest value for as long as possible and are then reused or recycled, leaving a minimum of residual waste.

'It is a new economic model that moves away from this current linear economy, where materials are mined, manufactured, used and thrown away, to a more circular economy where resources are kept in use and their value is retained.

For buildings, this means creating a regenerative built environment that prioritises retention and refurbishment over demolition and rebuilding. It means designing buildings that can be adapted, reconstructed and deconstructed to extend their life and that allow components and materials to be salvaged for reuse or recycling.²

Designing buildings for a circular economy can increase their value by avoiding depreciation and can help to stave off obsolescence. It can even secure a positive residual value at end-of-life.

In a circular economy, built environment assets are designed so that whole buildings, and materials, components and parts can be continually and easily recycled.

1 Policy SI7 'Reducing waste and supporting the Circular Economy' <https://www.london.gov.uk/what-we-do/planning/london-plan/new-london-plan/draft-new-london-plan/chapter-9-sustainable-infrastructure/policy-si7-reducing-waste>

2 Building Revolutions: Applying the Circular Economy to the Built Environment, David Cheshire, April 2016, (RIBA Publishing)



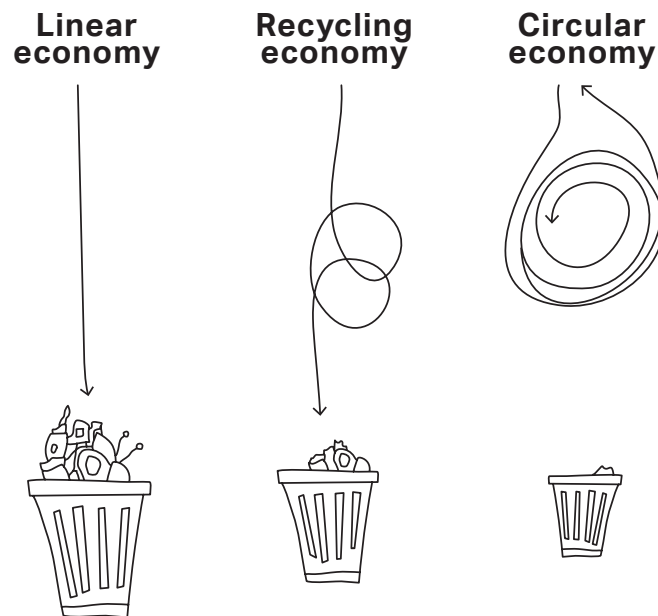
Cambridge Heath Road, Waugh Thistleton
(Photography: Tim Crocker)

CIRCULAR ECONOMY IN THE BUILT ENVIRONMENT

The impacts of our current linear economic model include man-made climate change, resource depletion, deforestation, loss of biodiversity, and pollution of land, air, rivers and oceans.

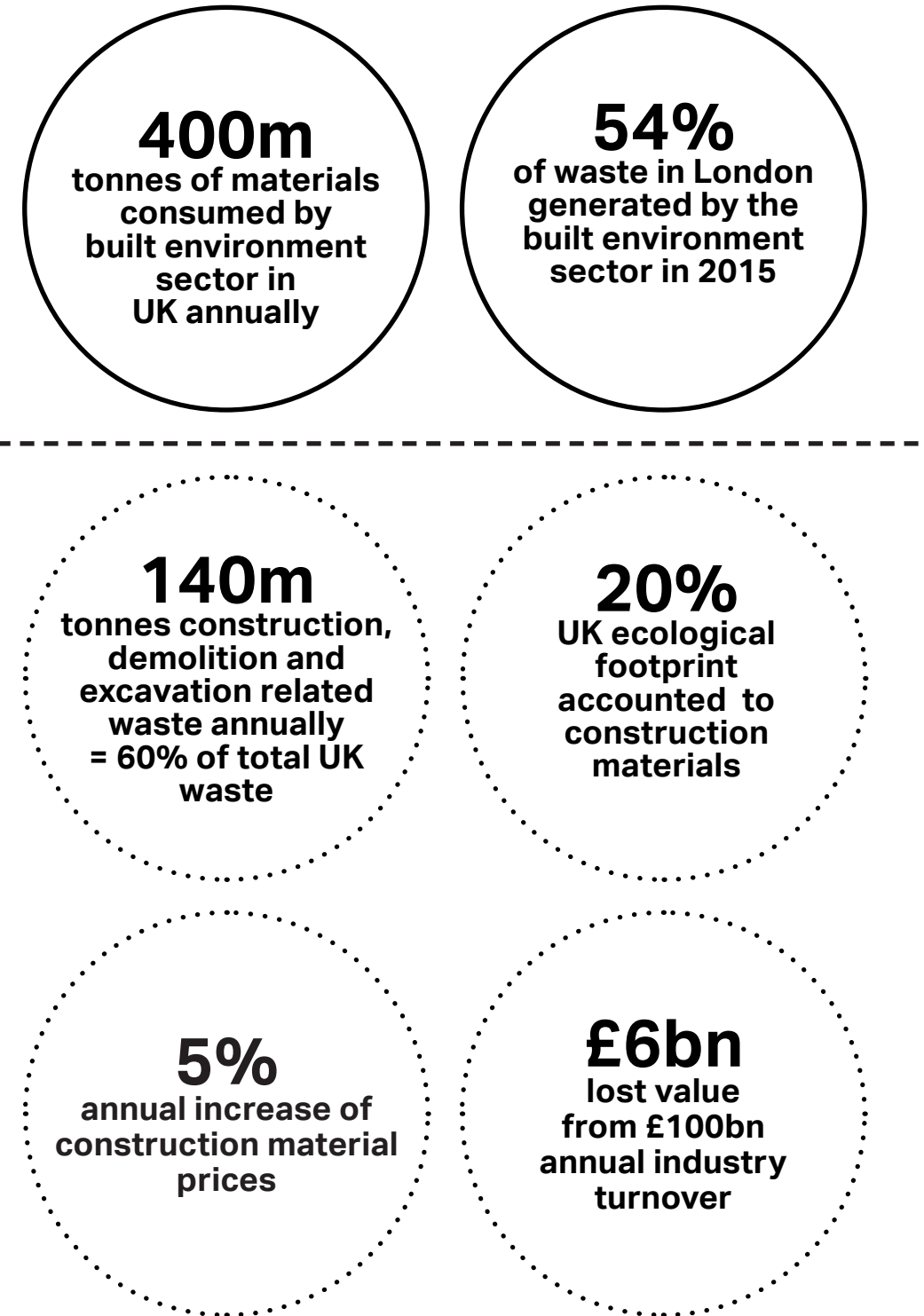
As the largest user of materials and generator of waste in the economy, the built environment sector must take a lead in supporting the shift towards a circular economy. In London, the sector consumes 400 million tonnes of material each year and accounts for 54% of waste. Extending the life of buildings and recovering and reusing materials at the end of their life can help reduce the demand for virgin materials and waste arising from the built environment.

It can also help protect the sector and the city against the rising cost of materials and disposal of waste, as well as the impact of demolition and waste on air and noise quality, congestion, land take.



