CIRCULAR ECONOMY, ENABLING THE TRANSITION TOWARDS **NET-ZERO**

HOW GLASGOW BUSINESSES CAN KEEP THE WORLD UNDER 1.5 DEGREES OF WARMING

Glasgow Chamber of Commerce | Circular Glasgow

Zero Waste Scotland

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EUROPE & SCOTLAND
European Regional Development Fund
Investing in a Smart, Sustainable and Inclusive Future

Circle Economy

COLOPHON

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As an impact organisation, Circle Economy connects and empowers a global community to create the conditions for systemic transformation. With nature as a mentor, Circle Economy works alongside businesses, cities and governments to identify opportunities to make the transition to the circular economy and provides a powerful combination of practical and scalable solutions to turn these opportunities into reality.

www.circle-economy.com

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Circular Glasgow is an initiative of Glasgow Chamber of Commerce. The project was set up with a vision for Glasgow to be positioned as one of the world's first circular cities, planning and implementing a strategy to encourage the city and its businesses to work towards greater circularity. Circular Glasgow delivers a business engagement programme in partnership with Zero Waste Scotland, Glasgow City Council and Circle Economy.

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GLOSSARY OF TERMS

NET-ZERO CARBON

Concept of a state in which human activities result in no net effect on the climate system. Achieving such a state would require balancing of residual emissions with emission (carbon dioxide) removal as well as accounting for regional or local effects of human activities that, for example, affect the local climate.

CARBON EMISSIONS

Carbon emissions relate to the greenhouse gases that are emitted and are expressed in terms of their equivalent warming potential to carbon dioxide (carbon dioxide equivalents (CO_2eq.)).

CONSUMPTION-BASED EMISSIONS

Consumption-based emissions are allocated to the consumers or users of goods or services. They incorporate the lifecycle greenhouse gas emissions of products and services that are consumed, as well as the emissions associated with waste management activities. These emissions may occur both within and outside a given territory and are allocated to the final consumers or users, rather than the producers of those emissions.

GREENHOUSE GAS EMISSIONS

Greenhouse gases are gases which allow direct sunlight to reach the Earth's surface unimpeded. They allow less heat to escape back to space, and 'trap' it in the lower atmosphere. Many greenhouse gases occur naturally in the atmosphere, such as carbon dioxide, methane, water vapor, and nitrous oxide, while others are synthetic.

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INTRODUCTION

Cities consume 75% of global natural resources, are responsible for more than 70% of greenhouse gas (GHG) emissions and generate two thirds of all waste in the world. But with more than 80% of GDP generated within their boundaries[1] and with over half of the global population living in urban settlements,[2] cities are also key drivers of economic growth and (sustainable) development. Their huge influence makes them an ideal intervention point for change towards a livable and resilient future, especially as they are able to bring citizens, businesses and higher levels of government along.

Cities' role in driving GHG emissions has received more attention in recent years.[3,4] Amid the social and economic fallout caused by the covid-19 pandemic, there is growing consensus that our reliance on a take-make-waste economy and on vulnerable global supply chains has exacerbated the magnitude of both the health and the climate crises. However, public debate to date has largely focused on the way cities produce, rather than consume, goods. As a result, the potential for cities to mitigate climate change beyond their boundaries is often overlooked—a missed opportunity, especially for cities that import a large part of—if not most—of their goods. This is what we refer to as a 'consumption-based' approach to GHG emissions: looking at the emissions that are embodied in the products we consume, from the moment materials are extracted for their production, to their end of life. In doing so, we regain agency over—and take responsibility for—our share of the global GHG emissions balance.

As highlighted in the recently launched OECD report[5] developed in collaboration with Zero Waste Scotland, Glasgow Chamber of Commerce and Glasgow City Council, in recent years, Glasgow has looked to move beyond its heavy manufacturing past and post-industrial challenges towards a vision for a more sustainable, net-zero carbon future. The circular economy has been pivotal to this vision[6], thanks to the significant potential it holds for climate mitigation and resilience through rethinking and redesigning our socio-economic system, regenerating the natural world, reducing the need for virgin materials and reusing and recovering resources to avoid waste.[7]

In light of the UN Climate Change Conference (COP26) and the ongoing drive for nations, cities, and businesses to reach 'zero', Glasgow is now looking to link its circularity ambitions with its net-zero carbon targets and to empower local businesses to effectively achieve both goals.

This publication, commissioned by Glasgow Chamber of Commerce, with support from Zero Waste Scotland, aims to help Glasgow businesses understand the links between the adoption of circular strategies and business models and reaching net-zero carbon. We highlight key opportunities for businesses in five sectors—food and drink, textiles, manufacturing, events and conferences and the built environment—whereby circularity meets net-zero carbon. We also outline ways forward for Glasgow to effectively leverage and enable the identified circular opportunities for climate change mitigation—including how to safeguard positive impacts on people and the planet along the way.

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CIRCULAR ECONOMY, ENABLING THE TRANSITION TOWARDS NET-ZERO

A CIRCULAR AND NET-ZERO CARBON GLASGOW

Over the last few years, the city of Glasgow has demonstrated strong leadership in the transition to a circular, net-zero carbon economy. Since the Circle City Scan in 2016, the city went on to release a 'Circular Economy Route Map' in 2020, which establishes the city's vision for a circular future,[8] and a 'Declaration of Climate Emergency' in 2019, which highlights the city's commitment to reduce GHG emissions.[9] With bold targets to become the first circular city in Scotland by 2045 and the first net-zero carbon city in the United Kingdom by 2030, the city effectively set the stage for the local business community to integrate both decarbonisation and circular strategies at the core of their activities.

From the many Small and Medium-sized Enterprises (SMEs) to the large multinationals—these businesses will play a crucial role in reaching the city's ambitious targets. In fact, they have already risen to the challenge, thanks in part to the collaboration between Glasgow Chamber of Commerce, Zero Waste Scotland, Glasgow City Council and Circle Economy, and circular business models are starting to gain in popularity. The Circular Glasgow Network led by Glasgow Chamber of Commerce has, for example, brought together over 220 businesses from different sectors to connect and collaborate over the circular economy. Meanwhile, the Circular Economy Routemap for Glasgow, which brings together public and private key actors for the city, defines the strategic development and directions of the circular economy in Glasgow towards 2030. The latter wouldn't be possible without the will and work of local businesses, who play a crucial role in the collective shift towards more circular and sustainable practices, from waste-to-wealth collaborations in food and drink to reuse business models in the apparel and lighting sectors.[10]

The impact potential of Glasgow businesses' circular economy practices goes beyond the city's boundaries. According to recent work from Zero Waste Scotland,[11] each Scot has a material footprint of 18.4 tonnes per year, a lot of which is extracted and produced abroad, generating carbon emissions beyond Glasgow and Scotland's borders. However, the contribution the circular economy can make to achieving 'net-zero carbon' goals has only recently come to the fore as an important opportunity to tap into. This report aims to highlight how the two concepts come together, with practical recommendations to businesses as to what they can already do today. With much of the efforts to date focused on waste management (or end-of-life solutions) and the powerful role of design underutilised,[12] this report also highlights some key sectors where Glasgow can leverage its long-established design tradition to effectively reduce material use and emissions.

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THE CIRCULAR ECONOMY, DECARBONISATION AND CITIES

A circular economy aims to design out waste and pollution, keep products and materials in use and to regenerate natural systems.[13] To achieve these objectives, four strategies[14] can be used:

- **Narrow flows**—Use less: Decrease the amount of materials used in the making of a product or in the delivery of a service, for example through circular design.
- **Slow flows**—Use longer: Optimise resource use by extending the functional lifetime of goods. Durable design, materials and service loops that extend life, such as repair and remanufacturing, both contribute to slowing rates of extraction and use.
- **Regenerate flows**—Make clean: Replace fossil fuels, pollutants and toxic materials with regenerative sources to maintain and even increase value in natural ecosystems.
- **Cycle flows**—Use again: Optimise the reuse of materials or products at end-of-life. This is enhanced with improved collection and reprocessing of materials and by creating value at each stage of reuse (or 'cascading').

Beyond its positive impact on material extraction and use, the past few years have also seen mounting evidence that a circular economy can reduce GHG emissions and keep global warming below 1.5ºC.[15,16] How?

1. **By avoiding emissions**, for example by reducing the need for the production and consumption of entirely new products (Narrow, Slow) or by cutting out fossil fuels from the economy and their associated emissions (Regenerate).
2. **By creating 'carbon sinks'** (natural environments that are able to absorb carbon dioxide from the atmosphere), for example by regenerating soils or through sustainable wood-based construction (Regenerate).

Under the right circumstances, the circular economy could slash global emissions by 39% by 2032.[17] To reap this benefit and ensure a net positive impact, it is important to highlight that a systems perspective is crucial in pursuing circular strategies. Evaluating strategies in the specific context they are applied to, for example, will help clarify their consequences not only in terms of circularity and emissions, but also on other social and environmental dimensions.

