

BRUSSELS CAPITAL REGION:

Circular Economy Transition



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ON CITY DATA

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Acronym List

BCR	Brussels Capital Region
BECI	Brussels Enterprises, Commerce and Industry
CCB-C	<i>Confederation Construction Brussels Capitale /</i> Construction Confederation Brussels Capital
CE	Circular Economy
DEP	Department of Environmental Protection (New York City, USA)
EGSS	Environmental Goods and Services Sector
ETS	EU Emission Trading System
GHG	Greenhouse Gases
IBSA	<i>Institut Bruxellois de Statistique et d'Analyse /</i> Brussels Institute for Statistics and Analysis
IPF	Iterative Proportional Fitting algorithm
IRP	International Resource Panel
ISO 37120	International Standardization Organisation Standards for City Data - 37120
MAD	<i>Mode and design centre</i> Brussels Fashion and Design Platform
MID	Material Import Dependency
MSW	Municipal Solid Waste
LFS	Labor Force Survey
PREC	<i>Programme régional en économie circulaire /</i> Regional Programme in Circular Economy
RME	Raw Material Equivalents
SM	Spatial Microsimulation
SME	Small and Medium Enterprise
SMUM	Spatial Microsimulation Urban Metabolism
SNTEDD	<i>Stratégie nationale de transition écologique vers un développement durable</i> National Strategy for the Ecological Transition Towards Sustainable Development
TWh	Terawatt hours
UCM	<i>Union des Classes Moyennes (Brussels)</i> Organization for independent workers and business owners
UM	Urban Metabolism
UN Environment	United Nations Environment Programme
WCCD	World Council on City Data
WHO	World Health Organization

Table of Contents

Acknowledgments	3
Acronym List	4
Contents	5
Introduction	6
Circular Economy: How Brussels Compares.....	8
City benchmarking using Clty Benchmarking using WCCD ISO 37120 Certified City Data	8
Benchmark 1: Quality of Life	9
Benchmark 2: Consumption	11
Benchmark 3: Global environmental impact	13
How Circular is Brussels	13
Opportunities for a circular economy: Water	14
Monitoring Circular Economy in BCR.....	17
Proposed CE Indicators for Brussels	20
Measuring and Monitoring Circular Economy Jobs	22
Starting Point: How Many Circular Economy Jobs Are There in Brussels?	24
Conclusions and Recommendations.....	26
Annex: Proposed Macro-Level Indicators.....	28
References.....	30

This document (which is a summary of a longer report) provides recommendations to support Brussels Capital Region (BCR) in monitoring its circular economy strategy. It provides a comparative analysis of Brussels and WCCD ISO 37120 cities, a recommended monitoring framework to measure circular economy flows and effects; it reflects on job measurement of other cities and possible applications in Brussels; and it provides a closer look at how urban metabolism can be used to analyse and improve Brussels' resource flows.

Introduction

According to the United Nations Environment Programme's (UNEP/UN Environment's) International Resource Panel (IRP), resource extraction increased twelve-fold between 1900 and 2015 (UNEP, 2011), much of it consumed in urban areas. While just over half of the global population live in urban areas, the urban population accounts for 75% of natural resource consumption, and this urban population is set to grow by almost 2% every year. Given this growth and the current and projected resource consumption related to key city services such as housing, mobility, energy, water, but also food, tourism and consumer goods, sustainable urbanisation and city level action are critical.

Transitioning to a circular economy is now widely viewed as the logical solution to the growing problem of overconsumption and unsustainable production, particularly at the city-level.

Changing the patterns of urban resource use has significant potential for impact—making a transition to a circular economy in the mobility, food and built environment sectors alone could lead to emissions reductions of 48% by 2030, and 85% by 2050, compared with 2012 levels¹. At the same time, increased 'circularity' has become a selling point for world cities as they compete for highly skilled labour, international businesses, and national investments.

The European Commission has adopted an ambitious circular economy package designed to boost global competitiveness, foster sustainable economic growth and generate jobs. World cities like Amsterdam, London, and Paris have taken on these concepts and aggressively pursued local-level circular economy plans to stimulate their economies.

Circular economy is defined as:

An economic system for exchange and production that aims to increase resource efficiency use and reduce environmental impact at all stages of the product (goods and services) life cycle, while developing the well-being of individuals. Moreover, the circular economy aims to drastically reduce resource waste at source while ensuring the reduction of environmental impacts and increase in well-being. To the greatest possible extent, it shall be developed at the local level and create value chains that are not easily outsourced.

An exact pathway to achieve a Circular Economy is still unknown, cities working to identify possible pathways have a big challenge ahead. Cities facing this challenge will find their transition pathway sooner and have a systematic advantage as "first movers" over other cities. Such a transition requires time, cities making changes toward a Circular Economy now will stand "ahead of the curve".

IMPORTANT POLITICAL GOALS



Increasing
local production



Reducing
transport of goods



Optimizing
use of local resources
especially land



Creating value and
improving quality of life
through job creation

The Brussels Capital Region (BCR) has also risen to the challenge of transitioning to a circular economy. In response to EU guidelines, BCR developed its *Programme Regional en Economie Circulaire* (PREC)² or “circular economy strategy,” which articulates Brussels’ aspiration to “use resources efficiently while reducing losses towards building an innovative regional economy” and identifies 111 targets for achieving a circular economy.

This document provides an analysis of existing data for Brussels and how it compares with a subset of cities in the WCCD ISO 37120 certified city network. Following this, the document provides recommendations to support Brussels Capital Region (BCR) in monitoring its circular economy strategy with local political goals in mind. It is a collaboration between BCR and the Global Initiative for Resource Efficient Cities³, led by the United Nations Environment Programme (UN Environment) along with Ecocity Builders and the World Council for City Data (WCCD).

Partners

UN Environment: The leading global environmental authority that sets the global environmental agenda. UN Environment has been exploring sustainable consumption and production and circular economy for over two decades and serves as Secretariat to the International Resource Panel.

Ecocity Builders specializes in bottom-up approaches to urban metabolism analysis. One of the few organization that supports community engagement in science-based planning and develops tools that support policymakers in understanding the overall picture.

World Council for City Data (WCCD) is recognized for its leadership in the development and implementation of the ISO 37120 *Sustainable Development of Communities: Indicators for City Services and Quality of Life*. WCCD is building a global network of cities reporting independently verified and globally comparable data.

UN Environment, EcoCity Builders and WCCD worked closely with Brussels Environnement and *L’Institut Bruxellois de Statistique et d’Analyse (IBSA)*, who provided strategic guidance and data.

Circular Economy: How Brussels Compares

Brussels, as the European capital, is committed to help lead Europe's transition to a circular economy. A circular economy can significantly reduce the overall environmental impact of cities and create benefits at the local level for cities and municipal governments⁴. These include:

- Local innovation, business development, and employment creation
- Relieving pressures on municipal services and budgets
- Increased disposable income
- Reduced GHG emissions
- Increased liveability
- Enhanced resilience

Circularity has become a selling point for world cities as they compete for highly skilled labour, international business, and national investments. Comparing Brussels to its peers suggests opportunities and provides insights on how peer cities address similar issues.

City benchmarking using World Council on City Data ISO 37120 Certified City Data

ISO 37120 is the first and only international standard for city data, with 100 indicators that measure social, economic and environmental performance. More than 50 of these indicators have direct relevance to the circular economy, in areas such as economy, energy, GHG emissions, air quality, solid waste and water. Peer cities were selected by the WCCD for this benchmarking, based on similar levels of economic development and resource use.

Current circular economy indicators in use are focused on materials, solid waste, energy and economic flows. The data in the following comparison under the ISO indicators has been expanded to include additional benchmarks including job creation, health and air quality, water and global environmental impact.

The data for BCR in the comparison was provided by Brussels-Capital Region or other major local institutions. The data and the sources are summarized in Annex 2. It has not been subject to independent third-party verification as is the case with the data from WCCD ISO 37120 Certified Cities. As such it is not possible to fully verify the data and its level of compliance with the definitions and methodologies as per ISO 37120. The WCCD ISO 37120 certified cities in this report include Amsterdam, Boston, Los Angeles, Melbourne LGA, Oslo, Toronto and Rotterdam.

Benchmark 1: Quality of Life

Employment and job creation

Unemployment in the Brussels Capital Region is relatively high compared with peers. The circular economy strategies of cities like London, Amsterdam, and Paris all include job creation, and Brussels is also keen to create new employment opportunities in sectors and activities aligned with circular economy.

The creation of new businesses is also a big motivation for cities to transition to a circular economy, increasing economic activity and employment. The relative creation of businesses can be measured over time through ISO 37120 Indicator 5.6: Number of businesses per 100 000 population (see Figure 2). City governments can play a catalytic role in formation of businesses linked to the circular economy. For example, Los Angeles has provided loan financing to eligible businesses that are supporting the city's zero waste targets by making their products out of post-consumer or post-industrial waste materials.

ISO 37120 Indicator 5.1: City's unemployment rate

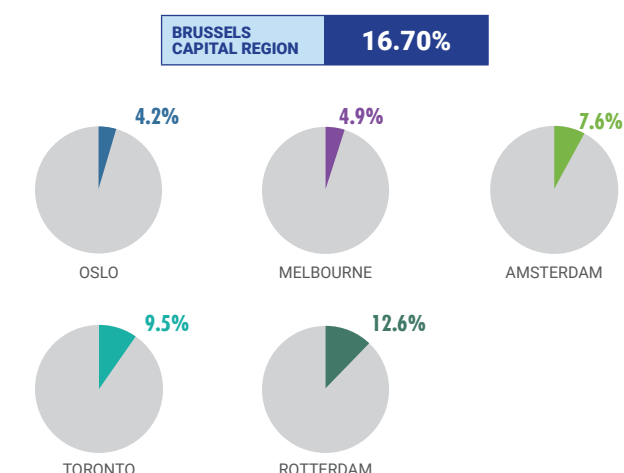


Figure 1

ISO 37120 Indicator 5.6: Number of businesses per 100,000 population

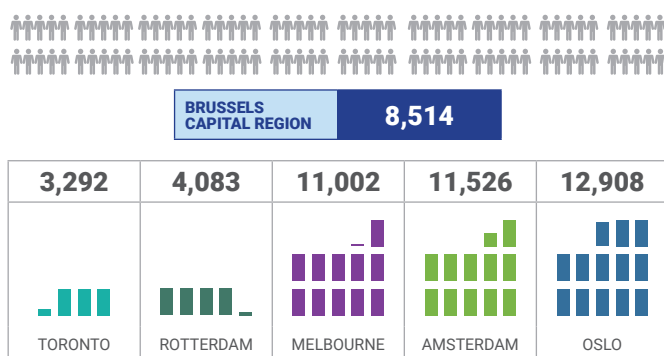


Figure 2

Health and Air Quality

Health is an important determinant of quality of life, which in cities is directly linked to air quality. Awareness of the impact of air pollution, especially particulate matter (PM), has increased pressure on local governments to improve air quality, and improvements in air quality are a major proposed benefit of CE transition. A transition to a circular economy model could produce improvements in the indicators below, particularly through reduced emissions from transportation, energy production, water and wastewater management, and materials transport and handling. Improved air quality not only improves health outcomes, but is increasingly seen as important for economic development and attracting investment.