FROM TAKE • MAKE • USE • DISCARD TO RE-MAKE • USE-AGAIN

Diagram courtesy of Circular Flanders



EXAMPLES OF CONSTRUCTION WASTE IN THE UNITED KINGDOM

5

The business opportunity

The benefits of adopting a circular economy approach in the built environment sector will be significant for London. LWARB estimates that if circular economy principles are successfully adopted it could contribute between £3 billion and £5 billion in growth for London by 2036 and create as many as 12,000 new jobs.

Developers will benefit from material optimisation and waste minimisation through the increase in the productive use of materials and a reduction in material and disposal costs. Developers like Clarion, which are beginning to explore the financial implications of circular economy approaches to development are uncovering opportunities to save millions of pounds by reusing excavation and demolition waste on site and by reducing waste from construction.

Innovation in material optimisation, designing lighter structures and reducing embodied carbon; reusing and recycling demolition and excavation materials; designing out waste both through design and construction; ensuring buildings are adaptable; and working with suppliers to lease and replace rather than sell products and systems will deliver short- and long-term value.

London will benefit from the reduction in the quantity of new material imported into the city, and the amount of waste exported to the surrounding boroughs. It will help reduce London's reliance on imported material and exported waste.

Better use and reuse of materials will be supported by smart technologies, better waste reprocessing, storage and logistics infrastructure.

Making better use of materials and eliminating waste will help reduce vehicle movements, congestion, associated air and noise pollution and greenhouse gas emissions and the health impacts associated with pollution, which have a disproportionate impact on the poorest

communities. It will also free up and make better use of land that has been set aside for waste management.

LWARB's Circular Economy Route Maps demonstrates how the circular economy provides an opportunity for businesses to be market leaders. The shift to a circular built environment will take time and active engagement of the wider built environment sector. Business leadership is therefore key to the transition to a circular economy. Businesses will need to provide products and services based on circular economy principles. Major investment is required including venture capital and equity, some of which will come from commercial investors, with the rest from the public and not-for-profit sectors. To support the transition, the GLA and LWARB are helping SME's, develop circular economy products and services.

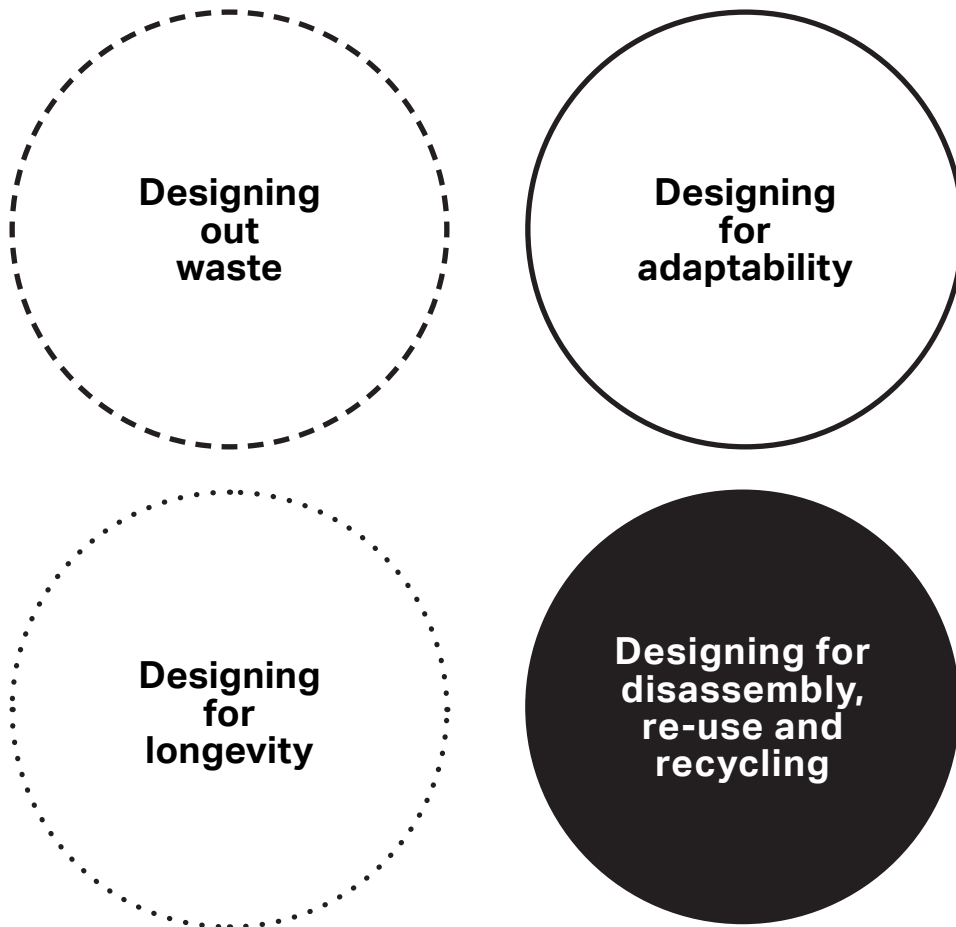
To facilitate the transition to the circular economy the GLA, is working with London Waste and Recycling Board (LWARB) and UK Green Building Council and other partners, to support industry to adopt circular economy practices.



6 LONDON LEADING THE WAY

The draft London Plan

The Mayor is leading the way in setting new policy in the draft London Plan to promote adoption of circular economy principles in development. This includes:



The Mayor's new London Plan will be a catalyst for the circular economy by requiring major developments to provide evidence that they are hard-wiring circular economy principles into schemes.

All new referable developments will be required to submit a Circular Economy Statement that demonstrates:

- **How demand for materials will be minimised**
- **How secondary materials can be used**
- **How new materials are being specified to enable their reuse**
- **How construction waste will be minimised. Statements must demonstrate how much waste the proposal is expected to generate, and how and where the waste will be managed in accordance with the waste hierarchy.**
- **How developments are supporting reuse and recycling through adoption of sharing facilities, space where unwanted building materials can be passed onto others, and by ensuring there is ample space for storage and collection of waste recycling streams as well as residual waste**

Guidance is being developed in collaboration with industry to support implementation of the London Plan policy. In addition, local authorities are also considering how they can adopt this approach for non-referable schemes.

CIRCULAR ECONOMY POLICY OBJECTIVES

- Create buildings that are high quality, flexible and pay attention to the building lifespan, through appropriate construction methods and the use of attractive, robust materials which weather and mature well;

- Improve resource efficiency to keep products and materials at their highest value use for as long as possible; and,

