

# CIRCULAR JOBS

Understanding Employment in the  
Circular Economy in the Netherlands

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# INTRODUCTION

A transition to the circular economy is essential to fight climate change, resource depletion, and achieve inclusive growth. The circular development of cities plays a pivotal role in this transition and provides unique opportunities for a sustainable future. To ensure that policy makers and governments know how and where to implement the circular economy, practical tools to measure it must be created. In light of this, Circle Economy and the Erasmus Research Institute for Happiness Economics (Ehero, part of the Erasmus University Rotterdam) have spearheaded research on employment in the circular economy. This report defines the key jobs in the circular economy and presents a standardised and replicable methodology to measure and monitor circular employment in cities around the world. This could provide cities with insights into circular employment in terms of shifting labour markets and changing demands for knowledge and skills. The presented method therefore empowers cities and governments that are transitioning to circularity, by providing them with a tool to effectively invest in the jobs of the future.



# TACKLING GLOBAL CHALLENGES

## Increasing threats of resource depletion and climate change

In the face of the threats that climate change is imposing on our ecosystems and societies, the world has committed to the COP21 agreement. This agreement, along with the adoption of the United Nation's Sustainable Development Goals, mark moments that are shaping the well-being of generations to come.<sup>1</sup> Sustainable solutions for the major challenges the world is facing today seek to provide well-being today whilst securing the same for the future, for our environment as well as for people.

Since the Industrial Revolution, material extraction has fueled global economic growth. During the 20th century, overall material use has increased eightfold, resulting in a global annual use of almost 60 billion tonnes of material by the beginning of this century. Unrestricted continuation of such exploitation will lead to depletion of precious metals, minerals and fossil fuels. Our economies today are heavily dependent on these natural resources, and well-being is therefore at stake.

In addition to resource depletion, climate change is a major and all-encompassing environmental issue affecting populations across the globe. It is a result of human activity that is causing a wide variety of concerns, ranging from food insecurity to rising sea levels. The Paris Agreement presents the most ambitious, binding engagement toward climate change mitigation by national governments in decades. However, current commitments will only deliver half of the emissions reductions necessary to remain within the ambitions set, to not surpass a 2° degree rise in our earth's temperature.<sup>3</sup>

## Circular cities as catalysts for a sustainable future

We are facing these challenges in an increasingly urbanised world. Approximately 50% of the world's population lives in urban areas and 70% is expected to live in cities by 2050. Even though economies have slowly been recovering from the economic crisis of 2008, well-being has not necessarily proliferated and social insecurity has endured. Increasing urbanisation fosters and concentrates the need for decent jobs within cities, which represent at the same time the centres of economic activity and the biggest sources of resource depletion and greenhouse gas emissions. Such pressures make cities an ideal hotbed and key inflection point for innovation and change.

We propose the circular economy as a systemic solution to the above challenges, as it addresses both the environmental and socio-economic issues we are facing. The worldwide implementation of the circular economy would bridge half of the emissions gap remaining,<sup>4</sup> eliminate our dependence on virgin materials, and offer societal benefits ranging from employment creation to an inclusive labour market.<sup>5,6</sup>

Cities play a critical role in the transition towards circularity. They are the culprit for most environmental pressures in terms of greenhouse gas emissions and resource use, but at the same time generate global wealth. In cities, people, materials and data are brought together and they thus form the world's key centres of economic activity. As such, increasing urbanisation trends present enormous challenges, but the circular development of cities provide unique opportunities for a sustainable future.

# 7 KEY ELEMENTS

## ENABLING STRATEGIES



### PRIORITISE REGENERATIVE RESOURCES

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



### 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.



### PRESERVE AND 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.



### 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.



### USE WASTE AS A RESOURCE

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



### INCORPORATE DIGITAL TECHNOLOGY

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



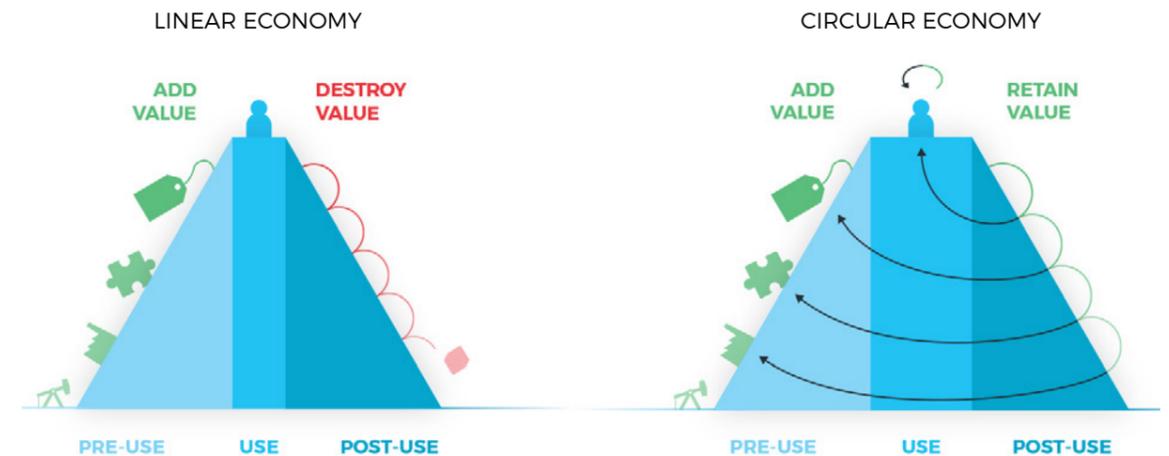
### RETHINK THE BUSINESS MODEL

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

## CORE STRATEGIES

# 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). For this, we need new business models and innovative product design that makes use of non-toxic materials that can be endlessly cycled. The circular economy shifts wealth and prosperity from our current means of consumption to a system that is continuous and long lasting. As such, it reduces our unhealthy and harmful dependency on scarce natural resources and provides economic, ecological and social benefits.



