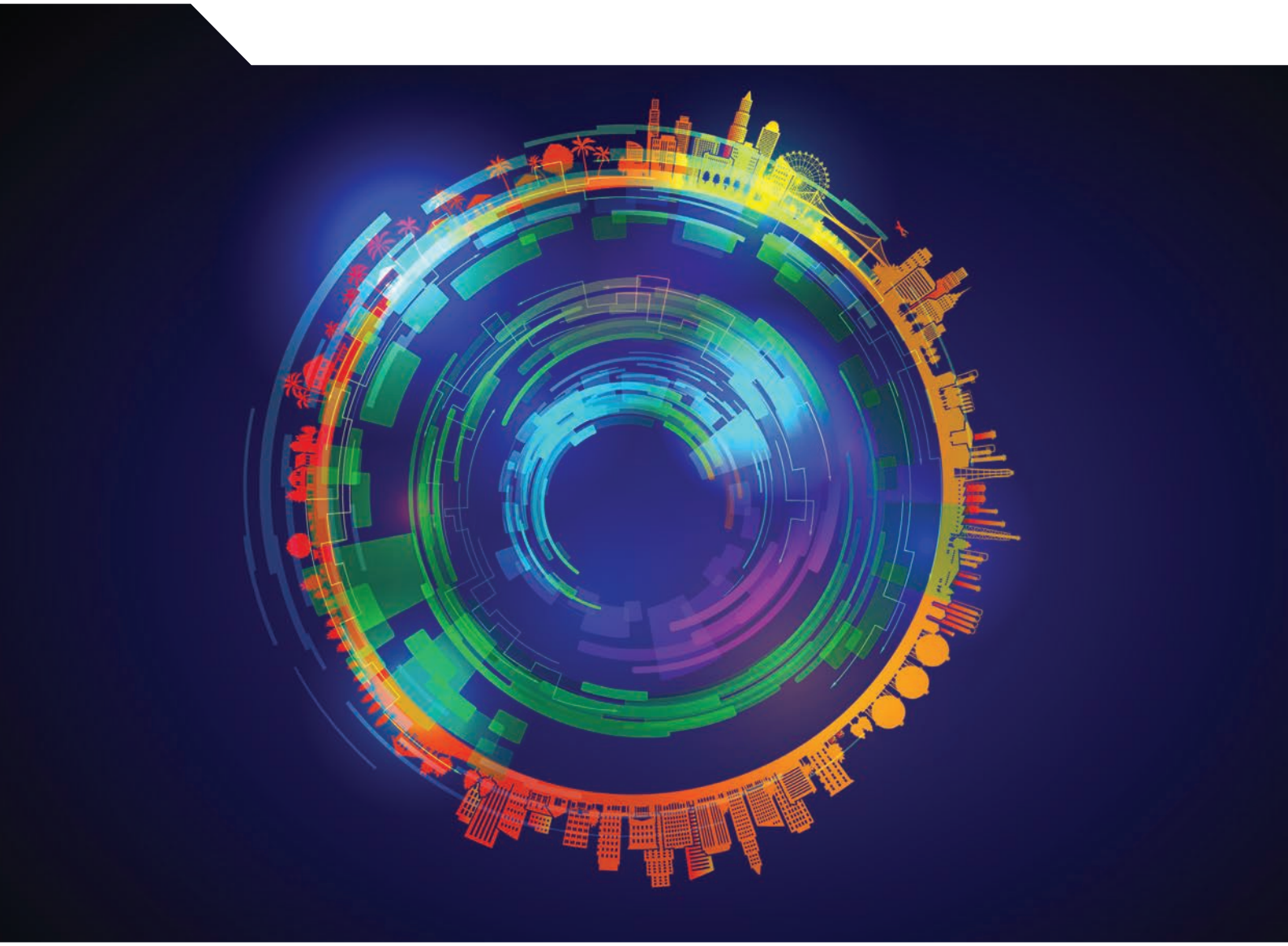
OECD Urban Studies

The Circular Economy in Umeå, Sweden



OECD

OECD Urban Studies

The Circular Economy in Umeå, Sweden

OECD

BETTER POLICIES FOR BETTER LIVES

This document, as well as any data and map included herein, are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

Please cite this publication as:
OECD (2020), *The Circular Economy in Umeå, Sweden*, OECD Urban Studies, OECD Publishing, Paris, *https://doi.org/10.1787/4ec5dbcd-en*.

ISBN 978-92-64-74497-4 (print)
ISBN 978-92-64-73911-6 (pdf)

OECD Urban Studies
ISSN 2707-3432 (print)
ISSN 2707-3440 (online)

Photo credits: Cover © Getty Images.

Corrigenda to publications may be found on line at: *www.oecd.org/about/publishing/corrigenda.htm*.

© OECD 2020

The use of this work, whether digital or print, is governed by the Terms and Conditions to be found at *http://www.oecd.org/termsandconditions*.

Preface

We are very proud to introduce the results of an 18-month policy dialogue with 100+ stakeholders to shape a vision and strategy for a circular economy in the city of Umeå, Sweden as part of the OECD Programme on the Circular Economy in Cities and Regions.

In the face of megatrends such as population growth in cities, urbanisation and climate change, the transition to a circular economy is becoming an imperative for cities of all sizes to reduce the pressure on natural resources, while addressing new infrastructure, services and housing needs, and boosting economic growth and environmental quality. Cities and regions are at the core of citizen well-being, in areas such as transport, solid waste, water or energy.

Moving from a “take-make-dispose” linear system to one in which resource waste is prevented, implies going beyond solely technical aspects and ensure governance and economic conditions are met. For the circular economy to materialise, policies need to be aligned, stakeholders engaged, and legal and regulatory frameworks enabling innovation.

This report summarises important milestones achieved so far. Its analytical framework puts People, Firms and Places at the centre of the shift towards a circular economy. It puts forward bold recommendations and concrete actions for Umeå to act as promoter, facilitator and enabler of this transition. This requires political leadership and commitment towards the transition to sustainable pathways, as well as multi-stakeholder and multi-sectoral approaches, and new business models.

An important part of the work was the bottom-up and inclusive policy dialogue, whereby each stakeholder could share experience, listen and learn from each other, and benefit from expertise and guidance from peer cities and the OECD team.

While we are aware that we are just at the beginning of the transition from a linear to a circular economy in Umeå, the city is committed to implement these recommendations and raise their profile within our community and globally. The OECD Centre for Entrepreneurship, SMEs, Regions and Cities stands ready to support Umeå with this endeavour. This will be all the more relevant in the aftermath of the COVID-19 crisis, when cities and regions will be urged to reconsider the link between environment and health, reflect on the de-materialisation of the economy and society and on circular resources loops in response to the hyper-globalisation of the recent years. The OECD Programme on the Circular Economy in Cities and Regions will seek further opportunities, evidence and recommendations to make the circular economy part of the solution towards healthier, less resource wasteful and environmental aware societies.

Hans Lindberg

Lamia Kamal-Chaoui

Director, OECD Centre for Entrepreneurship, SMEs, Regions and Cities

Hans Lindberg

Mayor of Umeå

UMEÅ KOMMUN

Foreword

The circular economy is about preventing wasted resources through reusing materials, improving design to increase the durability of goods and products, and transforming waste.

Population growth, climate change and urbanisation are likely to increase the pressure on natural resources, as well as the demand for new infrastructure, services and housing. By 2050, the global population will reach 9 billion people, 70% of which will be living in cities. Cities represent almost two-thirds of global energy demand, produce up to 80% of greenhouse gas emissions and 50% of global waste.

Cities and regions play a fundamental role in shifting from a linear to a circular economy, as they are responsible for key decisions in local public services such as transport, solid waste, water and energy that affect citizens' well-being, economic growth and environmental quality. In cities and regions, the circular economy should ensure that:

- *services* (e.g. from water to waste and energy) are provided while preventing waste generation, making efficient use of natural resources as primary materials, optimising their reuse and allowing synergies across sectors;
- *economic activities* are planned and executed in a way to close, slow and narrow loops across value chains, and;
- *infrastructure* is designed and built to avoid linear locks-in, which use resources intensively and inefficiently.

The OECD Programme on the Circular Economy in Cities and Regions was designed to support national and subnational governments in their transition towards the circular economy through evidence-based analysis, multi-stakeholder dialogues, tailored recommendations and customised action plans. The Programme relies on a consortium of cities and countries engaged in peer-to-peer dialogues and knowledge sharing activities, including Glasgow (United Kingdom), Granada (Spain), Groningen (Netherlands), Umeå (Sweden), Valladolid (Spain) and Ireland.

This report argues that a circular economy strategy in Umeå could help enhance coherence across existing strategies targeted to transform it into a green, sustainable and sharing city. It summarises the findings from an 18-month policy dialogue to develop a vision for the circular economy transition and learn from existing best practices. The circular economy is a mean to achieve Umeå's goal to be fossil-free by 2040, while enhancing innovation and creating the enabling environment for new business models. Transitioning towards a circular economy has been a political priority for the city since the Strategic Plan 2016-28. It set the objective for the city of Umeå to become a circular economy leader. Being one of the fastest-growing cities in Europe, Umeå is preparing for the future in terms of housing, infrastructure and use of natural resources. Umeå's local leadership and drive is also timely for the National Delegation for the Circular Economy created by the Swedish government in 2018 to strengthen society's transition to a resource-efficient, circular and bio-based economy.

Acknowledgements

This report was prepared by the OECD Centre for Entrepreneurship, SMEs, Regions and Cities (CFE) led by Lamia Kamal-Chaoui, Director, as part of the Programme of Work and Budget of the Regional Development Policy Committee. It is the result of an 18-month policy dialogue with 100+ stakeholders from public, private, non-profit sectors as well as representatives from the national government, the autonomous community of Castile and Leon and the municipality of Umeå, Spain.

The report and underlying policy dialogues were co-ordinated by Oriana Romano, Head of the Water Governance and Circular Economy Unit, under the supervision of Aziza Akhmouch, Head of the Cities, Urban Policies and Sustainable Development Division in the CFE. The report was drafted by a core OECD team of experts comprised of Oriana Romano, Luis Cecchi, Policy Analyst and Ander Eizaguirre, Junior Policy Analyst in the CFE.

The OECD Secretariat is grateful to the Mayor of the City of Umeå, Mr Hans Lindberg, and to Ms Janet Ågren, Deputy Mayor, for their for their high level of commitment and leadership towards circular economy in the city.

Warm thanks are also extended to the admirable local team in Umeå for the excellent collaboration throughout the dialogue, in particular: Albert Edman, Senior Project Manager (Municipality of Umeå, currently at RISE Research Institutes of Sweden); Agneta Filén, Business Developer (Municipality of Umeå); Jonna Lindström, Project Co-ordinator (Region Västerbotten); Philip Näslund, Project Manager (Municipality of Umeå); Liv Öberg, Project Co-ordinator (Region Västerbotten); Johan Sandström, Environmental Development Manager (Municipality of Umeå); Karin Söderström, Sustainability Manager (Vakin); Emmy Sundin, Development Strategist (Municipality of Umeå); and Sussane Thurén, Development Strategist (Municipality of Umeå). Special thanks are also due Laura Vidje, Sustainability Consultant (Esam AB), who supported the municipality during the policy dialogue process with passion and professionalism.

Furthermore, the policy dialogue benefited from insights from peer reviewers who are warmly thanked for sharing their valuable expertise and city experience, participating in the case study missions and providing international best practices as well as guidance on the report, namely: Rosa Huertas Gonzalez, Director of the Innovation, Economic Development, Employment and Commerce Department, City of Valladolid, Spain; Gonzalo Jimenez Espinosa, Director of Sustainable Development and Research and Innovation, Water and Sanitation Company of the City of Granada, Spain; and Anita Ravlic, Circular Economy Manager, Agency of Urban Ecology City of Paris, France. The OECD Secretariat is grateful to Ashima Sukhdev, Government and Cities Programme Lead, Ellen MacArthur Foundation, for her contribution during the policy seminar held in Umeå, Sweden, on 23 October 2019.

This report builds on a series of interviews with 100+ stakeholders during the OECD visits to Umeå, Sweden (18-21 March 2019 and 23 October 2019) (Annex B), as well as insights from the OECD Survey on the Circular Economy in Cities and Regions and desk research. Interim findings and progress results were presented at the 1st OECD Roundtable on the Circular Economy in Cities and Regions (4 July 2019, Paris, France).

The draft report benefited from written comments by stakeholders engaged throughout the policy dialogue, in particular: Stern Hutjes (RISE Interactive), Joanna Lindström (Region Västerbotten), Philip Näslund (Municipality of Umeå), Liv Öberg (Region Västerbotten), Sussane Thurén (Municipality of Umeå), Anna Olofsson (Municipality of Umeå), Daniel Remes (Harvest Umeå AB), Cynthia Reynolds (Circular Oslo – Circular Regions), Elin Söderberg (County Administration Board of Västerbotten), Karin Söderström (Vakin), Märta Streijffert (Municipality of Umeå), Mats Tysklind (Umeå University) and Laura Vidje (Esam AB).

The report was submitted to RDPC delegates for approval by written procedure by 6 March 2020 under the cote [CFE/RDPC/URB(2020)4]. The final version was edited and formatted by Eleonore Morena, and François Iglesias and Pilar Philip prepared the manuscript for publication.