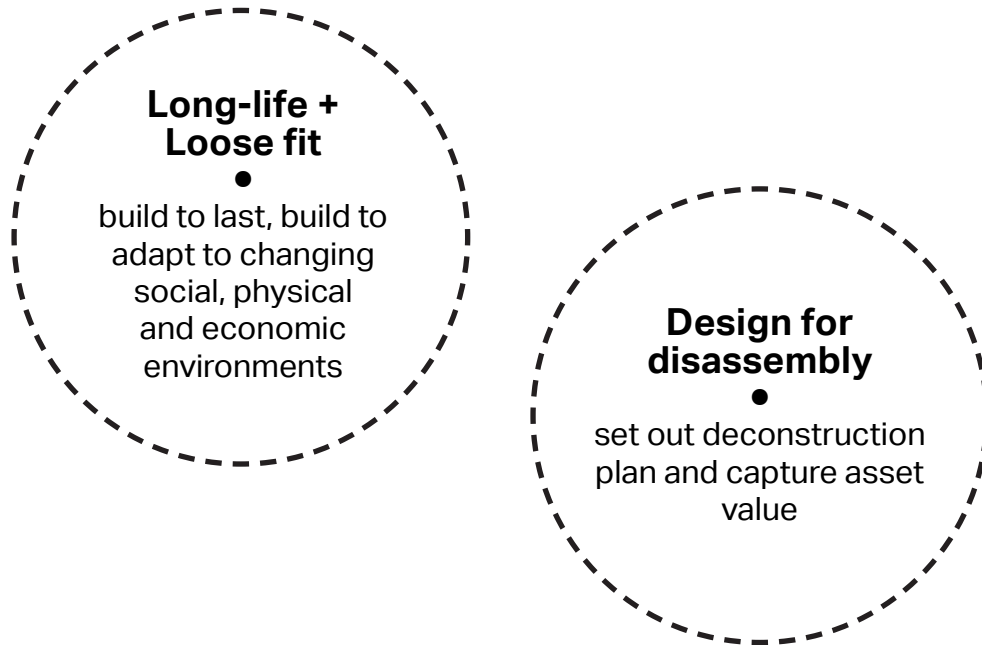
- Promote waste avoidance and minimisation and ensure that there is zero biodegradable or recyclable waste to landfill by 2026.

The transition will take time and will only be accomplished through collaboration and partnerships. It will require strong leadership and engagement by the whole supply chain from the Government and Mayor of London to investors and developers, consultants, contractors, product suppliers, demolition and salvage experts.

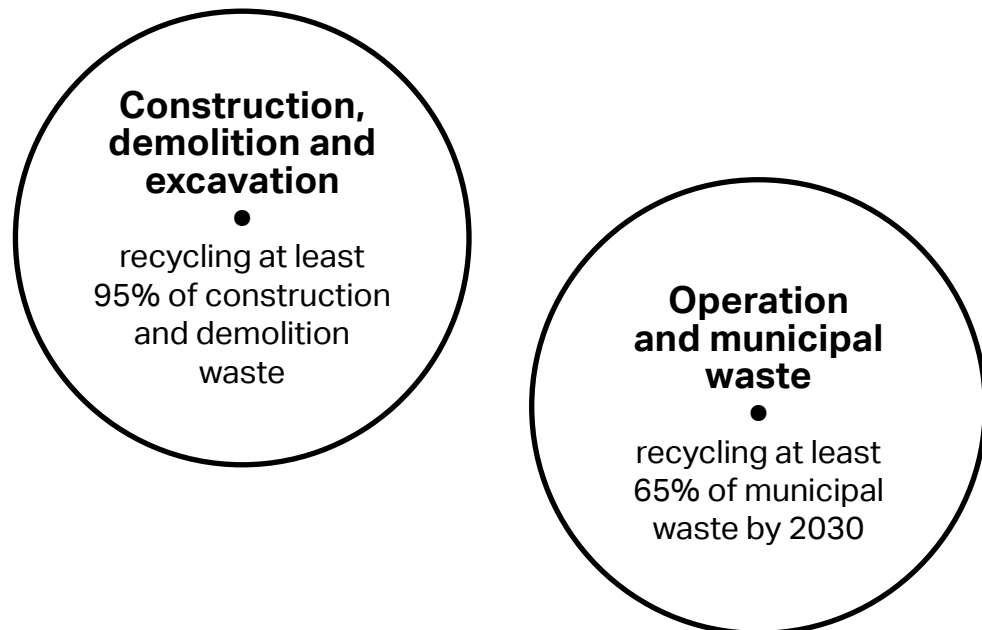


BEST PRACTICE FOR LONDON

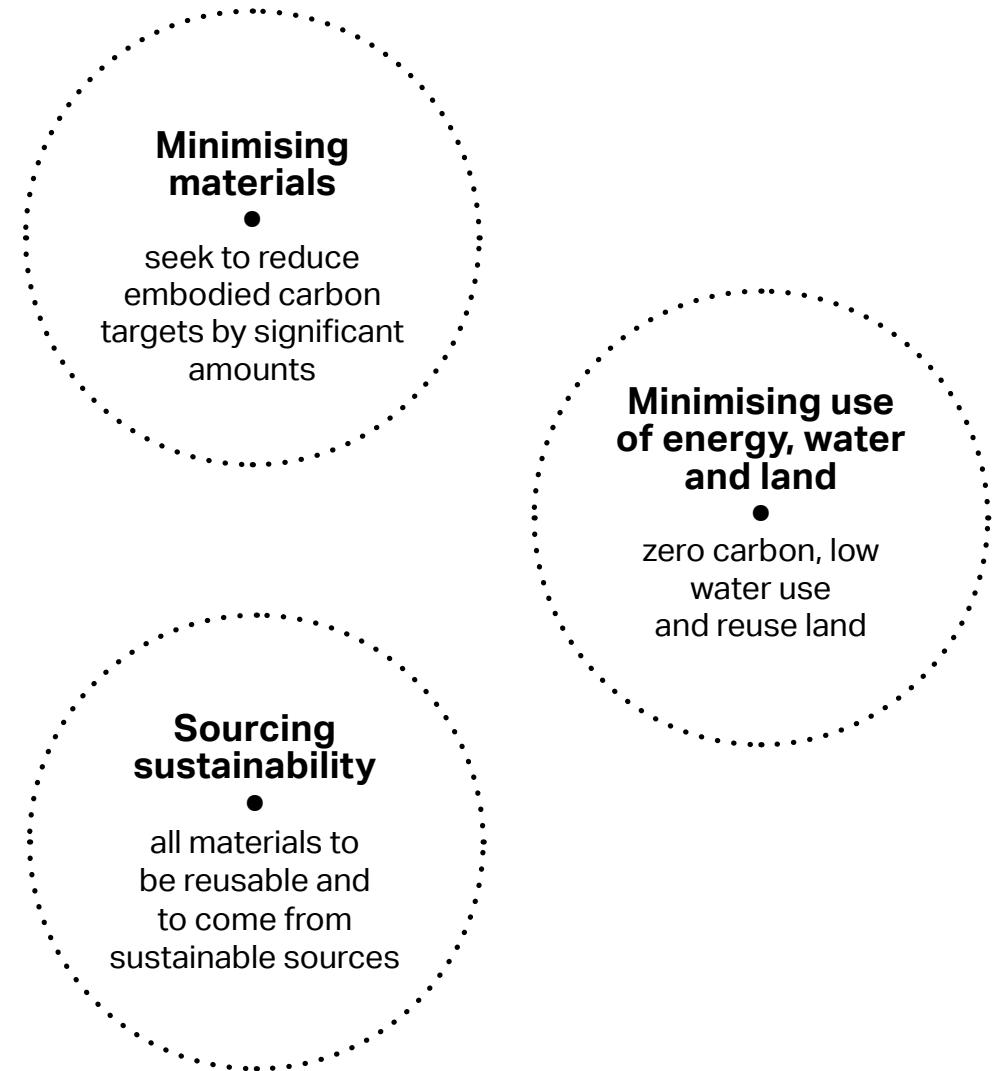
Design to eliminate waste and for ease of maintenance by:



Manage waste sustainably and at the highest value during:



Conserve resources, increase efficiency and source ethically by:



7 CIRCULAR ECONOMY PRINCIPLES AND PRACTICE

PRINCIPLES

The circular economy requires new approaches to development by everyone involved in making, managing, maintaining, using and renewing our buildings and infrastructure.