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.<sup>7</sup>

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 (see figure left).

Following this model, the circular economy consists of both core circular strategies and 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.

# DIRECTLY CIRCULAR JOBS

## ENABLING JOBS

### Director of a Trade Association

The director of a trade association manages a membership organisation composed of multiple companies within a specific industry. The director can support the circular economy by encouraging greater collaboration, knowledge sharing, and networking between companies. As such, the director can employ the 'collaborate to create joint value' strategy in order to contribute to the circular economy.



### Architect

The architect is responsible for designing buildings and by extension for the materials used during a building's construction, its energy efficiency during the use phase and the potential for material recovery when it is demolished. An architect can thus contribute to the circular economy by 'designing for the future'.



### Data Analyst

The data analyst makes sense of large amounts of information by means varying from simple data aggregation to complex data mining. The data analyst's occupation involves the 'incorporate digital technology' strategy and thus allows for smart systems and technology integration in the circular economy. This job often requires tertiary education in relatively new fields of data science and computer engineering.



## CORE JOBS

### Solar Panel Installer



The solar panel installer works within the energy sector to promote the use of solar as a renewable energy source. The job contributes to the circular economy by 'prioritising regenerative resources', the first strategy of the circular economy.

### Appliance Technician



The appliance technician contributes to the circular economy by extending the lifetime of products. By embodying one of the strategies of the circular economy, 'to preserve and extend what's already made', all repair and maintenance jobs are considered circular.

### Recycling Operative



The recycling operative's job consists of sorting through recyclable waste and separating materials to be recovered. This sorting and separating constitutes an essential element in the recycling process, which involves the 'use waste as a resource' strategy, and thus presents itself a circular job. Day to day activities of the recycling operative include physical labour and machine handling such as forklift driving.

### Leasing Process Manager



The leasing process manager is responsible for the coordination of the external service partners distributed across market segments. By contributing to the workings of a product as a service model, the leasing process manager contributes to the circular economy through the 'rethinking the business model' strategy.

# EMPLOYMENT IN THE CIRCULAR ECONOMY

In light of the economic crisis of 2008, recent political shifts and current global trends, the circular economy increasingly plays a central role in overcoming socio-economic challenges. 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 in a liveable and healthy environment.

Previous attempts at defining and measuring circular jobs consist of high-level estimates following one-dimensional sector-based approaches.<sup>8,9</sup> These studies distinguish a small number of sectors that are broadly classified and do not yet cover the circular economy to its full extent. Moreover, they do not take into account cross-sector interaction, thereby missing employment that is indirectly related to the circular economy. As such, they remain too generic to adequately inform circular economy policy.

For these reasons, Circle Economy and Ehero have jointly developed a more granular approach to define and measure the amount of circular jobs. This approach distinguishes over 1400 economic sectors and differentiates between directly circular jobs in sectors that follow core and enabling circular economy strategies and indirectly circular jobs in sectors that support directly circular jobs. Moreover, the approach takes economic interaction between these different sectors into account. As such, we are able to measure the circular labour force in a very detailed way. The method is a uniquely comprehensive way of measuring the circular labour force, providing cities with a tool to effectively invest in the jobs of the future.

More information about the methodology can be found in the appendix.

## What is a circular job?

Employment in the circular economy has been defined according to the 7 key elements of the circular economy discussed above:

**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.

As such, the circular labour market is comprised of all kinds of jobs in different sectors, ranging from waste management to the creative industries. The examples on the left illustrate the types of directly circular jobs that follow each of the 7 elements and indirectly circular jobs that support directly circular jobs.

# INDIRECTLY CIRCULAR JOBS

## The Courier

The courier's job does not directly contribute to the circular economy, however, they can play a role in enabling reverse logistics schemes for circular businesses. When the number of circular activities increases, the demand for logistics services will grow. At the same time, the more circular these logistics services operate, by for example using renewable resources, the more circular their jobs will be.

## The Teacher

The teacher does not directly contribute to the circular economy, however, they can play a role in educating the future work force on the circular economy. Circular economy education ranges from vocational training to tertiary education and therefore pertains to both core and enabling circular jobs. During a transition to the circular economy, education and training needs will evolve, and so will the jobs catering to those needs.