Meanwhile, cities are increasingly recognised as key enablers in the fight against climate change, thanks to their intensive consumption habits as well as their power to foster actionable change.[18,19] Indeed, through the products they choose to consume and offer—such as food, clothing, cars and phones—urban residents and businesses dictate much of the emissions generated beyond a city's borders ('consumption-based' emissions, see Box 1). Glasgow and the local business community are no exception and together, this unique position allows them to drive significant positive change globally.

The next chapters explore practical ways businesses can innovate and take advantage of circular economy practices in their race to net-zero.

CONSUMPTION-BASED VS. PRODUCTION-BASED EMISSIONS—WHAT'S THE DIFFERENCE AND WHAT IS THE IMPACT ON BUSINESS?

Consumption-based emissions refer to the full set of GHG emissions associated with a product's lifecycle. In emissions accounting, these are 'allocated' to the final consumers rather than the original producers of those emissions. This has implications for both cities and businesses: if a shirt is sold, worn and discarded in Glasgow, for example, the end consumer—Glasgow— is then responsible for its total carbon footprint, from the cotton grown in Bangladesh to make it, to its transport emissions, all the way to the landfill it may end in. For businesses, this relates to extended producer responsibility, whereby businesses are responsible for their upstream supply chains, as well as to what happens to the goods they sell, beyond the point of sale. We use this consumption-based approach to highlight the powerful role—and responsibility—that players close to the point of consumption have over emissions.

3

CIRCULAR ECONOMY, ENABLING THE TRANSITION TOWARDS NET-ZERO

CIRCULAR OPPORTUNITIES TO REDUCE CARBON EMISSIONS IN GLASGOW

In this chapter, we highlight key circular opportunities for each of the food and drink, textiles, manufacturing, construction and events and conferences sectors—five sectors that relate to key circular economy priorities for Glasgow and Scotland and that make significant contributions to the city's economy and jobs.

For each, we first paint a picture of emissions along the global value chain to build a better understanding of how the carbon footprint of products consumed in Glasgow expands along the way. This global perspective aims to highlight the role that local action—such as reducing food waste—can have on reducing emissions earlier in the supply chain, often across the world.

We then outline key ways businesses in the sector can utilise circular economy strategies to reduce global emissions and profile one of these, highlighting key issues it aims to address and offering practical examples from companies around the world. The circular strategies we investigate further in this chapter show the most promise from a feasibility,[20] circularity and emissions reduction potential perspective (more details can be found in section five).

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3.1 Food and drink

Global emissions at a glance

Globally, the food system is responsible for a third of all emissions.[21] Of those, over 44% relate to emissions within the farm—for example, methane emissions from the process through which animals digest food. 26.55% relate to energy use in supply chains—including fertilisers and equipment manufacturing, industrial food processing, packaging, refrigeration and retail. 20% relate to land-use change—the conversion of forests and other natural ecosystems for agricultural purposes. Finally, 6% relate to the transport and provision of food and 3% to the disposal of food waste.

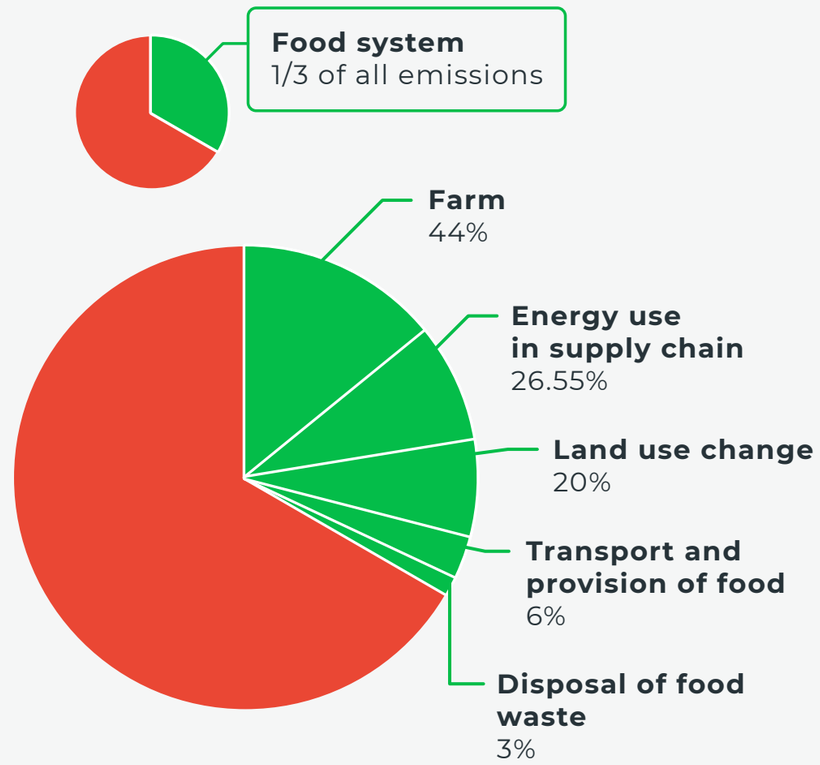
Circular strategies for the food and drinks sector

Opportunities for food and drink organisations to reduce emissions abound. Beyond sourcing food from—or, in the case of producers, shifting to—local, circular and regenerative[22] agriculture practices, food and drink companies can also design and market food products and menus in line with planetary health diets,[23] eliminate single-use packaging and reduce food losses and waste. By reducing pressure on land and resources, promoting shorter food miles and regenerating soils, these strategies can allow significant emissions reductions.[24] In many cases, these also present opportunities to realise clear financial gains and material savings.[25]

What can Glasgow businesses do?

Given the significant contribution of food systems to global emissions, it is particularly crucial to ensure that we only produce the food that we actually need and to prevent food from landing in the bin. In addition, reducing food losses and waste is increasingly recognised as a business opportunity, thanks to its cost saving potential[26,27] and to the fact that many of the technologies and knowledge to support food loss and waste reduction are already widely available—including in Glasgow. The next section therefore dives into practical solutions for food and drink businesses to ensure food never becomes waste.

The carbon footprint of global food systems



Source: Tubiello et al. (2021). Greenhouse gas emissions from food systems: building the evidence base. Environmental Research Letter, 16(6), 1-14. doi:10.1088/1748-9326/ac018e

CIRCULAR OPPORTUNITIES TO REDUCE CARBON EMISSIONS IN GLASGOW

SPOTLIGHT: REDUCING FOOD LOSSES AND WASTE

The potential

An estimated 990,000 tonnes of food and drink is wasted in Scotland every year. Households contribute 60% of this, while food and drink manufacturers contribute another quarter, and other sectors—including food service—account for the rest.[28,29] Although they do not contribute the lion's share of food waste, food service and hospitality companies alone discard 106 million meals every year—roughly one out of every six meals served. Meanwhile, one in three children in Glasgow live in poverty—38,000 children in the city—and one in ten people report experiencing at least one event indicating food insecurity.[30] Beyond the ethical implications of food waste, food waste is estimated to cost the Scottish hospitality industry approximately £212 million annually.[31]

How can reducing food waste help with emissions reduction?

Simply put, by only growing what we need, we avoid unnecessary emissions along the way. Project Drawdown—a team of more than 200 climate change scholars, scientists, policymakers, business leaders and activists—ranks it as the top solution available to us today to tackle climate change and keep us on track to keep global warming under 2 degrees since pre-industrial times.[32] This action is all the more powerful as anyone can start reducing food waste without waiting on other actors in the supply chain to change their habits first.

What is already being done in Glasgow?

Businesses in Glasgow have already made great strides in embracing food waste reduction—the most vibrant and recent example of which is the Plate up for Glasgow initiative, which has seen over 40 venues engage with different food waste reduction strategies. From a policy perspective, the Scottish Government has also expressed the ambition to reduce all food waste by 33% by 2025[33] and Waste Regulations require all food businesses generating more than five kilogrammes of waste in non-rural areas to recycle their food waste.[34]

CASE STUDY: THE SHIP INN[35]

The challenge

In the UK, 6.4 Mt of food produced is lost or wasted, contributing 8-10% of the UK's food systems emissions—over £19 billion a year worth of food and enough to feed the entire UK population three meals a day over three months.[36] Food service providers (together with hospitality) contribute 6–10% of this waste[37]. Fortunately—and as we will see here—restaurants are well positioned to take action on their food waste.

The Ship Inn, near Barrow in Furness, Cumbria, is no exception. The Inn was throwing away as much as 2.8 tonnes of food every year. Taking into account all associated costs (for example, energy for cooking and storage, staff time, water and waste disposal), the pub was estimated to spend £6,040 on food waste alone. To reduce their costs, the Inn started a project to separate, measure and prevent food waste.

