



GLASGOW
CHAMBER OF COMMERCE



EMPLOYMENT IN THE CIRCULAR ECONOMY

A baseline for the
city of Glasgow





TABLE OF CONTENTS



3	Executive Summary
4	Context
6	What Is The Circular Economy?
8	What Is Circular Employment?
10	Circular Jobs In Glasgow
12	Conclusions
13	Project Team
13	References
14	Annex: Method

EXECUTIVE SUMMARY



The present report provides a baseline of the current state of circular employment in Glasgow. This consists of determining the meaning of employment in the circular economy, and consecutively measuring its magnitude and nature. Accounting for 6% of all jobs in Glasgow, 21.000 jobs are related to the circular economy. These circular jobs are located in repair, leasing, and waste management activities related to the manufacturing industry, and in digital technology, engineering, and design activities in the creative industries. A continued monitoring of circular employment would result in the development of a decision support tool that would strengthen Glasgow's capacity to adopt circular strategies in their decision making. This report presents the start of such development, over time resulting in more circular jobs and income opportunities.



CONTEXT



Glasgow can be positioned as a city pioneering in the circular economy, and is well on the way to becoming one of Europe's frontrunning examples of a circular city. In June 2016, a Circle City Scan for the city of Glasgow¹ identified high potential sectors in terms of circular economy opportunities, providing a handhold as to where to start implementing the circular economy. This allowed for the city to focus on the food and beverages sector within the manufacturing industry, which resulted in a first pilot project turning unsold bread into beer by the end of 2016.²

In order to capitalise on the momentum generated by the Glasgow Circle Scan, more ventures, scaling up, and embedding circularity in Glasgow's economy will need to be explored and facilitated in the coming years. In pursuit of this, the Glasgow Chamber of Commerce and Circle Economy embarked on a two-year implementation trajectory in September 2017.

The circular economy is an economic development model that strives for the efficient and continuous use of resources. It closes materials loops within and across value chains, the production processes that add value every step of the way. The circular economy keeps resources and materials functioning at their highest potential so that they are not wasted, but re-entered into a system that creates value again and again. As such, the circular economy ensures that the highest level of long-term environmental, economic, and social value is preserved.

In light of the economic crisis of 2008, recent political shifts and current global trends, the circular economy increasingly plays a central role in creating social and economic value. The socio-economic impact that the circular economy brings about, comes, amongst others, in the shape of jobs. The circular economy has the potential to provide fulfilling jobs for an exponentially growing population in a shifting economy. By making the transition, cities attract innovative businesses while empowering their citizens by providing their families a liveable and healthy environment.

Aimed at defining, identifying, and quantifying these jobs in the circular economy, Circle Economy and the Erasmus University have developed a standardised and replicable methodology that measures such employment.^{3,4,5} This opens up the possibility of monitoring employment in the circular economy, and therefore empowers cities and governments to effectively invest in the jobs of the future.

It is in this context that the Glasgow Chamber of Commerce commissioned Circle Economy to carry out a baseline analysis of circular employment in Glasgow. The baseline consists of determining the meaning of employment in the circular economy, and consecutively measuring its magnitude and nature.

On the one hand, such baseline provides an understanding of the local circular labour market of Glasgow in its current state. On the other hand, it allows for monitoring of employment in the circular economy in the future, and thus for evidence-based circular economy policy making. The baseline measurement presented here equips Glasgow's policymakers and advisors with an indicator on circular economy employment.

WHAT IS THE CIRCULAR ECONOMY?