Table of contents

Preface 3

Foreword 4

Acknowledgements 5

Abbreviations and acronyms 10

Executive summary 11

1 Towards a circular economy in Umeå, Sweden 13
- Introduction: The circular economy in cities and regions 14
- The drivers for the circular transition in Umeå, Sweden 16
- Socioeconomic data and trends 19
- Overview of environmental data and trends 21
- References 26
- Notes 29

2 Assessing and unlocking the circular economy in Umeå, Sweden 31
- An ongoing agenda on the circular economy at the national and subnational levels 32
- Circular economy initiatives in Umeå, Sweden 33
- The analytical framework 35
- People and firms: An innovative ecosystem to boost the circular economy transition 37
- Policies: Identifying sectors holding potential for the circular economy 39
- Places: Fostering urban-rural synergies for the circular economy 46
- Governance challenges to design and implement the circular transition 46
- References 50
- Notes 53

3 Policy recommendations and actions for a circular economy in Umeå, Sweden 55
- Introduction 56
- Promoting a vision and a strategy for the circular economy 58
- Facilitating multilevel co-ordination for the circular economy 65
- Enabling the economics and governance conditions for the uptake of the circular economy 69
- References 75

Annex A. Circular economy in Umeå, Sweden 79

Annex B. List of stakeholders consulted during the policy dialogue 81

FIGURES

Figure 1.1. Tag cloud on the circular economy for Umeå, Sweden 16
Figure 1.2. Map of Umeå, Sweden 17
Figure 1.3. Main drivers in Umeå, Sweden, for the transition to a circular economy 18
Figure 1.4. Trends and projections of population growth in the municipality of Umeå, Sweden, 2001-29 19
Figure 1.5. Employment rates in Sweden by county, 2005-17 21
Figure 1.6. Total CO2 emissions by sector in Umeå, Sweden, 1990-2013 22
Figure 1.7. Consumption-based emissions by sector in Umeå, Sweden 23
Figure 1.8. Share of renewable energy in the district heating system in Umeå, Sweden, 2008-14 24
Figure 1.9. Biologically treated food waste in Umeå, Sweden 25
Figure 1.10. Household waste collected for recycling in Umeå, Sweden 25
Figure 2.1. Initiatives related to the circular economy at the national, county/ regional and municipal level 34
Figure 2.2. OECD analytical framework: Level of advancement, tools and roles 35
Figure 2.3. OECD circularity within and across sectors 40
Figure 3.1. Stakeholders map in Umeå, Sweden 57

TABLES

Table 2.1. Example of sectors included in circular economy initiatives in cities and regions 42
Table 3.1. Policy recommendations for the circular economy in Umeå, Sweden 56
Table 3.2. Circular economy initiatives at the subnational level 60
Table 3.3. OECD Circular Economy Scoreboard for Cities and Regions 73

BOXES

Box 1.1. Examples of circular economy definitions 14
Box 1.2. Levels of government in Sweden 17
Box 1.3. The New Comprehensive Plan for Umeå's sustainable growth 18
Box 1.4. The survey on consumption-based emissions in Umeå, Sweden 22
Box 2.1. Making the food sector circular: Examples from cities 43
Box 2.2. The Cradle to Cradle approach for the building sector 45
Box 2.3. Material passports for circular buildings 45
Box 2.4. Examples of business models for the circular economy in cities 49
Box 3.1. Examples of labelled products for the circular economy 64
Box 3.2. Green Public Procurement for the circular economy: Examples from cities 71
Box 3.3. The proposed OECD Circular Economy Scoreboard for Cities and Regions 73

Follow OECD Publications on:

http://twitter.com/OECD_Pubs

http://www.facebook.com/OECDPublications

http://www.linkedin.com/groups/OECD-Publications-4645871

http://www.youtube.com/oecdilibrary

http://www.oecd.org/oecddirect/

Abbreviations and acronyms

BAMB	Building As Material Banks
BBL	Federation for a Better Environment
CEBANS	Circular Economy Business Accelerator North Sweden
CEFUR	Centre for Research and Development
CFE	OECD Centre for Entrepreneurship, SMEs, Regions and Cities
CO_2	Carbon dioxide
EMASAGRA	Water and Sanitation Company of the City of Granada (*Empresa Municipal de Abastecimiento y Saneamiento de Granada*)
EU	European Union
EUR	Euro
FTI	Packaging and Newspaper Collection Service
GBP	British Pound
GDCP	Green Deal Circular Procurement
GDP	Gross domestic product
GHG	Greenhouse gas
GPP	Green Public Procurement
ICT	Information and communications technology
IoT	Internet of Things
IT	Information technology
LCA	Life Cycle Analysis
MOVEBI	Mobility and Transport for the Visitor Industry
OECD	Organisation for Economic Co-operation and Development
OVAM	Flemish Public Waste Agency
PM10	Particulate matter smaller than 10 microns in diameter
R&D	Research and development
RISE	Research Institutes of Sweden
RISN	Resource Innovation and Solutions Network
SEI	Stockholm Environmental Institute
SEK	Swedish Kronor
SME	Small- and medium-sized enterprise
UBI	Umeå Biotech Incubator
UMU	Umeå University
USBE	Umeå School of Business, Economics and Statistics
USD	American Dollar
VAT	Value-added tax
VTT	Technical Research Centre of Finland Ltd.
VVSG	Association of Flemish Cities and Municipalities

Executive summary

In Umeå, Sweden, the circular economy represents a new socioeconomic paradigm to stimulate businesses, while achieving the environmental goal of carbon neutrality by 2040. Umeå is the fastest-growing urban centre in Northern Sweden and will host 200 000 inhabitants by 2050, thus increasing the demand of infrastructure including the housing stock, schools, roads and green areas, as well the demand for natural resources, energy and food. This expected growth is an opportunity to move from "business as usual" to a more circular approach whereby construction materials can be used and reused, energy and water efficiency can increase in buildings, food minimised and innovation promoted for closing loops across value chains.

The Strategic Plan 2016-28 set the objective for Umeå to become a leader in the circular economy. A number of actions are in place: from the Circular Economy Business Accelerator North Sweden, a collaboration platform for business advisors to build knowledge and business model innovation, to the network "Green Umeå" supporting the implementation of local sustainable projects for the green transition, sustainable mobility and sharing economy.

Importantly, the future of the circular economy in Umeå can count on a wide range of stakeholders that build and share knowledge, while enhancing innovation and experimentation. In particular, civil society and business, in particular, have been increasingly contributing through their activities to minimise food waste, make mobility cleaner and increase the use of recycling materials in the building sector. Umeå is a knowledge hub for the region and hosts a young and highly educated community. Moreover, the business and innovation scene is vibrant and environmentally friendly: there are five incubators involving start-ups, universities, the municipality and public companies. Municipal companies apply innovative *cleantech* solutions, consisting of using alternative clean energy, reducing water consumption, green chemistry and promoting sustainable construction and transport.

Going forward, a full-fledge transition towards the circular economy will require overcoming a number of challenges:

- **Clarifying roles and responsibilities** within the municipality to reach the objective stated in the Strategic Plan 2016-28 to enhance leadership and accountability;
- **Creating synergies across existing projects** and initiatives that are making Umeå a green, smart and sustainable city;
- **Matching the human and technical capacities** to the needs brought about by the circular economy to enhance the legitimacy of the municipality in leading and managing the transition;
- **Engaging stakeholders to identify opportunities** within the circular economy, beyond the use of the concept as a synonym for recycling.

The report recommends concrete actions to improve Umeå's ability to promote, facilitate and enable the circular economy. In particular:

- **To promote the circular economy**, the municipality could:

  - map existing circular initiatives and future jobs and skills required for the circular transition;
  - perform a metabolism analysis;
  - develop a strategy on the circular economy and link it with existing long-term plans;
  - promote circular business through guidelines for specific sectors, as well as labels, certifications and awards;
  - foster a circular economy culture.
- **To facilitate collaboration among a wide range of actors** to make the circular economy happen on the ground, the municipality could:
  - set up co-ordination mechanisms within the municipality;
  - coordinate further with the national and the regional government;
  - collaborate with universities, existing business and start-ups, and;
  - strengthen territorial linkages between urban and rural areas.
- **To enable the necessary governance and economic conditions**, the municipality could:
  - identify the regulatory, fiscal and economic instruments that need to be updated to foster the transition to the circular economy;
  - implement green public procurement;
  - foster capacity building for the circular economy, and;
  - develop a monitoring and evaluation framework of the circular economy strategy.

1 Towards a circular economy in Umeå, Sweden

This chapter provides an overview of the circular economy in cities and focuses on the rationale for the circular economy transition in the city of Umeå, Sweden, by looking at main drivers leading to a shift from a linear to a circular economy, and socioeconomic and environmental data and trends.

Introduction: The circular economy in cities and regions

The transition to a circular economy is underway and cities and regions are at the centre of it. By 2050, the global population will reach 9 billion people, 70% of which will be living in cities (UN, 2018[1]). The pressure on natural resources will increase, while new infrastructure, services and housing will be needed. Already, cities represent almost two-thirds of global energy demand (IEA, 2016[2]) and produce up to 80% of greenhouse gas emissions (World Bank, 2010[3]). By 2050, urban dwellers will still be the most exposed to high concentrations of air pollutants[1] (OCDE, 2012[4]). Cities produce 50% of global waste (UNEP, 2013[5]). It is estimated that globally, by 2050, the levels of municipal solid waste will double (IEA, 2016[2]; UNEP/IWSA, 2015[6]). A total of 80% of food is consumed in cities and compared to today's levels, 60% more food will be required in the coming decades to feed the population (Ellen MacArthur Foundation, 2019[7]). At the same time, water stress and water consumption will increase by 55% by 2050 (OCDE, 2012[4]). Cities and regions have core responsibilities for local public services such as transport, solid waste, water and energy. As such they are at the centre of key decisions having a strong impact on citizens' well-being, environmental quality and economic growth.

There is no unique definition for circular economy, which is now facing a validity challenge period. Although there are many definitions of the circular economy, they all include as a basic assumption the recognition of waste as a resource (Box 1.1). The circular economy is about preventing wasted resources through reusing materials, improving design to increase the durability of goods and products, and transforming waste. In cities and regions, the circular economy should ensure that: services (e.g. from water to waste and energy) are provided whilst preventing waste generation, making efficient use of natural resources as primary materials, optimising their reuse and allowing synergies across sectors; *economic activities* are planned and carried out in a way to close, slow and narrow loops across value chains and *infrastructure* is designed and built to avoid linear locks-in, which use resources intensively and inefficiently.

The circular economy is not an end per se, but a means to an end: it provides an opportunity to do more with less, to better use available natural resources and to transform waste into new resources, while promoting new jobs opportunities and tackling inequalities (e.g. access to sharing services and commodities, form mobility to agro-food, to buildings). As such, while the environmental narrative, whereby less use of materials implies reduced greenhouse gas (GHG) emissions has been so far predominant in promoting the shift to a circular economy, cities and regions are increasingly paying attention to the social and the economic aspects, as drivers for this transition. According to Blomsma and Brennan (2017[8]), the circular economy is now facing its "validity challenge period" on its way to becoming a robust and consolidated concept, implying a radical shift in consumer behaviour.

Box 1.1. Examples of circular economy definitions

- "The circular economy is where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimised." (EC, 2015[9])
- "The circular economy is restorative and regenerative by design. Relying on system-wide innovation, it aims to redefine products and services to design waste out while minimising negative impacts. A circular economy is then an alternative to a traditional linear economy (make, use, dispose)." (Ellen MacArthur Foundation, 2018[10])
- "An economic system that replaces the end-of-life concept, with reducing, alternatively using, recycling and recovering materials in production/distribution and consumption processes. It operates at the micro level (products companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim of accomplishing sustainable

development, thus simultaneously creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations. It is enabled by novel business models and responsible consumers." (Kirchherr, Reike and Hekkert, 2017[11])

- "The circular economy is one that has low environmental impacts and that makes good use of natural resources, through high resource efficiency and waste prevention, especially in the manufacturing sector, and minimal end-of-life disposal of materials." Ekins et al. (2019[12])
- "There are three different layers of circularity, with increasingly broad coverage: i) closing resource loops; ii) slowing resource loops; and iii) narrowing resource loops. All these explicitly or implicitly aim at addressing the market failures associated with materials use, the failure to address local environmental consequences associated with extraction; or the failure to include the environmental externalities associated with waste generation. Furthermore, there are economic inefficiencies associated with the inefficient use of scarce resources." (OECD, 2019[13]).

Source: EC (2015[9]), *Closing the Loop – An EU Action Plan for the Circular Economy*, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52015DC0614&from=EN (accessed on 21 February 2020); Ellen McArthur Foundation (2018[10]), *What is a Circular Economy?*, https://www.ellenmacarthurfoundation.org/circular-economy/concept (accessed on 21 February 2020); Kirchherr, J., D. Reike and M. Hekkert (2017[11]), *"Conceptualizing the circular economy: An analysis of 114* definitions", http://dx.doi.org/10.1016/j.resconrec.2017.09.005; Ekins et al. (2019[12]), "The Circular Economy: What, Why, How and Where", Background paper for an OECD/EC Workshop on 5 July 2019 within the workshop series "Managing environmental and energy transitions for regions and cities", Paris; OECD (2019[13]), *Global Material Resources Outlook to 2060: Economic Drivers and Environmental Consequences*, https://doi.org/10.1787/9789264307452-en.