Reduction of food loss and waste through prevention, planning, raising awareness and monitoring

The Inn monitored food waste by separating it into three bins, depending on the cause of waste: 'spoilage', 'prep' or 'plate waste'. The kitchen and front of house staff were briefed and trained early on so that the bins were weighed and emptied at the end of each night. These numbers were then entered into the Food Waste Calculator, which covers a four week measurement period and works out how much waste is in each category as well as the annualised cost and the difference between the first and four weeks of measurement.

Impact

Between week one and week four, the total amount of waste reduced by 72% with an estimated annual saving of £2,454:

- Spoilage reduced by 84% as waste awareness among kitchen staff was increased and working practices improved as a result.
- Prep waste was down 80%, mainly as a result of switching to pre-prepared vegetables and pre-cut chips.
- Plate waste was reduced by 67% by offering smaller portion sizes, particularly chips and putting out smaller portions of sauce. The kitchen also stopped putting garnishes on sandwiches, burgers and other meals. The changes have gone down well with customers who are happy to have lighter options.

CIRCULAR OPPORTUNITIES TO REDUCE CARBON EMISSIONS IN GLASGOW

SOLUTIONS TODAY

So, how can food and drink businesses in Glasgow use the circular economy to reduce costs, generate new revenue by creating value from food surplus and therefore reduce their impact on global emissions?

Table 1 outlines example strategies that Glasgow businesses in food and drink can choose to prevent, redistribute or recycle their food waste.

Table 1: Example strategies for stakeholders in the food and drink industry to reduce food waste

COMPANIES	EXAMPLE STRATEGIES	TYPE	EXAMPLE COMPANIES
Food producers	Package and distribute surplus, off-grade, near-expiration or imperfect produce via alternative sales channels or directly to consumers	**Slow**	Farms can sell their 'ugly' produce directly to Bella Dentro, which resells it at an affordable price.
	Allow the gleaning of leftover product from fields after the initial commercial harvest that would be otherwise inefficient or uneconomical to harvest	**Narrow**	The Gleaning Network connects local farmers and communities to harvest surplus produce
Food manufacturers	Work together with retailers and governments on standardising food expiration date labels to prevent unnecessary food waste at the consumer level	**Narrow**	Food producers and retailers commit to simplify food date labels worldwide
	Find high value utilisations for byproducts	**Slow**	The Barilla Group hosts an innovation challenge to valorise its side streams
Retailers	Decrease food transit times by sourcing from (more) local suppliers	**Narrow**	The Landmarkt supermarket offers fresh, local produce
	Reduce amount of unsold food through dynamic discounting	**Narrow**	Albert Heijn uses AI analytics for dynamic discounting
Food service providers	Measure and monitor food waste levels, for example using smart bins	**Narrow**	IKEA uses AI-powered bins to reduce food waste
	Discount unsold food at the end of the day and make it accessible via alternative sales channels such as mobile applications	**Slow**	Too Good to Go helps restaurants sell surplus food at the end of the day
	On-site composting	**Cycle**	The Circl venue composts its food waste in a worm hotel

CIRCULAR OPPORTUNITIES TO REDUCE CARBON EMISSIONS IN GLASGOW

3.2 Construction and built environment

Global emissions at a glance

Beyond its vast material footprint, the built environment is responsible for approximately 38%[38] of global emissions. Here, two main phases in construction come to the fore: the manufacturing of building materials such as steel, cement and glass—which accounts for a quarter of construction-related emissions—and the use phase of buildings, which accounts for the majority of the rest.

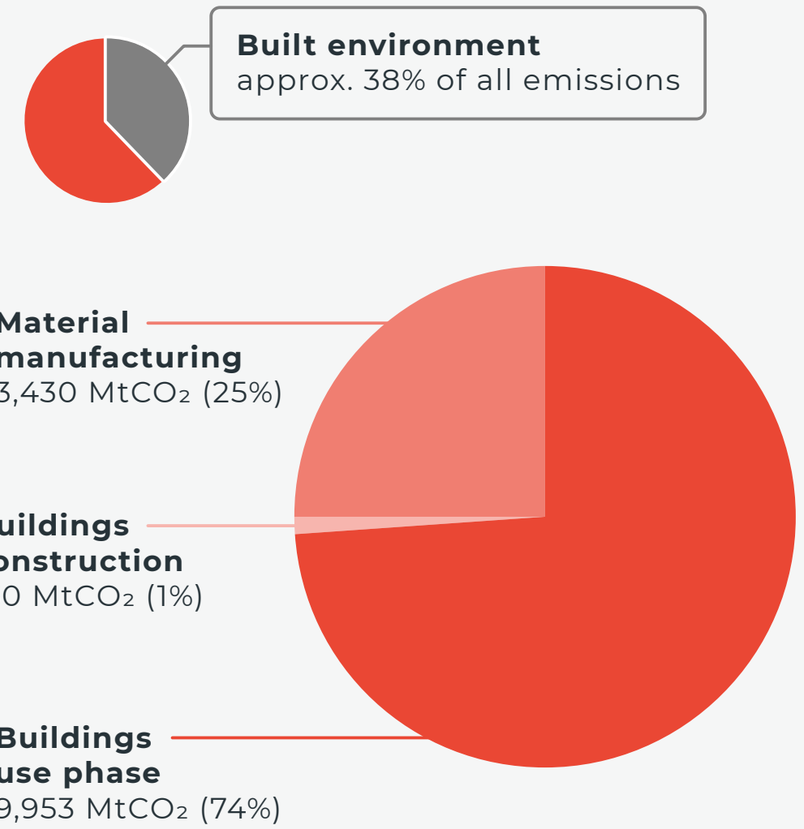
Circular strategies for the construction sector

To decrease the material and carbon footprint of construction, we identified three main areas of improvement. For new buildings, the adoption of circular design principles that minimise waste, optimise buildings for energy efficiency and for usage, combined with incorporating materials and components that are regenerative (such as cross-laminated timber (CLT)), recycled (such as circular aggregates) or reused are key. For existing buildings, maximising their utilisation, improving their energy efficiency and preventing their demolition through adaptive reuse, circular refurbishment and retrofitting should be prioritised. Finally, looking beyond individual buildings, collaborating with different levels of government on the development of self-sufficient neighbourhoods, circular construction and demolition criteria or green infrastructure—such as rainwater harvesting systems or green roofs—also present important opportunities both for material use reduction and to reach net-zero emissions.

What can Glasgow businesses do?

Given the impact of the design stage on energy use as well as the type and amount of materials used—which, as we have seen earlier, are responsible for nearly all of a building's footprint—and given the costs saving opportunities that circular design offers—modular construction techniques, for example, can reduce total construction costs by 30 to 60 percent.[39] The next section will explore in further detail what circular design strategies can do to help reduce both the construction sector's material and carbon footprints. While circular design may prove most effective at the onset of a new build project, it is also highly relevant to retrofitting projects, a key priority in Glasgow.

The carbon footprint of the built environment globally



Source: UNEP. (2020). Global status report for buildings and construction: Towards a zero-emission, efficient and resilient buildings and construction sector. (pp.1-80, Rep.). Nairobi.

Retrieved from: UNEP website

CIRCULAR OPPORTUNITIES TO REDUCE CARBON EMISSIONS IN GLASGOW

SPOTLIGHT: ADOPT CIRCULAR DESIGN PRINCIPLES

The potential

Construction accounts for about 50% of all waste in Scotland[40]—the equivalent of 7.4 million tonnes of waste every year—and represents the largest source of waste in Scotland.[41]

How can circular construction design help with emissions?

Whether through resource-efficient design strategies or through designing for deconstruction and reuse, circular design strategies allow us to minimise the extraction and use of new material inputs and therefore help to reduce emissions from the manufacturing of these construction materials. Passive design strategies can also reduce the need for energy use during the use phase of the buildings, combined with building retrofitting that can profitably reduce energy consumption by 20-40%[42], while offsite construction, especially when paired with building with wood[43]—makes for quicker build phases and minimises emissions from the construction process, for example by reducing the need for transport activities.

What is already being done in Glasgow?

Glasgow became the first local authority in the UK to adopt a council-wide minimum requirement for recycled content in building works in 2005.[44] Because of the nature of recycling in the construction industry today, however—which largely refers to downcycling—design is increasingly being recognised as a key driver for improved retrofitting, reuse and recycling practices. It is a key focus area of Zero Waste Scotland's Circular Construction Industry Support Programme[45] as well as a clear value driver in Scotland's circular economy strategy.[46] In addition, innovations are being developed in the Innovation School at Glasgow's Kelvinside Academy and at the Construction Scotland Innovation Centre and the city council plans to develop a clear circular strategy for all construction projects, with a commitment to 'never demolish' under consideration.[47].