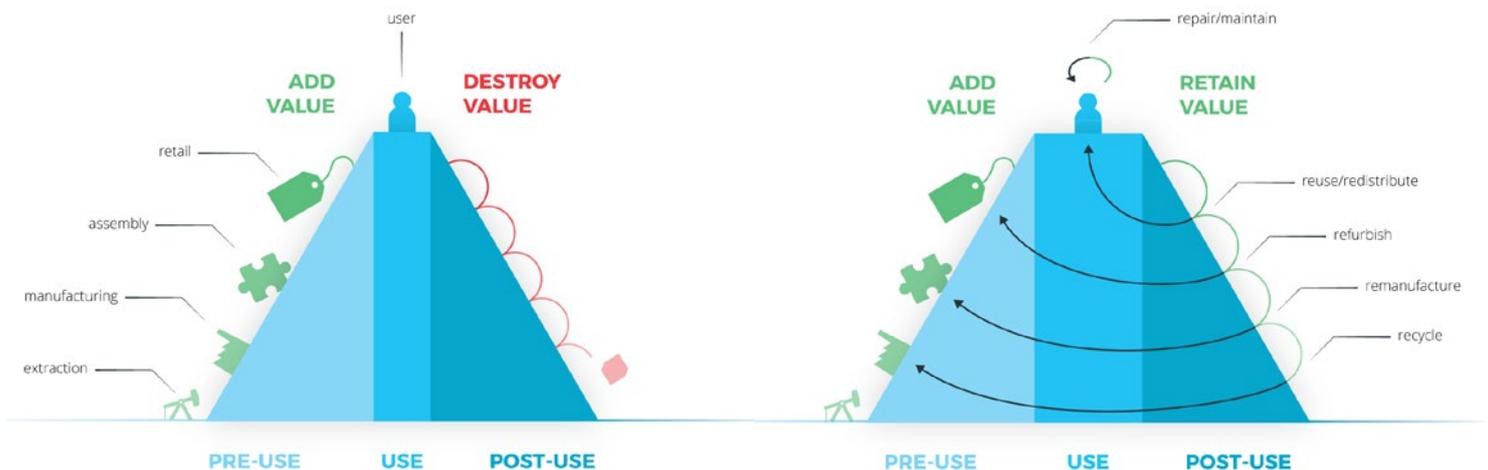


The circular economy is a way in which we make effective use of the resources that we already have. It provides a holistic solution to the world's emerging resource problem that has resulted from the linear take-make-waste economy. In a circular economy, resources are not consumed, but recovered in a system that is continuous and long-lasting, with the goal of keeping them functioning at their highest potential. Instead of destroying value after the use phase, value is retained through cycles of reusing, repairing, remanufacturing or recycling (see figure below). As such, the circular economy reduces our unhealthy and harmful dependency on scarce natural resources and provides economic, ecological and social benefits.

By following circular strategies and principles, organisations can ensure that the highest level of economic and societal value is attained while

minimising planetary impacts. Circle Economy has compiled a set of 7 key elements that characterise the circular economy and highlight the different categories of strategies that businesses and organisations can employ to implement circularity, as depicted on the page on the right.

Following this model, the circular economy consists of both (A) core circular strategies and (B) enabling circular strategies. Without the latter, circularity would not be possible. Core circular strategies include the prioritisation of regenerative resources, the preservation and extension of what's already made, the use of waste as a resource, and the rethinking of business models. Enabling circular strategies include collaborating to create joint value, designing for the future, and incorporating digital technology.



The value hill model proposes a categorisation based on lifecycle phases of a product in pre-, in-, and post-use, and clarifies the systemic differences between the current linear economy and the circular economy that we are striving for.⁶

7 KEY ELEMENTS OF THE CIRCULAR ECONOMY



A. CORE CIRCULAR STRATEGIES



Prioritise regenerative resources: Ensure renewable, reusable, non-toxic resources are utilised as materials and energy in an efficient way.



Preserve & extend what's already made: While resources are in-use, maintain, repair and upgrade them to maximise their lifetime and give them a second life through take back strategies when applicable.



Use waste as a resource: Utilise waste streams as a source of secondary resources and recover waste for reuse and recycling.



Rethink the business model: Consider opportunities to create greater value and align incentives through business models that build on the interaction between products and services.

B. ENABLING CIRCULAR STRATEGIES



Collaborate to create joint value: Work together throughout the supply chain, internally within organisations and with the public sector to increase transparency and create joint value.