The air quality of Brussels ranks in the middle of its peers. A transition to a circular economy model could produce improvements in these indicators through reduced emissions from transportation, energy production, water and wastewater management, and materials transport and handling. Air quality and employment are key considerations for quality of life, and a transition to a circular economy can support long term improvements.

ISO 37120 Indicator 8.1: Fine particulate matter PM _{2.5} concentration	ISO 37120 Indicator 8.2: Particulate matter PM ₁₀ concentration	ISO 37120 Indicator 8.4: NO ₂ (nitrogen dioxide) concentration	ISO 37120 Indicator 8.5: SO ₂ (sulfur dioxide) concentration
7.9 MELBOURNE	16.2 MELBOURNE	19.2 MELBOURNE	1.1 AMSTERDAM
9.0 TORONTO	17.0 AMSTERDAM	29.2 TORONTO	1.4 MELBOURNE
9.0 OSLO	20.3 ROTTERDAM	31.5 ROTTERDAM	2.0 TORONTO
13.6 AMSTERDAM	24.0 OSLO	32.9 AMSTERDAM	2.0 OSLO
14.9 ROTTERDAM		53.0 OSLO	7.1 ROTTERDAM
13.4	18.3	28.7	1.6
BRUSSELS CAPITAL REGION			

Figure 3

Benchmark 2: Consumption

The relationship between a city and the areas beyond its boundary is essential to the circular economy concept. UN Environment's review of the global circular economy discussion showed that material flows and consumption are central to existing global indicators on circular economy. In 2015, Brussels Capital Region conducted an urban metabolism study which confirmed that BCR is highly dependent on large quantities of national and international resource flows (agriculture, energy, metals)⁵. Efforts to reuse and recycle these goods are insufficient, and demand for raw materials increases the region's dependence on outside resources.

Water consumption

Water is an important part of a circular economy and an essential resource. Large cities like Brussels typically have a range of instruments to enable and incentivise efficiency in water use, as well as measures to encourage water reuse and recycling. The treatment and distribution of water – especially when taken together with the collection and treatment of wastewater – is one of the single largest uses of energy for many cities.

In the case of water consumption, Brussels has relatively low per-capita usage relative to its peers (Figure 4). The city still suffers a loss of 13% of its water supply per day (Figure 5), which is average among its peers but could be reduced significantly through additional measures.

According to Brussels Environnement, 68% of water consumption is residential. The average daily drinking water consumption is one of the lowest in Europe and has shown a downward trend since 1996. Possible factors include expansion of water-saving devices (showers, toilets, dishwashers and washing machines), water pricing that increases when consumption level per person goes up, and possibly some reduction due to growing awareness of households⁶.

Compared to its peers, Brussels is doing a reasonably good job in water management and should look to bigger cities for ideas on improving performance.

ISO 37120 Indicator 21.5:
Total water consumption per capita (liters/day)

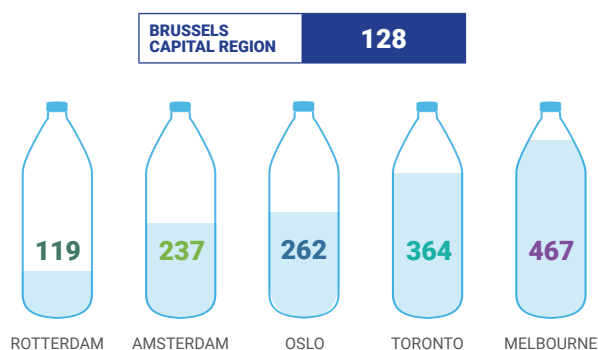


Figure 4

ISO 37120 Indicator 21.7:
Percentage water loss (unaccounted for water)

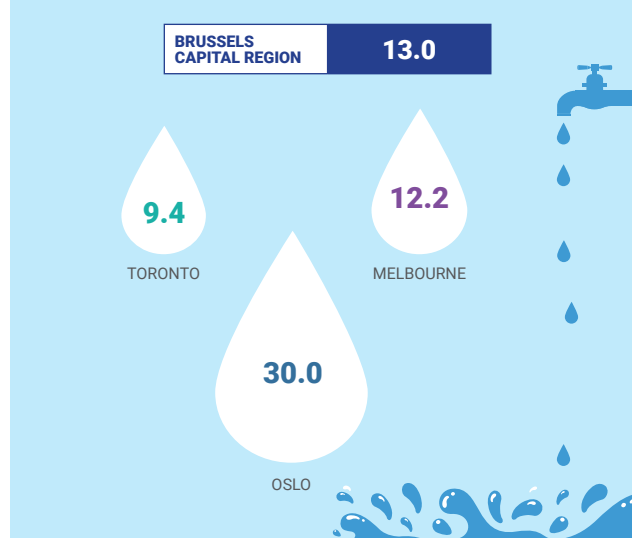


Figure 5

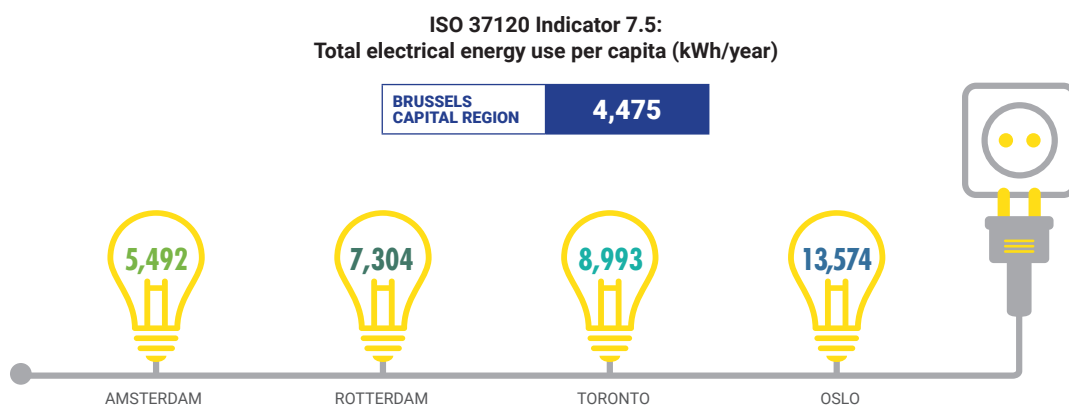


Figure 6

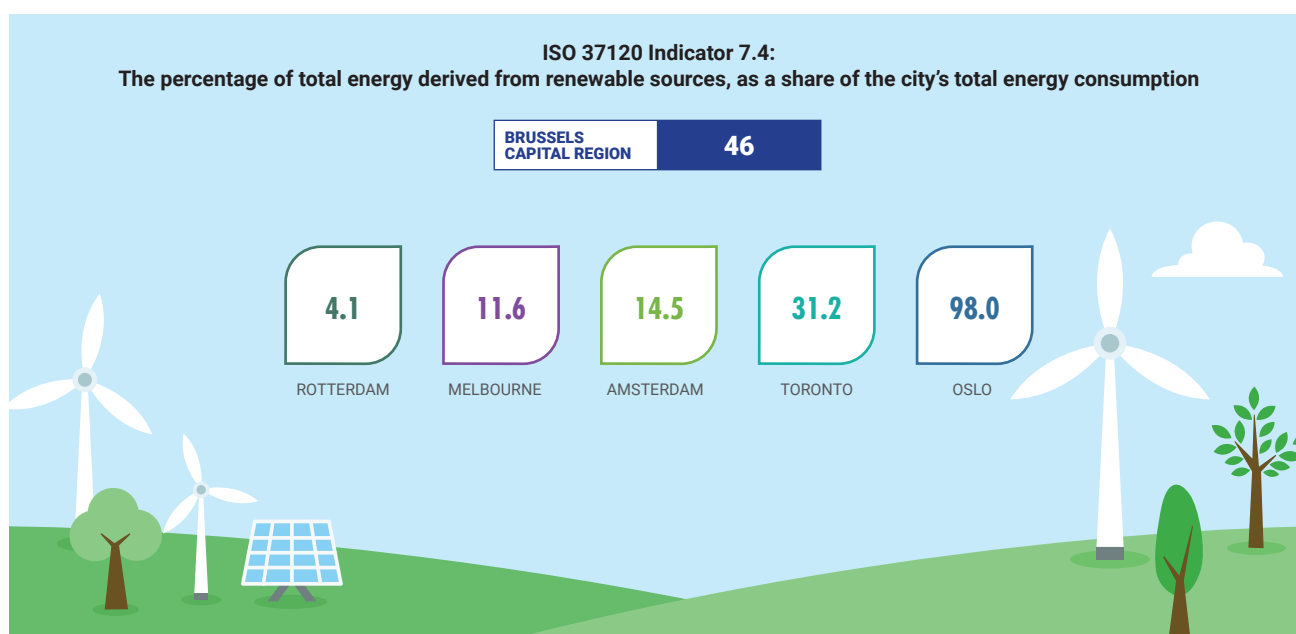


Figure 7

Energy consumption

Brussels leads in energy efficiency measures, with only Barcelona having a lower per-capita usage (Figure 6). *ISO 37120 Indicator 7.5* looks at overall consumption by commercial, industrial, and residential sectors.

46% of BCR's total energy mix comes from renewable energy sources. Renewable energy is often a core component of city plans to significantly reduce GHG emissions.