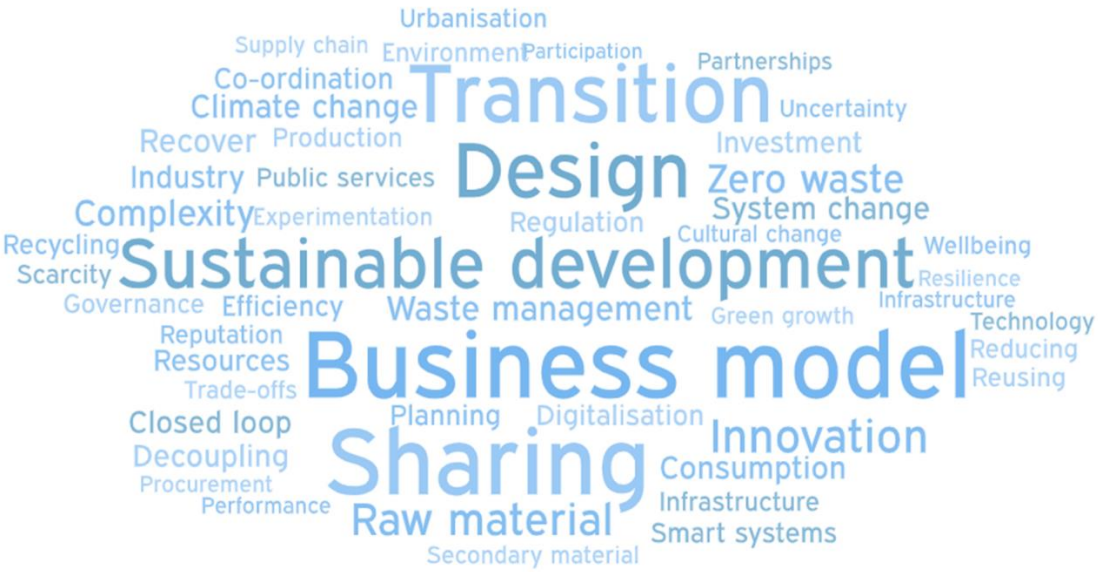
The circular economy in cities and regions is expected to generate a positive impact on economic growth, the creation of new jobs and the reduction of negative impacts on the environment. By 2030, shifting from a linear approach of "take, make and dispose" to a circular system is estimated to hold a potential of USD 4.5 trillion for economic growth (Accenture, 2015[14]). Projections show that, by 2030, resource productivity in Europe can improve by 3% and generate a gross domestic product (GDP) increase of up to 7% (McKinsey Centre for Business and Environment, 2016[15]). Projections at the city level show that for example, applying a circular economy approach to the construction chain in the city of Amsterdam (Netherlands) would decrease GHG emissions by half a million tonnes of CO2 per year. In London (United Kingdom), the benefits from circular approaches applied to the built environment, food, textiles, electricals and plastics are estimated at GBP 7 billion every year by 2036.[2] About 50 000 jobs related to the circular economy are estimated to be created in the Île-de-France region.[3] Environmental benefits consist of: decreased pollution; increased share of renewable or recyclable resources; and reduced consumption of raw materials, water, land and energy (EEA, 20016[16]). Yet, the transition should be "just" by taking into account people' social well-being, quality of life and equity.

The potential of the circular economy still needs to be unlocked. Today, less than 10% of the global economy is circular (Circle Economy, 2020[17]). Unlocking the potential of the circular economy in cities and regions implies going beyond solely technical aspects and putting the necessary governance in place to create incentives (legal, financial), stimulate innovation (social, institutional) and generate information (data, knowledge, capacities). It would also mean looking at the barriers for businesses to "close the loops", by re-thinking business models (e.g. leasing and sharing) and analysing the economic instruments that could support the transition in several sectors, including waste, food, built-up environment and water. The circular economy implies governance models based on multi-stakeholder and multi-sectoral approaches. For the circular economy to happen, policies need to be aligned, stakeholders informed and engaged, legal and regulatory frameworks updated and in support of innovation.

The drivers for the circular transition in Umeå, Sweden

The circular economy in Umeå, Sweden, is perceived as a new socioeconomic paradigm leading to new ways of conceiving business, products (design) and consumption (sharing). Figure 1.1 indicates the words that the city through the OECD Survey on the Circular Economy in Cities and Regions most associates with the circular economy concept (the bigger the word in the figure, the higher the importance) (OECD, 2019[18]). These words are: "business model", "design" and "sharing". In the fastest-growing urban centre in Northern Sweden, where a number of bottom-up initiatives to increase resource efficiency are flourishing, the circular economy represents a represent a new socioeconomic paradigm through which to stimulate businesses, while achieving the environmental goal of carbon neutrality by 2040.

Figure 1.1. Tag cloud on the circular economy for Umeå, Sweden



Note: The respondent had to choose the top 5 words most often associated with the circular economy. The answer is based on the following question: "Please indicate the top 5 words from the list suggested below you most often associate with the circular economy in your context, ranking from 1 (most important) to 5 (less important)".
Source: Own elaboration based on the city of Umeå's answers to the OECD (2019[18]) OECD Survey on the Circular Economy in Cities and Regions.

The city of Umeå made the circular economy a priority in its Strategic Plan 2016-28. Umeå is the capital of Västerbotten County located in the North of Sweden (Figure 1.2). Västerbotten County encompasses the province of Västerbotten and part of the Lapland and Ångermanland provinces (Box 1.2). It shares borders with the Finnish Vaasa region and Norway. The Strategic Plan 2016-28 Plan states that Umeå should be a role model in the circular economy (Municipality of Umeå, 2016[19]). While the municipality is working on how to concretise this goal, it can build on its long experience in the integrated treatment of the waste, energy and water. Figure 1.3 shows the main drivers for the circular economy transition in Umeå presented in this chapter.

Box 1.2. Levels of government in Sweden

Sweden is composed of 20 counties and 290 municipalities. Municipalities are responsible for several facilities and services such as housing, roads, water supply and wastewater processing, schools, public welfare, elderly care and childcare. The municipalities are entitled to levy income taxes on individuals, and they charge for various services. The county council is responsible for health, regional development and public transport. The County Administrative Board is a governmental authority representing a link between citizens and levels of government. It is responsible for infrastructure planning, sustainable community planning and housing, energy and climate and cultural environment, amongst others.

Since 2008, the Västerbotten County Council and the county's 15 municipalities constitute Västerbotten Region, a co-operative body that is responsible for regional development in Västerbotten County. Västerbotten Region has responsibilities in five key areas of work: healthcare, social welfare, public transport, regional development and culture, and research, innovation and education.

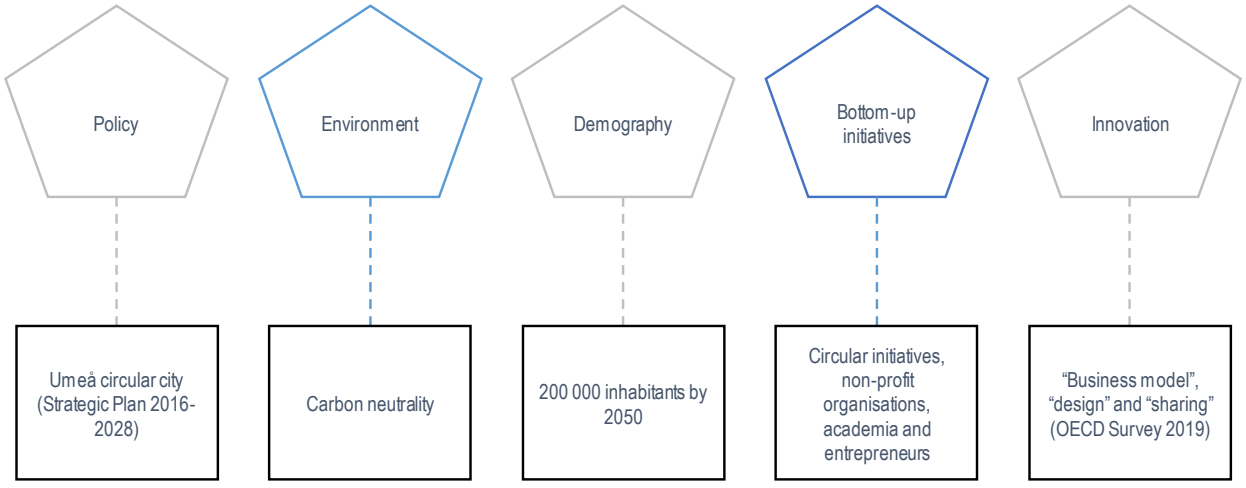
Source: Swedish Institute (2019[20]), *The Swedish System of Government*, https://sweden.se/society/the-swedish-system-of-government/; Västerbotten Region (2019[21]), *This is What the Region Does*, www.regionvasterbotten.se/det-har-gor-regionen (accessed on 23 January 2020).

Figure 1.2. Map of Umeå, Sweden

Source: The Municipality of Umeå (2020[22]) *Umeå's location in Sweden's Map*.

The circular economy represents a means to achieve Umeå's environmental goals for 2040. The New Comprehensive Plan for Umeå Municipality (Box 1.3) set the goal for the city to be fossil-free by 2045. However, in February 2020, the city council approved the new environmental goals for the City of Umeå, anticipating the target by 5 years to 2040. As a matter of fact, Some goals included in the aforementioned plan and scheduled to be reached by 2020, have already been successfully achieved (e.g. climate neutrality in the energy system by 2018 and fossil-fuel-free public transport by 2020) and are now under revision for updates. The city is planning a fossil fuel private vehicle fleet by 2030. The goal will be achieved thanks to the pro-environmental attitude of citizens, ranked in 2014 as Europe´s most environmentally aware citizens by Vienna University of Technology European as part of the "Smart city Ranking of European medium-sized cities" (Municipality of Umeå, 2018[23]).

Figure 1.3. Main drivers in Umeå, Sweden, for the transition to a circular economy



Box 1.3. The New Comprehensive Plan for Umeå's sustainable growth

The New Comprehensive Plan (2011) foresees five sustainable growth strategies:

- Promoting city growth in a five-kilometre radius from the city centre: Umeå aims to grow in an organic way in order to make sustainable mobility easy and effective. This will stimulate citizens to use public transport, aiming to accomplish a shift from car dependency towards sustainable transport modes (e.g. bicycle).
- Developing high-density new city districts: high density will make it possible to support new areas with sustainable services and sharing solutions.
- Planning population growth along public transport corridors.
- Investing in public parks to provide citizens with a healthy environment, through fostering access to recreation and promoting a sustainable lifestyle.
- Offering citizens an open, transparent and democratic process encouraging participation in the planning process, through co-creation and citizen engagement processes.

The New Comprehensive Plan for the Municipality of Umeå aims to accomplish the following by 2050: develop "the knowledge city of Umeå" with education and lifelong learning systems; retain Umeå's

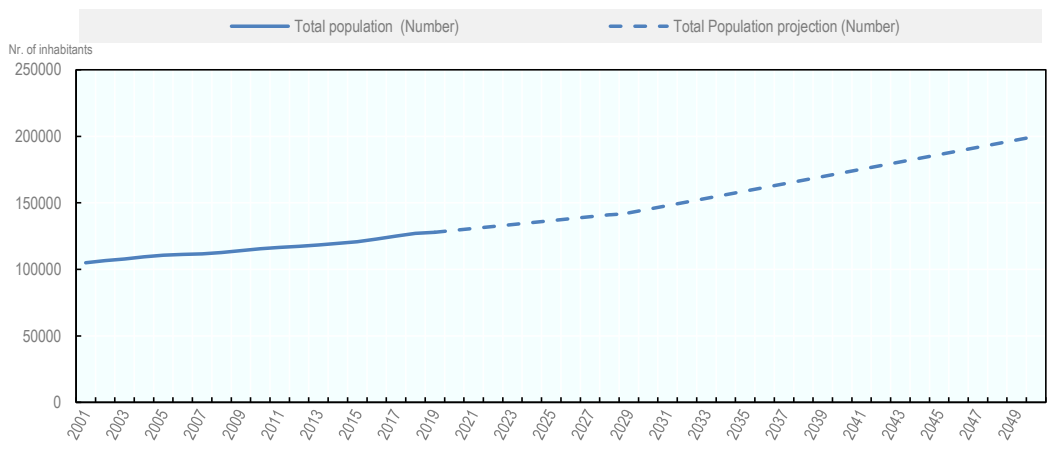
position as international city of culture and promote culture as an investment and inspiration for a sustainable society and growth. Moreover, by 2020, the plan aims to achieve the best public healthcare system in Sweden and halve child poverty. Social issues are high on the city's political agenda. Since 2000, the municipality has implemented different measures to foster gender equality in the city, from improving gender representation in cultural events to enhancing safety in the streets. In 2014, the Observatory of the European Charter defined Umeå as a "model town for gender equality".

Source: Municipality of Umeå (2018[24]), *Comprehensive Plan for Umeå Municipality*, http://www.umea.se/oversiktsplan (accessed on 14 November 2019); Municipality of Umeå (2018[23]), *EGCA 2018, Umeå, Sweden City Introduction and Context-involvement, Investment and Innovation*; Observatory of the European Charter (2014[25]), *Umeå – A Model Town for Gender Equality*, https://www.charter-equality.eu/exemple-de-bonnes-pratiques/umea-a-model-town-for-gender-equality.html (accessed on 14 November 2019).