Design for the future: Account for the systems perspective during the design process, to use the right materials, to design for appropriate lifetime and to design for extended future use.



Incorporate digital technology: Track and optimise resource use and strengthen connections between supply chain actors through digital, online platforms and technologies that provide insights.

WHAT IS CIRCULAR EMPLOYMENT?



Circular employment are jobs within the circular economy, shortly circular jobs. The structuring of the circular economy elaborated upon in the previous section is applied in order to analyse circular employment. Similarly, (A) directly core circular jobs are differentiated from (B) directly enabling circular jobs. An additional category of (C) indirectly circular jobs supports these directly circular jobs.

DEFINITION

A **circular job** is any full or part-time occupation that directly involves one of the elements of the circular economy or indirectly supports such activities.

A **directly circular job** includes jobs that follow **core** and **enabling** circular economy strategies.

An **indirectly circular job** includes jobs that support the directly circular jobs.

The methodology that was applied to calculate the amount of circular jobs in Glasgow was jointly developed by Circle Economy and the Erasmus University and has been applied to Dutch cities such as Amsterdam and Haarlemmermeer. It consists of a sector-based approach. Based on the 7 key elements of the circular economy (p.7), over 600 sectors are differentiated and classified as core, enabling or indirectly circular. It is assumed that all jobs within core circular sectors are circular. For enabling circular and indirectly circular sectors; however, this assumption does not hold as not all activity within these sectors is circular. Here, the economic cross-interaction between indirectly, enabling and core circular sectors and their trickle down effects are used to estimate the number of enabling and indirectly circular jobs. We refer to the Annex for a full overview of the methodology.

EXAMPLE JOBS IN THE CIRCULAR ECONOMY



A. CORE CIRCULAR JOBS



The **solar panel installer** builds solar panels and thus contributes to the use of solar energy as a regenerative resource.



The **appliance technician** repairs appliances, machines, or vehicles and thus extends the lifetime of things already made.



The **recycling operative** separates waste into materials that can and cannot be recovered, allowing for waste to be used as a resource.



The **leasing process manager** coordinates external service providers distributed across market segments that enable their leasing service, and thus new business model.

B. ENABLING CIRCULAR JOBS



The **director of a trade organisation** manages a membership organisation composed of representatives from across the value chain and can thus facilitate collaboration for joint value creation.



The **architect** designs buildings and hence is responsible for potential material recovery after the building's user phase and can thus design for the future.



The **data analyst** makes sense of large amounts of information that can for example connect supply with demand of secondary materials, they can thus enable circular activities through the integration of digital technology.

C. INDIRECTLY CIRCULAR JOBS

The **courier** could contribute to the circular economy by enabling for example reverse logistics schemes for circular businesses.

CIRCULAR JOBS IN GLASGOW

From the method explained above, it shows that Glasgow counts a total of 21.000 circular jobs. With an overall pool of 375.000 jobs, this means that about 6% of all jobs in Glasgow are circular. The graph on this page indicates how these circular jobs are divided across core, enabling, and indirectly circular sectors, and the spider chart on the page on the right details the distribution of directly circular jobs across the 7 key elements of the circular economy. For reference, the same distribution is shown for circular jobs in the Netherlands. The circular labour market of Glasgow is remarkably equally divided across both levels of categorisation.

37% of circular jobs in Glasgow follow core circular strategies. Core circular jobs following the strategies 'use waste as a resource' and 'preserve and extend what's already made' are in general closely related to manufacturing industries, which, considering their space and infrastructure intensive character, tend to gravitate towards urban peripheries rather than urban cores. In the case of Glasgow, however, we observe that the core circular jobs mainly stem from waste collection, repair and maintenance of motor vehicles, and leasing activities, rather than waste treatment or heavy duty repair and remanufacturing activities. It follows that a considerable share of the core circular jobs follow the 'rethink the business model' strategy, whereas 'preserve and extend what's already made' and 'use waste as a resource' activities do not necessarily relate to heavy duty repairs and waste treatment and remediation activities.