'Designing with Consequence': Rethink Resource Use

Some of the key principles that a circular built environment should adopt in place of current practices include:

Current practice 01: Designing without consequence

Buildings are increasingly designed for a single purpose and with little flexibility. Space standards, building form and ownership and structural solutions often don't lend themselves to adaptation. We need to rethink development from a whole life perspective and ensure that it is built to last and respond positively to change.

Circular Response: Principle 01

Maximise the value of the building and its materials, parts and components over the whole life of the asset, including creating buildings that weather well, are designed to last, and can adapt to changing needs and conditions including climate change.

Current practice 02: Designing without consequence

We increasingly use materials, components and systems that are complex, fixed in ways that make them hard to remove without being damaged, include toxic materials that are hard to dispose of and generally make repair, reuse and safe disposal difficult.

Circular response: Principle 02

Specify and procure materials, products and components that eliminate waste and support reuse and end of life recovery.

Current practice 03: Designing without consequence

We live in an era of rapid change. Development designed to last for decades must be able to respond to technological, climate, social, cultural, demographic and economic change and yet we develop buildings and infrastructure that are less adaptable than ever before.

Circular response: Principle 03

Adopt different circular economy strategies for different projects.

Long term development needs to demonstrate how it can adapt to change; flex to meet different user needs, and be disassembled in ways that enable different parts of a building to be re-purposed without generating waste.

Some development is purposefully designed to be short lived and fulfil a temporary need. Short life development should be designed to enable easy disassembly and reuse of whole buildings, components and parts.

Current practice 04: Designing without consequence

Our Georgian and Victorian buildings including civic, housing and other stock together with the urban form and public spaces that are the legacy of many of our cities, have generally stood the test of time. They have weathered well and are easy to adapt. New buildings are often built with materials that look old prematurely, overheat, are poorly insulated, leak or fail in other ways, which undermines their long-term value. We need to relearn how to create a built environment that weathers well and stands the test of time.

Circular response: Principle 04

Specify materials to meet strategic goals (long life, adaptable, high quality, weather well, low embodied carbon, sustainable).

●

Current practice 05: Designing without consequence

The construction industry has been very good at avoiding sending waste to landfill. This is largely a response to the cost of landfill disposal due to the landfill tax.

However, it is much less good at maximising value for waste and much of the waste generated is used as fill on sites. We need to develop processes that enable materials, parts and components to be recovered for reuse or high value recycling. This requires time, support, infrastructure and adoption of new approaches to waste management that enable reuse of low value recycling.

Circular response: Principle 05

Reuse before recycling and avoid landfill and incineration.

●

Current practice 06: Designing without consequence

Procurement rules often promote competition around short-term cost not whole life value.

Circular response: Principle 06

Work with partners to enable reuse and recycling, with developers finding ways to reward innovation in circular practices and encourage their suppliers to invest in new products and services that make the circular economy achievable.

●

Current practice 07: Designing without consequence

Product suppliers are encouraged to design products that can be produced cheaply but they rarely consider the long-term implications for repair, recovery and reuse.

Circular response: Principle 07

Shift away from the current procurement and ownership model towards design, construction and maintenance systems that encourage suppliers to maintain long term ownership of their products by leasing or hiring out their products and ensuring they meet agreed performance standards.

Introduce different ownership, asset management, procurement and business models that keep products and materials circulating within the economy at their highest value for as long as possible, through re-use, recycling, re-manufacturing, delivering products as services and sharing.

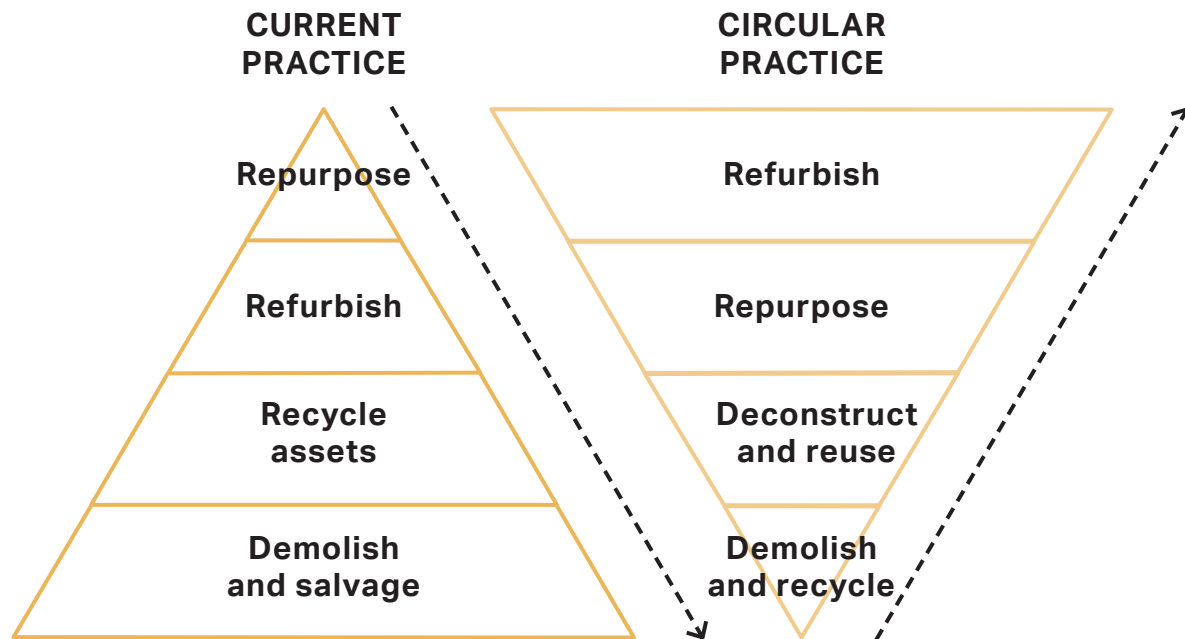
PRACTICE

Adopt the circular economy hierarchy to inform key decisions

Refurbishment and existing development

Developers and their contractors have become very good at demolishing and recycling existing buildings and assets. However, this is usually often crude and results in hard core and soils being used as fill and metals being smelted and turned into new product. In this process, buildings which could be refurbished are often demolished and valuable materials and products which could be reconditioned and reused are lost.

The Mayor therefore wants to promote an approach that encourages refurbishment of buildings wherever possible, including if necessary, through extensive re-purposing. Where this is not possible, developers should undertake a pre-demolition audit and provide sufficient time for existing buildings and assets that are identified for demolition to be carefully stripped so that materials can be recovered for reuse where possible.



Second Home Spitalfields, SelgasCano / Webb Yates
(Photography: ©Agnese Sanvito)



Examples of re-use, refurbishment and re-purpose.

- Image left: South London Gallery Fire Station - Designed by 6a
Re-purposed a fire station into an art gallery.