Socioeconomic data and trends

The city of Umeå is the most populated city in the Norrland region and the fastest-growing urban centre in Northern Sweden. The city counted 127 000 inhabitants in 2018, corresponding to 50% of Västerbotten County's population (Regionfakta, 2019[26]; North Sweden Cleantech, 2019[27]) (Figure 1.4). Umeå is the 11th largest city in Sweden and the largest city across the northern counties of Jämtland-Härjedalen, Norrbotten and Västerbotten, which are considered sparsely populated areas. Most of the population in Northern Sweden is concentrated in larger cities along the east coast, where Umeå is located. The city has doubled its population in the last 50 years: since 2001, Umeå's population has grown by almost 22% (Figure 1.4). Moreover, projections show that, by 2050, Västerbotten County, driven by Umeå, will continue to grow (+3.2% compared to 2016), while the population in the neighbouring counties of Jämtland and Norrbotten will shrink (OECD, 2019[28]).

Figure 1.4. Trends and projections of population growth in the municipality of Umeå, Sweden, 2001-29



Source: Own elaboration based on data from the Municipality of Umeå (2019).

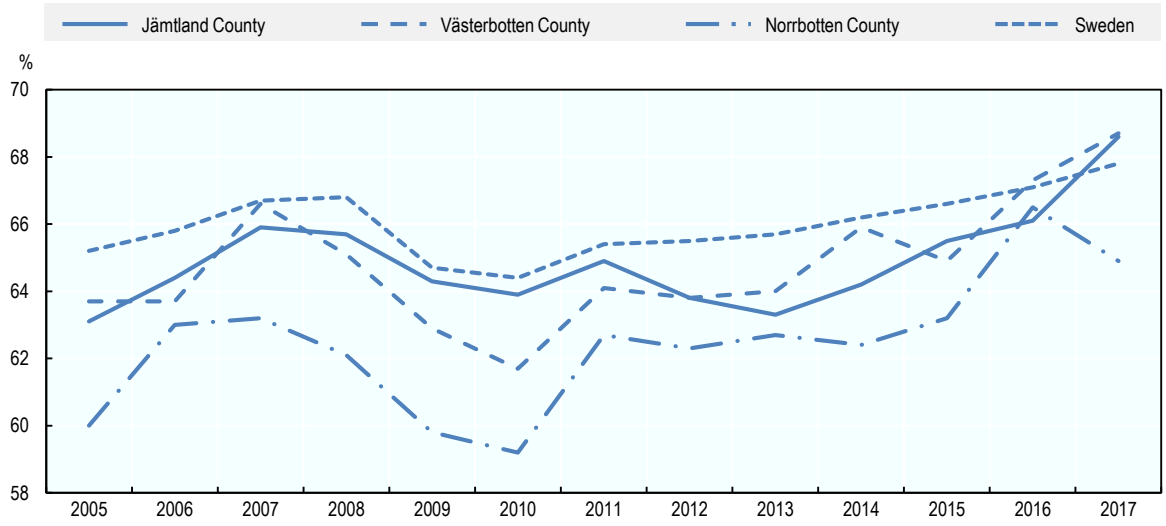
The city aims to reach a population of 200 000 inhabitants by 2050, with consequences on the use of natural resources and infrastructure needs. The expected population growth (22% higher than the current population) (Municipality of Umeå, 2018[24]) is likely to demand an expansion of infrastructure, including the housing stock, schools, roads and green areas. The city government foresees an increase of

60 000 houses by 2050 in order to meet the growing population goal. The housing stock in Umeå doubled in the last 30 years. Since 2011, a total of 800 new apartments have been built each year (Municipality of Umeå, 2019[29]). More people will mean greater demand for housing, transport and services, while likely to produce more waste. As such, the circular economy can guide decisions towards sustainable use of resources and alignment across policies (e.g. housing, transport, land use, waste management and logistics). A higher population density is expected to favour further development of sharing economy initiatives, especially in the transport sector.

Umeå is a knowledge hub for the region and hosts a young and highly educated community. Umeå is the main education centre in northern Sweden. The city hosts two renowned universities and eight colleges (e.g. technology, architecture, design and fine arts). The Umeå Institute of Design ranked first worldwide in 2019 (Umeå University, 2020[30]). In 2018, the city hosted 34 000 students, corresponding to 25% of the population (Municipality of Umeå, 2018[23]). The average age in Umeå is 38.4 years old, below the national average (41) and the other counties in Northern Sweden (43.2 in Jämtland-Härjedalen and 43.7 in Norrbotten) (OECD, 2019[28]). The city figures in the top ten list among the 290 municipalities in Sweden for the level of education of its population. (North Sweden Cleantech, 2019[27]). A total of 37% of individuals have at least 3 years of post-secondary education, including at postgraduate level (North Sweden Cleantech, 2019[27]).

The business and innovation scene is dynamic and environmentally friendly. Since the 1950s, forestry, energy and mineral exploitation characterised Northern Sweden's economy. These sectors are still relevant in the provincial economies of Jämtland-Härjedalen, Norrbotten and Västerbotten, representing a quarter of the regional GDP in 2017, behind the services sector (57%) and the goods production sector (32%) (Statistics Sweden, 2016[31]). In 2016, Umeå's GDP per inhabitant (SEK 416 000) was 5% lower than the Swedish national average (SEK 441 000) and 9% higher than Västerbotten County's level (SEK 372 000) (Regionfakta, 2019[26]). A total of 12 300 small- and medium-sized enterprises (SMEs) and 650 start-ups are currently based in Umeå. There are five incubators (Uminova Innovation, eXpression Umeå, Umeå Biotech, BIC Factory and Coompanion) involving start-ups, universities, the municipality and public companies. The manufacturing, building and construction sectors, trade, ICT and life science account for 7 000 firms in Umeå. In 2017, employment rate levels have been higher in Västerbotten County and in the neighbouring County of Jämtland than in the rest of the country (68.6% and 68.7% respectively compared to 67.8% at the national level) (Figure 1.5). In 2017, in Västerbotten County, the unemployment rate was 5.3%, below Sweden's average (6.7%) (OECD, 2019[28]). Regarding environmental aspects, municipal companies apply innovative cleantech solutions, consisting of using alternative clean energy, reducing water consumption, sustainable construction, green chemistry and/or sustainable transport solutions (North Sweden Cleantech, 2019[27]).

Figure 1.5. Employment rates in Sweden by county, 2005-17



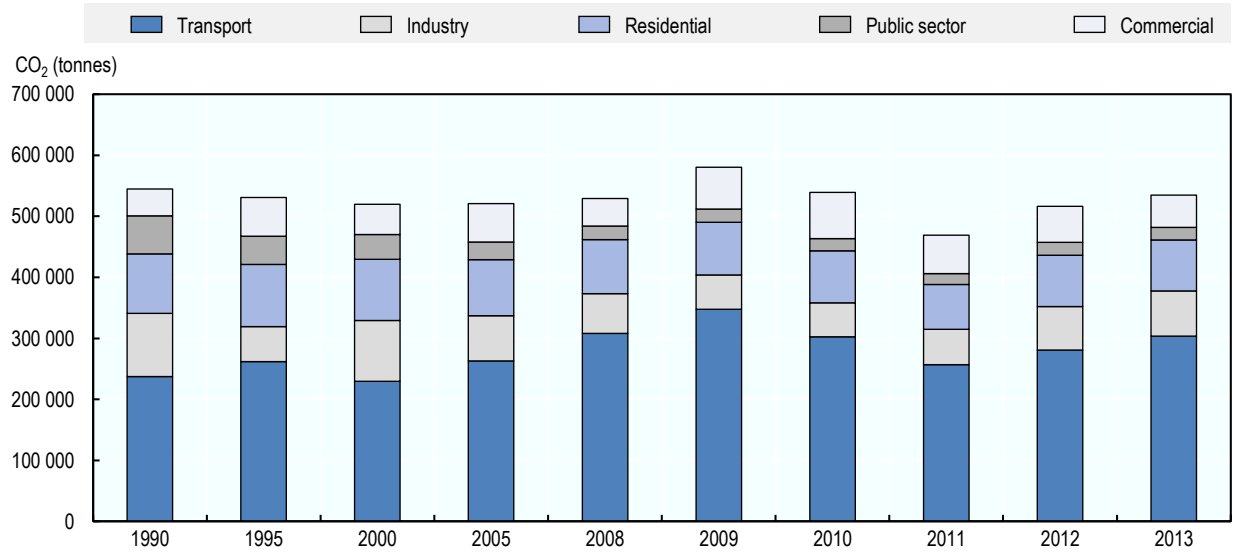
Source: OECD (2019[28]), *Linking the Indigenous Sami People with Regional Development in Sweden*, https://dx.doi.org/10.1787/9789264310544-en; Statistics Sweden (2020[32]), *Labour Market Statistics*, http://www.statistikdatabasen.scb.se/pxweb/sv/ssd/ (accessed on 6 February 2020).

Overview of environmental data and trends

Umeå's CO2 emissions have been historically lower than the national level and the city expects to achieve net-zero emissions by 2050. Total CO2 emissions from fossil fuels (tonnes/capita) have sharply decreased since 1990 (from 6.0 tonnes/capita to 4.5 tonnes/capita) and have remained below the national average, which is approximately 4.7 tonnes of CO2/capita (Municipality of Umeå, 2018[33]). The city expects to achieve net-zero emissions by 2050 following national emission reduction objectives (Municipality of Umeå, 2018[33]).

The transport sector represents the main source of CO2 emissions in Umeå. The greatest challenge for residents is the extensive use of fossil fuels in transport, which in 2013 accounted for more than 50% of total emissions (300 000 tonnes of CO2) (Figure 1.6). However, transport emissions have experienced a slight reduction (4%) between 1990 and 2013 (from 2.6 tonnes/capita in 1990 to 2.5 tonnes/capita in 2013). According to the survey on consumption-based emissions in Umeå (Box 1.4), transport is the sector causing most of the atmospheric emissions (Municipality of Umeå, 2018[33]). The Strategy for Liveable Cities set by the Swedish government encourages cities to take sustainable transport measures (Ministry of the Environment and Energy, 2018[34]). In particular, it sets two interim targets: By 2025, the proportion of passenger transport in Sweden using public transport, cycling and walking (expressed in passenger kilometres) must be at least 25%, with the aim of doubling the proportion of walking, cycling and public transport over time. By 2020, municipalities must have access to a refined method for making use of and integrating urban green spaces and ecosystem services in the planning, building and managing of cities.

Figure 1.6. Total CO2 emissions by sector in Umeå, Sweden, 1990-2013



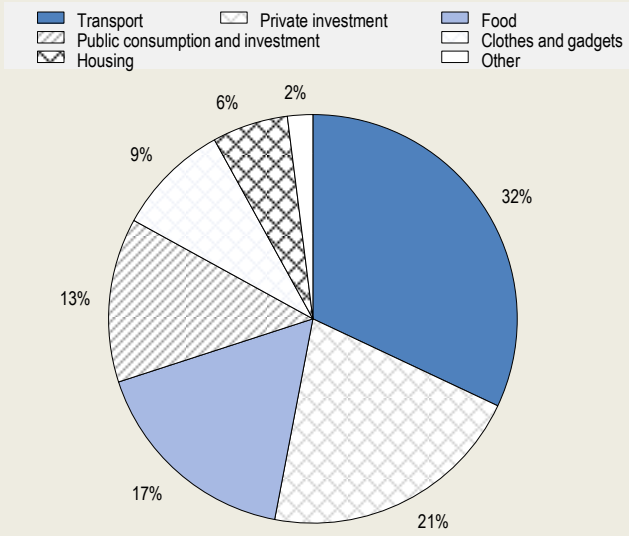
Note: Most recent available information dates from 2014.
Source: Municipality of Umeå (2018[33]), *EGCA 2018, Umeå, Sweden. Climate Change: Mitigation and Adaption*.

Box 1.4. The survey on consumption-based emissions in Umeå, Sweden

In 2018, the municipality of Umeå launched a survey on consumption-based emissions to analyse environmental impacts due to citizens' consumption. The survey, based on the IVL Swedish Environmental Research Institute´s climate account, received 1 475 responses (from a total of 4 004). Results, combined with national data, revealed that the average emissions from consumption in Umeå (11.7 tonnes of CO2 per year/person)[4] remained above the national average (9 tonnes of CO2 per year/person).[5] These levels of emissions stand above those set by the Paris Agreement under the United Nations Framework Convention on Climate Change, which states that emissions per person and year should be on average 1 tonne by 2050 (Naturvårdsverket, 2019[35]).

Consumption-based emissions include emissions that occur at all stages before a product is consumed, regardless of where these emissions occur. The fact that most of the products consumed in Umeå are not locally produced increased their impacts. Based on the results of the survey, transport is the sector producing higher number of emissions in Umeå (32%), followed by private investment (21%), food (17%), public consumption and investment (13%), clothes and gadgets (9%), housing (6%) and others (2%) (Figure 1.7).

Figure 1.7. Consumption-based emissions by sector in Umeå, Sweden



Source: Naturvårdsverket (2019[35]), *Consumption-based Emissions of Greenhouse Gases*, http://www.naturvardsverket.se/Sa-mar-miljon/Klimat-och-luft/Klimat/Tre-satt-att-berakna-klimatpaverkande-utslapp/Konsumtionsbaserade-utslapp-av-vaxthusgaser/ (accessed on 29 January 2020).