# CIRCULAR EMPLOYMENT IN THE NETHERLANDS

## 8.1% of Dutch Jobs are Currently Circular<sup>10</sup>

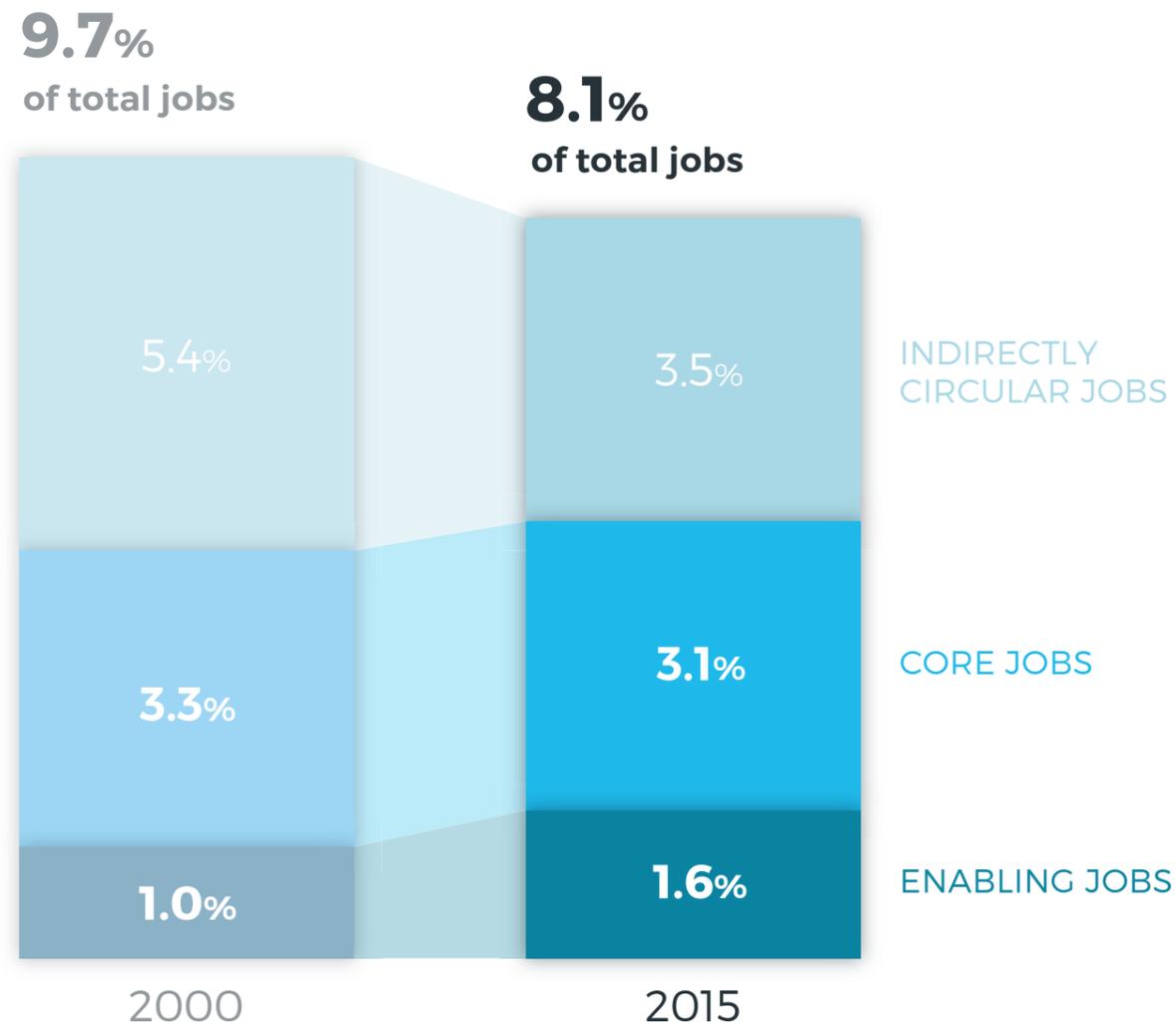
Circle Economy and Ehero have found that the Dutch circular labour force comprises 810.000 jobs in 2015, representing 8.1% of the entire Dutch workforce.<sup>11</sup> The number of circular jobs as a share of the entire dutch workforce remained relatively stable, around the 10% mark, before 2008, after which it has declined significantly with a loss of almost 100,000 circular jobs.

The decline in circular jobs after 2008 is largely due to a significant decrease in indirectly circular jobs that support circular activities. Such indirectly circular jobs include jobs at educational and governmental institutions and other service-related jobs supporting the circular economy. Indirect circular employment used to account for the majority of circular jobs, however, they became the minority of circular jobs in 2011. With almost 5% in 2015, core and enabling circular jobs now account for the majority of all circular jobs.