- Image above: Paxton House - Designed by Alma Nac
Refurbished an existing concrete frame into 43 high quality homes.

ADOPT THE CIRCULAR ECONOMY HIERARCHY TO INFORM KEY DECISIONS

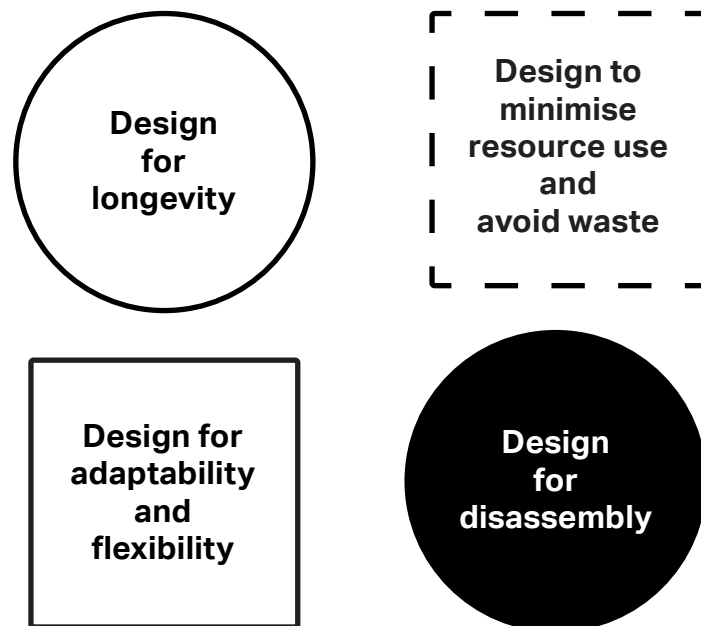
New development

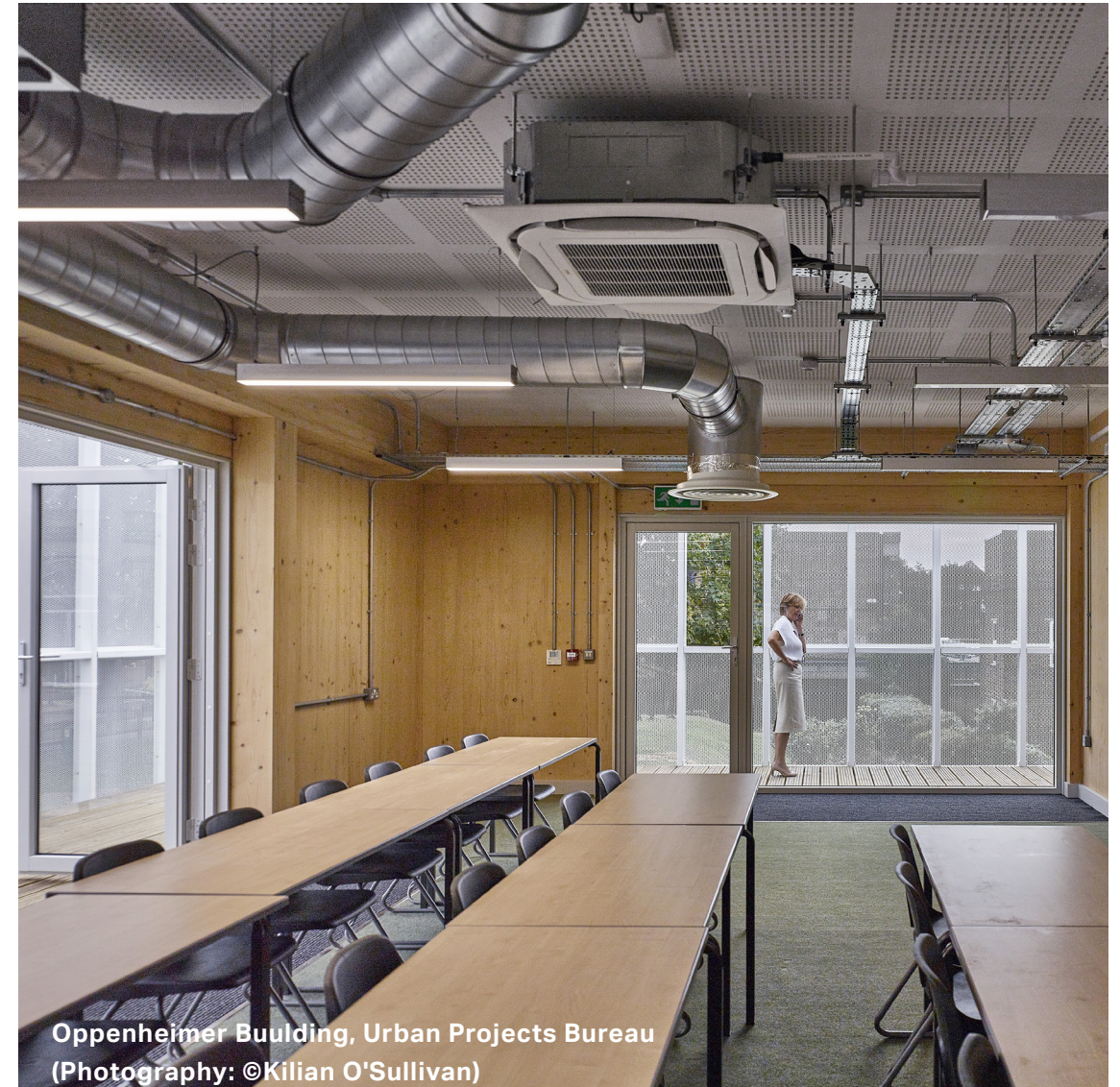
For new developments, projects should be designed to ensure they are future proofed and will last. They should demonstrate how they have been designed to weather well and minimise the need for maintenance over the long term.

They should demonstrate how they will adapt to potential changes in use and to climate change.

They should demonstrate how they can be reconfigured to enable different uses and how they allow for changing circumstances.

They should demonstrate how they will be maintained over the long term so that major renewal like façade replacements will not adversely impact on residents and how different layers of the development have been designed to be disassembled cost effectively to support recovery and reuse of the building's systems, components and parts as and when they need replacing.





Examples projects designed with circular economy principles

- Image left: Barretts Grove designed by Amin Taha
Design to minimise resource use and avoid waste

- Image above: Oppenheimer Building designed by Urban Projects Bureau
Design for adaptability and flexibility



Waterloo City Farm, Feilden Fowles
(Photography: ©Peter Cook)

Examples projects designed with circular economy principles

- Image above: Waterloo City Farm by Feilden Fowles
Design for disassembly

- Image right: Here/East designed by Hawkins Brown
Design for longevity as the building allows for multiple uses and programmes.



Here East, Hawkins\Brown / Buro Happold
(Photography: © Rory Gardiner)

8 STEP BY STEP APPROACH

Building circularity into projects is complicated. There are many different approaches a project can adopt and all of the design professions together with project managers and cost consultants can help identify solutions.

The steps below set out a very simple and practical, step-by-step approach that will help ensure circular principles are considered from the outset and embedded into the design process.

Step 01 Concept & Strategy (The brief)

Developers are encouraged to adopt circular economy principles and include these in their brief for their project team. They should encourage their design teams and construction partners to explore how circular principles can inform the concept design.