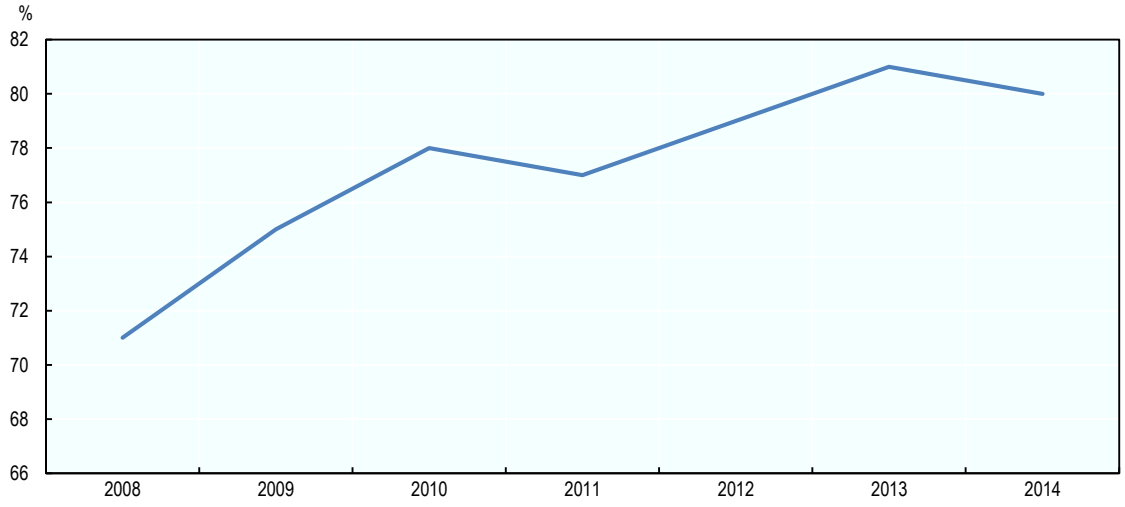
Key findings from the survey highlight actions needed to substantially reduce atmospheric emissions:

- reduction in air travel and car use
- reduction in meat and dairy consumption and a reduction in food waste
- reduction in domestic energy consumption
- reduction in consumption and increase in the reuse of furniture and clothing.

Source: Stockholm Environment Institute (2018[36]), *Consumption-based Emissions in the Municipality of Umeå*, http://www.sei.org (accessed on 25 January 2020); Naturvårdsverket (2019[35]), *Consumption-based Emissions of Greenhouse Gases*, http://www.naturvardsverket.se/Sa-mar-miljon/Klimat-och-luft/Klimat/Tre-satt-att-berakna-klimatpaverkande-utslapp/Konsumtionsbaserade-utslapp-av-vaxthusgaser/ (accessed on 29 January 2020).

District heating increased steadily since 2008. As a consequence of the investments the municipality made in district heating infrastructure since the 1960s, almost 99.8% of all municipal buildings are connected to district heating or rely on renewable energy sources. In 2014, a total of 80% of the district heating system energy derived from renewable resources, including wind, hydropower, biofuels and waste incineration (Figure 1.8).

Figure 1.8. Share of renewable energy in the district heating system in Umeå, Sweden, 2008-14

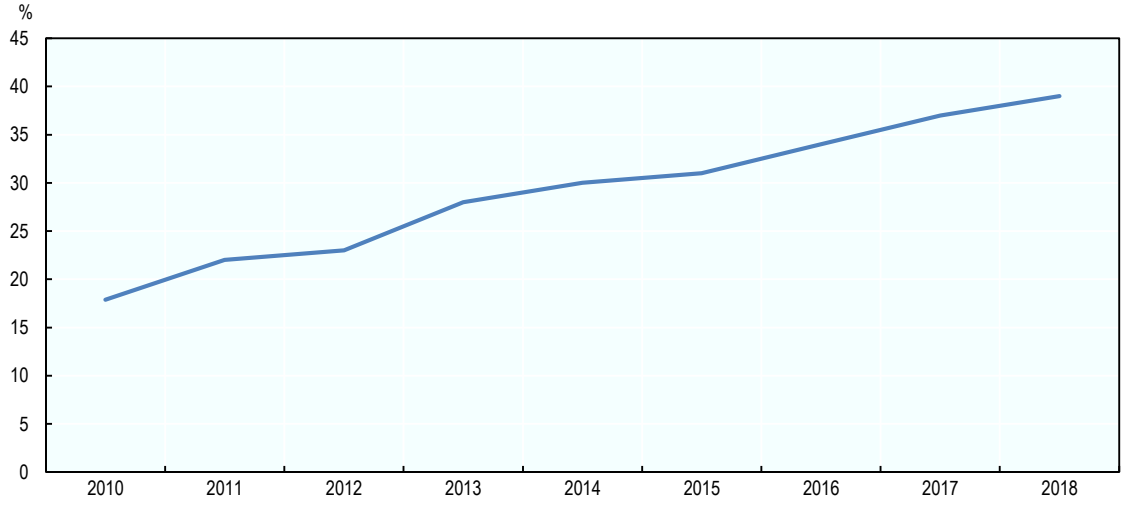


Note: The graph is built upon the most recent available information, until 2014.
Source: Municipality of Umeå (2018[33]), *EGCA 2018, Umeå, Sweden. Climate Change: Mitigation and Adaption*.

The per capita waste generated in Umeå has increased by almost 5% between 2008 and 2018 (Municipality of Umeå, 2018[37]). Umeå's households generated around 450 kg per year/inhabitant in 2018, which is similar to the Swedish national average, 466 kg per year/inhabitant in 2018. Nonetheless, waste production per inhabitant has been increasing in Umeå between 2008 and 2017. In 2017, incineration concerned a total of 33% of Umeå's household waste (150 kg/year/inhabitant). Figure 1.9 shows that the share of biologically treated food waste has more than doubled since 2010 (standing at 39% in 2018), while Figure 1.10 reveals that the household waste material collected for recycling has been falling since 2014, reaching in 2018 the same level than in 2011 (since 2014 it has decreased by 5% reaching 27% in 2018). In Sweden, 50% of household waste is used for energy recovery, compared to 30% in the European Union (EU) (Avfall Sverige, 2018[38]). According to the Swedish national survey on the circular economy (2018), there are some difficulties in obtaining differentiated data on the industrial and household waste managed by different companies. At the same time, the survey pointed out that the municipalities should have a clear role in preventing waste production. In 2019, in order to promote separate waste collection, the national government strengthened the Environmental Code towards Packaging and Newspaper Collection Service (FTI) responsible for collecting packaging waste.

Figure 1.9. Biologically treated food waste in Umeå, Sweden

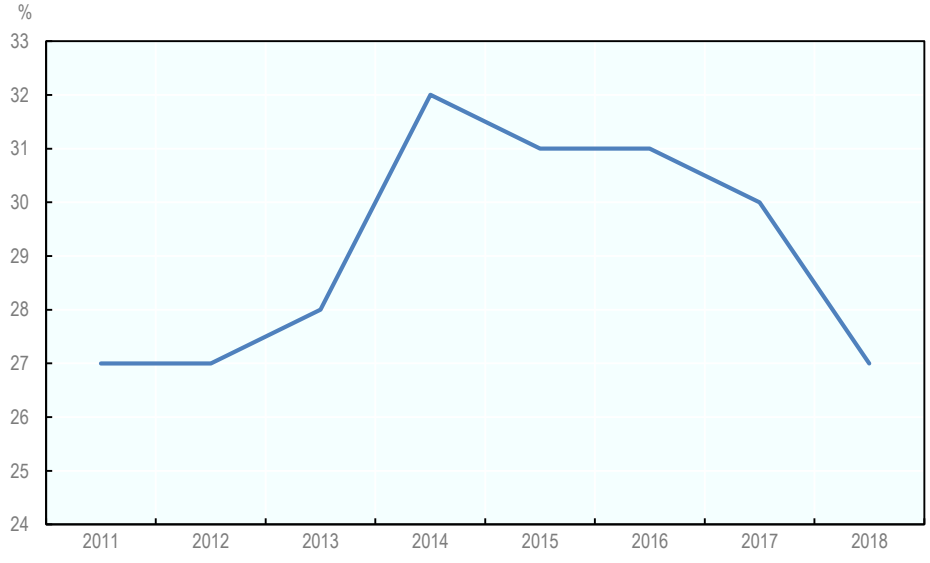
Percentage of total food waste, 2011-18



Source: Own elaboration based on data from Vakin (2019[39]). *Biologically treated food waste in Umeå, Sweden.*

Figure 1.10. Household waste collected for recycling in Umeå, Sweden

Percentage of total household waste, 2010-18



Source: Own elaboration based on data from Vakin (2019[40]). *Household waste collected for recycling in Umeå, Sweden.*

References

Accenture (2015), "The circular economy could unlock $4.5 trillion of economic growth", https://newsroom.accenture.com/news/the-circular-economy-could-unlock-4-5-trillion-of-economic-growth-finds-new-book-by-accenture.htm (accessed on 21 February 2020). [14]

Avfall Sverige (2018), *Swedish Waste Management 2018*. [38]

Blomsma, F. and G. Brennan (2017), "The emergence of circular economy: A new framing around prolonging resource productivity", *Journal of Industrial Ecology*, Vol. 21/3, pp. 603-614, http://dx.doi.org/10.1111/jiec.12603. [8]

Blomsma, F. and G. Brennan (2017), "The emergence of circular economy: A new framing around prolonging resource productivity", *Journal of Industrial Ecology*, Vol. 21/3, pp. 603-614, http://dx.doi.org/10.1111/jiec.12603. [45]

Circle Economy (2020), *The Circularity Gap report*, https://docs.wixstatic.com/ugd/ad6e59_733a71635ad946bc9902dbdc52217018.pdf. [17]

Commission, E. (2016), *Circular Economy Package: Four legislative proposals on waste*. [46]

EC (2015), *Closing the loop – An EU action plan for the circular economy*, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52015DC0614&from=EN (accessed on 21 February 2020). [9]

EEA (20016), *Environmental Indicator Report 2016 - In Support to the Monitoring of the 7th Environment Action Programme*, European Environment Agency, https://www.eea.europa.eu//publications/environmental-indicator-report-2016 (accessed on 21 February 2020). [16]

Ekins, P., Domenech, T., Drummond, P., Bleischwitz, R., Hughes, N. and Lotti, L. (2019), *"The Circular Economy: What, Why, How and Where", Background paper for an OECD/EC Workshop on 5 July 2019 within the workshop series "Managing environmental and energy transitions for regions and cities", Paris*. [12]

Ellen MacArthur Foundation (2019), *Cities and Circular Economy for Food*, https://www.ellenmacarthurfoundation.org/assets/downloads/Cities-and-Circular-Economy-for-Food_280119.pdf (accessed on 6 November 2019). [7]

Ellen MacArthur Foundation (2018), *What is a Circular Economy?*, https://www.ellenmacarthurfoundation.org/circular-economy/concept (accessed on 21 February 2020). [10]

IEA (2016), "Cities are in the frontline for cutting carbon emissions", https://www.iea.org/news/cities-are-in-the-frontline-for-cutting-carbon-emissions-new-iea-report-finds (accessed on 21 February 2020). [2]

Kirchherr, J., D. Reike and M. Hekkert (2017), *Conceptualizing the circular economy: An analysis of 114 definitions*, Elsevier B.V., http://dx.doi.org/10.1016/j.resconrec.2017.09.005. [11]

McCarthy, A., R. Dellink and R. Bibas (2018), "The Macroeconomics of the Circular Economy Transition: A Critical Review of Modelling Approaches", *OECD Environment Working Papers*, No. 130, OECD Publishing, Paris, https://dx.doi.org/10.1787/af983f9a-en. [41]

McCarthy, A., R. Dellink and R. Bibas (2018), "The Macroeconomics of the Circular Economy Transition: A Critical Review of Modelling Approaches", *OECD Environment Working Papers*, No. 130, OECD Publishing, Paris, https://dx.doi.org/10.1787/af983f9a-en. [44]

McKinsey Centre for Business and Environment (2016), *Growth Within: A Circular Economy Vision for a Competitive Europe*. [15]

Ministry of the Environment and Energy (2018), *Strategy for Liveable cities*, https://www.government.se/49f4b6/contentassets/093aaf895dbd44119d5ee023138c0f94/strategy-for-livable-cities---short-version (accessed on 5 March 2020). [34]

Municipality of Umeå (2020), *Umeå's location in Sweden's Map*. [22]

Municipality of Umeå (2019), *The Portal for Umeå Municipality, University and Business*, https://www.umea.se/2.bbd1b101a585d70480003.html (accessed on 23 January 2020). [29]

Municipality of Umeå (2018), *Comprehensive Plan for Umeå Municipality*, http://www.umea.se/oversiktsplan (accessed on 14 November 2019). [24]

Municipality of Umeå (2018), *EGCA 2018, Umeå, Sweden 7. Waste Production and Management*. [37]

Municipality of Umeå (2018), *EGCA 2018, Umeå, Sweden City Introduction and Context-involvement, Investment and Innovation*. [23]

Municipality of Umeå (2018), *EGCA 2018, Umeå, Sweden. Climate Change: Mitigation and Adaption*. [33]

Municipality of Umeå (2016), *Strategic Plan 2016-2028*, https://www.umea.se/download/18.25332a9916cb14274219795/1567417715728/UK_Oversiktsplan_2018-SVE_low_resolution.pdf (accessed on 14 November 2019). [19]