Materials management

Moving away from the 'take-use-dispose' model of material use is fundamental to the concept of circular economy. Cities can play a pivotal role in this transition due to the proximity of people and materials in the urban environment; the sufficient scale that cities represent for building new markets for materials, goods and services; and the opportunities for the deployment of new digital technologies for applications such as virtualisation, dematerialisation, transparency on product use and material flows, and feedback-driven intelligence⁷.

A recent report by Circle Economy (2018)⁸ states that the global economy is only 9.1% circular, leaving a 90.9% 'circularity gap'. This implies an enormous amount of wasted potential for reuse or recycling of existing materials.

Fundamental to establishing a baseline of resource use and disposal in cities is understanding current levels of waste generation and collection and the rate of waste recycling—measured through *ISO 37120 Indicator 16.2* (Figure 8) and *Indicator 16.3* (Figure 9) respectively. The two figures show that Brussels is on par with other peer European cities with regard to waste collection and recycling. There may be significant opportunities for further learning for Brussels on enhancing recycling rates.

A number of WCCD Certified cities are now achieving recycling rates over 50%. Brussels can look to Los Angeles, USA and Oslo, Norway as global leaders in waste management for ideas on how to improve. Los Angeles has gone beyond a 75% recycling rate target as part of its ambitious goal of zero waste by 2035. Oslo uses a combination of technology and lifestyle approaches to address its waste issues, and a biogas plant processes organic waste from households and industry and turns it into fuel. The city is also piloting a carbon capture and storage facility for non-recyclable waste, which would cut Oslo's CO2 emissions by 12%.

ISO 37120 Indicator 16.2:
Total collected municipal solid waste per capita
(in tons/capita)



Figure 8

ISO 37120 Indicator 16.3:
Percentage of the city's solid waste that is recycled

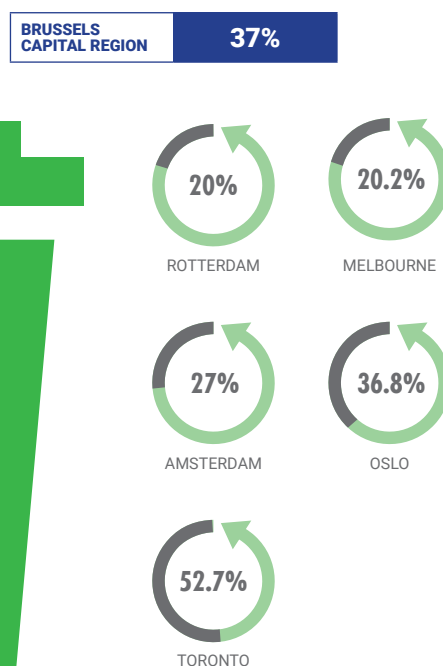


Figure 9

Benchmark 3: Global environmental impact

Consumption is interlinked with GHG emissions, meaning that a city's environmental impacts extend beyond its boundaries to the global level. Measurement of consumption-based emissions is quite new and it is still difficult to achieve a systematic comparison between cities, but Brussels has been making efforts to reduce GHG emissions for a long time. GHG emissions tracking is a good indicator of global impact and success of efforts to transition to circular economy. Under ISO 37120, GHG emissions per capita is measured through *Indicator 8.3* (Figure 10).

Brussels already achieves relatively low emissions per capita, comparable with other leading WCCD Certified peer cities in Europe. Research by the Ellen MacArthur Foundation estimated that a circular economy development path could halve carbon dioxide emission in Europe by 2030⁹, indicating how additional GHG emissions reductions could be a key co-benefit of the implementation of the Brussels Circular Economy Plan.

ISO 37120 Indicator 8.3:
Greenhouse gas emissions measured in tons of CO2 equivalent

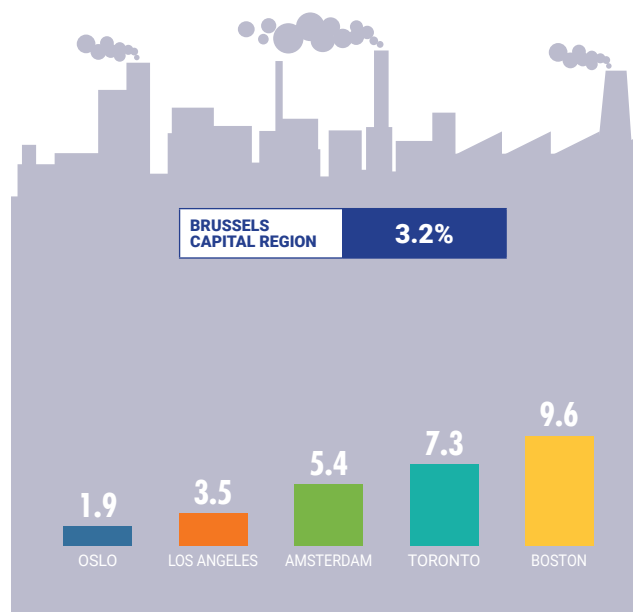


Figure 10

How circular is Brussels?

Brussels is doing well in terms of reducing overall water and energy consumption, and is among the leaders in tracking GHG emissions and consequently has managed to reduce emissions significantly. However, BCR lacks a more holistic approach to its water management and still has scope to further reduce (13%) water loss. There are opportunities to make water flows more circular through rainwater harvesting and more recycling (see case on water below). There is room to improve in the percentage of waste recycled as well.

The comparative analysis above provides a glimpse of measures with regards to the “quality of life” of the citizens of Brussels (in terms of the creation and distribution of jobs, and the environmental impact, as specified in the suggested indicators below). Pushing for a circular economy transition should help with these measures.

It is worth noting that Brussels has lower comparative performance on managing issues that go beyond its boundaries, such as transitioning its energy mix and having a more holistic water management system. This could be linked to Belgium's complex governance system. Belgium's multi-faceted and complex administrative structure enables it to be politically robust and resilient because of its redundancies but also makes it difficult to change and respond to emerging issues.

Opportunities for a circular economy: Water

In the BCR, drinking water is produced, treated and supplied by the water company VIVAQUA¹⁰. Most of the water, (roughly 68%), comes from ground water aquifers which require little or no treatment. The remainder comes from the Meuse River which must undergo a comprehensive treatment process at the Tailfer plant (Lustin-Namur province) to make it drinkable. Using the available data, we constructed a meta - diagram (the first figure, figure 11) to suggest the current state of the water system for Brussels' residential building sector. This figure is meant to illustrate typical aspects of BCRs water system and was developed using publicly available data in the English language. The diagram shows typical aspects of the current water system as it travels from sources and conversions to meet residential demands, after which it is treated and eventually discharged back into the environment. The diagram is meant to be illustrative, not authoritative, and to serve as a meta-diagram that represents a snapshot of, on average, how and where water is currently coming from and going to as it meets household demands¹¹.

The diagram "flow of water in liters per day through a hypothetical BCR residential eco-household" (the second diagram, figure 12) is meant to illustrate how water efficiency and environmental stewardship can be achieved at the household level to improve the health and resiliency of the BCR water system. The diagram is meant to be illustrative and suggestive, and to serve as a meta-diagram that represents a snapshot of, on average, how water could be used and reused efficiently and effectively at the residential scale, thereby reducing demands and impacts on upstream and downstream sources and sinks, and returning ground filtered water back to the aquifers for recharging.

Figure 11: Flow of water in liters per day through a typical BCR residential household. © Ecocity Builders 2018