At the early stage the developer should think about the most appropriate circular strategy or strategies to adopt. The decision tree for new and existing development on pages 48-49 provides a simple guide on how to select the right strategies that should inform the design and development brief.

Design commissions should provide enough time for design teams to explore and test the best ways in practice to achieve the strategies. The strategies should be discussed and agreed with the local planning authority as part of the pre-application process.

The output from the workshop should be a clear brief for the project delivery team who should be engaged to develop practical ways to deliver the strategic goals.

This process will take time and may need additional input from the design team. The outcome should be to demonstrate how materials can be optimised and waste eliminated not just during construction but over the life of the project and how materials can be reused

beyond the life of the development. Ideally, the developer will also engage with their contractors and product supply chain to identify opportunities to create a circular development.

Step 2: Design (Long-life loose-fit)

Once the strategy is agreed and the circular economy forms part of the design brief, the second step is to look at all elements of the project. One way of doing this is to look at the different layers of the development. Different parts of a development will have a different design life and set of design requirements.

The structure will typically be designed to outlast the development and require minimum maintenance. Circular economy opportunities might include using materials with a lower embodied carbon (timber rather than concrete frame), using more recycled content in the materials and finding other ways to enhance recovery and recyclability (e.g. reinforcement free concrete).

Services including M&E will typically need to be replaced every 20 years and should therefore be designed to allow easy recovery, reconditioning and reuse whilst also optimising for performance and carbon emissions. Each part of a development will need to adopt its own specific approach.

An effective way to identify and test options is to run thematic workshops. Experience suggests if these are well facilitated, they can generate lots of ideas for integrating circular principles into a development ranging from whole building reuse strategies, to the use of secondary materials, and the leasing of building products and services.

An important aspect of this step is to engage the right people at the right time, give key people lead responsibility for different aspects of the building and if possible, go beyond the core design team and talk to contractors, suppliers, demolition and enabling works contractors and others.

DEFINITIONS OF CIRCULAR STRATEGY APPROACHES

Applying the strategic approaches in practice is challenging, as development projects are inherently complex. They last much longer than other products and services and are made up of many different parts.

The following definitions elaborate on the circular economy strategic approaches that are most suitable for different development or component types. These are not mutually exclusive, but can provide an overarching framework for teams to define the strategic approach to a given project (or part of a project). The design teams and clients should remember that all development types should be designed to facilitate disassembly with minimal waste.

Existing developments and components

- **Refurbish**

Redeveloped for similar needs and uses but meeting or exceeding current regulations and standards through restoring, refinishing and future proofing while minimising changes and avoiding replacement of any parts. Parts of historical significance are incorporated in the design and carefully preserved. Designed for longevity, adaptability or flexibility to prolong the new life of the development.

- **Re-purpose**

Redeveloped to accommodate different needs and/or uses (e.g. from industrial use to mixed use) but exceeding current regulations and standards through significant changes and replacement of shorter-life parts. Parts of historical significance are incorporated in the design and carefully preserved. Designed for longevity, adaptability or flexibility to prolong the new life of the development.

- **De-construct and reuse**

Building/infrastructure disassembled, with the entire asset being reconstructed elsewhere, or individual components directly reused elsewhere.

- **Demolish and recycle**

Traditional demolition, with elements and materials converted into new elements and materials and objects for use on the site or on another site nearby.

Long-life new developments or components (expected life over 25 years)

- **Longevity**

Tailored to well-defined, long term needs while being durable and resilient or able to cope with change with little modification/no replacement of parts due to its 'loose fit', generous proportions and readiness for alternative technologies, different ways of living or working and a changing climate.

- **Adaptability**

Designed to meet the needs of the present, but with consideration of how those needs might change in the future and designed for change in the form of periodic remodelling including alterations or replacement of non-structural parts – modifications are likely to involve planning, building control and 'wet trades'.

- **Flexibility**

Designed to balance the needs of the present with how those needs will change in the future and designed for change through frequent reconfiguring including reconfiguration of non-structural parts – configurations are likely to be pre-agreed with planning and building control and not involve 'wet trades' or any waste.

**Short-life new developments or components
(expected life under 25 years)**

- **Reusability**

Designed to be redeployed as modules or reused as a kit of parts on one or more different sites while minimising any servicing and maximising the size of the future market by using high-demand, standard dimensions and specifications.

- **Recoverability**

Designed to be deconstructed and reused or recycled on a part by part basis due to neither modules nor a kit of parts being desirable, feasible or viable and/or a limited future market as a result of unusual parts, dimensions or specifications.

To identify the appropriate strategic approach, project and design teams are encouraged to use the 'Decision Tree Flow Chart' on the following page.