Naturvårdsverket (2019), *Consumption-based Emissions of Greenhouse Gases*, http://www.naturvardsverket.se/Sa-mar-miljon/Klimat-och-luft/Klimat/Tre-satt-att-berakna-klimatpaverkande-utslapp/Konsumtionsbaserade-utslapp-av-vaxthusgaser/ (accessed on 29 January 2020). [35]

North Sweden Cleantech (2019), *North Sweden Cleantech - Umeå*, https://www.northswedencleantech.se/en/trade-and-invest/the-region/umea/ (accessed on 23 January 2020). [27]

Observatory of the European Charter (2014), *Umeå – A Model Town for Gender Equality*, https://www.charter-equality.eu/exemple-de-bonnes-pratiques/umea-a-model-town-for-gender-equality.html (accessed on 14 November 2019). [25]

OCDE (2012), *OECD Environmental Outlook to 2050: The Consequences of Inaction*, OECD Publishing, Paris, https://doi.org/10.1787/9789264122246-en. [4]

OECD (2019), *Global Material Resources Outlook to 2060 Economic drivers and environmental consequences HIGHLIGHTS*, https://doi.org/10.1787/9789264307452-en (accessed on 8 November 2019). [47]

OECD (2019), *Global Material Resources Outlook to 2060: Economic Drivers and Environmental Consequences*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264307452-en. [13]

OECD (2019), *Linking the Indigenous Sami People with Regional Development in Sweden*, OECD Rural Policy Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264310544-en. [28]

OECD (2019), *OECD Survey on the Circular Economy in Cities and Regions*, OECD, Paris. [18]

Regionfakta (2019), *Statistics from Counties and Regions in Sweden*, http://www.regionfakta.com/vasterbottens-lan/befolkning-och-hushall/befolkning/folkmangd-31-december-alder/ (accessed on 31 January 2020). [26]

Statistics Sweden (2020), *Labour Market Statistics*, http://www.statistikdatabasen.scb.se/pxweb/sv/ssd/ (accessed on 6 February 2020). [32]

Statistics Sweden (2019), *Environmental Accounts*, http://www.scb.se/hitta-statistik/statistik-efter-amne/miljo/miljoekonomi-och-hallbar-utveckling/miljorakenskaper/ (accessed on 29 January 2020). [42]

Statistics Sweden (2016), *Gainfully Employed 16+ Years by Region of Work (RAMS) by Industrial*. [31]

Stockholm Environment Institute (2018), *Consumption-based Emissions in the Municipality of Umeå*, http://www.sei.org (accessed on 25 January 2020). [36]

Swedish Institute (2019), *The Swedish System of Government*, https://sweden.se/society/the-swedish-system-of-government/ (accessed on 23 January 2020). [20]

Umeå University (2020), *Rankings and Recognition*, https://www.umu.se/en/about-umea-university/facts-and-figures/rankings/ (accessed on 23 January 2020). [30]

UN (2018), "68% of the world population projected to live in urban areas by 2050", United Nations, http://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html (accessed on 6 November 2019). [43]

UN (2018), "68% of the world population projected to live in urban areas by 2050", United Nations, http://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html (accessed on 6 November 2019). [1]

UNEP (2013), *UNEP-DTIE Sustainable Consumption and Production Branch*. [5]

UNEP/IWSA (2015), *Global Waste Management Outlook*. [6]

Vakin (2019), *Biologically treated food waste in Umeå, Sweden. Percentage of total food waste, 2011-18*. [39]

Vakin (2019), *Household waste collected for recycling in Umeå, Sweden. Percentage of total household waste, 2010-18*. [40]

Västerbotten Region (2019), *This Is What the Region Does*, https://www.regionvasterbotten.se/det-har-gor-regionen (accessed on 23 January 2020). [21]

World Bank (2010), *World Development Report 2010*, World Bank, http://dx.doi.org/10.1596/978-0-8213-7987-5. [3]

Notes

[1] Air pollutant concentrations refer in particular to Particulate Matter (PM10).

[2] Amec Foster Wheeler: see focus area profiles in this document (pp. 20-30) (2015), https://www.lwarb.gov.uk/wp-content/uploads/2015/12/LWARB-circular-economy-report_web_09.12.15.pdf.

[3] For more information, see: https://www.paris.fr/economiecirculaire.

[4] Most of the activities analysed in the research are based on input/output (I/O) methodology while a few others are calculated through the life cycle analysis (LCA) (Stockholm Environment Institute, 2018[36]). Data was collected through the survey and complemented with national statistics from the environmental accounts.

[5] The methodology is based on environmentally expanded input-output analysis. The used data was obtained from the environmental accounts of the Swedish Central Bureau of Statistics (*Statistiska centralbyrån*) (Statistics Sweden, 2019[43]; Naturvårdsverket, 2019[35]).

2 Assessing and unlocking the circular economy in Umeå, Sweden

The chapter details the main components of the existing circular economy strategies and initiatives promoted by the Swedish government, the region of Västerbotten and the city of Umeå, Sweden. The chapter also identifies actors, policies and co-operation tools across urban and rural areas that can foster the circular economy. Finally, it describes the main challenges that the city of Umeå is facing in its transition from a linear to a circular economy.

An ongoing agenda on the circular economy at the national and subnational levels

In 2016, the Swedish government started to investigate on the circular economy, focusing on consumers and reuse, and on industrial symbiosis. The research on consumers and reuse aimed to enhance the reuse of products in order to prevent waste production, with the ultimate goal of leading towards a zero-waste society, which is an objective shared by waste management companies and municipalities, gathered in the industrial organisation for waste management called Avfall Sverige. The investigation concluded in 2017 with a report calling for further collaboration between the government and the business sector to promote sustainability and innovation. The Swedish government reformed the tax system in 2017 favouring repairs on used items and supported initiatives for recycling materials, including the textile sector. In 2018, a second investigation developed *A Roadmap for Increased Uptake of Industrial Symbiosis in Sweden* (Harris et al., 2018[1]). Interestingly, it makes a connection between the industrial and urban symbiosis. While the industrial symbiosis allows resource exchanges across companies, urban symbiosis looks at mutual and beneficial exchanges of resources within urban areas and across industries. The roadmap provides instruments for enhancing the co-operation across industry and urban areas, such as a systematic facilitation programme, regional centres supported by a national centre; task forces building knowledge in key areas (e.g. recovery technology) and local and national government procurement (Harris et al., 2018[1]).

A National Delegation for the Circular Economy was set up in 2018. The delegation is an advisory body to the government and part of the Swedish Agency for Economic and Regional Growth (*Tillväxtverket*). It is formed by representatives from the business, academia and public sectors. The purpose of the delegation is to support society's transition to a resource-efficient, circular and bio-based economy. The national delegation focuses on three priorities: plastic, public procurement and circular design. It aims: to contribute to new business models through circular design; to increase the recycling of plastic and enhance the use of green procurement, increasing reuse and extending material life. It will investigate the regulatory and fiscal barriers, identify best practices and involve stakeholders for information sharing and knowledge building, both offline and online. The delegation will provide cost-effective measures and recommendations on the strategic implementation of the circular economy at the national and subnational levels (Tillväxt verket, 2019[2]).

National policies, funding programmes and international collaborations promotes the transition towards a circular economy. For example:

- The Sweden's Rural Policy (Ministry of Enterprise and Innovation, 2015[3]) incorporates the circular economy in one of its four objectives. The policy states that rural areas should contribute to strengthening Sweden's competitiveness in the development of a circular, bio-based and fossil-free economy, through the sustainable use of natural resources and in compliance with relevant environmental quality objectives (Riksdag, 2018[4]).
- The Swedish Innovation Agency, Vinnova, provides funds for initiatives that investigate policy and behavioural issues to facilitate the transition to a bio-based and/or circular economy. The Swedish Innovation Agency is currently running two strategic innovation programmes on the circular and bio-based economy (Vinnova, 2019[5]; 2019[6]): i) the Bio-innovation Programme, which aims to promote collaboration across industry boundaries, mainly within the forestry, textile and chemistry sectors; and ii) the RE:Source Programme, the Sweden's first co-ordinated initiative focusing on resource and waste management. It gathers waste management operators and research actors to apply jointly for funding innovation projects.
- The Swedish Environmental Protection Agency supports the national government in its transition to a circular economy, by contributing to the implementation of the EU action plan on the circular economy (RISE, 2019[7]).

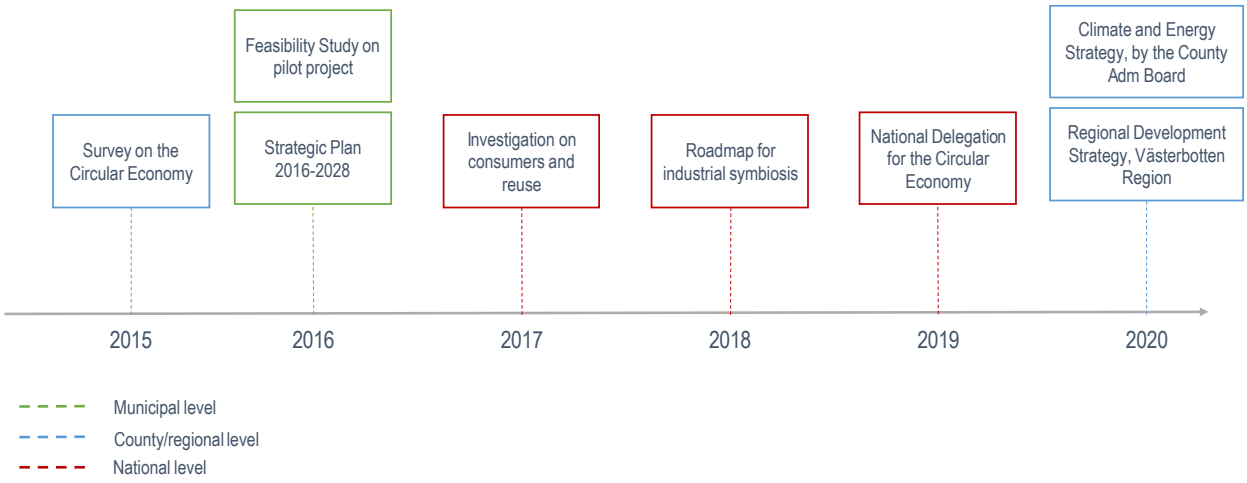
- The Swedish Agency for Economic and Regional Growth, under the Ministry of Enterprise and Innovation, aims at promoting competitiveness among Swedish companies and sustainable growth. The agency has worked on supporting entrepreneurship through the Start-up Sweden Programme and some of the start-ups supported by this initiative have developed solutions for the circular economy.
- At the international level, amongst other research activities, the Research Institutes of Sweden (RISE) and the Technical Research Centre of Finland Ltd (VTT) signed an agreement to strengthen their collaboration on biomaterials, biofuel manufacturing processes and the digitalisation of a bio-based and circular economy (RISE, 2019[7]).

At the subnational level, the region of Västerbotten, Sweden, aims at a circular, self-sufficient and sharing economy. The Regional Development Strategy of Västerbotten Region (ongoing) includes the circular economy as one of its goals (Västerbotten Region, 2019[8]). Västerbotten County is geographically large, the population is scattered and the region is relatively far from larger markets. On the other hand, in many ways, Västerbotten is well placed to lead the development in sustainable societies with developed digital infrastructure, great access to renewable energy and biomass, as well as expertise in sustainable construction. The county also has good expertise and raw materials for building in wood. Tackling climate change and the loss of biodiversity implies changes in consumption, production patterns and transport. By the end of 2020, the County Administrative Board will launch a Climate and Energy Strategy aiming at lowering greenhouse gas (GHG) emissions and supporting the transition to a circular economy. The Regional Transport Plan (2018-22) foresees the phasing out of fossil fuels through sustainable transport modes (e.g. via charging terminals for electric vehicles, vehicles, bionic drainage facilities) (Västerbotten Region, 2019[8]).

Circular economy initiatives in Umeå, Sweden

The Strategic Plan 2016-28 explicitly states that the city should become a role model for the circular economy (Municipality of Umeå, 2016[9]). The Strategic Plan was informed by a circular economy survey carried out in the Västerbotten County in 2015 and a feasibility study on the circular economy, carried out in 2016. The consultancy company firm Esam AB carried out both the survey and the feasibility study. The Survey on the circular economy was shared across 15 municipalities, as well as advisors, business developers and CEOs of 23 companies. A total of 83% of respondents expressed their interest to increase their knowledge on the circular economy and 90% of the respondents were interested or maybe interested in a pilot project on the circular economy (Esam AB, 2015[10]). On the basis of these results, the Business Department of the Umeå Municipality committed a feasibility study on the circular economy in 2016. The feasibility study investigated the possible content and sources of finance for a pilot project to be carried out in Umeå. One of the main results of the study was the commitment to build knowledge, capacities and new business models related to the circular economy in the upcoming years. Figure 2.1 visualises the activities carried out in relation to the circular economy at various scales from 2015 to 2020.