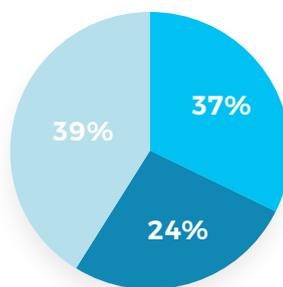
24% Of circular jobs in Glasgow follow enabling circular strategies. Enabling circular activities are generally located in urban cores and business centres. They take place in service-oriented sectors and hence require a labour force that is more skilled and with higher education. The enabling circular jobs are roughly equally divided across the key elements 'incorporate digital technology' and 'design for the future'. Most of these jobs are therefore to be found in the professional (technical) services, digital technology and the creative industries.

The enabling circular activities in Glasgow embody a high potential for future development thanks to the coinciding of the city's focus sectors for economic development and its ambitions in the circular economy. On the one hand, the city will focus on, amongst others, digital technology, creative

industries, and engineering and design for economic development.⁷ On the other hand, the present analysis shows how the city has already built a base of expertise connecting these very sectors to the circular economy. Consequently, both 'incorporate digital technology' and 'design for the future' embody high-energy circular economy strategies for Glasgow.

39% Of circular jobs in Glasgow do not follow any directly circular strategies, but support them and are thus indirectly circular. In absolute terms, most of these indirectly circular jobs are located in facilities support and public administration. The high number of jobs related to the circular economy in facilities support is to be traced back to a small part of this sector's services to repair and leasing sectors by means of, amongst others, (industrial) cleaning activities. The other way around, the high number of jobs in the public sector that is indirectly connected to the circular economy, is due to the public administration's application of circular activities, mainly in repair and waste management.

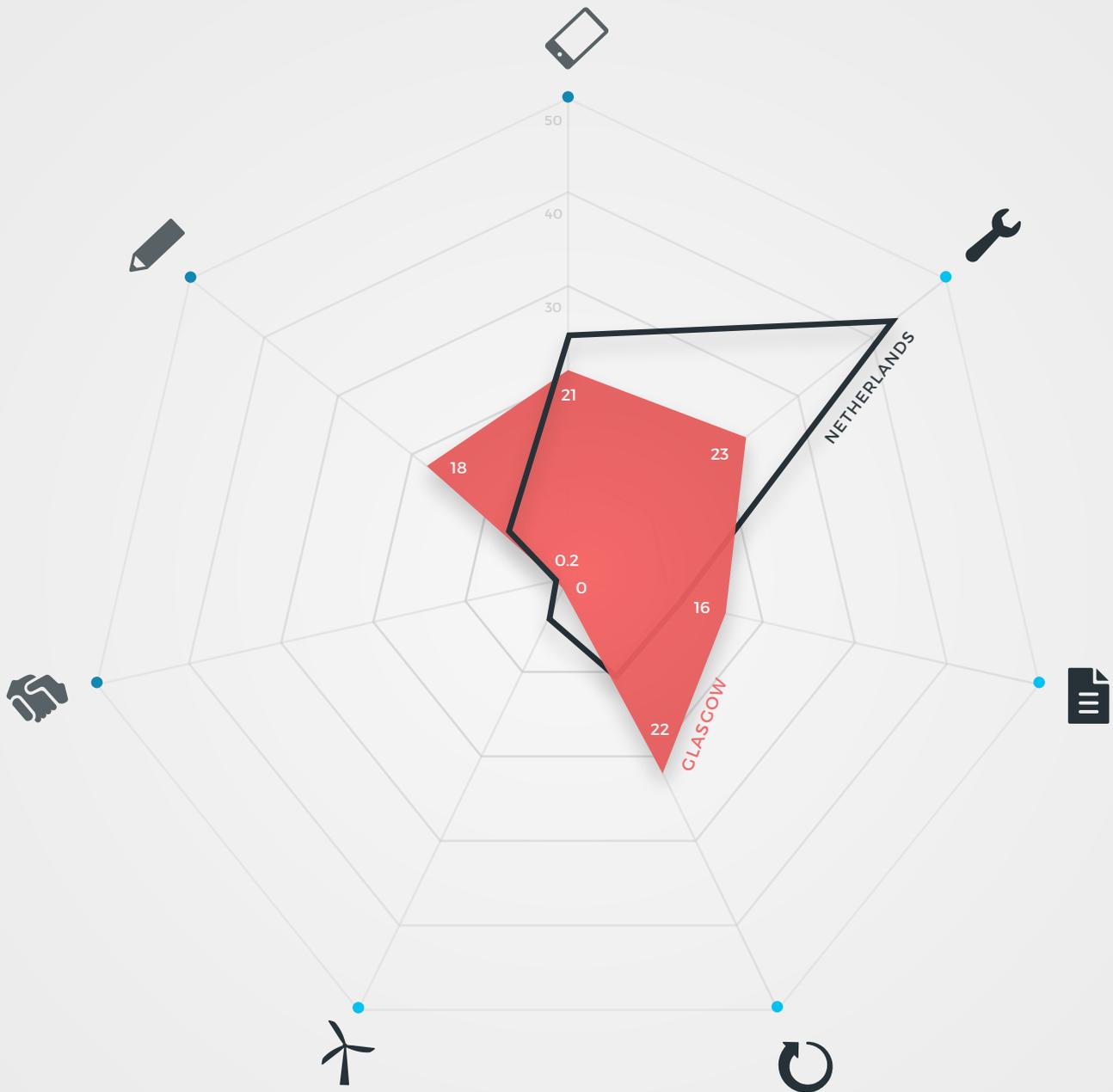
Relatively speaking, however, there is a much larger share of jobs in the sale of motor vehicles that is connected to the circular economy. This number is explained by the important connection between this sector and the car repair and rental sectors, which are considered core to the circular economy. This situation accounts for a little under 1000 indirectly circular jobs. Whereas this number is too small to distort the overall overview of circular jobs in Glasgow, it is to be interpreted with care.