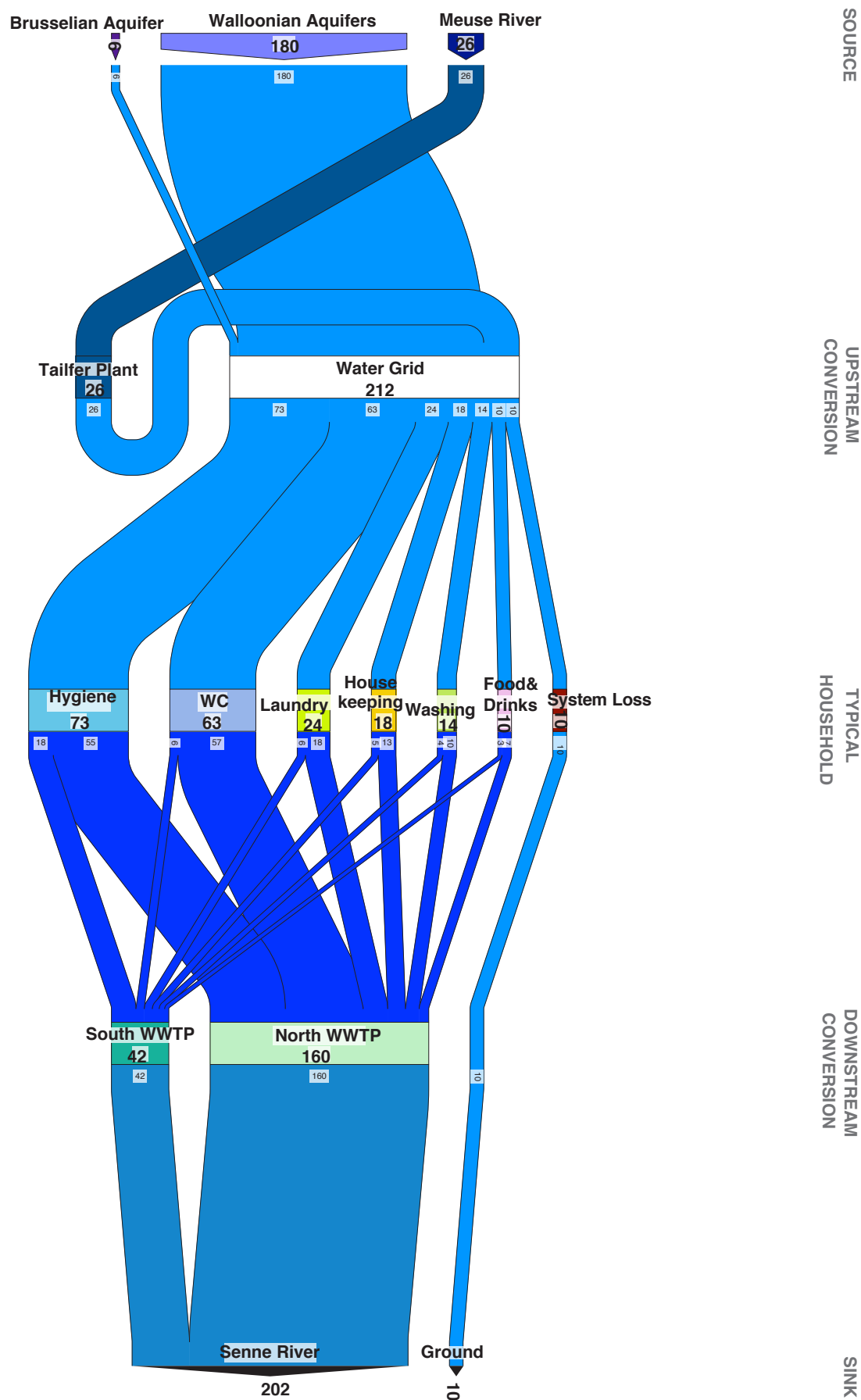
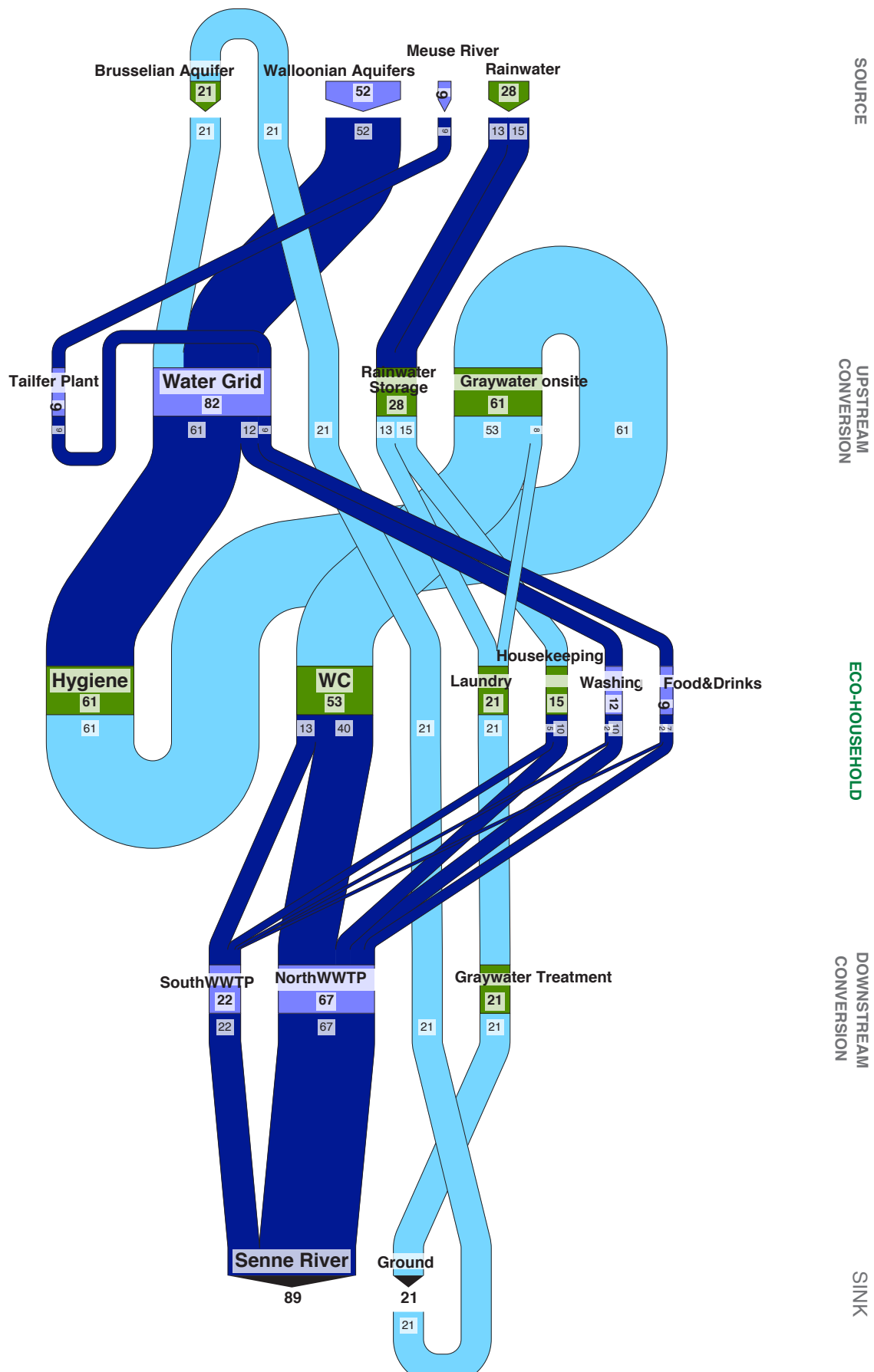


Figure 12: Flow of water in liters per day through a hypothetical BCR residential eco-household. ©Ecocity Builders 2018



Monitoring Circular Economy in BCR

Following the comparative analysis on Brussels' current resource use, the three partner organizations were tasked to develop a conceptual framework together with its corresponding indicators to provide a path to chart progress towards a Circular Economy in BCR. The framework advances upon the considerable actions and strategies that BCR has already taken and notes where existing datasets are available to measure the recommended indicators. The indicators are designed to match both local priorities and global environmental goals.

Conceptual Framework

The circular economy indicators are in three categories:

Flows are the movement of resources in and out of the city. Urban ecosystems bring in energy and materials and process them through their components as they flow through the system. Urban ecosystems include people and the built environment as well as the productive ecosystems generating the energy and matter required to sustain the whole.

Quality of life refers broadly to the socio-economic and cultural fabric of the city, but for the purpose of this framework is focused on jobs—both the quantity of jobs and the spatial and demographic distribution—as a local priority, and an area of insight on the impact that a shift to a circular economy would have on people's lives.

Job creation and attraction of new businesses is a critical area of improvement for Brussels that may be addressed in part through a circular economy transition. By monitoring job distribution through geospatial and demographic data, the city can estimate how policies are impacting the distribution of resources among citizens, especially vulnerable groups like the urban poor, minorities, and women, and then create or modify policies with the goal of more equitable distribution and social inclusion.

Accelerators are policy levers that Brussels can use to achieve a more circular economy. The PREC already details some accelerators that can influence both quality of life and environmental impact (Table 1).

Table 1: Examples of PREC indicators as 'Accelerators'¹²

	INDICATOR	DESCRIPTION	WHAT OR HOW DOES IT SUPPORT?
PREC	LEG2	Governance mechanism to identify, prioritize, and provide legal and administrative solutions necessary for the deployment of a circular economy	Top-down support
	AED1	Brussels Economy, Brussels Environnement and Brussels Impulse will have a call for projects for circular economy (1M EUR)	Accelerate quality of life and environmental impact
	AEI2	The incubator Greenbizz shall be supported and promoted as a hosting platform dedicated to jobs related to the environment and the circular economy	Job creation
	ECOSOC3	EMPLOI 2 measure: call for a "social economy" project led by Brussels Economy and Labour which will identify circular economy as a thematic priority in 2016	Integrating circular economy into the social economy discussion
	INNOV7	Brussels Environnement will continue to stimulate innovation through calls for projects linked to the circular economy.	Nature-based or technological innovation
	FOR2	UCM and MAD Brussels will ensure the transmission of eco-design and eco-functionality tools to higher education institutions to public training providers to enable integration into course curricula.	Job skills transition
	RD5	Brussels Environnement will strengthen the circular management of resources and waste at the neighbourhood and municipal level.	Scalability
	TER6	BCR will support the development of digital manufacturing workshops commonly known as Fab Labs.	New Jobs
	INDIC1	Brussels Environnement, in collaboration with PREC partners, will develop a scoreboard of performance indicators and results for monitoring.	Monitoring
EXPERT SUGGESTIONS	Regional R&D investment (% of GDP)	Growth within could be an important source of additional consumer utility and growth for Europe. A circular economy would provide multiple value-creation mechanisms decoupled from the consumption of finite resources.	Local jobs, local prosperity, resilience, sustainability, environmental protection
	EGSS investment (USD/year)	Environmental Goods and Services Sector (EGSS) consists of activities which produce goods and services to measure, prevent, limit, minimize or correct environmental damage to water, air and soil.	Green development, environmental restoration, liveability and health
	Local investment back into local businesses (% of GDP)	Investment capital is usually invested globally. Even a small shift into the local economy could have large benefits and increase resilience of the local economy.	Economic health and resilience
	Fossil fuel taxation (USD of %)	Increase taxation of resource use and consumption, applying 'the polluter pays' principles. A New era study identifies over a hundred potential tax bases, ranging from carbon emissions to ecosystem services and land use.	Paris Accord, green business, circular economic stimulus
	Renewable energy incentive (USD of %)	Phase-out support for the recovery of energy from waste to encourage movement towards the circular economy and support the generation of truly sustainable energy	Align renewable energy incentives with circular economy
	Businesses that are locally owned (% increase per year)	Local ownership of businesses stabilizes the local economy and retains any profit generated within the local economy. Procurement policies by the city could support local businesses or business with shared ownership structure (e.g. worker-owned or community owned).	Developing a healthy regional ecology of the circular economy
	Carbon price (USD/tonne)	Incorporate the waste industry into the EU Emission Trading System (ETS). If emissions from landfills and incineration were to be carbon-priced, the incentive for waste recovery would be immense. The collection of food waste would be more competitive, allowing this resource to be recycled to produce biogas.	Generate revenues to support circular economic activities, reduce GHG emissions
	Expenditure in sustainable procurement (USD/year and %)	Circular procurement looks at the whole life of a product or service that an organization buys and uses. Done properly it can challenge the way in which an organization uses and consumes products and materials and introduces a framework to assess buying decisions in accordance with circular economy principles.	A framework to assess buying decisions in accordance with circular economy principles
	Training expenditure (USD/year or % of GDP) Number of people trained (Persons/year)	Education and training policies that take into account the 'green skills' needed in the shift towards a circular economy.	Build up a workforce skilled to participate in the circular economy

Accelerators will change over time based on political priorities and local government decisions, so the monitoring framework should focus on Flows and Quality of Life.

Indicators should reflect both quantity and quality of the intended outcomes, illustrated here for jobs and resource flows.