Figure 2.1. Initiatives related to the circular economy at the national, county/ regional and municipal level



There are several projects and initiatives promoted by the municipality that can be linked to current and future circular-related activities, such as:

- Circular Economy Business Accelerator North Sweden (CEBANS): Created in 2017, by the municipality of Umeå, the consultancy firm Esam AB and North Sweden Cleantech, the accelerator is a collaboration platform for business advisors to build knowledge and business model innovation. During 2017-19, a series of educational meetings were conducted in the region, during which 60 business advisors from different organisations participated. In a long-term perspective, CEBANS aims to create a platform for business advisors to create opportunities for collaboration across circular businesses.
- The Sharing City Umeå: This is a testbed for the sharing economy to test and evaluate sharing services in Umeå and support entrepreneurs. It is part of Sharing Cities Sweden, a national programme on the sharing economy in cities. The objective of the testbeds consists of developing sharing services and digital solutions as well as analysing and evaluating opportunities and risks derived from the sharing economy. Furthermore, it addresses the design of a platform for citizen engagement and co-creation of solutions and explores ways to enhance integration in Umeå. It counts with a total budget of SEK 24 million (2018-20).
- Municipal projects for a green, smart and sustainable Umeå, Sweden: A number of projects are shaping the future infrastructure in Umeå. For example, the RUGGEDISED project, funded by the European Union's Horizon 2020 research and innovation programme, will test nine innovative climate-smart solutions in the innovation district situated in the university district for the next five years; the Low Carbon Place project supports sustainable lifestyles in Umeå (e.g. mobility, housing, food systems and energy consumption), providing grants to not-for-profit organisations. The "green parking" pay-off consists of co-investments with property developers for sustainable transport modes. The Project for a Climate Neutral Umeå 2030 aims to reach carbon neutrality in the city by 2030: together with eight other Swedish cities, Umeå started participating in the programme in 2019 and will contribute to a joint action plan to be finalised by 2021. Finally, "Green Umeå" is a network created by the municipality gathering citizens, companies and organisations. It provides grants to support sustainable projects taking place in the city (Green Umeå, 2019[11]).

Annex A presents initiatives in place to transition to a circular economy in Umeå, Sweden, collected through the OECD Survey on Circular Economy in Cities and Regions (OECD, 2019[12]), and interviews with local stakeholders.

The analytical framework

The analytical framework used in this report is based on three dimensions that help to identify tailored solutions for cities and regions willing to transition from a linear to a circular economy (Figure 2.2):

- The level of advancement of cities and regions in the transition to a circular economy: Advanced, In progress, Newcomers.
- Tools and instruments for the transition according to the 3Ps Framework: People, Policies and Places.
- Roles of cities and regions to promote, facilitate and enable the circular economy.

Figure 2.2. OECD analytical framework: Level of advancement, tools and roles

Source: OECD (forthcoming[13]), *The Circular Economy in Cities and Regions*, Synthesis Report, OECD Publishing, Paris.

According to the level of advancement towards the transition to a circular economy, it is possible to identify three clusters of cities and regions:

- **Advanced**: Cities and regions that have developed and put in place circular economy strategies. These cities show strong innovative initiatives, as well as a firm political will in favour of a circular economy. An important future priority for these cities would be to build metrics for measuring

progress and evaluating their policies in place. Brussels and the Flanders region (Belgium), Paris (France), Amsterdam (Netherlands) and London (United Kingdom) belong to this cluster.

- **In progress**: Cities "in progress" are those that are taking actions towards the circular economy, following ad hoc initiatives. Cities or regions in this cluster have recently set specific programmes on the circular economy and/or are starting their implementation. They are less advanced compared to the pioneers, but they have already taken key steps towards a circular economy. This is the case of Rotterdam (Netherlands), the Metropolitan Area of Barcelona (Spain) and Glasgow (United Kingdom), amongst others.
- **Newcomers**: Cities in this cluster recognise the relevance and potential of the circular economy and they are exploring options for implementation. These cities have already achieved good results in waste recycling levels (Oslo, Norway); water reuse (Granada, Spain); have signed political commitments to advance towards a circular economy (Milan and Prato, Italy); are starting to develop a circular economy strategy (Groningen, Netherlands; Valladolid, Spain); or have included the circular economy in broader policy plans (Helsinki and Oulu, Finland). These cities see in the circular economy a means for reducing environmental impacts in cities while increasing attractiveness and competitiveness. The city of Umeå, Sweden is included in this cluster.

Each city and region, regardless of their level of advancement, can identify the conditions needed to transition to a circular economy, making sure that *people* are engaged, *policies* are co-ordinated and that linkages across *places* are set to close the loops (3 Ps Framework) (OECD, 2016[14]):

- **People**: The circular economy is a shared responsibility across levels of government and stakeholders. As such, it is key to identify the actors that can play a role in the transition and allow the needed cultural shift towards different production and consumption pathways, new business and governance models. For example, the business sector can determine the shift towards new business models (e.g. renting, reusing, sharing, etc.). Citizens, on the other hand, make constant consumption choices and can influence production.
- **Policies**: The circular economy requires a holistic and systemic approach that cuts across sectoral policies. As somebody's waste can be a resource for somebody else, the circular economy provides the opportunity to foster complementarities across policies. The variety of actors, sectors and goals makes the circular economy systemic by nature. It implies a wide policy focus through integration across often siloed policies, from environmental, regional development, agricultural and industrial ones. Identifying these key sectors and possible synergies is the first step to avoid the implementation of fragmented projects over the short-medium run, due to the lack of a systemic approach.
- **Places**: Cities and regions are not isolated ecosystems, but spaces for inflows and outflows of materials, resources and products, in connection with surrounding areas and beyond. Therefore, adopting a functional approach going beyond the administrative boundaries of cities is important for resource management and economic development. Linkages across urban and rural areas (e.g. related to bio-economy, agriculture and forest) are key to promote local production and recycling of organic residuals to be used in proximity of where they are produced, to avoid negative externalities due to transport. At the regional level, loops related to a series of economic activities (e.g. to the bio-economy) can be closed and slowed.

As a result and in accordance with predefined short-, medium- and long-term objectives, cities and regions can play a role as *promoters*, *facilitators* and *enablers* in the transition from a linear to a circular economy. In practice:

- Cities can **promote** the circular economy as illustrated by the roadmaps and strategies set out in cities like Brussels (Belgium), Paris (France), Amsterdam (Netherlands) and London (United Kingdom). These strategies identified priorities, promoted a number of concrete projects and engaged stakeholders.

- Cities can **facilitate** connections across stakeholders operating along the value chain that are not necessarily used to collaborate with one another, citizens and levels of government. They help direct and facilitate contacts, inform about existing projects, provide soft and hard infrastructure for new circular businesses. The city of Phoenix (United States), for example, created together with Arizona State University a Resource Innovation and Solutions Network (RISN) Incubator for accompanying businesses in the shift towards a circular economy. In 2017, the city of Paris, France, launched a circular economy incubator, hosting 19 start-ups.
- Cities can **enable** the circular economy transition to happen by providing the appropriate governance and economic tools. Cities can set up incentives, catalyse funds, adapt regulations, etc. For example, the London Waste and Recycling Board (LWARB) in London (United Kingdom) proposed to develop a venture capital fund, seeking private sector partners to join; the city of Amsterdam (Netherlands) created a revolving sustainability fund for businesses to pay back within 15 years with a very low interest rate.

This analytical framework applied to the case of Umeå, Sweden, will identify the main opportunities and challenges (Chapter 2), as well as tailored policy recommendations to promote, facilitate and enable the circular economy (Chapter 3).

People and firms: An innovative ecosystem to boost the circular economy transition

The dynamism of the business community and the civil society is a key factor for the implementation of the circular economy in the city of Umeå, Sweden. Beyond the actions that the municipality put in place, i.e. for the green transition, sustainable mobility and sharing economy, the future of the circular economy in the city can count on a wide range of stakeholders that can contribute by building knowledge while enhancing innovation and experimentation. Categories of stakeholders and their actions are reported below.

Non-governmental organisations (NGOs), associations and businesses located in the city of Umeå play a role as promoters and implementers of the circular economy. Several stakeholders from civil society and the business sectors have been increasingly contributing through their activities to reduce food waste, make mobility cleaner and increase the use of recycling material in the building sector. Importantly, some initiatives focus specifically on building knowledge and raise awareness, with the ultimate goal of creating a collaboration for the implementation of circular economy related projects. For example, the Umeå branch of the NGO Cradlenet Norr, founded in 2015, organises bi-monthly meetings to raise awareness of circular economy issues, discusses challenges with different stakeholders (e.g. small- and medium-sized enterprises [SMEs], municipal authorities, business coaches, university researchers and students), organises specialised field visits and participates in international events and platforms on the circular economy. Similarly, from 2010 to 2019, a group of engaged citizens gathered together in the Environmental Café (Miljöcaféet) to discuss environmental topics, including the circular economy (Swedish Society for Nature Conservation, 2016[15]).

Universities and research centres can help create technical and non-technical knowledge on the circular economy. There are some initiatives already in place:

- The Umeå University (UMU) is specialised in environmental science and technology, natural resources management and design. The UMU's School of Architecture has included the circular economy in its sustainable urban development master courses and has been collaborating with the municipality and the Sharing Cities group as a way of encouraging students to include the circular economy in their research.
- The Institute of Design is adapting to the demand of the transformative industry, calling for expertise in eco-design for products, production processes, modular building, etc. Various

collaborations with the municipality are ongoing, including an incubator on creative industries. During 2018 and 2019, master's students from the institute collaborated with Västerbotten Region in the Mobility and Transport for the Visitor Industry (MOVEBI) project. The preliminary study will test sustainable transport and mobility solutions for tourists and the food sector in the biosphere reserve Vindelälven-Juhtatdahka.

- The Umeå School of Business, Economics and Statistics (USBE) provides a course on sustainable entrepreneurship, in collaboration with SMEs and start-ups. Research in this field is key for the circular economy to happen. If pilot activities are not profitable, they will not be likely to scale up. The USBE hosts the Council for Sustainable Development, an initiative of the municipality of Umeå, gathering students, tutors, politicians, officials and sustainability experts, to discuss solutions in line with the 2030 Agenda for Sustainable Development.[1]
- The Faculty of Science and Technology of Umeå University has carried out several research and development (R&D) projects with a focus on future sustainable solutions. These initiatives are carried out in collaboration with the municipality of Umeå, companies owned by the municipality and the private sector. This scheme leads to the exchange of knowledge and the creation of interfaces between students, researchers, citizens and the private sector. Specific technical or system analysis results (e.g. life cycle analysis) can also provide support for circularity at the urban level.

Innovative business and start-ups can benefit from existing incubators to develop circular-related projects. The incubators[2] are specialised in five main areas: new business models support (Uminova Innovation), creative industries (eXpression Umeå), life sciences (Umeå Biotech), young start-ups (BIC Factory) and sharing economy (Coompanion Nord). The first three incubators are co-financed by the municipality, the regional government and Umeå University, while the BIC Factory is co-financed by local and regional government. There is a demand by the municipality to include circular economy projects in the core activities of the incubators while enhancing circular upgrading (valorisation and new business opportunities):

- Uminova Innovation is specialised in innovative and scalable business ideas that have the potential to grow in the market. Since its creation in 2003, it has provided business support to more than 150 companies that together have more than 650 employees and have a turnover of nearly SEK 850 million. Nowadays, 50 start-ups and 40 companies are part of the incubator (Uminova Innovation, 2019[16]).
- eXpression Umeå encourages the inclusion of sustainability dimensions within companies and promotes innovative design and creativity in close co-operation with local producers (eXpression Umeå, 2019[17]).
- Umeå Biotech Incubator (UBI) is one of Europe's top 15 biotech incubators (Umeå Biotech Incubator, 2019[18]). The incubator aims to grow the Scandinavian life sciences sector by developing biomedical businesses that contribute to regional and national growth. A cluster of the forest industry is part of the UBI Incubator. The cluster is formed by start-ups and forest industry companies (e.g. paper mills) working on a bio-refinery project transforming bio-waste into new products. The municipality supports the Forest Hub financially through European Regional Development Fund (ERDF) projects.
- The BIC Factory supports young entrepreneurs who want to start their own businesses in the municipality (BIC Factory, 2019[19]).
- Coompanion Nord is an incubator specialised in fostering co-operative entrepreneurship. It provides advice and guidance in starting co-operative companies[3] and supports start-ups in developing new tools focusing on sustainable projects and the sharing economy (Coompanion, 2019[20]).

There are several networks aiming to create synergies within and among economic sectors and to engage citizens towards sustainable consumption patterns. The Network for Sustainable Construction and Real Estate Management in Cold Climates (*Nätverket för hållbart byggande och förvaltande*) launched by the municipality in 2008 gathers 55 members from all segments of the construction supply chain. Sustainability and the circular economy are key topics for the monthly breakfast meetings and at the annual member meeting (Network for sustainable construction and real estate management in cold climates, 2013[21]). The network has enabled the creation of a public-private partnership[4] to develop by 2024 the new Tomtebo Strand city district, which incorporates circular economy principles in its structural plan (Municipality of Umeå, 2019[22]). The Sustainable Restaurants Network (*Hållbara Restauranger*) involves 14 restaurants in the city for sustainable practices in the food industry and food waste management. On a wider scale, the North Sweden Cleantech is a regional innovation platform focusing on exporting green technology, clean energy and sustainable solutions through business support and networking. A hundred companies are currently part of the platform. Since 2016, the platform has been organising circular economy capacity building events (North Sweden Cleantech, 2019[23]).