6%
**GLASGOW
CIRCULAR
JOBS**

- core circular jobs
- enabling circular jobs
- indirectly circular jobs

CIRCULAR JOBS IN GLASGOW ACCORDING TO THE 7 KEY ELEMENTS OF THE CIRCULAR ECONOMY



 Prioritise regenerative resources

 Collaborate to create joint value

 Preserve and extend what's already made

 Design for the future

 Use waste as a resource

 Incorporate digital technology

 Rethink the business model



CONCLUSIONS



The original objective of this project was to set out the current state of employment in the circular economy in Glasgow. The analysis indicates that 6% of all jobs in Glasgow are currently related to the circular economy. The city shows great potential when it comes to the circular economy creating an inclusive labour market, considering the great variety of job types and related skill requirements.

The share of circular employment indeed represents a great variety of circular strategies, covering both activities that are core to the circular economy and those enabling it. For the core of Glasgow's circular economy, activities in waste management, repair of motor vehicles, and leasing activities represent the most important employment creators. When it comes to activities enabling the city's circular economy, professional (technical) services, digital technology, and the creative industries are prevailing employment creators.

Whereas there is not one area in the circular economy in which Glasgow uniquely excels, the overlap between the expertise the city has in enabling circular economy activities and its strategic focus on the same sectors when it comes to economic development, digital technology and the creative industries present high potential areas for the city's circular economy.

The present report provides a first measurement of the current state of circular employment in Glasgow. Next to an understanding of the existing situation, the results will serve as a baseline to compare upcoming measurements to in the future, and is thus a first step in the direction of monitoring employment in the local circular economy. Continued monitoring of circular employment would support Glasgow's policy makers to realise the city's potential for a circular labour market.