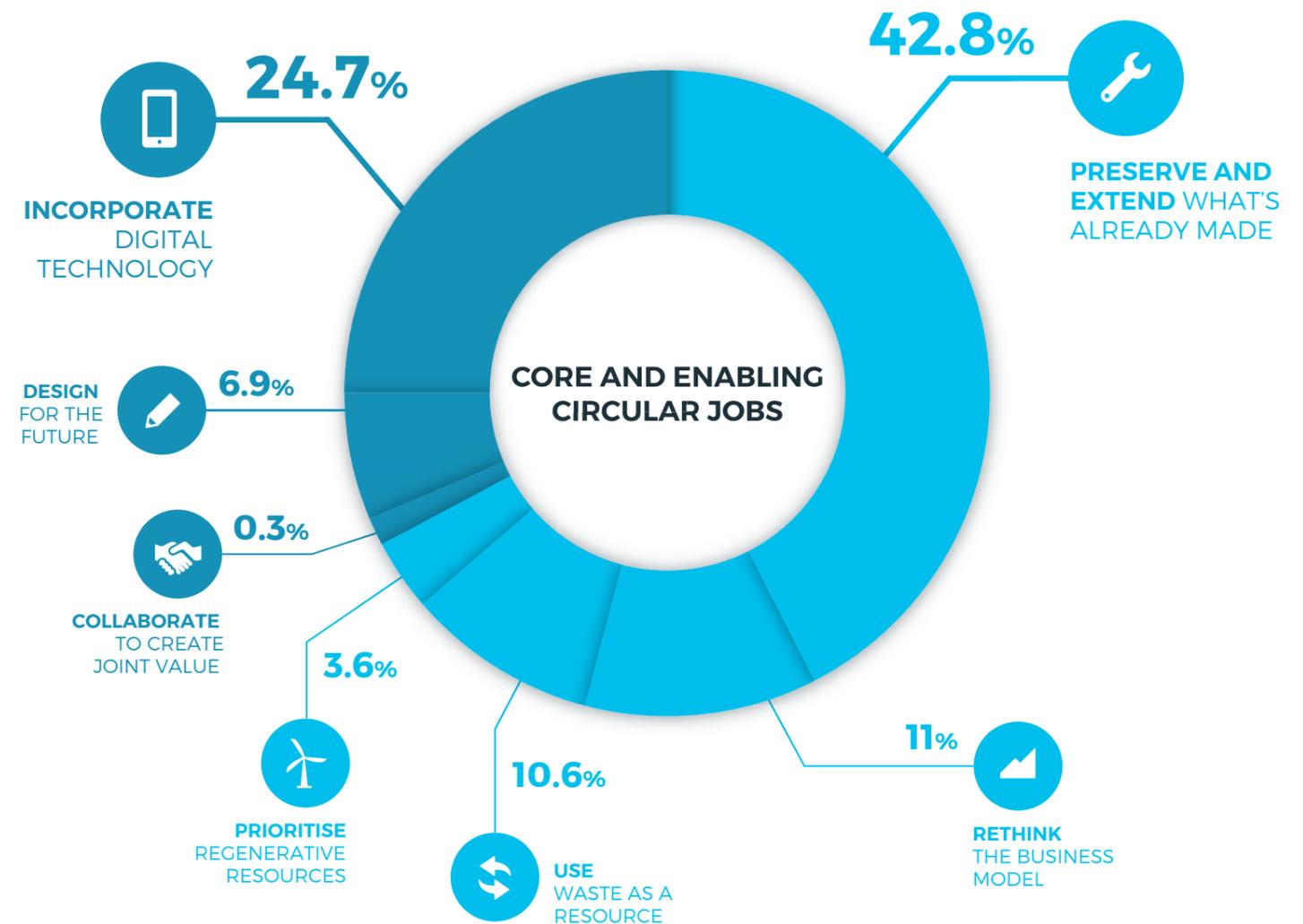
Today, about two thirds of the directly circular jobs involve the core strategies of the circular economy. 'To preserve and extend what's already made' has consistently been the biggest category, accounting for more than half of the directly circular jobs that involve the core strategies. Jobs involving the enabling strategies are mostly represented by the 'incorporate digital technology' strategy.

Within the enabling circular jobs, for example the data analyst, these jobs are one of the fastest growing and there is a high future potential. These enabling jobs provide a the digital infrastructure for the smart, effective, and efficient application of the core activities and are areas of innovation in the circular economy.

Partially curbing the decrease in indirectly circular jobs, those directly circular jobs involving the 'incorporate digital technology' strategy have almost doubled in number over the past two decades.



Breakdown of circular jobs (indirectly, core, enabling) 2000-2015.



Breakdown of circular jobs (according to 7 key elements) 2015.

# CIRCULAR EMPLOYMENT CENTERED IN CITIES

Looking at the density of directly circular jobs per square kilometer, these jobs are primarily located in urban areas.

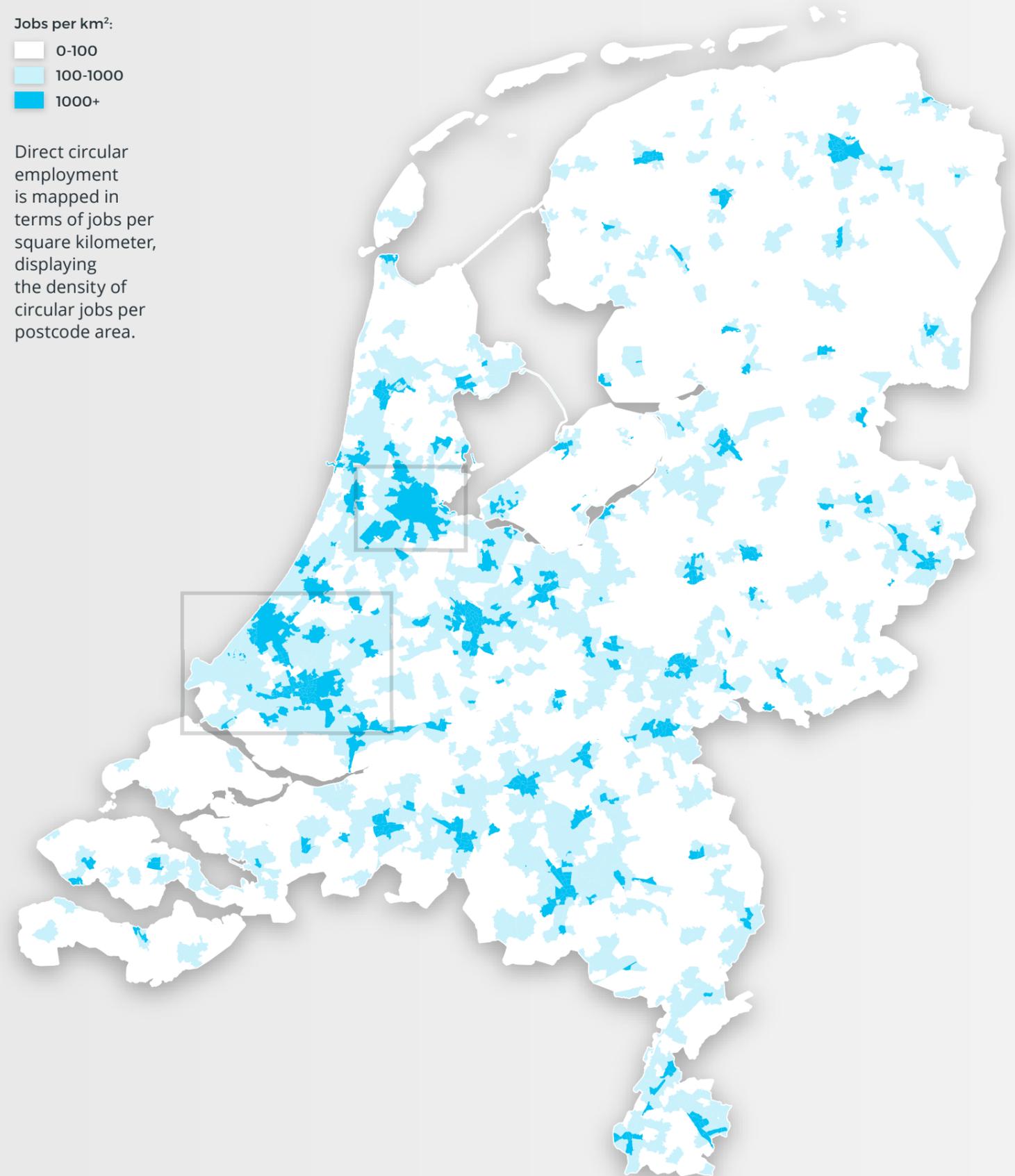
Taking a closer look at these urban areas, there is a pronounced difference between city centers and their periphery. Historically, city centres have grown to be more attractive for service-oriented and more knowledge intensive activities because they depend on one another for labour markets and knowledge spillovers. Industries such as the manufacturing industry are less knowledge intensive, and their location factors are therefore more oriented towards space, cost of scaling and logistical connectivity.<sup>12</sup> That being said, the more knowledge intensive and service-oriented activities sort out and concentrate in urban cores and core circular activities relatively more in the urban peripheries.