JOBS

RESOURCE FLOWS

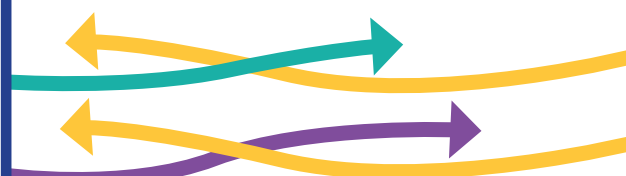
QUANTITY



Number of Circular Economy Jobs

There is no globally agreed upon methodology to define and measure “circular economy jobs”. National methodologies exist but are still evolving, and Brussels has the opportunity to contribute to this conversation.

Paris, London and Amsterdam have commissioned in-depth studies to measure the number of current circular economy jobs as a baseline and to make projections of what a circular economy transition would add.



Resource Flow Pathways

In 2015, Brussels Environnement commissioned a report to track the material flows of Brussels inspired by the EUROSTAT methodology. The report describes specific resource flows (materials, waste, water, energy, etc.) and provides the government with relevant data to implement coherent urban environmental policies.

QUALITY



Distribution of Circular Economy Jobs

Measuring distribution of circular economy jobs could include:

- A qualitative analysis of current circular economy jobs as a baseline, and potential jobs that would be created by the CE transition based on income bracket
- An analysis of the demographic distribution of circular economy job creation to target specific groups such as new graduates
- An analysis of the spatial distribution of circular economy job creation. This can be further enhanced by analytical tools such as Urbinsight¹³.

Brussels already has the tools to measure job distribution using the National Labour Force Survey and calibration through microsimulation.

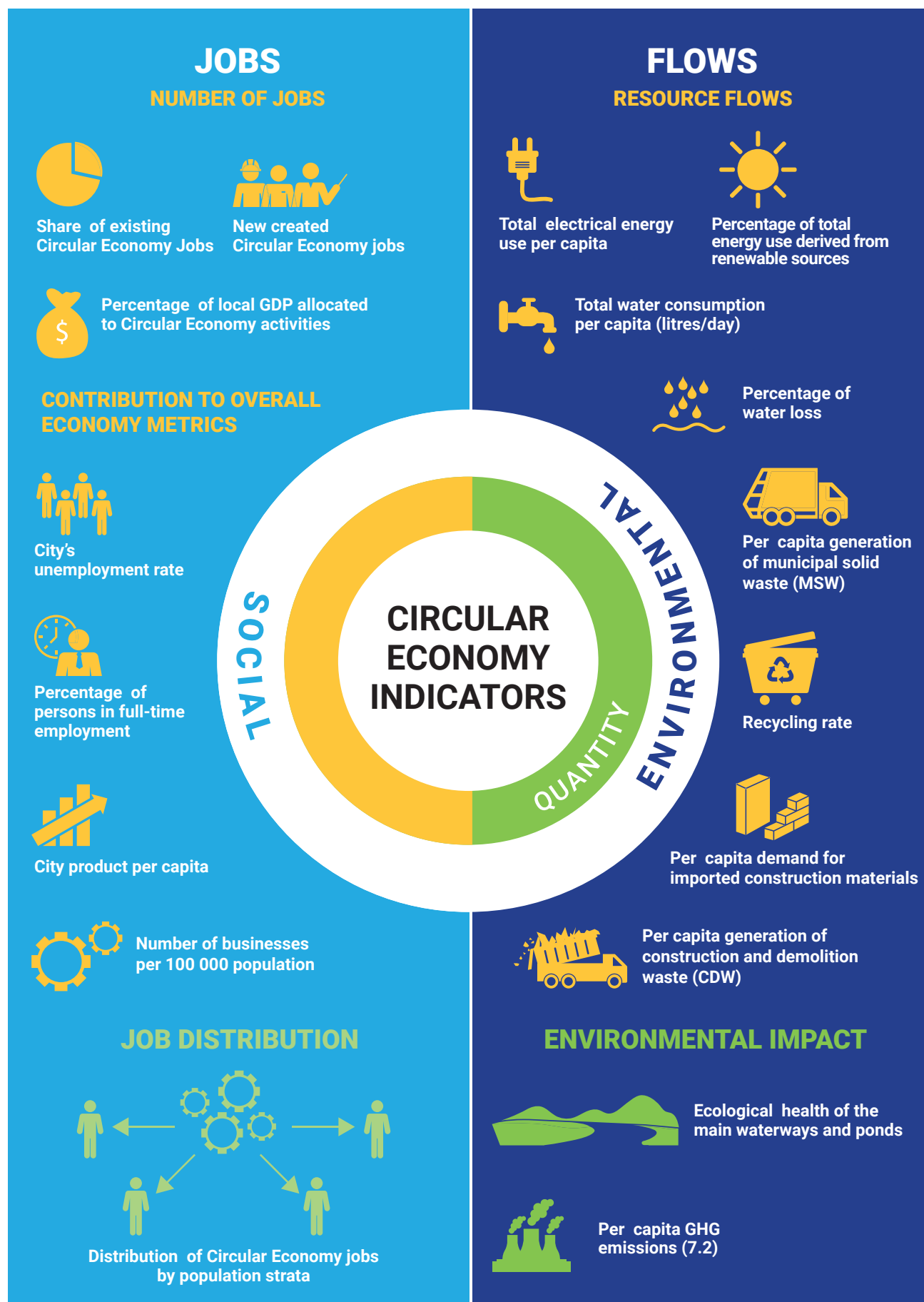


Environmental Impact of Consumption

Environmental impact should be the most important indicator of long-term success of circular economy policies. Brussels can go beyond its boundaries for the measurement of environmental impact starting with Per capita GHG emissions and Overall water quality.

Lower per capita GHG emissions will signal an increase in the circularity of flows as energy efficiency rises and more renewable energy sources are adopted in the city. Reducing municipal solid waste and construction and demolition waste due to recycling, upcycling, or reuse will also produce CO2 savings.

Proposed CE Indicators for Brussels



The proposed indicators are meant to be a conversation starter in for the implementation of the Brussels Circular Economy Plan. They have been framed to make best use of available data in Brussels while responding to the global debate on circular economy. Ideally, there should be a multi-stakeholder process that validates the framework, methodology and recommended indicators.

The Annex includes a list of proposed indicators with data requirements and sources for producing an analysis that responds to the recommended framework. For most indicators listed, data is available for immediate measurement. Where there is no readily available data, estimates can be made using appropriate proxy data. This proxy data could be created using the Spatial Microsimulation Urban Metabolism (or SMUM) tool developed by UN Environment. SMUM creates a synthetic population for the specific city-system with consumption values allocated to individual groups within the city. This allows cities – including those in data-scarce environments – to monitor the distribution of resource flows. This same information can be used as a scenario-building tool to simulate the potential impact that a policy change can have on the resource flow distribution¹⁴.

The main data sources for the measurement and monitoring of BCR's circular economy are from the Institut Bruxellois de Statistique et d'Analyse (IBSA) and the Brussels Environnement Report. ISO 37120 indicators have been included to allow global comparisons and benchmarking through WCCD ISO 37120 Certified city data.

This set of indicators deliberately focuses on the Flows and Quality of Life categories of the analytical framework, with the recommendation that these should be the ones used to monitor over time.

Measuring and Monitoring Circular Economy Jobs

Brussels is well equipped to monitor its circular economy transition, with a dedicated team gathering environmental data. Adding a measure of the number and distribution of circular economy jobs would be a useful supplement. Amsterdam, London and Paris have all taken a granular look at employment and developed robust methodologies which Brussels could learn from, for example to:

- Focusing on a strong definition of circular economy jobs and a thorough calculation
- Looking at job distribution and sectors
- Ensuring a participatory process, engaging national level stakeholders and the general public
- Engaging the private sector

Defining circular economy jobs

Definitions developed by Amsterdam, London and Paris share a common thread focusing on recycling and reuse but the prioritization differs from city to city. There is room to better define 'circular economy jobs' to ensure a shared global understanding.

► Amsterdam

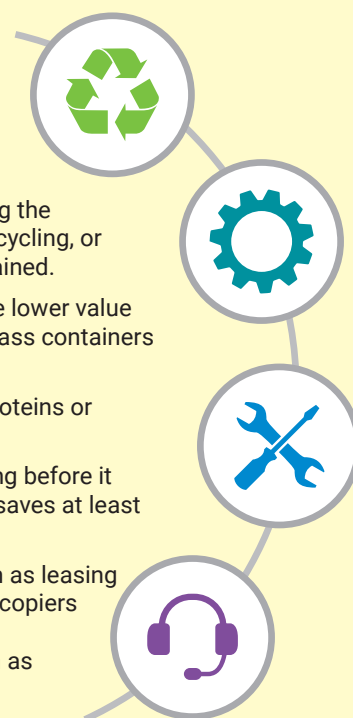
The report *Circular Jobs: Understanding Employment in the Circular Economy in the Netherlands*¹⁵ (2015), defines a circular job as it relates to seven key elements of circularity divided into 'enabling strategies' and 'core strategies'.

Enabling strategies include: (1) collaborating to create joint value (2) designing for the future, and (3) incorporating digital technology. Core strategies include (4) prioritizing regenerative resources (5) preserving and extending what's already made (6) using waste as a resource, and (7) rethinking the business model. The Dutch definition breaks it down further into three categories of job types:

- A circular job is any full-time 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

London's definition of circular economy jobs by sector¹⁶:

- 1 **Reuse** > Finished products are worth much more than the raw materials they are composed of and direct reuse preserves the most value and embodied energy in products
- 2 **Closed loop recycling** > Using waste to make new products without changing the inherent properties of the material being recycled, such as bottle to bottle recycling, or recycling where the product changes but the quality of the material is maintained.
- 3 **Open loop recycling** > Uses recovered materials to create products that have lower value compared to those produced in closed loop recycling, for example turning glass containers into aggregate.
- 4 **Biorefining** > Extraction of small quantities of valuable materials (such as proteins or specialty chemicals) or conversion of waste into energy.
- 5 **Repair and remanufacturing** > Where a product needs repair or reconditioning before it can be used again, remanufacturing preserves the most value, and typically saves at least 70 per cent of the materials required to manufacture new goods.
- 6 **Servitisation** > Any system which increases the effective use of assets, such as leasing and moving from providing products to services instead. Xerox leases photocopiers and printers is a B2B (business to business) example, but there are also B2C (business to customer) or even C2C (customer to customer) examples, such as Airbnb.



► London

London focused on specific sectors of the economy where new jobs will emerge and which groups will be affected by the economy transition (see box on facing page), and its approach also goes beyond its borders. This is a valuable example for Brussels especially in the area of buildings and construction, where there is already an existing market in the city periphery.