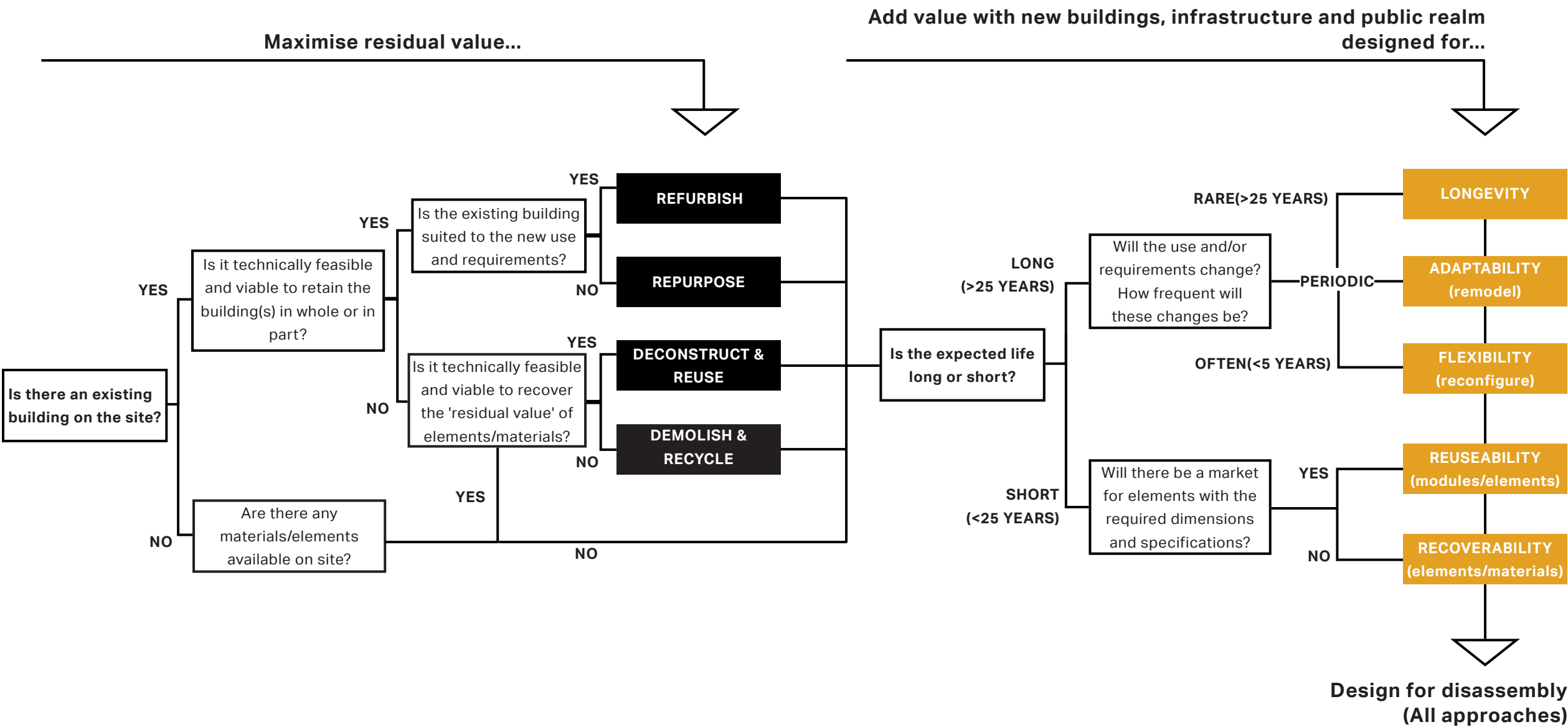


Oppenheimer Building, Graveney School, Urban Project Bureau
(Photography: © Killian O'Sullivan)

CHOOSING THE RIGHT CIRCULAR STRATEGY APPROACH

Decision tree flow chart

The decision tree is split into two strategies: one for development with existing building and one for development on a clear site.



EVERYONE IS IMPORTANT AND HAS A ROLE TO PLAY

The transition will take time and will only be accomplished through collaboration and partnerships. It will require strong leadership and engagement by the whole supply chain from the Government and Mayor of London to investors and developers, consultants, contractors, product suppliers, demolition and salvage experts.

●
The Mayor of London working with Local Authorities will help bring together the different partners and provide leadership, policy and support.

●
Investors need to consider how asset value can be retained over the long term and the whole life of their developments in ways that eliminate waste.

●
Developers need to consider how assets can be designed for longevity, adaptability, flexibility and re-usability or recoverability.

●
Designers need to consider how they can deliver long life, loose fit, low carbon buildings, design out superfluous materials, and use robust materials that wear well.

●
Contractors need to consider how they can construct buildings that support disassembly and avoid waste through the construction process.

●
Suppliers need to provide materials, products and systems that, minimise waste, can be assembled to support disassembly and retain value at the end of their life.

●
Facility managers need to ensure that disassembly and recovery are followed through during the lifetime of the building.

●
Demolition and salvage experts should be engaged at the beginning of a project to test design options and ensure they support disassembly and resource recovery.

●
Technologists are needed to develop building information modelling tools that help the industry understand what materials are in our buildings, how they have been assembled, how they can be disassembled, how they are performing and how they can be recovered for reuse at the end of their life.

●
Legislation, regulation, digital tools and incentives are needed that promote reuse and elimination of waste, and to support the establishment of a marketplace for material reuse.

●
New circular economy infrastructure and spaces are required to support recovery, reconditioning and re-purposing of materials. Investment will be required in new infrastructure to support waste processing, reuse and recycling.

●
Business models are needed that reward longevity, disassembly and material reuse.

10 GLOSSARY OF KEY TERMS

Adaptability (Design for)

Designed to meet the needs of the present, but with consideration of how those needs might change in the future and designed for change in the form of periodic remodelling including alterations or replacement of non-structural parts – modifications are likely to involve planning, building control and 'wet trades'.

Construction and demolition (C&D) waste

C&D waste arises from construction and demolition (or deconstruction) activities including smaller do-it-yourself projects within private households. Wastes may include concrete, bricks, tiles, ceramics, wood, glass, plastic, bituminous mixtures, coal tar, metals, insulation and gypsum among other materials.

Construction stuff

Any temporary installations/works/materials, packaging and equipment. (New Rules of Measurement (NRM) 0)

Excavation waste

Excavation waste is material excavated from construction sites and includes rock, sand, stones and soils uncontaminated with dangerous substances.

Flexibility (Design for)

Designed to balance the needs of the present with how those needs will change in the future and designed for change through frequent reconfiguring including reconfiguration of non-structural parts – configurations are likely to be pre-agreed with planning and building control and not involve 'wet trades' or any waste.

Longevity (Design for)

Tailored to well-defined, long term needs while being durable and resilient or able to cope with change with little modification/no replacement of parts due to its 'loose fit', generous proportions and readiness for alternative technologies, different ways of living or working and a changing climate.

Municipal waste

Municipal waste includes all household waste, street litter, waste delivered to council recycling points, municipal parks and gardens wastes, council office waste, Civic Amenity waste, and some commercial waste from shops and smaller trading estates where local authorities have waste collection agreements in place. It can also include industrial waste collected by a waste collection authority with authorisation of the waste disposal authority. Waste under the control of local authorities or agents acting on their behalf is now better known as 'Local Authority Collected Waste'

Recover

Recover is an element of material converted into a new element, material or object for use on the existing building site or on another site nearby.

Recoverability (Design for)

Designed to be deconstructed and reused or recycled on a part by part basis due to neither modules nor a kit of parts being desirable, feasible or viable and/or a limited future market as a result of unusual parts, dimensions or specifications.

Refurbish

Redeveloped for similar needs and uses but meeting or exceeding current regulations and standards through restoring, refinishing and future proofing while minimising changes and avoiding replacement of any parts. Parts of historical significance are incorporated in the design and carefully preserved. Designed for longevity, adaptability or flexibility to prolong the new life of the development.

Repurpose

Redeveloped to accommodate different needs and/or uses (e.g. from industrial use to mixed use) but exceeding current regulations and standards through with significant changes and replacement of shorter-life parts. Parts of historical significance are incorporated in the design and carefully preserved. Designed for longevity, adaptability or flexibility to prolong the new life of the development.

Reusability (Design for)

Designed to be redeployed as modules or reused as a kit of parts on one or more different sites while minimising any servicing and maximising the size of the future market by using high-demand, standard dimensions and specifications.

Services

Installations to ensure comfort, practicality, accessibility and safety. (NRM 5)

Shell/Skin

The layer keeping out water, wind, heat, cold, direct sunlight and noise. (NRM 2.3, 2.5, 2.6 - roofs, external walls, windows and external doors)

Site

The geographical setting, urban location and external works. (NRM 8)

Space

The layout, internal walls, ceilings, floors, finishes, doors, fitted furniture. (NRM 2.7, 2.8 and NRM 3)

Stuff

Anything that would fall if the building was turned upside down!

Substructure

Excavations, foundations, basements and ground floors. (NRM 1)

Superstructure

Load-bearing elements above plinth including roof supporting structure. (NRM 2.1, 2.2 and 2.4 - frame, upper floors, stairs and ramps)

WASTE MANAGEMENT DEFINITIONS**Backfilling**

Backfilling is any recovery operation of suitable non-hazardous waste for the purposes of reclamation in excavated areas or for engineering purposes in landscaping and quantity of waste used for backfilling should be limited to the amount strictly necessary to achieve those purposes.

Composting

Composting refers to the aerobic decomposition of bio-waste in a way that fulfils a high level of environment protection and results in output which meets relevant high-quality standards.

Downcycling

Downcycling is the opposite of upcycling and the transformation of products and materials into lower quality and/or lower value products and materials.