CASE STUDY: KENOTEQ

The challenge

Modern construction techniques often exploit raw materials that are amongst the largest contributors to carbon emissions. The built environment currently contributes some 40% of the UK's carbon emissions and it is estimated that the construction sector contributes up to 11% of global carbon emissions.[48]

Currently, up to 85% of bricks used in Scotland are imported from England or Europe,[49] largely due to shortages in domestic supply—a strategy that leaves Scotland vulnerable to linear, supply chain risks in the long-term.[50] These shortages, combined with legislation-led waste reduction, during government-mandated growth in new housing led to the foundation of Kenoteq.

Design for construction waste reduction and emissions cuts

The K-Briq is a more sustainable building brick that is unfired and made of at least 90% construction waste, launched by Scottish startup Kenoteq. The K-Briq looks like a normal brick, weighs the same and behaves like a clay brick, but offers better insulation properties. To make it, construction and demolition waste including bricks, gravel, sand and plasterboard is crushed and mixed with water and a binder. The bricks are then pressed in customised molds. Tinted with recycled pigments, they can be made in any color. The low-carbon production process does not require high temperature firing, virgin cement or high volumes of clay for its production. The company is also producing its bricks in Edinburgh, thus minimising the amount of transport required in the process.

Impact

K-Briq generates less than a tenth of the carbon emissions in its manufacture than a regular brick. In addition, its production uses only 1 kWh of energy, compared to 11kWh for a regular brick[51]. Usually, producing clay bricks generates 10kg of waste per tonne of production. The K-Briq not only does not generate waste at all, but it is made of at least 90% of construction waste[52]. As well as saving energy in the manufacturing process, Kenoteq cuts emissions from transportation by producing the bricks locally. By scaling production, Kenoteq expects to enable the construction industry to deliver the equivalent of 924 low carbon homes over a five-year period.[53]

CIRCULAR OPPORTUNITIES TO REDUCE CARBON EMISSIONS IN GLASGOW

SOLUTIONS TODAY

Table 2 provides a combination of example strategies of circular design that architects and designers can incorporate, as well as recommendations for other actors in the value chain to push the adoption of circular design in construction

Table 2: Example strategies and recommendations to push the adoption of circular design strategies in construction

COMPANIES	EXAMPLE STRATEGIES	TYPE	EXAMPLE COMPANIES
Contractors	Incorporate circular design specifications in new project briefs	**All**	Oslo's municipal building tender criteria on environmental performance
	Use public procurement to stimulate further adoption of circular economy practices in buildings and infrastructure	**All**	Closed loop town hall construction in a Dutch city
Developers, architects, advisers and engineers	Embrace modularity and offsite prefabrication to minimise waste	**Narrow**	Meka Modular: Modular housing and workspaces
	Design buildings for minimal energy use through passive design strategies, green and cool roofs or better insulation	**Narrow**	Boyen Street: Zero-emission, passive design apartments
	Design for minimal waste production	**Narrow**	Bam: Driving down construction waste through supply chain collaboration
	Design for deconstruction and reuse so that components and whole buildings can serve the same or different purposes in multiple lifecycles	**Slow**	The Green House: A pavillion that can be fully disassembled
	Design components and buildings to resist damage and wear and to serve a long and useful life	**Slow**	Heijmans: Self-healing asphalt
Industry partners (suppliers and vendors, building companies, facility managers, deconstruction and demolition companies)	Engage in cross-industry collaboration and sector networks to exchange information, experiences and best practice on circular design	**All**	BauKarussell: public-private consortium for recovery-oriented demolition
	Push for greater collaboration across construction project lifecycles to ensure circular design criteria can be taken on board in a cost-effective way	**All**	Chandos' Integrated Project Delivery model (IPD): a collaborative model to (circular) construction project delivery

CIRCULAR OPPORTUNITIES TO REDUCE CARBON EMISSIONS IN GLASGOW

3.3 Events and conferences

Global emissions at a glance

The carbon footprint of events and conferences lies at the intersection of the different sectors and value chains they bring together: from travel and food and drink to energy, venues and accommodations. The highly localised and varied nature of events means there is a lot of variability in terms of their carbon footprints, but some studies point to travel—especially air travel—as one of the main culprits when it comes to an event's carbon footprint, followed by energy use in venues and guest accommodations and, to a lesser extent, food and drink consumption.[54, 55]

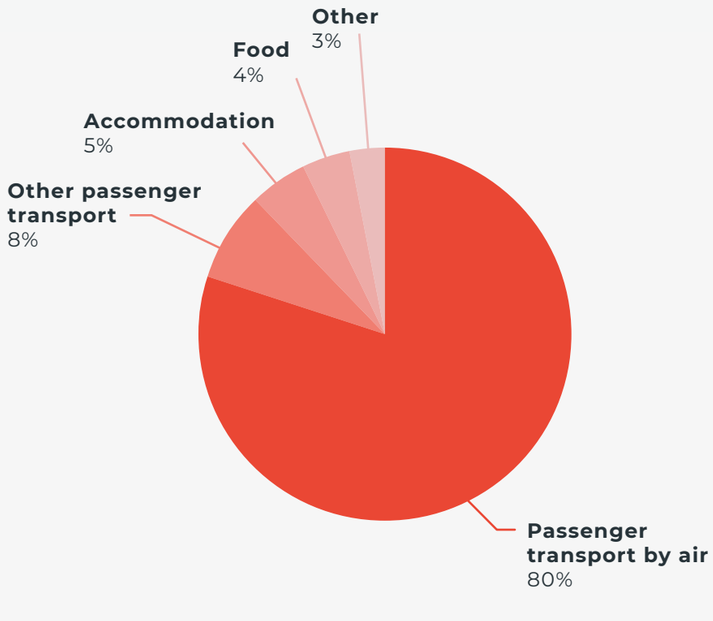
Circular strategies for the events and conferences sector

There are many strategies available to event organisers to minimise their carbon and material footprints, from reducing food waste and eliminating single-use packaging, to embracing digitalisation and promoting shared or non-motorised modes of transport to the events so as to reduce the air miles they are responsible for. Food and drink companies can look to Chapter 3.1 for guidance, while event organisers can also find inspiration in Chapter 3.2 in terms of prioritising energy-efficient venues and accommodations for guests. Beyond minimising their own energy and material use, however, events also present larger opportunities to scale up change.

What can Glasgow businesses do?

Considering the crucial role they play in bringing people together and fostering a sense of community and belonging, here, we rather look at events and conferences as living labs: opportunities for experimentation and innovation that could benefit the city as a whole. For instance, a large event could be a unique setting to pilot sustainable food and closed loop innovations and business models, which, if successful, could be scaled up city-, country- or worldwide.

The carbon footprint of international conferences



Source: UNEP. (2020). Global status report for buildings and construction: Towards a zero-emission, efficient and resilient buildings and construction sector. (pp.1-80, Rep.). Nairobi.

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CIRCULAR OPPORTUNITIES TO REDUCE CARBON EMISSIONS IN GLASGOW

SPOTLIGHT: USING EVENTS AS LIVING LABS FOR FUTURE CITY-WIDE INNOVATIONS

The potential

Events can often act as 'micro-societies', limited in time and space and sometimes subject to more relaxed laws and regulations. This makes them perfect testing grounds for innovations that can then potentially be scaled up city-wide.[56] For a city like Glasgow, the first UNESCO City of Music since 2008, host to the second most popular venue after Madison Square Garden (Scottish Events Campus)[57], with a capacity to host more conferences than all six Scottish cities combined and with over three million attendees recorded at high profile events within the city—from festivals and concerts to football matches and conferences in 2017 alone[58]— this is an incredible opportunity to accelerate change.

How can using events as living labs help with emissions?

Circular innovations may have different impacts on an event's carbon footprint, but they serve a crucial driving role. Indeed, demonstrations can be used to rapidly test and get feedback on prototypes, raise awareness of the issues the circular economy aims to solve and garner public support for the scaling of more advanced solutions.

What is already being done in Glasgow?

Most recently, at COP26, Glasgow venue SWG3 demonstrated a state-of-the-art renewable heating system that collects and stores heat from customers, staff and visitor bodies. This is only the latest example of a longstanding tradition of leveraging events to push for greater sustainability. In 2014, for example, the Commonwealth Games proved a great opportunity for all venues in Glasgow to get a green certification, contributing to Glasgow's ranking as fourth in the world on the Global Destination Sustainability (GDS) Index[59]. Most recently, the city also became the first UK city to achieve the 'Bronze Benchmarked' status under the EarthCheck Sustainable Destinations Certification programme, which provides cities with a scientific framework to benchmark, certify and continuously improve their environmental, cultural, social, and economic performance.[60]

CASE STUDY: DGTL—WORLD'S FIRST CIRCULAR FESTIVAL

The DGTL festival in Amsterdam aims to be the first fully circular festival in the world. DGTL considers its festival terrain as a living lab for circular innovation in neighbourhoods and cities and partners with the City of Amsterdam and the Central Government to take on urban challenges—from food, mobility and waste to energy and water—to demonstrate best practices and to trial new innovations.[61, 62]

Some of the past innovations used at the festival include:

- A solely vegetarian menu, sourced from surplus food from local supermarkets and restaurants.
- Biodegradable plates and cutlery that are converted into compost within 24 hours. This compost was then distributed among participating urban farmers who use it for the cultivation of products, which are then used as ingredients for the following year.
- Ecological composting toilets.
- A collaboration with PureWaste and RePack to promote more circular fashion production and consumption practices. PureWaste produces garments made of 100% recycled textiles, whereas RePack enables online shoppers to return their packaging for reuse.
- An ecological currency (the 'Eco Coin')[63], which encouraged participants to participate in sustainable projects at the festival.
- The festival is also committed to renewable energy and trialled a new green heating system in 2019.