► Paris

The way that Paris counts circular economy jobs is anchored to the national framework of circular economy and integrated into the 2015 National Strategy for the Ecological Transition Towards Sustainable Development (SNTEDD 2015-2020)¹⁷ and the Circular Economy Roadmap 2018¹⁸. France used a multi-stakeholder process to define the criteria for a circular economy job and the coefficients at the national level where specific sectors contribute to the circular economy transition. Paris built on these national level efforts, downscaled to the city level, and adjusted slightly to accommodate political priorities.

Measuring circularity

The Paris approach in measuring 'circularity' for a sector is one that Brussels would be able to adopt quite easily. Circular economy coefficients were assigned to each economic sector. For example, a circularity coefficient of 1¹⁹ would attribute all jobs under this economic activity as CE jobs, while a circularity coefficient of 0.5 would allocate only half of the jobs as CE jobs.

Since Brussels does not have these national level 'circularity' coefficients in place, one solution would be to copy the French national circularity coefficients as a good approximation given the similarity in the sources of materials and economic profile of both cities.

The second path would be to make independent computations through a simplified method adapted from the Paris method, based on three components:

- Consumption intensities, through the use of raw material equivalents (RME)
- Import dependencies of the individual economic sectors, weighted by raw material equivalents
- Indirect import dependencies by dependency to other sectors

Brussels has taken the important step of starting to build a 'circular economy jobs' database, but it is in early stages.

Starting Point: How many circular economy jobs are there in Brussels?

Belgium has an ongoing country-wide effort to measure circular economy jobs through applying a methodology to derive circular economy coefficients, developed by Circle Economy, a social enterprise based in The Netherlands.

Circle Economy's²⁰ work has been the basis of Amsterdam's circular economy job calculation as well, which, it is worth noting, is very similar to the methodology deployed by Paris. Amsterdam used expert reports and existing literature to establish their 'circularity coefficient'. Similarly, Paris used national level expert consultations. In both cities, existing sector calculations were used as a basis for the analysis.

UN Environment and Circle Economy are currently working on a combined methodology that further strengthens the methodology of computing circular economy jobs by introducing a two-step approach. The first step is a diagnosis of Brussels' material dependency, complementing the second step of identifying the number of circular economy jobs. This allows a city to assess the areas of its material dependency and possibilities of expanding circular

economy in 'problematic areas' vis a vis the low-hanging fruit where jobs are already transitioning to a more circular economy.

The use of material import dependency may yield complementary results to those from Amsterdam or Paris. The renewable energy sector, for example, is classified by Amsterdam and Paris²¹ as fully circular, but would not be so classified in the UN Environment proposed calculation because of this sector's strong material import dependency.

For this initial diagnostic step, UN Environment classified all economic sectors for Belgium by its material import dependency (MID) where in this MID calculation, the required materials for the manufacturing of the energy infrastructure are relevant and captured in the coefficient.

- Belgium's circular economy coefficients were estimated based on monetary import dependencies²² (blue bars on figure 1 below) from input-output tables.
- These monetary import dependencies are then translated to raw material equivalent import dependencies (orange bars on figure 1 below).

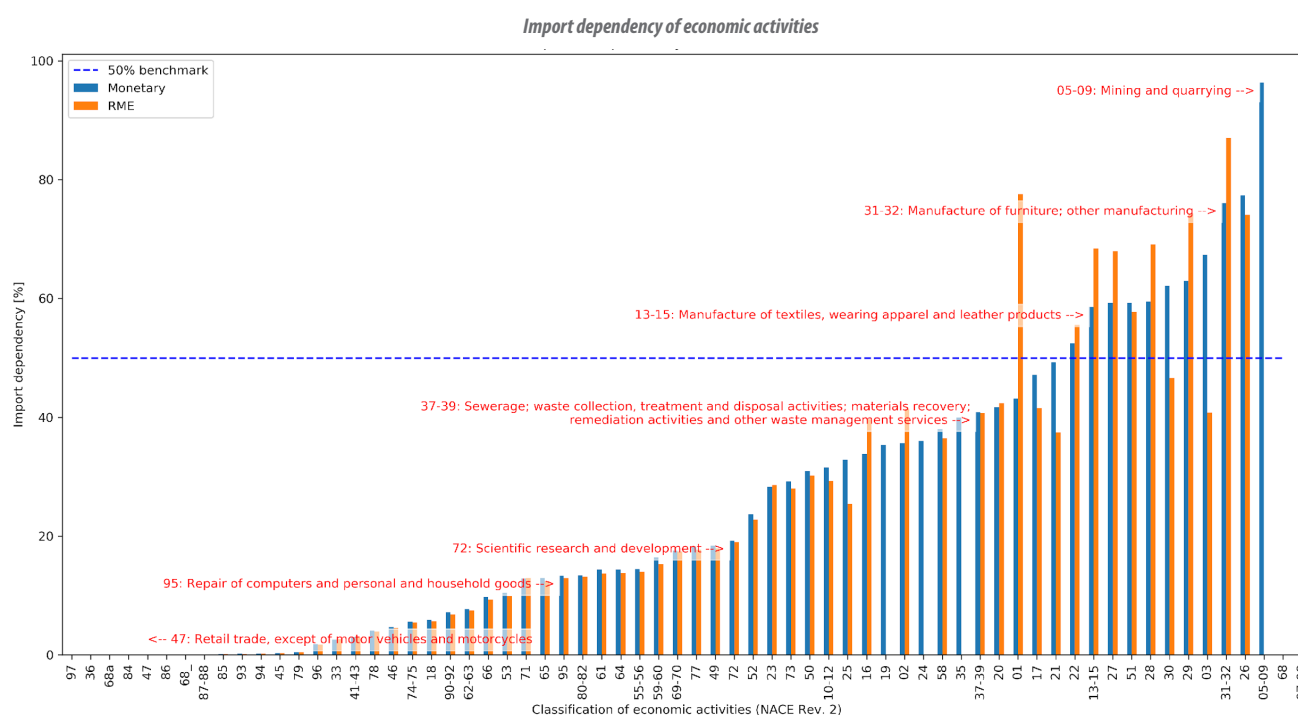


Figure 13: Import Dependency of Economic Activities in Belgium

- This translation is made through Raw Material Equivalents (or RME)²³ of imports and exports for each economic activity (codified by a NACE code²⁴) and the available national Economy Wide Material Flow Accounts (EWMFA)²⁵.

Using this methodology by UN Environment, we estimate that the Belgian economy has a 30.84% Material Import Dependency.

Figure 1 (above) on material import dependency and economic metrics shows that there is a strong correlation between material consumption and economic growth. This means that more materials are necessary to further develop. We believe however, that as the economy becomes more circular, the correlation between the two will diminish. This makes it an effective overall metric to check if policy interventions and city investments related to circular economy have an impact.

The computation of the material import dependency indicator serves as a diagnostic assessment tool of the cities' economic activities. The estimation of circular economy jobs (CE-Jobs) methodology²⁶ complements this assessment by identifying the potential of a particular city to transition to a more circular economy. The coefficients calculated by Circle Economy (methodology to be published soon) were then applied to Brussels using the same local-level NACE sectors (seen in figure 2 below). Using

the methodology developed by Circle Economy, we estimate that 9.65% of all existing jobs in Brussels are contributing to the circular economy.

In parallel, if Brussels seeks to increase circularity in each sector, Figure 2 shows the distribution of circular economy jobs and can provide policymakers with an idea of which sectors they can provide incentives to increase circularity, highlighting so the potential of this economy towards a more circular economy.

UN Environment and its partners recognize that there is room for international agencies to work together and align methodologies to provide a global standard. This is something in the pipeline which Brussels would be among the first to benefit. For example, indirect import dependencies by reliance on other sectors could be factored in to refine the calculation, particularly for cities that have a high number of service-related economic activity. This could be a subject for further work on the methodology for the calculation of CE-MID and CE-jobs.

Jobs and the circular economy

Many big cities focus on job creation and employment in making the argument for a circular economy. While important, the team recommends that Brussels challenge itself to go beyond jobs and have an equal or greater focus on overall environmental impact.

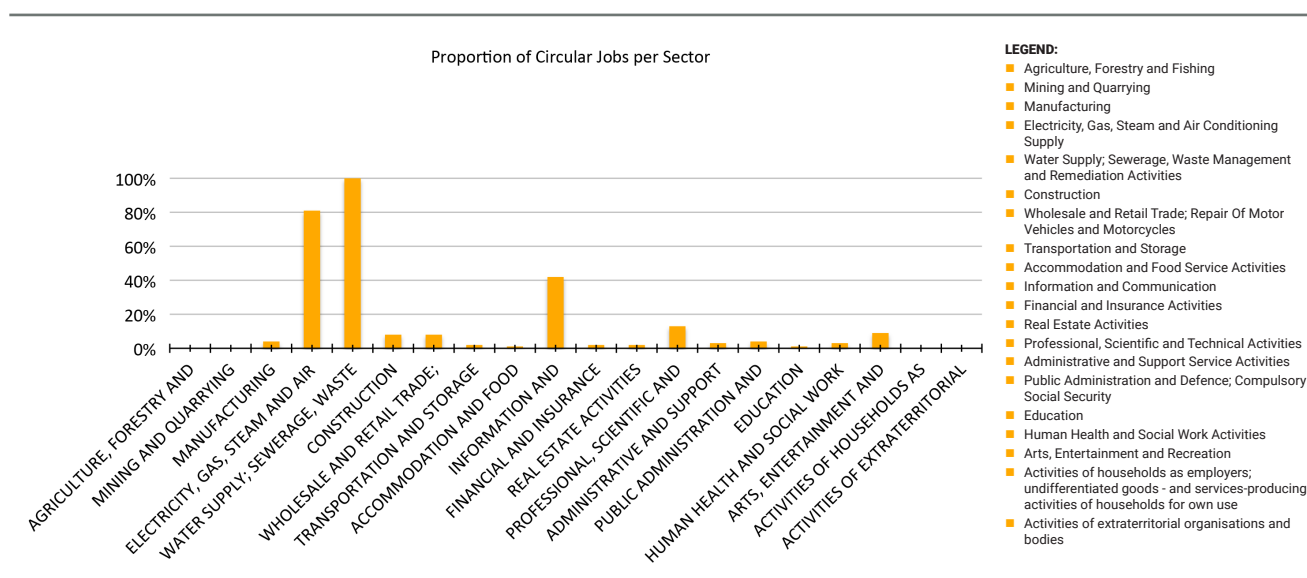


Figure 14

Conclusions and recommendations

Environmental and social impact and implications of consumption and production patterns and processes are elements that are important in understanding circular economy potential and opportunities in the Brussels Capital Region. From the consumption side, it appears that the BCR is making greater progress than its peer cities in reducing resource footprints, but there is room for institutional change to ensure long-term sustainability and the quality of key resources such as water and energy. Brussels has already taken critical steps in these directions. The work that it conducted in developing its circular economy plan is ground-breaking and has important lessons for other cities.