From this analysis, additional research into the labour force is recommended in order to foster the circular economy is required. Such research would answer questions like; what skills are required to perform these activities, is the current labour supply fit to perform these activities, and how do we develop or attract an adequate labour force? As such, policymakers would be able to drive the circular economy from a labour perspective and further advance Glasgow's transition to circularity.

PROJECT TEAM



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REFERENCES



1. Circle Economy et al. 2016. *Circular Glasgow, A vision and action plan for the city of Glasgow*. Retrieved from <http://www.circle-economy.com/wp-content/uploads/2016/06/circular-glasgow-report-web-low-res.pdf> on August 9th 2017.
2. <https://www.jawbrew.co.uk/hardtack-launches-blonde-beer-made-bread/>
3. The project team consisted of Prof. Frank van Oort, Dr. Martijn Burger, Dr. Spyridon Stavropoulos, Annerieke Douma, Jurn de Winter, Shyaam Ramkumar, and Joke Dufourmont.
4. Circle Economy et al. 2017. *Circular Jobs, Understanding employment in the circular economy in the Netherlands*. Retrieved from <https://www.circle-economy.com/circular-jobs> on September 11th, 2017.
5. Van Oort, F. et al. 2017. *Putting the Circular Economy to Work: Measuring Gross Employment Effects in the Netherlands, 1996-2015*. Paper submitted for publication at the Journal for Cleaner Production.
6. Achterberg, E. (Circle Economy & Sustainable Finance Lab), Hinfelaar, J. (Nuovalente) & Bocken, N. (TU Delft). 2016. *Master Circular Business with the Value Hill*. Retrieved from <http://www.circle-economy.com/wp-content/uploads/2016/09/finance-white-paper-20160923.pdf>
7. Glasgow Chamber of Commerce, Glasgow Economic Leadership & Glasgow City Council. N.d. *Glasgow Economic Strategy 2016 - 2023*. Retrieved from <https://www.glasgow.gov.uk/CHttpHandler.ashx?id=36137&p=0> on August 9th 2017.
8. Office for National Statistics, Annual Business Survey (Compiled by Scottish Government).
9. Horbach, J., K. Rennings and K. Sommerfeld. (2015). *Circular economy and employment*. Working paper: University of Applied Sciences, Augsburg.
10. Elliott, R.J.R. and J.K. Lindley. 2014. *Green jobs and growth in the United States: green shoots or false dawn?*. Discussion paper 14-09, University of Birmingham, Department of Economics.
11. FOEI. 2010. *More jobs, less waste: potential for job creation through higher rates of recycling in the UK and EU*. London: Friends of the Earth International.
12. Circle Economy. 2016. *Making Sense of the Circular Economy, The 7 key elements*. Retrieved from <http://www.circle-economy.com/the-7-key-elements-of-the-circular-economy> on August 9th 2017.

ANNEX: METHOD



SUMMARY The methodology for measuring the number of circular jobs consists of a sector-based approach. Based on the 7 elements of the circular economy (p.7), over 600 sectors are differentiated and classified as core, enabling or indirectly circular. It is assumed that all jobs within core circular sectors are circular. For enabling circular and indirectly circular sectors; however, this assumption does not hold. Here, the economic cross-interaction between indirectly, enabling and core circular sectors and their trickle down effects are used to estimate the number of enabling and indirectly circular jobs.

DATA The data used for the present analysis was obtained from the Business Register and Employment Survey. The database contains the count of total employees per sector for the year 2015 in Glasgow. The database distinguishes 616 sectors following the SIC 2007 classification on the 4 digit level of detail, including divisions, groups, and classes of industries.⁸

DEFINITION In order to quantify the number of circular jobs, using this database, a definition for circular jobs and sectors relevant to the circular economy was necessary. In the literature, there is an initial understanding of which sectors contain circular jobs.^{9,10,11} However, these studies incorporated mostly end-of-life aspects of the circular economy as it relates to waste management, and additional aspects of the circular economy needed to be considered.