Such locational disparity of circular employment is linked to the nature of different circular activities. The core circular strategies (prioritise renewable resources, preserve and extend what's already made, use waste as a resource, and rethink the business model) are closely intertwined with traditional manufacturing industries. The enabling circular strategies on the other hand (design for the future, collaborate to create joint value, and incorporate digital technology) characterise a more knowledge intensive and service-oriented economy.

On the next page, we zoom in on the urban areas of Amsterdam, Rotterdam and The Hague. Jobs involving strategies that enable the circular economy take the upperhand in the city centers. In peripheral areas, jobs involving core circular strategies gain in importance. Most striking are the ports of Rotterdam and Amsterdam, where the number of enabling jobs is relatively limited along the dock areas while the number of core jobs is significantly higher.

Jobs per km<sup>2</sup>:  
0-100  
100-1000  
1000+

Direct circular employment is mapped in terms of jobs per square kilometer, displaying the density of circular jobs per postcode area.

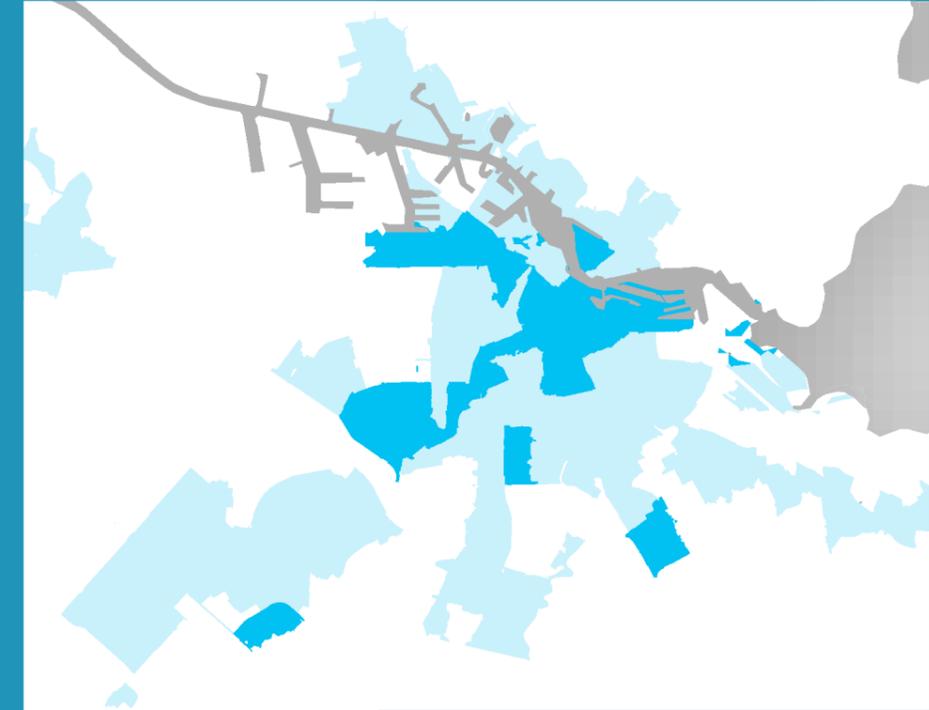
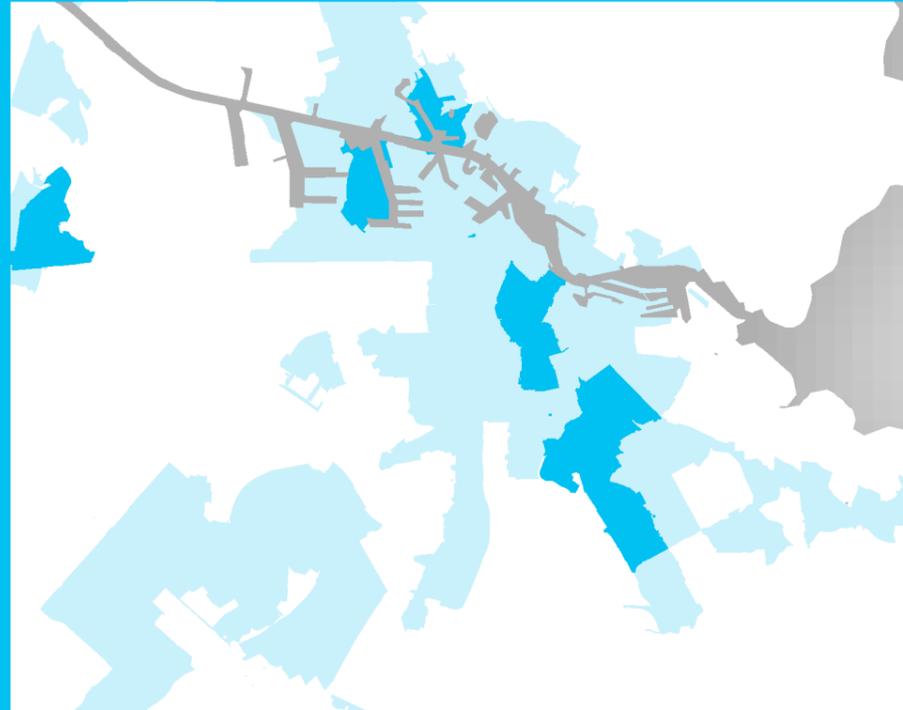