Impact

Compared to 2017, DGTL visitors cut their waste in half in 2018. The festival was also able to achieve large emissions reductions from energy use—from 70 to 15 tonnes of CO_2eq between 2018 and 2019. The adoption of the Eco Coin scheme alone allowed to reduce 5,000 kg of Co_2eq. Most of all, the festival serves as a shining example of how events can act as living labs that enable early and continuous involvement of users for co-creation and experimentation of solutions addressing the challenges of climate change, resilience and urban sustainability.[64]

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Table 3 provides an overview of different ways events can be used to mimic wider systems in a city, from food and energy systems to the built environment, mobility and more.

Table 3: Example strategies for events to be used as living labs for city-wide innovations

EVENTS AS LIVING LABS FOR	EXAMPLE STRATEGIES	TYPE	EXAMPLE COMPANIES
Innovation (relevant stakeholders: event organisers, governments)	Call for innovators to participate in events and work with different levels of government to unlock financial support for innovations to be demonstrated at events	**All**	Innofest: an EU-supported initiative to encourage events as living labs
The built environment (relevant stakeholders: hotels, venues, stage and installations designers)	Use events to test out circular construction methods in stages and installations such as reversible buildings	**Slow**	Lowlands festival: Reversible barn to house a zero-waste restaurant
Food systems (relevant stakeholders: catering companies)	Use events to test out edible, reusable or fully recyclable container systems that eliminate single-use plastics	**Slow, Cycle**	Glasgow Coffee Festival partners with KeepUp to be disposable-cup free
	Use events to promote foods designed from food surplus or from food manufacturing side streams	**Slow**	Plate Up Campaign Glasgow encourages restaurants to create new recipes made from surplus or donated food
	Experiment with plant-based menus and with measuring and communicating the carbon and material footprint of food in food menu design to raise awareness and encourage low-carbon and low-waste consumer choices	**Narrow**	COP26 partners with Klimato to highlight impact of menu
Mobility systems (relevant stakeholders: event organisers, transport companies)	Use events to stimulate circular behaviour through education and incentive systems, for example in choosing modes of transport to the event	**Narrow**	Eco Coin scheme incentivises participation in sustainable projects
	Experiment with decentralised events that meet their participants instead of requiring participants to travel to them	**Narrow**	The Next Web, Hard Fork Decentralised is distributed over smaller venues in London
Energy systems (relevant stakeholders: water, energy and sanitation companies)	Use events to experiment with closed loop sanitation systems	**Cycle, Regenerate**	Semilla Sanitations: Testing and scaling wastewater treatment toilets through festivals
	Use events to experiment with heat recovery systems	**Cycle**	Hamwells uses the heat of shower wastewater to preheat clean shower water for the next person to take a shower.
Consumer goods (relevant stakeholders: event organisers, marketing material, decoration and installation producers, AV equipment providers etc.)	Establish a zero waste event policy and ensure all goods are returned, donated for reuse or recycled	**All**	Event Cycle - Turning leftover event materials into charitable donations

3.4 Textiles

Global emissions at a glance

The global textiles value chain is responsible for over 3.3 billion tonnes of GHG emissions across the value chain per year—more than all international flights and maritime shipping combined.[65] The textile production and consumption stages alone are responsible for the majority of these—36% and 24% of textile emissions respectively—followed by yarn and fabric production (22%) and fibre production (12%).

Circular strategies for the textiles sector

Brands and manufacturers have tremendous influence over the material and carbon impacts of the textiles they produce and many solutions to reduce these impacts are already available to them. Recent advances in mechanical sorting, for example, are enabling higher value recycling of textiles—although the impact of such recycling processes on emissions needs to be evaluated more closely. Secondhand, resale and rental models that extend the lifetime of garments are also increasingly gaining in popularity in Europe and North America, with both mainstream brands and consumers embracing this trend[66]—although here as well, the impact of the added logistics of cleaning and transport must be carefully considered and weighed against the potential for displacing the production of entirely new fibres and fabrics. Designing for circularity, however, is a strong avenue for those companies looking to take responsibility for their garments.

What can Glasgow businesses do?

Given the impact of the design stage on a garment's carbon footprint especially—80% of a product's environmental and economic impact is determined at the design stage[67]—and given the uncertainties in what the net impact on emissions of recycling and reuse business models is, the next section explores in detail what strategies designers can leverage to slash both waste and emissions.

The carbon footprint of the global textiles industry

FIBRE PRODUCTION	**12%**
Raw material production	
Material processing and sorting	
Fibre preparation	
YARN AND FABRIC PRODUCTION	
Yarn preparation (spinning)	**12%**
Weaving / knitting / bonding	**10%**
TEXTILE PRODUCTION	
Bleaching / dyeing and finishing	**36%**
Assembly	**5%**
CONSUMPTION	
Distribution and retail	**1%**
Use	**24%**
END-OF-LIFE	**0%**
Collection and sorting	
Landfilling / waste to energy	

Source: UNEP. (2020). Sustainability and circularity in the textile value chain: Global stocktaking. (pp. 1-95, Rep.). Nairobi: UNEP.

Retrieved from: One Planet Network website

CIRCULAR OPPORTUNITIES TO REDUCE CARBON EMISSIONS IN GLASGOW

SPOTLIGHT: DESIGNING FOR CIRCULAR TEXTILES

The potential

In the UK, processing and production waste of textiles is estimated to amount to over 800,000 tonnes.[68] Once clothing is purchased, it will usually last for a little over three years on average before it is discarded or passed on, contributing over a third to the 921,000 tonnes of used textiles that ends up in the household residual waste.[69] Glasgow's textile manufacturing industry alone contributes 6% of total turnover for the sector nation-wide, so local manufacturers can play a key leadership role in the adoption of circular design strategies.

How can circular textile design help with emissions?

Circular design aims to minimise inputs—and therefore avoid emissions from the processing and production stages—but its impact extends beyond production. Designing garments to be highly durable, for example, can slow down material and emission flows by enabling textiles to be in use longer—for example via resale and rental schemes. Meanwhile, designing with recyclability in mind can enable greater recycling efforts and potentially prevent emissions from the growing and processing of additional fibres.

What is already being done in Glasgow?

The Glasgow School of Art's Innovation School has been working and researching concepts around sustainable and circular design, with student projects that recently included creative economic innovation and participatory design practice for the circular economy in areas such as textiles.[70] Textiles was also identified as a key focus for private action in the Glasgow Circular Economy Route Map and private initiatives are cropping up around the city, not the least of which is ACS clothing, which specialises in the rental, return and resale of garments.

CASE STUDY: SHEERTEX: DURABLE AND RESISTANT TIGHTS

The challenge

Every year, as many as eight billion pairs of pantyhose are manufactured and thrown away.[71] With an average service life of less than two uses (some tights easily tear after the first use alone)[72], they are one of the most wasteful products of the fashion industry today.