In addition to continued monitoring and improving efficiency at city level, the bigger challenge for the BCR is to look beyond its boundaries to improve its circularity. The very nature of cities, as socio-economic and political centres drawing in resources and talent from the periphery, makes it impossible for its economy to become independently circular. Cities, especially capital cities like Brussels, have to consider their influence beyond boundaries when discussing an actionable circular economy strategy. Brussels as the ‘capital of Europe’ for example, is well positioned to influence European and global practice in the circular economy domain²⁷.

Facing this challenge means that the BCR must begin to monitor and engage in partnerships and exchanges beyond its borders, while, at the same time, deepening its understanding at the granular level to increase awareness and highly localized actions required to enable a well-planned shift towards a circular economy.

Indicators that go beyond city borders

Working on the direction of Brussels Environment, there was a deliberate effort by the research team to form a circular economy monitoring framework from existing data and indicators; thus, building on existing work. The indicators themselves would not speak to circular economy, but when combined, would shift these same indicators from simple environmental

monitoring to a means towards measuring a circular economy transition. The proposed conceptual framework and corresponding indicators provide options that Brussels is already equipped to monitor, with a link to environmental impact indicators beyond BCR’s border and which tackle the sustainability of resources at their sources and sinks.

There is also an opportunity for BCR to influence global standards as it further develops its circular economy indicator framework. There will be opportunities to incorporate ISO city indicators into its Indicator Framework – through the revised ISO 37120 and the new ISO 37122 Indicators for Smart Cities and ISO 37123 Indicators for Resilient Cities Standards, the development of which is still ongoing.

In this context, the wider set of indicators that Brussels-Capital Region is developing to support their implementation of their Circular Economy Plan could be considered for inclusion in future ISO Standards Development.

Job discussion and understanding quality of life

Job creation is a key point of discussion on circular economy in Brussels. In recognition of its political importance, this report makes initial calculations to better inform this conversation. It is essential however, to note that in the framework, the job indicator is used only as a proxy, and hopefully, as a catalyst for an extended discussion on quality of life.

As a limited indicator, job creation within the BCR needs to connect to a more complex analysis that should extend beyond Brussels’ borders. As a service-oriented city with most of its resource flows coming from outside its borders, Brussels should strive to ensure strong horizontal integration with the two other Belgian regions (Flanders and Wallonia) as well as vertical integration (with the national government), in an analysis of jobs and eventually quality of life. This would ensure that the circular economy plans will link to related upstream and downstream resource flows and have an impact not only within its city-regional administrative boundaries, but on the country level as well.

Importance of the granular analysis

Since the driver of BCR's economy comes from its residents and businesses, it only makes sense that a closer understanding of demand at a granular level, including resource use, volume and quality at the neighbourhood scale, will enable BCR to target support via programs and policies to accelerate the transition in a way that addresses environment, health, and quality of life goals and targets. Brussels has done well with its current efforts to generate bottom-up data which can support an understanding of its needs and its relationship with its periphery. Taking a granular, neighbourhood approach, as well as a wider view to understand the local context within larger systems, can provide valuable information to help make informed decisions that address the needs of the present and future.

Annex: Proposed Macro-Level Indicators

INDICATOR	REQUIRED DATA	RECOMMENDED PROCESS	IS DATA AVAILABLE?
Share of existing Circular Economy Jobs	National IO Tables, RME and local CE-jobs database	Downscaled IO tables, with EU-defined raw material equivalents (RME). Downscaled with help of an Iterative Proportional Fitting algorithm (IPF).	Estimates/ Proxy data Available
Newly created Circular Economy jobs	Idem + t1 data	Won't be able to compute until year 2. Eventually historical trends will be available.	Estimates/ Proxy data Available.
Percentage of local GDP allocated to Circular Economy activities	Idem + GDP share by economic activity	The same downscaled IO-Tables will be used to estimate the allocated added value to Circular Economy activities.	Estimates/ Proxy data Available
City product per capita	IBSA Tab. 8.1.1.2 ISO 37120 (2018 Revision) - 5.11	Gross domestic product per capita, at current prices: 2005-2016 in EUR. This indicator contextualizes the framework to the overall economic performance of the city. This indicator is important in order to contextualize the deviation of gross domestic product attributed to CE activities.	Yes
City's unemployment rate	IBSA Tab. 7.2.1.1 ISO 37120 - 5.1	Unemployment rate measured as share of working age population actively seeking a job. This indicator gives context to the creation of new CE jobs. Computed as: Total number of habitants actively seeking a job divided by working age population.	Yes
Percentage of persons in full-time employment	IBSA Tab. 7.5.2.1 ISO 37120 - 5.4	Share of the working age population currently employed. Computed as: Total number of habitants with a job divided by working age population.	Yes
Number of businesses per 100 000 population	IBSA Tab. 8.2.1.4 ISO 37120 - 5.5	Number of businesses subject to VAT per 100 000 habitants. Computed as: Number of businesses subject to VAT divided by total number of habitants multiplied by 100 000.	Yes
Total electrical energy use per capita	IBSA Tab. 12.3.3.1 ISO 37120 - 7.5	Describes the demand of electricity of BCR. Total electricity use in [TWh] divided by total number of habitants	Yes
Total end-use energy consumption per capita	IBSA Tab. 12.3.1.1 ISO 37120 (2018 Revision) - 7.1	Describes the total energy demand of BCR. Computed as: Total final energy consumption in [GWh] divided by total number of habitants	Yes
Share of energy generation within the Brussels Region	BE Report 2011-2014 ISO 37120 - 7.2	This indicator describes the amount of energy produced locally. Computed as: Percentage of generated renewable energy in the electricity mix.	Yes
Per capita consumption of tap water	IBSA Tab. 12.2.1.1 ISO 37120 - 21.5	Describes the total demand of drinking water. Total supplied drinking water in m ³ .	Yes
Percentage of water loss	ISO 37120 - 21.7	This indicator describes the overall performance of the water supply infrastructure. Data not available.	Not available
Per capita generation of municipal solid waste (MSW)	BSA Tab. 12.2.2.1 ISO 37120 - 16.2	This indicator is used as a proxy for the monitoring of consumption demand. Collected municipal solid waste in tonnes.	Yes
Recycling rate	IBSA Tab. 12.2.2.4 ISO 37120 - 16.3	This indicator monitors the recycling rate of BCR. Computed as: total recycling of collected household packaging materials divided by MSW.	Yes
Per capita demand for imported construction materials (residential sector)	Increase in floor space + Materials intensities per sqm	With help of the SMUM model a synthetic database is constructed describing the material intensities of different building typologies and the distribution of floor space per building type.	Est.
Per capita generation of construction and demolition waste	IBSA Tab. 12.2.2.3	Computed as: total amount of collected construction and demolition waste divided by total number of habitants.	Partially
Distribution of Circular Economy jobs by population strata	Labour Force Survey (LFS) and local benchmarks (demographic data)	With help of the SMUM model a synthetic population (working age residents) is constructed and benchmarked to: 1) demographic characteristics and 2) number of jobs per economic activity. Data from the LFS is required to link demographic characteristics with economic activities.	Estimates/ Proxy data Available
Per capita GHG emissions	BE Report 2011-2014 ISO 37120 - 8.3	The monitoring of GHG emissions is used within the framework for the monitoring of the direct environmental impact of the city-system.	Based on existing framework
Water quality	To be determined		Assessment framework to be determined
Distribution of resources by population strata	Micro-level consumption model and demographic data	With help of the SMUM model we generate a synthetic population, define micro-level consumption models and benchmark this population to: 1) aggregated demographic data and 2) aggregated consumption values.	Estimates/ Proxy data Available