## CORE JOBS

## ENABLING JOBS

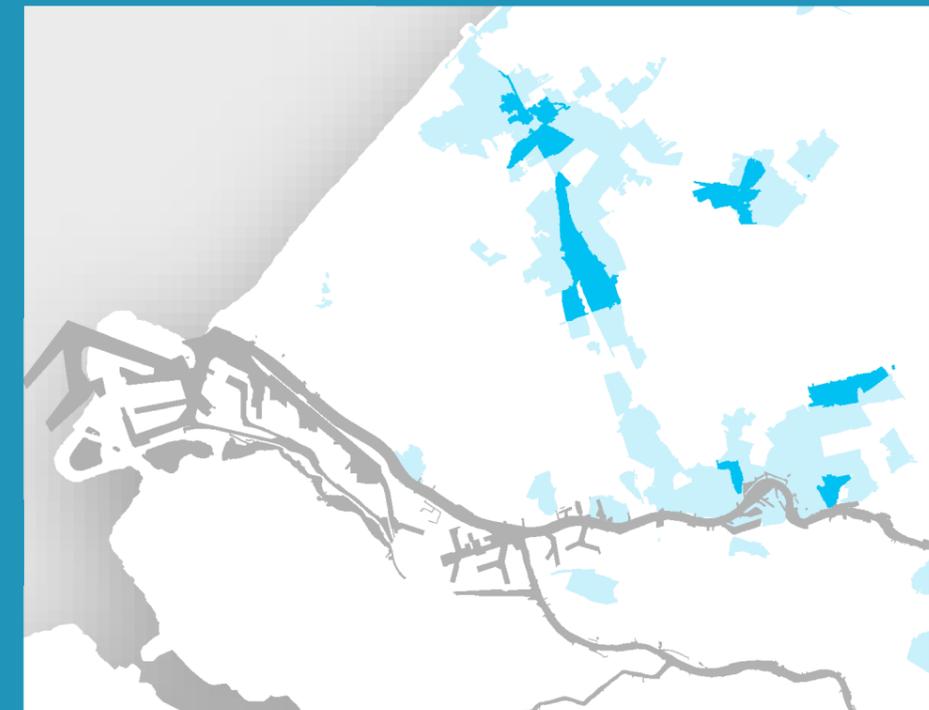
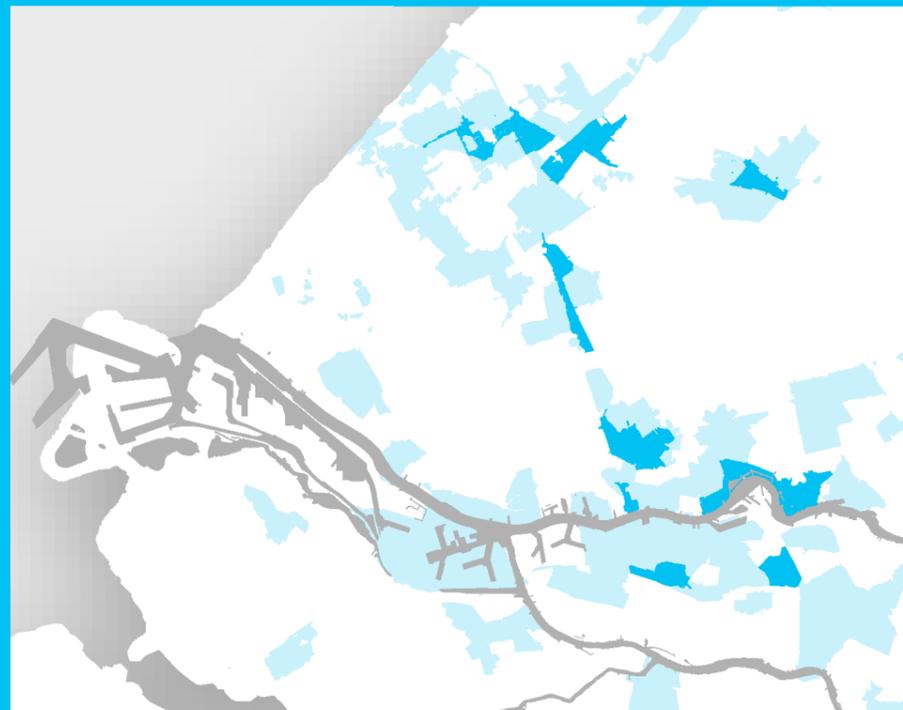
### AMSTERDAM