This is particularly problematic as tights are predominantly made of a blend of nylon and elastane, making them impossible to recycle using the recycling technologies available to us today. Every kilo of virgin Nylon 6 produced in Europe is also responsible for six to nine kg of CO_2-eq emissions[73]—and while nylon alone can be recycled today, once it is blended with other fabrics, this is no longer the case.[74]

Design for durability, repairability and minimal waste

Durability. Sheertex tights are made with ballistic grade fibres often found in bullet-proof vests. Designed to last ten times longer than a typical designer pair,[75] the sheers use proprietary fiber that is marketed as 'stronger than steel'.[76] To support its claims, the company challenges users to put their tights to strength tests featuring everything from pineapples to a 10 pound fire extinguisher.[77]

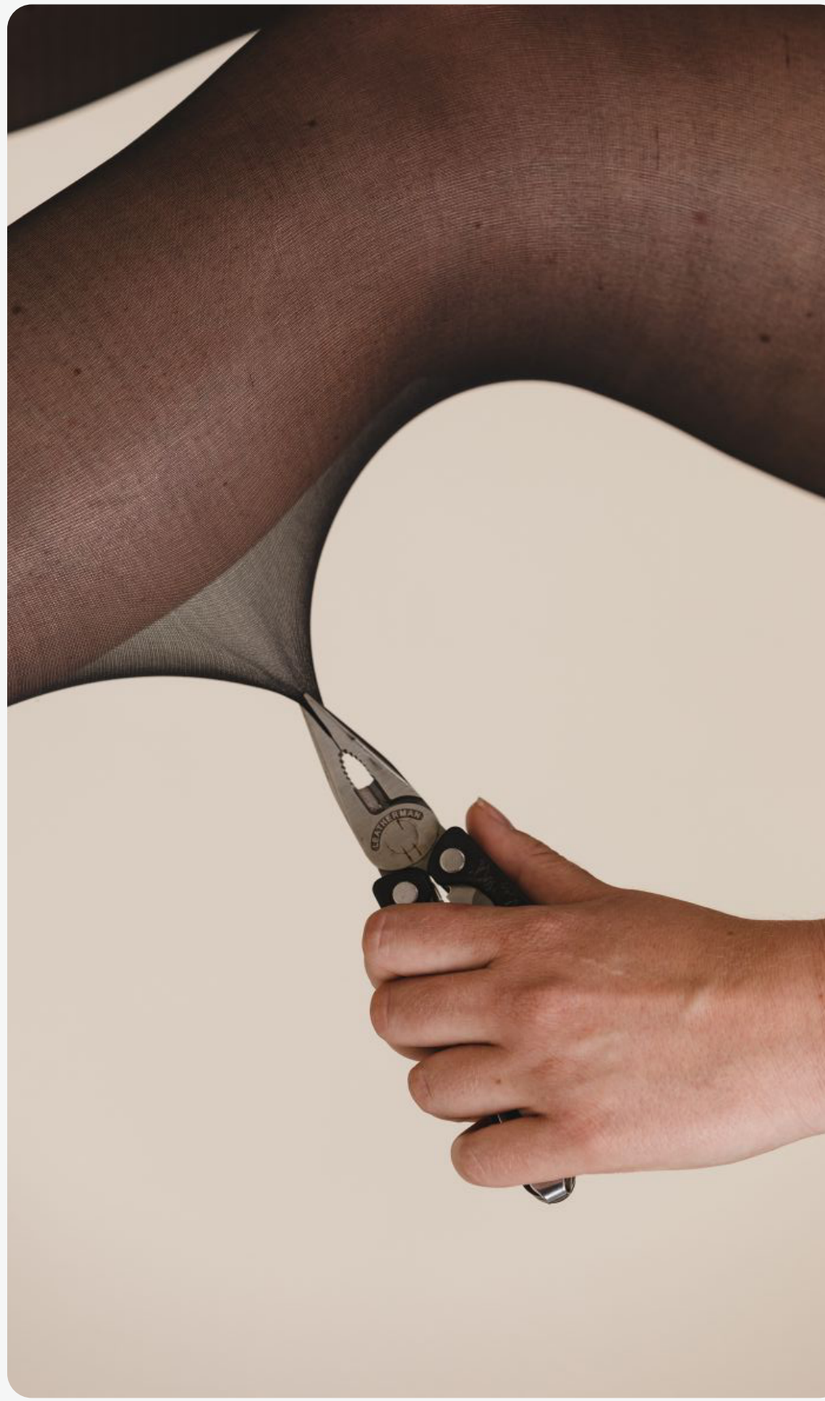
Repairability. According to the brand, the knit is also 'self-healing': if it gets pulled out of place, it can be manipulated back into place without running the risk of rips or runs.[78]

Minimal waste. The company's 'Second Chances' collection features products such as masks and headbands produced using extra material or defects from their production process—minimising waste from their operations.[79, 80]

Recyclability. Although it is unclear whether the tights can be recycled at the moment, their mono-material composition is promising—and, as of December 2021, a recycling programme is said to be under development.[81]

Impact

Extending clothing life is the single largest opportunity to reduce the environmental footprints of clothing in the UK.[82] While exact figures are not available yet, by ensuring tights can last ten times longer than conventional alternatives and enabling consumers to repair and hold on to their garments longer, SheerTex is making a significant contribution to reducing the hosiery industry's impact.



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CIRCULAR OPPORTUNITIES TO REDUCE CARBON EMISSIONS IN GLASGOW

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Table 4 provides an overview of example strategies that brands and manufacturers can utilise to design for greater circularity, along with recommendations for other industry partners.

Table 4: Example circular design strategies for textile manufacturers

COMPANIES	EXAMPLE STRATEGIES	TYPE	EXAMPLE COMPANIES
Brands and manufacturers	Design for physical durability and reuse	**Slow**	SheerTex, durable and resistant pantyhose
	Design for emotional durability	**Slow**	Hiut Denim: encouraging emotional longevity through storytelling
	Design for bio-degradability	**Regenerate**	Vollebak's compostable t-shirt, made from plant and algae
	Design garments for current recycling technologies that favour mono-materials	**Cycle**	Napapijri: first 100% recyclable jacket, designed for circularity
	Design for easy repair	**Slow**	Eugenia Morpurgo: Shoe design that allows soles to be disassembled and replaced
	Design for modularity - Design garments and accessories of multiple parts that can be easily exchanged or repaired	**Slow**	Pack Bag offers modular bags that are easy to replace and update
	Design for minimal waste - Reduce textile waste in the production process through zero waste pattern cutting techniques, for example	**Narrow**	Vera de Pont: on-demand production with zero waste pattern cutting techniques
	Design for resource efficiency - Reduce water use in the production process through water-saving finish techniques	**Narrow**	Levi's reduces water use in the production of denim
Other industry partners (collectors, sorters, recyclers)	Work together with brands and other industry partners on addressing key barriers to textile-to-textile recycling such as negative perceptions on recycled content, the lack of urgency for textile waste, the unknown origin of post-consumer textiles or current higher prices for recycled content.	**All**	Multi-stakeholders projects such as the Fibersort project, the Alliance for Responsible Denim or the Sorting for Circularity project.

CIRCULAR OPPORTUNITIES TO REDUCE CARBON EMISSIONS IN GLASGOW

3.5 Manufacturing

Global emissions at a glance

As manufacturing is virtually involved in all value chains—from the manufacturing of building materials and fertilisers to finished food and drink products and other consumable goods—we turn to global emissions averages to understand where the most reductions can be achieved.[83] Here, we find that the extraction, consumption and disposal stages are responsible for nearly a quarter of global emissions each, while processing and production account for around 19% of emissions each. Meanwhile, activities related to the provision and transport of goods account for 12.57% of emissions. In other words: circular strategies that reduce emissions along as many different steps of the value chain as possible can be especially effective when it comes to manufacturing.

As previous chapters in this report already cover food and drink and textile manufacturing, the rest of this chapter will focus on another important area: capital equipment.

Circular strategies for capital equipment

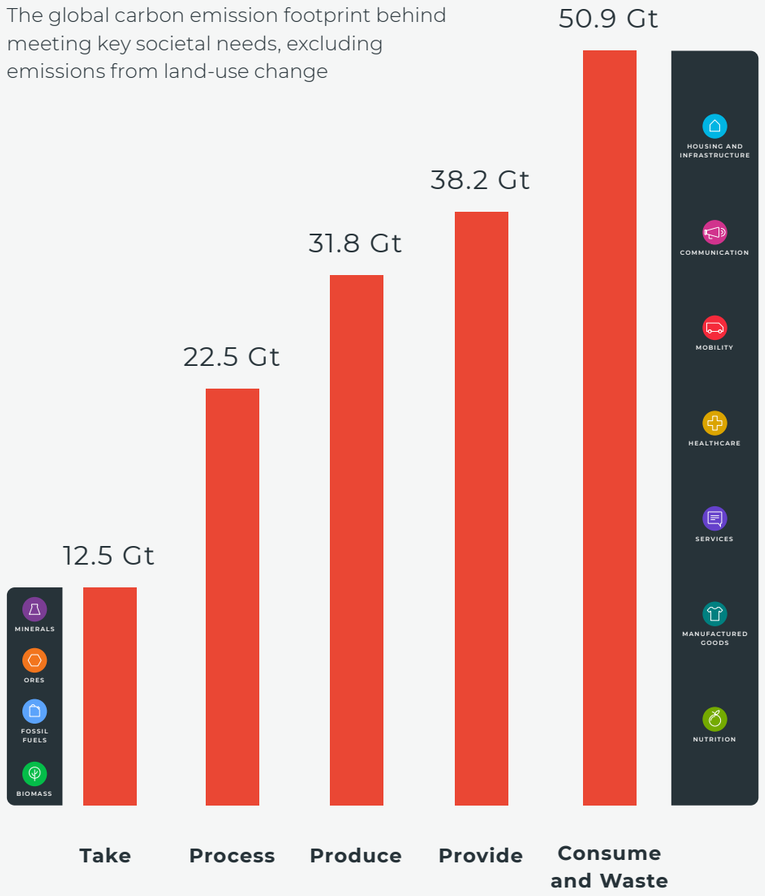
Capital equipment manufacturers produce durable goods, designed to last for years. As such, design plays an important role, not only in ensuring the durability of goods, but also in ensuring they can be dismantled for remanufacturing or recycling at the end of their useful life. Likewise, take-back schemes are equally crucial to ensure components and assets actually make it back to manufacturers at end of life. And while customer demand and new technological advances may still drive the obsolescence of some capital goods, designing these products to be easy to maintain or to upgrade can all contribute to extending their lifetime.