Annex 2: List Of Data Sources For Indicators For The City Benchmarking

ISO 37120 INDICATOR	INDICATOR VALUE	SOURCE	EXPLANATORY NOTE IF APPLICABLE
5.1 City's unemployment rate	16.7%	InnovationData (Belgium). (2016). Unemployment rate, Regional Data. Retrieved from http://www.innovation-data.be/i/LFSI_UNEMP/Unemployment-rate	
5.5 Number of businesses per 100 000 population	8513.50	Institut Bruxellois de Statistique et d'Analyse (IBSA). (2016). Studies and Statistics: Economy, Companies. Retrieved from http://statistics.brussels/themes/economy#.W8zHvBNKj_Q	
7.2 The percentage of total energy derived from renewable sources, as a share of the city's total energy consumption	46%	Brugel. (2016). Les Garanties d'Origine. Retrieved from https://www.brugel.brussels/acces_rapide/energies-renouvelables-11/les-garanties-d-origine-42	NOTE: Indicators in the ISO 37120 Energy Theme focus on electricity generation and consumption. Therefore, ISO 37120 Indicator 7.2 The percentage of total energy derived from renewable sources, as a share of the city's total energy consumption is calculated as the total consumption of electrical energy generated from renewable sources (numerator) divided by the total electrical energy consumption (denominator), where this indicator is often derived from data on the electrical energy supply mix.
7.5 Total electrical energy use per capita (kWh/year)	4475.57	Bruxelles Environnement. (2016) Energy Balance for Brussels Capital Region. Provided by Bruxelles Environnement.	NOTE: Indicators in the ISO 37120 Energy Theme focus on electricity generation and consumption. Therefore, ISO 37120 Indicator 7.5 Total electrical energy use per capita (kWh/year) is calculated as the total electrical usage of the Brussels Capital Region in kilowatt hours including residential and non-residential use (numerator) divided by the total population of the Region (denominator).
8.1 Fine particulate matter (PM2.5) concentration (µg/m3)	13.40	BSI-Brussels Centre Observatory. (2016). Zoom in Zoom out on the Brussels city centre (p.128). Retrieved from https://www.researchgate.net/publication/321193826_A_brief_guide_to_the_air_of_Brussels	NOTE: ISO 37120 Environment air quality indicators are based on the annual average concentrations of air pollutants. In the case of this report, annual average concentrations of air pollutants for the Brussels Capital Region were calculated by using a spatial annual average of all the air quality stations within the Region and expressed in micrograms per cubic metre (µg/m3).
8.2 Particulate matter (PM10) concentration (µg/m3)	18.30	BSI-Brussels Centre Observatory. (2016). Zoom in Zoom out on the Brussels city centre (p.128). Retrieved from https://www.researchgate.net/publication/321193826_A_brief_guide_to_the_air_of_Brussels	NOTE: ISO 37120 Environment air quality indicators are based on the annual average concentrations of air pollutants. In the case of this report, annual average concentrations of air pollutants for the Brussels Capital Region were calculated by using a spatial annual average of all the air quality stations within the Region and expressed in micrograms per cubic metre (µg/m3).
8.3 Greenhouse gas emissions measured in tonnes per capita	3.24	Bruxelles Environnement. (2016). Retrieved from https://environnement.brussels/sites/default/files/rbc_ges_1990-2016_sub2018.xlsx	
8.4 NO2 (nitrogen dioxide) concentration (µg/m3)	28.70	IRCEL-CELINE. (2016). NO2 annual mean. Retrieved from http://www.irceline.be/en/air-quality/measurements/nitrogen-dioxide/history/trends	NOTE: ISO 37120 Environment air quality indicators are based on the annual average concentrations of air pollutants. In the case of this report, annual average concentrations of air pollutants for the Brussels Capital Region were calculated by using a spatial annual average of all the air quality stations within the Region and expressed in micrograms per cubic metre (µg/m3).
8.5 SO2 (sulphur dioxide) concentration (µg/m3)	1.56	IRCEL-CELINE. (2016). Provided by Bruxelles Environnement.	NOTE: ISO 37120 Environment air quality indicators are based on the annual average concentrations of air pollutants. In the case of this report, annual average concentrations of air pollutants for the Brussels Capital Region were calculated by using a spatial annual average of all the air quality stations within the Region and expressed in micrograms per cubic metre (µg/m3).
16.2 Total collected municipal solid waste per capita (tonnes/capita/year)	0.40	Institut Bruxellois de Statistique et d'Analyse (IBSA). (2016). Studies and Statistics: Environment and Energy, Environment and Society. Retrieved from http://statistics.brussels/themes/environment-and-energy#.W8y_zBNKj_Q	
16.3 Percentage of the city's solid waste that is recycled	37%	Bruxelles Environnement. (2016). Share and management of waste prepared for reuse and recycling. Retrieved from https://environnement.brussels/etat-de-lenvironnement/synthese-2015-2016/dechets/part-et-gestion-des-dechets-prepares-en-vue-du	
21.5 Total water consumption per capita (litres/day)	127.56	Institut Bruxellois de Statistique et d'Analyse (IBSA). (2017). Studies and Statistics: Environment and Energy, Environment and Society. Retrieved from http://statistics.brussels/themes/environment-and-energy#.W8y_zBNKj_Q	NOTE: ISO 37120 Indicator 21.5 Total water consumption per capita (litres/day) is calculated as the amount of water billed to all consumers including both residential and non-residential water users (numerator) divided by the total population of the Brussels Capital Region (denominator).
21.7 Percentage of water loss (unaccounted for water)	13%	Bruxelles Environnement. (2016). Supply and consumption of tap water. Retrieved from https://environnement.brussels/etat-de-lenvironnement/synthese-2015-2016/eau-et-environnement-aquatique/approvisionnement-et	NOTE: ISO 37120 Indicator 21.7 Percentage of water loss (unaccounted for water) is calculated based on both non-revenue water consumption by the fire service and other municipal services (e.g., cleaning of roads etc.), as well as losses attributed to leaks in the distribution network. Based on these two (2) components of non-revenue water, water loss amounts to 13% in the Brussels Capital Region, where it is estimated that water loss attributed to leaks in the distribution network is 5%.

References

- ¹ McKinsey Center for Business and Environment. Growth Within: A Circular Economy Vision for a Competitive Europe; Ellen MacArthur Foundation: Cowes, UK, 2015.
- ² English Translation: Regional Plan for a Circular Economy
- ³ The Global Initiative for Resource Efficient Cities (GI-REC) is a cooperation platform offered by UN Environment to connect many different institutions that are using systems approaches (specifically urban metabolism) towards building low-carbon, resilient, and resource-efficient cities. For more information, visit www.resourceefficientcities.org
- ⁴ Ellen MacArthur Foundation (2017) Cities in the Circular Economy: An Initial Exploration. Available at: <https://www.ellenmacarthurfoundation.org/publications/cities-in-the-circular-economy-an-initial-exploration>
- ⁵ EcoRes and Université Libre de Bruxelles (2015). Métabolisme de la région de Bruxelles-Capitale: identification des flux, acteurs et activités économiques sur le territoire et pistes de réflexion pour l'optimisation des ressources.
- ⁶ Brussels Environment (2016). Domestic consumption of drinking water. Available at : <https://www.environment.brussels/state-environment/report-2011-2014/water-and-aquatic-environment/domestic-consumption-drinking-water>
- ⁷ Ellen MacArthur Foundation (2017). Cities in the Circular Economy: an Initial Exploration. Available at: https://www.ellenmacarthurfoundation.org/assets/downloads/publications/Cities-in-the-CE_An-Initial-Exploration.pdf
- ⁸ Circle Economy (2018). Circularity Gap Report. Available at: <https://www.circularity-gap.world/>
- ⁹ Ellen MacArthur Foundation (2017). Cities in the Circular Economy: an Initial Exploration. Available at: https://www.ellenmacarthurfoundation.org/assets/downloads/publications/Cities-in-the-CE_An-Initial-Exploration.pdf
- ¹⁰ Retrieved from <https://www.vivaqua.be>
- ¹¹ Brussels Environment (2015). Domestic consumption of drinking water. Retrieved from <https://environment.brussels/state-environment/summary-report-2011-2012/water-and-aquatic-environment/domestic-consumption>
- ¹² Acronyms and details from : Brussels Environment (2016). Programme régional en économie circulaire. Available at : http://document.environment.brussels/opac_css/elecfile/PROG_160308_PREC_DEF_FR
- ¹³ Urbinsight is a global initiative connecting cities and citizens with tools designed to explore, measure, and act upon holistic urban health data.
- ¹⁴ "Information on SMUM can be found at www.resourceefficientcities.org/resources/smum"
- ¹⁵ Circle Economy (2015). Circular Jobs: Understanding Employment in the Circular Economy in the Netherlands. Available at: <https://www.circle-economy.com/wp-content/uploads/2017/03/goldschmeding-jobs-report-20170322-lite.pdf>
- ¹⁶ WRAP (2015). Employment and the circular economy – job creation through resource efficiency in London. Available at: <https://www.lwarb.gov.uk/wp-content/uploads/2015/12/Employment-and-the-circular-economy-%E2%80%93-job-creation-through-resource-efficiency-in-London.pdf>
- ¹⁷ Ministère de la transition écologique et solidaire (2015). Stratégie nationale de transition écologique vers un développement durable (2015-2020). Available at : http://www.statistiques.developpement-durable.gouv.fr/fileadmin/documents/Sujets_transversaux/Developpement_durable/Indicateurs-SNTEDD/sntedd-la-strategie-b.pdf
- ¹⁸ Ministère de la transition écologique et solidaire (2018). Feuille de route économie circulaire. Available at : <https://www.ecologique-solidaire.gouv.fr/sites/default/files/Feuille-de-route-Economie-circulaire-50-mesures-pour-economie-100-circulaire.pdf>
- ¹⁹ Assumes an equal distribution of CE-Jobs and all other jobs of all economic sectors.
- ²⁰ Circle Economy (2015). Circular Jobs: Understanding Employment in the Circular Economy in the Netherlands. Available at: <https://www.circle-economy.com/wp-content/uploads/2017/03/goldschmeding-jobs-report-20170322-lite.pdf>
- ²¹ Based on discussions with the City of Paris (April 2018), UTOPIES (May 2018), and on documents from the Ministère de la Transition Economique et Solidaire (2017). Méthodologie de quantification de l'emploi dans l'économie circulaire - Observatoire national des emplois et métiers de l'économie verte (Work document no. 29). Available at: http://www.statistiques.developpement-durable.gouv.fr/fileadmin/documents/Produits_editoriaux/Publications/Documents_de_travail/2017/document-travail-29-methode-quantification-emploi-ecocirculaire-fevrier2017.pdf
- ²² The full calculations, graphs, and tables can be found at: <https://gitlab.com/UNEnvironmentEconomy/CE-Jobs>
- ²³ For the computation of RME coefficients defined in [t (tonnes) per product weight] the prices for representative products were used to transform the raw material equivalents into a per 1000 EUR value coefficient.

- ²⁴ Each economic activity (codified by a NACE code - or "Nomenclature des Activités Économiques dans la Communauté Européenne" code) represents a specific industry. These codes are the industry standard classification system of the EU, and are the EU implementation of the UN classification called ISIC, or "International Standard Industrial Classification."
- ²⁵ Federal Planning Bureau (2017). Economy Wide Material Flow Accounts (2008-2015). Available at: <https://www.plan.be/databases/data-44-en-economy+wide+material+flow+accounts+2008+2015+>
- ²⁶ Burgera, M., Stavropoulosb, S., Ramkumar, S., Dufourmont, J., & van Oort, F. (2019). The heterogeneous skill-base of circular economy employment. Research Policy - (-) -/-.
- ²⁷ The input of Brussels will have more 'weight' if Brussels-Capital Region has direct experience of implementing the existing ISO 37120 Standards through WCCD Certification. For example, in the current set of macro indicators under consideration, the following additional indicators may be considered due to their global applicability and relevance: (a) Share of existing Circular Economy Jobs (b) Newly created Circular Economy jobs (c) Distribution of Circular Economy jobs by population strata (d) Percentage of local GDP allocated to Circular Economy activities (e) Share of energy generation within the Brussels Region (f) Per capita demand for imported construction materials (residential sector) (g) Per capita generation of construction and demolition waste (CDW) (h) Distribution of resources by population strata

BRUSSELS CAPITAL REGION:

Circular Economy Transition



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