The Amsterdam city centre lights up with jobs that directly enable the circular economy; with most of the neighbourhoods housing over 500 such jobs each. The Schiphol area is another hub for jobs that involve activities directly enabling the circular economy. Jobs with core circular activities on the other hand, are more spread out in the North-West of the city, in the port of Amsterdam, in the South-East around Schiphol airport and in the South-East periphery.



### ROTTERDAM/THE HAGUE

In the Rotterdam and The Hague metropolitan area, jobs involving core circular strategies are overwhelmingly present in the port of Rotterdam and along the traffic axis connecting both cities. Jobs involving strategies enabling the circular economy are mostly located within the city centres, with the Hague gaining in importance compared to Rotterdam.



# CONCLUSION

The growing threat of climate change, resource depletion, and the persisting consequences of the 2008 economic crisis present enormous socio-economic challenges, such as unemployment and the shift to a new economy. In cities, threats and opportunities meet, and their circular development provides unique opportunities to move towards a sustainable and inclusive future with jobs for a cross-section of society.

In order to carry out the systemic changes that the circular economy entails, cities need tools to monitor and track the progress that is made according to a set of parameters. The need for quantitative data analysis of circular strategies thus emerges.

The present report has proposed a clear definition of circular employment and put forward a standardised and replicable method to measure it. Moreover, it has outlined shifts in core and enabling circular jobs and mapped these activities across urban cores and peripheries.

The method to measure the number of circular jobs makes use of existing datasets, directly enabling the monitoring and evaluation of jobs in the circular economy. This work therefore contributes to evidence-based circular economy policy making and allows for different levels of governments to effectively invest in the jobs of the future.

The report has established a first baseline to measure jobs in the circular economy. Further development and detailing of the methodology is planned and focuses on skills that are needed in the circular labour market. Subsequently, such insights can be employed to develop predictive models, which could estimate the impact of the transition to the circular economy on a city's labour market. This could bring crucial information for active policy making on employment, benefiting the overall socio-economic system.

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- <sup>9</sup> **WRAP, London sustainable Development Commission, Greater London Authority & London Waste and Recycling Board.** (2015). Employment and the circular economy: Job creation through resource efficiency in London. Retrieved from <http://www.lwarb.gov.uk/wp-content/uploads/2015/04/London-Circular-Economy-Jobs-Report-2015-Online-Version-Final.pdf>
- <sup>10</sup> This is a conservative estimate, as it only takes one level of economic interaction up and down the value chain into account. In other words, the full trickle down effect of circular economy activities is not captured by this number, and the real number of circular jobs is somewhat higher than this figure.
- <sup>11</sup> The methodology applies, for reasons of replicability and standardisation, solely to wage work jobs. This means that jobs in self-employment are not taken into account when calculating the share of circular jobs. The total number of circular jobs is an extrapolation of this share to the total Dutch workforce, both wage work and self employment.
- <sup>12</sup> **Krabbenborg, L. & F. Daalhuizen (Planbureau voor de Leefomgeving).** (2016). De geografie van het werken in Nederland verandert [The geography of working in the Netherlands is changing]. Retrieved from [http://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2016-geografie-van-het-werken-in-Nederland-verandert\\_2263.pdf](http://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2016-geografie-van-het-werken-in-Nederland-verandert_2263.pdf)

# APPENDIX

In determining the number of circular jobs in the Netherlands, both qualitative and quantitative research methods were employed. The approach taken is elaborated in more detail in the following sections.

## 1. Qualitative Preliminary Research

A combination of literature review and expert interviews were conducted. The research and interview questions were aimed to better understand the current thinking around circular jobs and their measurement. The results of these interviews and research are summarised in the table below.

From this research, it was determined that a sector-based approach - counting the number of jobs within classifications of economic activity relevant to the circular economy - is the ideal starting point for measuring circular jobs. However, there is a need to go beyond the sectors considered in these studies in order to more comprehensively capture the 7 elements of the circular economy.

RESEARCH	DESCRIPTION
<b>Qualitative Interviews (15 experts)</b>	Most participants define circular jobs as company-based and sector-based. All participants included recycling as part of the circular economy, 5 mentioned renewable energy, 5 mentioned lifetime extension.
<b>WRAP &amp; Green Alliance</b>	Sector-based approach to measuring circular jobs. Following sectors are considered circular: <ul style="list-style-type: none"> <li>• Retail of second hand goods in store</li> <li>• Waste and recycling</li> <li>• Wholesale of waste and scrap</li> <li>• Repair of machinery equipment</li> <li>• Repair of electronics and household goods</li> <li>• Renting and leasing</li> </ul>
<b>Indirectly Circular Job</b>	Sector-based approach to measuring circular jobs. Following sectors are considered circular: <ul style="list-style-type: none"> <li>• Waste collection, treatment, disposal and recovery of sorted materials</li> <li>• Wholesale of waste and scrap</li> <li>• Repair of metal products machinery and equipment</li> <li>• Repair of computers, electronics and household goods</li> <li>• Retail sale of second-hand goods</li> <li>• Rental and leasing activities</li> </ul>
<b>Scottish Government</b>	Activity-based approach to measuring jobs from Zero Waste Plan. Following activities are considered: <ul style="list-style-type: none"> <li>• Recycling collections</li> <li>• Sorting of waste</li> <li>• Resource efficiency</li> <li>• Food waste processing</li> <li>• Plastic waste reprocessing</li> <li>• Residual waste treatment infrastructure</li> </ul>