A piece of work by Circle Economy, *Making Sense of the Circular Economy: The 7 Key Elements*,¹² conducted a literature review and mapped the various terms and definitions used by over 20 organisations - NGOs, government agencies, academia, consultancies, etc. - working on the circular economy. From this work, the definition of the circular economy and the description of a circular job were formulated.

DEFINITION

A circular job is any full or part-time occupation that directly involves one of the elements of the circular economy or indirectly supports such activities.

A directly circular job includes jobs that follow core and enabling circular economy strategies.

An indirectly circular job includes jobs that support the directly circular jobs.

SECTOR CLASSIFICATION Using this definition, the sectors of economic activity were classified as core circular, enabling circular, or indirectly circular. These classifications were made based on how well the sectors are connected to the 7 elements of the circular economy, as the table outlines below. For the core circular sectors, it is assumed that 100% of the jobs are circular. For the enabling circular and indirectly circular sectors; however, not all jobs are circular and it was necessary to analyse what percentage of the jobs within these sectors can be considered circular. This analysis was done through the use of input-output analysis.

		KEY ELEMENT	EXAMPLE SECTORS AND ACTIVITIES
DIRECTLY CIRCULAR	Core element	Prioritise Regenerative Resources	Renewable energy
		Preserve and Extend What's Already Made	Repair
		Use Waste as a Resource	Recycling
		Rethink the Business Model	Renting or leasing activities
	Enabling element	Collaborate to Create Joint Value	Professional and networking associations
		Design for the Future	Industrial design and architecture
		Incorporate Digital Technology	Digital technology
INDIRECTLY CIRCULAR			Education, Government services

INPUT-OUTPUT ANALYSIS The share of jobs that are circular within enabling and indirectly circular sectors is approached by the share of the respective sector's turnover that happens in interaction with core circular sectors. Determining this share happens by means of input-output analysis. Input-output tables contain monetary values of transactions between sectors, where sectors in rows deliver services to sectors in columns. This way, a row represents all outputs of a sector, where a column represents all inputs of a sector. As such, an input-output table shows interdependencies between sectors, both as clients of sectors and as providers for sectors, Based on above sector classification, the input-output table are classified and subsequently analysed as outlined below.

	CORE CIRCULAR SECTORS	ENABLING CIRCULAR SECTORS	INDIRECTLY CIRCULAR SECTORS	TOTAL
CORE CIRCULAR SECTORS		B (core circular services delivered to enabling circular sectors)		Total Row
ENABLING CIRCULAR SECTORS	C (enabling circular services delivered to core circular sectors)	D (enabling circular services delivered to enabling circular sectors)		
INDIRECTLY CIRCULAR SECTORS	E (indirectly circular services delivered to core and enabling circular sectors)			
TOTAL	Total column			

To determine the percentage of circular jobs within enabling circular sectors, the monetary value of core circular sector services delivered to enabling circular sectors, the monetary value of enabling circular sector services delivered to enabling circular sectors, and the monetary value of enabling circular sector services delivered to core circular sectors was taken into consideration. Mathematically, the following calculation was performed:

$$\frac{\{(B+D) + (C+D)\}}{\{\text{Total Row} + \text{Total Column}\}} = \% \text{ of enabling circular jobs}$$

To determine the percentage of circular jobs within indirectly circular sectors, the monetary value of indirectly circular sector services delivered to core circular sectors and the monetary value of indirectly circular sector services delivered to enabling circular sectors was taken into consideration. Mathematically, the following calculation was performed:

$$E / \text{Total Column} = \% \text{ of indirectly circular jobs that support directly circular jobs}$$

These percentages assume fixed input-output proportions, whereas the reciprocity of cross-industry interaction leads to trickle-down effects which cannot be captured by this initial interaction. The exact magnitude of this multiplier effect is determined by means of a Leontief-inverse in a Markov chain analysis of the sectors in the input-output tables after 1 Pound of extra demand in primary circular output.

Finally, the resulting percentages are applied to the employment database to calculate the number of enabling and indirectly circular jobs.



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