What can Glasgow businesses do?

In order to keep asset value as high as possible for as long as possible, here, we highlight lease and product-as-a-service (PaaS) models. PaaS models provide strong incentives to manufacturers to design and produce goods for durability, recyclability and repairability. They can ensure that assets are intensively used and properly maintained throughout their useful life. They can also ensure that assets are actually taken back at the end of this useful life to be refurbished, dismantled or recycled. We will therefore focus on this opportunity further in the next section.

Carbon impacts along global value chains, excluding emissions from land-use change

The global carbon emission footprint behind meeting key societal needs, excluding emissions from land-use change



Source: Circle Economy. (2019). The circularity gap report, 2019.

Retrieved from: Circle Economy website

CIRCULAR OPPORTUNITIES TO REDUCE CARBON EMISSIONS IN GLASGOW

SPOTLIGHT: LIFETIME EXTENSION THROUGH PRODUCT-AS-A-SERVICE AND OTHER REUSE MODELS

The potential

Glasgow is globally renowned as a centre for engineering and design excellence across a range of specialist sectors, thanks to its role as one of the world's first industrial and heavy engineering centres. Home to key capital equipment sectors such as aerospace, shipbuilding and space and satellite technologies, Glasgow's state-of-the-art facilities and infrastructure and long-lived expertise have earned the city the title of 'workshop of the world'.[84] These key strengths place the city in a unique position to harness the power of circularity, to reduce the capital equipment sector's heavy environmental footprint: the demolition of long lived assets, which for example represents 23% of global waste being produced every year, while the sector accounts for more than half of global ore consumption.[85]

How can product-as-a-service business models help with emissions?

Product-as-a-service business models extend the lifetime of current assets and components and ultimately reduce the need to extract, process and produce new equipment, avoiding all related waste and emissions in the process.

What is already being done in Glasgow?

Scotland's circular economy strategy already highlights extended producer responsibility as an opportunity to drive innovation and greater circularity for certain products and to influence product design and increase reuse and recycling.[86] In Glasgow, we find a great example in Re-Tek, which provides smaller organisations with lower technical requirements the opportunity to lease refurbished IT equipment. PaaS models are also gaining ground in other manufacturing sectors, for example with EGG Lighting, who provide a circular service model around their lighting equipment.[87]

CASE STUDY: PHILLIPS, HEALTHCARE-AS-A-SERVICE

The challenge

Capital equipment activities contribute an estimated 6.5% of global emissions.[88] Capital equipment manufacturing also consumes 7.2 billion tons of raw materials globally each year—including half of all metal ores consumed globally—and contributes almost 13% of global gross value added.[89] The industry is well positioned to drive the circular economy transition, thanks to its business-to-business nature and the highly durable nature of the assets it produces.

Lifetime extension through access-over-ownership business model, improved maintenance and take-back and refurbishment

- **PaaS business model**. Philips' Healthtech Leases programme allows healthcare facilities to lease healthcare equipment for the duration of its economic life—without owning it. Payment structures vary from fixed monthly fees, stepped payment loans and pay-per-use agreements.[90]
- **Improved maintenance.** This service model includes maintenance services, powered by usage data and analytics that allow the company to manage its assets more efficiently. Customers can also easily upgrade their technologies, returning assets to Philips when they are no longer fit for purpose.
- **Take-back and refurbishment.** Philips trades in and repurposes this equipment at the end of its use cycle and is extending these practices across all its medical products.[91] As a result, customers can also choose from from new, upgraded or refurbished product ranges.[92]

Impact

Philips' leasing model allows the company to have greater control over its products' lifecycle and therefore incentives better product stewardship. By retaining ownership, Philips has all the incentives to design them for circularity, to maintain them at the highest value throughout their active service life and, ultimately, to take them back for refurbishing or recycling—, hopefully resulting in less new components needing to be made overall.[93] It is clear that Philips' circular economy strategy is listed as one of the main ways they aim to minimise their climate impact in their supply chain.[94]

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Product-as-a-service models come in many shapes and forms and are ideally combined with different types of proactive maintenance and repair strategies as well as take-back and refurbishment programmes that ensure the value of components and assets is maintained as much as possible, as long as possible.

Table 5 provides different examples to illustrate these strategies as well as recommendations to other stakeholders in the sector to support a shift towards reuse models.

Table 5: Example strategies and recommendations for the capital equipment sector to implement product-as-a-service business models. Sourced from the Action Agenda for Capital Equipment.

COMPANIES	EXAMPLE STRATEGIES	TYPE	EXAMPLE COMPANIES
Manufacturers	**Optimise business models for product life extension**		
	Offer equipment—or components—under a pay-per-use or pay-per-performance business model	**Slow**	NIO: Batteries-as-a-service business model
	Offer customers opportunities for asset sharing	**Slow**	Burly Rentals: Online platform to enable construction equipment rentals
	Lease equipment to customers	**Slow**	NHS: Leasing contracts for medical equipment
	Boost repair and maintenance efforts		
	Scale training and certification for repair and refurbishment to independent service providers	**Slow**	Damen Shipyard: Maintenance and usage training programmes for service providers
	Integrate data collection and analytics technologies into products to offer predictive and remote maintenance services to customers	**Slow**	Bundles: IoT-enabled maintenance for washing machines
	Standardise components to facilitate repair services	**Slow**	Fairphone: Modular components that can be easily swapped or repaired
	Offer customers options for upgrade (both in software and hardware)	**Slow**	Mettler Toledo: Offering customers the option to upgrade truck scales instead of a complete replacement
	Ensure take-back and refurbishment at end of life		
	Increase take-back efforts when products reach the end of their useful life though reverse logistics	**Slow**	Desko: Buy back and remanufacturing scheme
	Refurbish assets after take-back	**Slow**	Damen: Refurbishment programmes
	Harvest and reuse or refurbish components after take-back	**Slow**	Core Centric: A repair programme and distribution network for returned products
Financial institutions	Improve access to capital for product use extension business models that require additional capital expenditure	**Slow**	ABN AMRO, ING, Rabobank: Finance guidelines for circular economy
Accountants	Propose specific changes for adapting accounting to a circular economy for capital equipment	**Slow**	Coalition Circular Accounting: Tackling reporting and valuation challenges to circular accounting
All	Work together with industry partners to identify and address barriers to retaining value in the capital equipment value chain	**Slow**	Capital Equipment Coalition: Sharing best practice and leading the industry

RECOMMENDATIONS

The transition to a circular economy is decidedly underway in Glasgow. With this report, we hope to have made the connection between circularity and net-zero carbon clearer and shed light on the business opportunities that this intersection provides. As the local business community makes sense of its role in driving emission reductions across value chains through circular economy strategies, so too is it crucial to ensure that environmental, social and economic considerations are adequately balanced within these new practices.

Meanwhile, businesses still face a number of barriers before they can fully embrace circular practices, from a lack of customer awareness and tax incentives that promote linear practices to a lack of funding needed to invest in less (as of yet) competitive circular alternatives. Glasgow City Council, Glasgow Chamber of Commerce, Zero Waste Scotland and other key city changemakers have an important role to play in addressing these barriers and in strengthening the conditions for businesses to transition.

This chapter provides key considerations for businesses to safeguard the positive environmental and social impacts of their transition, as well as key recommendations for the city to continue supporting local businesses in driving down consumption-based emissions.

4.1 For businesses

Focus on the ‘zero’ in ‘net-zero’

Although reaching net-zero will be an important step, it is important to stress that pursuing ‘zero carbon’ practices and solutions from the onset—where possible—will yield longer-term benefits and prevent unintended negative consequences. These practices also provide first movers with a number of competitive advantages—for example, by enabling them to save on taxation costs, attracting new customers and investments and taking advantage of resource-free business activities[95]—and they are also more economically and environmentally sustainable in the long term.

What gets measured gets managed

While this report paints a global picture of emissions as a guideline, a more localised picture will provide a more robust evidence base for decision-making. Analyses such as Life Cycle Assessments or Material Flow Analyses can help businesses pinpoint exactly what the largest drivers of resource consumption are for their products and their supply chains and what key levers are to save on each. In particular cases—for example, food waste—measurement can be done much more quickly and efficiently and savings realised in a matter of weeks. Finally, industry or global standards such as those of the Global Reporting Initiative (GRI)—for example, GRI 306 on waste[96]—also allow to measure key environmental impacts and will likely become key requirements of doing business going forward, so aligning with standards and certifications ahead of time will save significant efforts and create competitive advantages down the line.