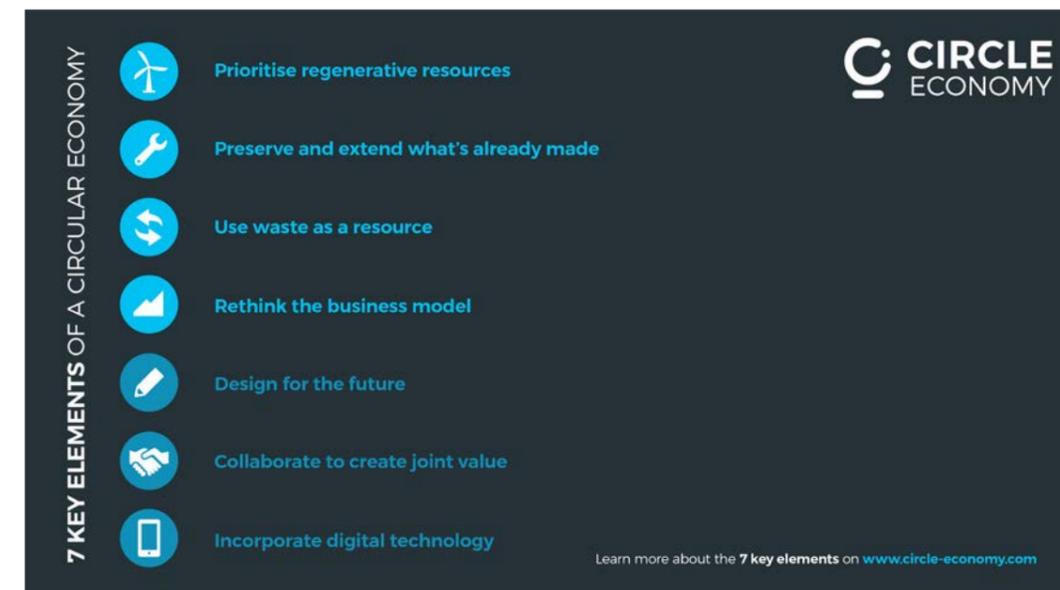
## 2. Quantitative Data Analysis

To get the relevant employment data for the circular jobs analysis, a database of jobs in the Netherlands was purchased from Stichting LISA from 1996 to 2014. This database was selected because it contains employment data from each establishment in the Netherlands where paid work is performed, with addresses of the businesses and their relevant sector category at a 4-digit level of detail. As a result, it is not only possible to determine the number of jobs based on relevant circular sectors, but also identify the geographical distribution of circular jobs across the Netherlands.

### Definition of a circular job

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. From the qualitative research, there was an initial understanding of which sectors contain circular jobs based on previous studies. However, these studies incorporated only 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, 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.

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 elements**.

An **indirectly circular job** includes jobs within all other sectors of the economy that support the directly circular jobs.

Using this definition, the sectors of economic activity in the LISA database 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.

CIRCULAR JOB	ECONOMIC SECTOR	CIRCULAR ECONOMY ELEMENT	EXAMPLE SECTORS & ACTIVITIES
Directly Circular Jobs	Core jobs	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 jobs	Collaborate to Create Joint Value	Industrial design and architecture
		Design for the Future Incorporate Digital Technology	Professional and networking associations Digital technology
Indirectly Circular Jobs	Indirectly circular		Education Government services Professional services

Regarding 'rethink the business model,' it should be noted that there are a number of circular business models, such as leasing and sharing strategies, that have a positive effect on resource use. These business models are very innovative and have often not yet penetrated the market on a larger scale and are therefore not yet distinguished as such in existing databases. In this methodology, all renting and leasing activities are included to represent the 'rethink the business model' element.

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 tables.

### Input Output Analysis

To calculate the percentage of jobs within enabling circular and indirectly circular sectors, the Use table for the Netherlands was utilised for the years 2000 to 2014. These Use tables contain the monetary values of transactions between the products of various sectors along the rows and the economic sectors that use these products along the columns. Using the classification of core, enabling, and indirectly circular sectors, the rows and columns were categorised as outlined in the table below.

	CORE CIRCULAR SECTORS	ENABLING CIRCULAR SECTORS	INDIRECTLY CIRCULAR SECTORS	TOTAL
Core Circular Sector Products		<b>B</b> (core circular products used by enabling circular sectors)		<b>Total_Row</b>
Enabling Circular Sector Products	<b>C</b> (enabling circular products used by core circular sectors)	<b>D</b> (enabling circular products used by enabling circular sectors)		
Indirectly Circular Sector Products	<b>E</b> (indirectly circular products used by core and enabling circular sectors)			
<b>Total</b>	<b>Total_Column</b>			

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

$$\{(B+D) + (C+D)\} / \{Total\_Row + Total\_Column\} = \% \text{ of enabling circular jobs}$$

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

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

These percentages were then applied to the LISA database to calculate the number of enabling and indirectly circular jobs.