Recover

Recover refers to forms of recovery other than energy recovery and other than the reprocessing of waste into materials used as fuels or other means to generate energy. It includes preparing for re-use, recycling and backfilling and other forms of material recovery such as the reprocessing of waste into secondary raw materials for engineering purposes in construction of roads or other infrastructure.

Depending on the specific factual circumstances, such reprocessing can fulfil the definition of recycling if the use of materials is based on proper quality control and meets all relevant standards, norms, specifications and environmental and health protection requirements for the specific use.

Recycle

Recycle refers to the conversion of waste into new materials and products by remanufacturing in ways that reduce demands for extracting raw materials from the natural environment. EU Directive 2018/851 provides further guidance on what qualifies as recycling as follows:

- Waste converted into secondary raw materials for engineering purposes in construction of roads or other infrastructure can fulfil the definition of recycling if the use of materials is based on proper quality control and meets all relevant standards, norms, specifications and environmental and health protection requirements for the specific use.
- Waste that enters aerobic or anaerobic treatment can be counted as recycled provided that such treatment generates output which is to be used as a recycled product, material or substance.
- Waste ceasing to be waste as a result of a preparatory operation before being actually remanufactured (or reprocessed) can be counted as recycled provided that it is destined for subsequent reprocessing into products, materials or substances for either the original or other purposes.
- Waste to be used as fuels or other means to generate energy, which are backfilled or disposed of, or which are to be used in any operation that has the same purpose as recovery of waste other than preparing for reuse and recycling, should not be counted as recycled.

Reduce

Reduce refers to the design, manufacture and use of products that use materials and other resources efficiently and effectively with consideration of waste throughout the entire life cycle including their suitability for reuse or recycling (with minimal reprocessing or remanufacturing).

Remanufacturing

Remanufacturing is to make a new or different product and is more closely associated with recycling than reuse.

Reprocessing

Reprocessing is a general term for treatment of materials to make them reusable. Note that reprocessing is frequently used interchangeably with remanufacturing but should be used to describe less labour and energy intensive routes back to market.

Reuse

Reuse is the use of a product in its original form with minimal reprocessing, that was originally destined for waste or recycling.

Upcycling

Upcycling is to transform products and materials into higher quality and/or higher value products and materials. Upcycling requires proper quality control and compliance with environmental and health protection requirements, standards, norms and specifications for the specific intended use.

11 OTHER USEFUL REFERENCES

'Designing for Circularity Primer' is an introduction to the circular economy from the perspective of the built environment sector. Below are references to other organisation's reports and documents that can provide further detail about the circular economy.

•

**'Circular economy guidance for construction clients',
UKGBC, April 2019**

**'Circular Economy in Cities: Project Guide',
Ellen Macarthur Foundation, March 2019**

**'London Environment Strategy',
Greater London Authority, May 2018**

**'London's circular economy route map',
LWARB, June 2017**

**'Building Revolutions: Applying the Circular Economy to
the Built Environment'
David Cheshire, April 2016**

**'Towards a circular economy - context and opportunities',
LWARB, December 2015**

**'Towards a Circular Economy: Business rationale for an
accelerated transition',
Ellen Macarthur Foundation, December 2015**

**Opalis Directory by Rotor DC
<https://opalis.co.uk/en>**

**Institute of Making by UCL
<https://www.instituteofmaking.org.uk>**



Orsman Road, Waugh Thistleton
(Photography: Tim Crocker)

ABOUT GOOD GROWTH BY DESIGN

Good Growth by Design

The Mayor's Good Growth by Design programme seeks to enhance the design of the built environment to create a city that works for all Londoners. This means development and growth should benefit everyone who lives here. As such, it should be sensitive to the local context, environmentally sustainable, and physically accessible.

The programme calls on all involved in London's growing architectural, design and built environment professions to help realise the Mayor's vision.

Good Growth by Design uses the skills of both the Mayor's Design Advocates and the wider sector. This includes teams here at City Hall, the London Boroughs and other public bodies.

The programme has six pillars:

SETTING STANDARDS

Using design inquiries to investigate key issues for architecture, urban design and place-shaping, in order to set clear policies and standards.

APPLYING STANDARDS

Ensuring effective design review and scrutiny across London, including establishing a London Review Panel.

BUILDING CAPACITY

Enhancing the GLA Group's and boroughs' ability to shape new development to deliver good growth.

SUPPORTING DIVERSITY

Working towards a more representative sector and striving for best practice while designing for diversity.

COMMISSIONING QUALITY

Ensuring excellence in how the Mayor and other public sector clients appoint and manage architects and other built environment professionals.

CHAMPIONING GOOD GROWTH

Advocating best practice to support success across the sector.

The Mayor's Design Advocates

The Mayor's Design Advocates are 50 built environment professionals. They were chosen for their skill and experience to help the Mayor support London's growth through the Good Growth by Design programme. They are independent and impartial, and provide support, advice, critique and expertise on London's built environment. The group includes practitioners, academics, policy makers and those from community-led schemes. Fifty per cent of the advocates are women, and one in four are from a BAME background.

Setting Standards: Circular Economy

The Mayor's Design Advocates and City Hall's Regeneration and Economic Development, Environment and Planning teams have been developing research related to the circular economy in response to policy SI7 in the draft London Plan. This work has been led by the Circular Economy Sounding Board with support from sustainability consultants Useful Projects. This document shows the Mayor's commitment and leadership, with London leading the way in the transition to a circular economy. It is a call to action for the built environment sector and construction industry to join him by applying new design approaches to projects, supporting the Mayor's aim of making London a sustainable and inclusive city for all Londoners.

ABOUT GOOD GROWTH

Good growth...

- Means building a more inclusive city and an inviting place to live, work and visit. This will help improve the health and well-being for all Londoners.

- Plans for a balanced mix of young and old, of people from different cultures and backgrounds, of housing tenures and workplaces.

- Supports and enriches a city's public and civic spaces along with the streets and routes that connect them. It takes a contextual approach. This allows for vitality and change whilst sustaining and strengthening the character of London's existing neighbourhoods.

- Allows Londoners to benefit from living actively. It uses the 'Healthy Streets' approach to reduce car dependency and enable people to walk, cycle and use public transport instead.

- Helps the city to work more efficiently by reducing car dominance. This helps make the best use of public space and ensures that essential freight traffic can help London's businesses to thrive.

- Prioritises high-density, mixed-use developments to create a compact city in which communities are well connected. It means people do not have to depend on cars to get around and ensures the best use is made of scarce land.

- Is a partnership between the public and private sector. It takes a long-term approach to investment to yield the wider benefits of change.

- Ensures that London remains resilient to our changing climate and is green and healthy. It means clean air, easy access to green space, more efficient buildings supplied by cleaner energy, and a move towards zero emission transport.

- Enables everyone to fulfil their potential, by providing inclusive access to transport and other public services. It ensures that all communities see the benefits of growth and enables broader public participation in how the city changes.



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www.london.gov.uk/what-we-do/regeneration/advice-and-guidance/about-good-growth-design

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A BUILT ENVIRONMENT FOR ALL LONDONERS

MAYOR OF LONDON

**DESIGN
FOR A
CIRCULAR
ECONOMY**

PRIMER

GOOD GROWTH BY DESIGN