Keep a systems perspective in mind and consider a careful balance between emissions, circularity and social benefits

To reap the benefits of a circular economy and to ensure a net positive impact, a systems perspective is crucial. Evaluating strategies in the specific context they are applied to, for example, will help clarify their consequences not only in terms of circularity and emissions, but also on other social and environmental dimensions. For example, reuse business models that extend the lifetime of garments such as rental or resale can have multiple benefits on society and the environment—if implemented with a positive impact in mind.[97] This is the case, for example, with Glasgow-based ACS Clothing: a net-zero carbon operation with a clear social agenda that benefits the local community.

Embrace collaboration

Where circular practices are well understood and could be profitable—for example, in the case of designing circular buildings—improving collaboration across the project lifecycle and amongst project partners could help bring circular designs through to final builds. Where circular practices still face many barriers to scale, working together with industry partners to address those barriers in pre-competitive spaces can significantly accelerate change.[98]

Test and up-scale (‘learning by doing’)

Pilot circular business models that have the potential to be profitable in a pre-competitive setting and use no risk funding sources such as European, national or local public funding. Public-private partnerships and private parties’ consortia can foster collaboration to harness the opportunities and lower the risks of testing and scaling-up circular business models.

Diversify

The global economy is rapidly moving towards a paradigm where environmental and social sustainability will become key forces for businesses to consider in order to be profitable. Although transitioning a linear business model to a fully functioning circular business model overnight may be unrealistic, diversifying can be a smart solution to cover the risks of the transition. New circular business services or product lines, even if they’re small-scale pilots (as suggested above) and cost centres in the short-run, can become competitive advantages in the mid and long-run as market norms and regulations force businesses to shift practices towards sustainability.

4.2 For Glasgow

Demonstrate leadership through public procurement

Across sectors and opportunities, public procurement could play a massive role in accelerating the uptake of circular solutions. As one of the biggest clients and landlords in Glasgow, the city could improve the current public procurement process to fully exploit the potential of the circular economy[99] and effectively lead by doing—whether in retrofitting existing buildings or constructing new ones or in sourcing food for its hospitals and schools.

Create market conditions for new supply chains to develop

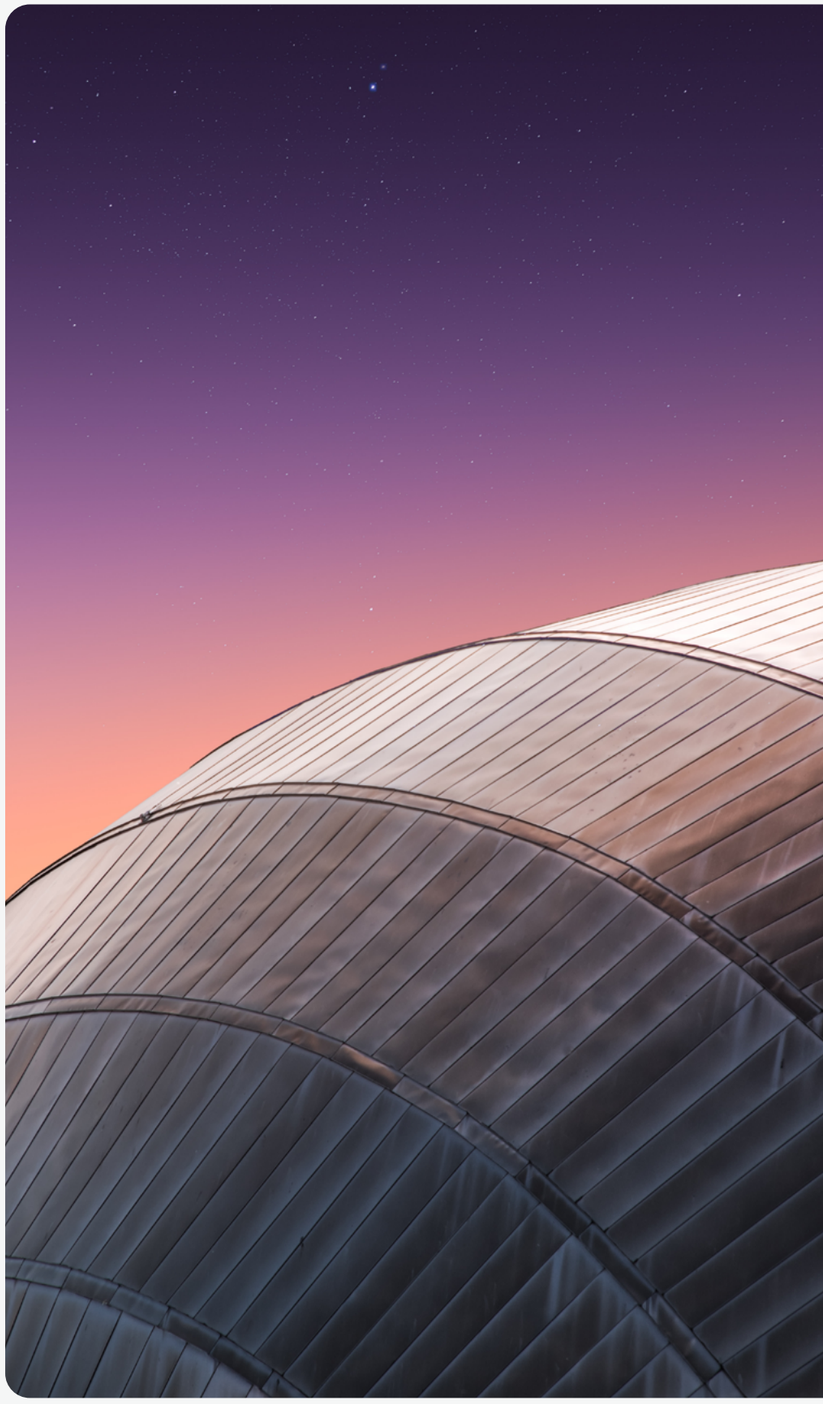
Beyond public procurement, Glasgow can also support business innovations in a variety of ways, for example by integrating circularity into the new Economic Development Strategy, continuing to de-risk the transition for SMEs, implementing innovation programmes[100] that support entrepreneurs in addressing key city challenges or by supporting the development of digital data platforms such as material exchange platforms. Meanwhile, Glasgow Chamber of Commerce can complement policy efforts by continuing to support and promote pilot projects that demonstrate how circularity can look like on the ground and by identifying and engaging influential people in these pilots. They can also bring in more technical expertise to support businesses in their transition, as companies need to better understand what the realistic costs, expectations and risks are to move towards circular. Finally, both should continue to prioritise participatory approaches to engage with experts such as Zero Waste Scotland and sector representatives, for example through roundtable discussions or workshops.

Continue raising awareness and building capacity for the circular economy by engaging with a broader set of stakeholders

Together with other organisations advising and supporting the public—from Zero Waste Scotland to the Energy Saving Trust (EST) and the Scottish Environmental Protection Agency— Glasgow should continue to embrace to its convening role and establish dialogue with a broader range of stakeholders beyond SMEs. Larger multinational organisations and the national government are key stakeholders to involve going forward, given their respective roles in driving change throughout supply chains and in establishing key legislation such as Extended Producer Responsibility schemes. ‘Sustainable Glasgow’, a partnership bringing together the private sector, academics and the public sector to raise awareness about net-zero emissions—is a great example to replicate. Knowledge-sharing with other cities and foreign SMEs and capacity-building via professional and education programmes will also boost awareness-raising efforts.

Regulation and innovation

Regulation-free areas can break down barriers for SMEs that are looking to pilot and experiment with circular innovations. Whether through events and conferences or through living labs or other public spaces in the city, lifting regulations to allow for testing the technical feasibility of circular innovations and to familiarise the public with these new ideas may provide just the boost that the transition in Glasgow needs.



APPROACH AND METHODOLOGY

This report was put together by the Circle Economy team on behalf of Glasgow Chamber of Commerce with the support of Zero Waste Scotland to highlight the contribution of circular economy business models to global emissions reductions and to empower Glasgow businesses with tools and knowledge to support Glasgow's ambition in driving down emissions locally and globally through a consumption-based lens.

The five sectors highlighted in the report were selected for their economic contribution to Glasgow, the potential for circularity and relevance to current local and national policy. To select which opportunities to highlight in more depth in the report, first a longlist of opportunities with documented evidence on their link with climate change mitigation from authoritative sources (for example, Ellen MacArthur Foundation, Zero Waste Scotland, Circle Economy) was compiled. These were then scored and prioritised based on feasibility (50% of the final score), potential impact on emissions (25%) and circularity (25%).

Finally, we conducted interviews with stakeholders in Glasgow, representatives and experts from the city and the different sectors in this report, to validate our findings and inform the recommendations chapter.

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