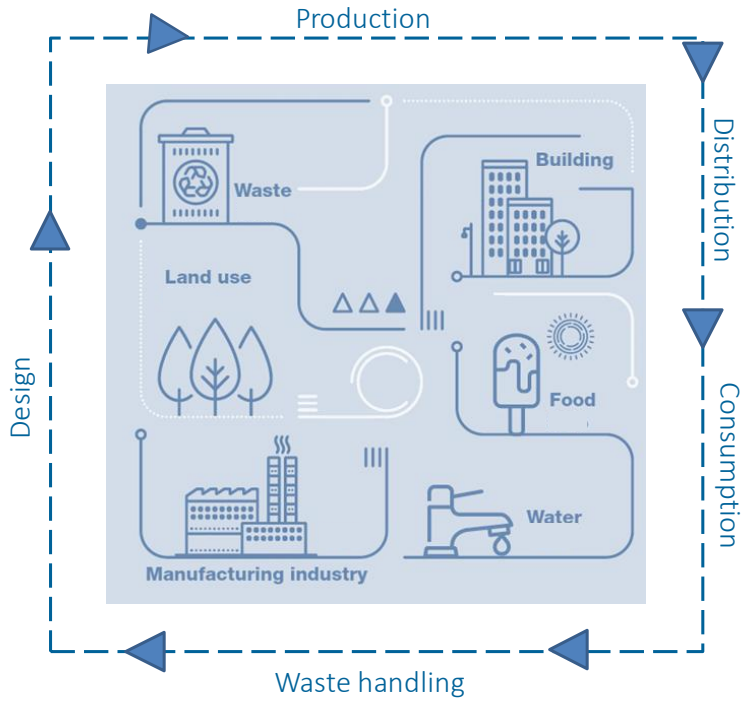
The traditional knowledge of the Sámi people[5] can be inspirational for the circular economy transition. The Sámi people are part of the indigenous peoples of Sweden. The Sámi economy, based on traditional livelihoods such as reindeer husbandry, hunting and fishing, is dependent on shared access to land and water. The protection of nature is therefore linked to the preservation of the Sámi culture. Principles of sustainability are foremost in Sámi considerations. As such, the use of natural resources should take into account a balance between the exploitation of resources and the negative consequences on ecosystems (e.g. soil degradation) (OECD, 2019[24]).

Policies: Identifying sectors holding potential for the circular economy

All sectors are concerned in a circular economy but some have higher potential. Often the circular economy in cities and regions is seen as a synonymous with municipal waste recycling but it is more than that. Cities and regions in their circular economy strategies have identified key sectors that show the greatest potential in terms of economic, social and environmental benefits. These sectors include built environment, food, water, and textile amongst others. According to local specificities, cities and regions are setting up circular economy initiatives for less traditional sectors, such as fashion and culture.

Making a sector “circular” implies rethinking value chains and production and consumption processes. “Circularity” implies that any output can be an input for something else within and across sectors. It aims to: make products and goods last longer through better design; produce products and goods using secondary and reusable materials and renewable energy while reducing atmospheric emissions; produce and distribute products locally and consume them in a conscious and sustainable manner; and transform waste into a resource (Figure 2.3). Below, specific attention will be dedicated to those sectors that more prominently stand out from the discussion with various stakeholders in Umeå. This is key to establish the role of the “do-ers” (e.g. entrepreneurs, SMEs, private companies, CSOs, etc.) in the transition from a linear to a circular economy and foresee coherent policies for the future. Information on the sectors included in other cities and regions’ circular economy initiatives is presented in Table 2.1.

Figure 2.3. OECD circularity within and across sectors



Source: OECD (forthcoming[13]), *The Circular Economy in Cities and Regions*, Synthesis Report, OECD Publishing, Paris.

Waste

The new municipality's Waste Plan is expected to include circular principles by 2021. The Waste Plan 2010-20 sets guidelines for the waste management in the municipality and includes reuse, waste minimisation and recycling goals. The plan foresees three overarching goals: i) decrease the amount of waste; ii) increase recycling; and iii) reduce environmental impacts due to waste management (e.g. related to the vehicles for collecting waste, littering and hazardous waste). The Waste Plan 2010-20 foresees an increasing rate of household waste recycling: it aims to reach 50% of biologically treated food waste and recycled household waste, including through biological treatment. Vakin, the waste and water utility company owned by the municipality, is responsible for drafting the plan for six municipalities by 2021. Afterwards, each municipality will set its own specific waste plan. The plan aims to promote the circular economy through the prevention of waste, which is a requirement from the national Swedish Environmental Protection Agency. Given the diversity in size and capacity of the six municipalities, the major challenge in setting the waste plan is to be ambitious but also realistic enough to take this diversity into account. As such, the plan will be reviewed every four years and will be accompanied by indicators for each action that can be progressively fulfilled, instead of having a binding end date.

The municipality is taking action to reduce waste and promote sustainable behaviours. As part of the reuse goals, the municipality set that, by 2020, all building materials suitable for reuse in city-owned properties (e.g. doors, windows, etc.) should be sorted before demolition. By that time, the second-hand shop Returbutiken that resells used merchandise from recycling centres, will receive disposed furniture, inventory and machinery from all city administrations and municipality-owned companies to enable reuse. To minimise the generation of waste, awareness-raising campaigns and training activities are planned, for municipal employees and students.

Recycling is strongly promoted in the city of Umeå. As for the recycling goals, the Waste Plan of Umeå established that, by the end of 2020, 70% of domestic waste and 50% of food waste should be source-separated (Municipality of Umeå, 2018[25]). The waste and water utility company owned by the municipality, Vakin, is responsible for the collection of domestic waste and the recycling centres. Household combustible domestic waste and food waste are collected in a curbside system. Packaging waste, i.e. glass, paper/cardboard, plastic, metal packages and newspapers are collected in 80 recycling stations located in the municipality. Bulky waste, waste for reuse and garden waste are collected in seven recycling centres. Metals are recycled in Umeå while other materials in Germany, the Netherlands or the South of Sweden (Municipality of Umeå, 2018[25]). A pyrolysis plant located in Umeå will produce biocarbon from the phosphorus derived from sewage sludge. This biocarbon produced will be used as fertiliser in parks.

The “pay as you throw” principle is applied in Umeå to reduce waste production. Waste management in Umeå is financed by a waste tariff, which is divided into three fees: a basic fee, which covers costs for recycling centres; a fee that covers the cost for collection, transport and the purchase and maintenance of vessels; and a variable weight-based fee, which covers costs for treatment of collected waste (Umeå Municipality, 2018[26]). The weight-based fee gives an incentive for households to reduce the amount of waste (e.g. through increased waste separation and sorting food waste separately). Collection of food waste will become mandatory from March 2020. Food waste is also financed through a vessel fee and a weight-based fee will be introduced. Local compost is allowed by the municipality: households have to report to the municipality if they choose to produce compost so that other citizens are aware and can complain in the event of odours or other associated problems (Municipality of Umeå, 2018[27]).

Energy

Waste is a source of energy: biogas is produced from wastewater for heating and electricity. The public provider of energy, Umeå Energi, is contracted by the municipal waste and water company, Vakin, to transform waste into energy. Umeå Energi provides district heating to 80% of Umeå’s buildings from waste incineration. A total of 150 000 tonnes of waste are incinerated per year by Umeå Energi. The ashes resulting from the incineration process (25 000 tonnes ashes per year) are sent to the DÅVA landfill company, located 500 metres away from the energy plant. The landfill, the biggest in northern Sweden, receives ashes from incineration, household waste (1%), industrial waste, contaminated soil and hazardous waste. For the last two decades, Vakin has produced biogas from wastewater for heating and electricity. It provides energy to company facilities, while the energy surplus is integrated into the municipal energy grid.

The municipality applies “product-as-a-service” schemes for the promotion of renewable energies. Since 2015, Umeå Energi offers households within the municipality of Umeå to rent a turnkey package of photovoltaic cells instead of buying them. The business model changed from an initial 15-year contract into the current service-renting scheme, which generated great interest among Umeå’s citizens. Umeå Energi received 800 requests during the first months of the programme. Installation and repairs are included throughout the contract period and, in the event of a property being sold, the new owner can choose to keep the service under the same original conditions. Umeå Energi is the first company to implement this system in Sweden and boasts 100 new customers a year.

Table 2.1. Example of sectors included in circular economy initiatives in cities and regions

City/Region	Initiative	Waste	Construction and demolition	Land use and spatial planning	Food and beverage	Manufacturing industry	Textile	Water and sanitation	Energy	Biomass	Agriculture	Mobility	ICT sector	Forestry	Culture
Amsterdam (Netherlands)	Amsterdam Circular 2020-25	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Barcelona Metropolitan Area (AMB) (Spain)	Circular Economy Promotion Programme AMB Circular (2019)		✓	✓	✓			✓	✓	✓	✓	✓			
Flanders (Belgium)	Circular Flanders (2016)	✓	✓	✓	✓	✓		✓					✓		
Greater Porto Area (Portugal)	LIPOR's commitment to circular economy principles (2018)	✓	✓	✓	✓		✓	✓	✓		✓	✓			
Nantes (France)	Circular Economy Roadmap	✓	✓	✓	✓				✓	✓	✓	✓			
North Karelia (Finland)	CIRCWASTE – Towards Circular Economy in North Karelia	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	
Paris (France)	Circular Economy Plan of Paris 2017-20	✓	✓	✓					✓	✓					✓
Rotterdam (Netherlands)	Rotterdam Circularity Programme 2019-23	✓	✓	✓	✓	✓		✓		✓	✓				
Scotland (United Kingdom)	Circular Glasgow	✓	✓		✓	✓	✓		✓		✓		✓	✓	
Tilburg (Netherlands)	Tilburg Circular Agenda 2019	✓	✓	✓	✓	✓	✓			✓					
Valladolid (Spain)	Valladolid Circular Economy Roadmap (2017-18)		✓	✓	✓	✓	✓	✓		✓		✓			

Source: OECD (forthcoming[13]), *The Circular Economy in Cities and Regions*, Synthesis Report, OECD Publishing, Paris.

Food

The food sector holds great potential for greater circularity. The city of Umeå promotes sustainable farming practices and fosters local food production and commercial network. The planned local food strategy intends to incentivise people under 40 years old for to conduct farming activities in Umeå's surrounding areas. The city is developing an online tool to map the relevant actors involved in the food sector value chain (producers, processors, manufacturers and retailers, restaurants, coffee shops). At the regional level, a first draft of the regional food strategy is expected to be launched in 2020 and it is likely to include circular economy principles. Box 2.1 illustrates examples of circular initiatives in the food sector in cities. The circular food system in cities and regions are based on strengthening synergies across the food value chain from production to distribution and waste handling (OECD, forthcoming[13]).

Box 2.1. Making the food sector circular: Examples from cities

By 2050, cities will consume 80% of food. A total of 2.9 billion tonnes are destined for cities annually (resulting in 0.5 billion tonnes wasted). According to the Ellen MacArthur Foundation (2019), cities can significantly influence the way food is grown, distributed and consumed, by ensuring environmentally sustainable cultivation and by fostering the interaction with producers in their peri-urban and rural surroundings. Moreover, achieving a regenerative food system in cities will entail an annual reduction of greenhouse gas emissions by 4.3 billion tonnes of CO2 equivalent and the generation of annual benefits amounting to USD 2.7 trillion by 2050.

There are several examples of initiatives to make the food sector more circular in urban and rural areas. These initiatives focus on different aspects of the food sector dynamics, from reducing food waste (Ljubljana, Porto, Umeå), promoting urban agriculture (Brussels, Guelph, Paris), supporting local food production (Umeå), improving the co-ordination between urban and rural areas (Valladolid), incorporating restaurants and the hospitality activities into these efforts (Amsterdam, Umeå, Valladolid) or the production of organic fertilisers (Porto). For example, in Spain, Valladolid's food strategy intends to improve the co-ordination between urban and rural areas and create employment opportunities whereby the city can act as an agro-incubator for responsible consumption and local production. The eco-market located in the city is the first step to providing city customers with locally grown products. The city of Toronto (Canada) put in place the Urban Harvest programme to help reduce food waste and benefit the broader community by collecting surplus fruit and vegetables from residents' backyards and redistributing them to local food banks and programmes. Urban Harvest also provides opportunities to learn about preserving food through canning workshops.

Source: OECD (OECD, forthcoming[13]), *The Circular Economy in Cities and Regions*, Synthesis Report, OECD Publishing, Paris; Ellen MacArthur Foundation (2019[28]), *Cities and Circular Economy for Food*, https://www.ellenmacarthurfoundation.org/assets/downloads/Cities-and-Circular-Economy-for-Food_280119.pdf (accessed on 30 April 2019).

Through the Sustainable Restaurants Network (*Hållbara Restauranger*), the municipality of Umeå helps restaurants become more sustainable and in the long term, will provide Umeå's residents with information about consuming sustainably when eating out. Created by a Swedish sustainability consulting firm, the network is a national project carried out in Gothenburg, Malmö, Stockholm and Umeå, where it started in 2017 with four restaurants and currently counts ten more. The restaurant network is financed through two municipal projects: Low Carbon Place and Coaches for Energy and Climate. The network builds knowledge and allows sharing good practices among members. Resulting from the collaboration between Västerbotten Region, the County Administrative Board and Smakfestivalen, a networking meeting was held during the local food festival Smakfestivalen that aimed at connecting producers, restaurants and

other stakeholders. Several restaurants took the initiative to start collaborations with local producers. Some of the member restaurants are already implementing circular practices to minimise food waste, such as buying wholesale products not usually sold to restaurants and selling the remaining food of the day through apps at a reduced price. The network is also developing a certification to show customers which restaurants are incorporating more sustainable ways of working (Green Umeå, 2020[29]).

There are also interesting new business models to minimise food waste and reinforce local food production and consumption. REKO-ring, in particular, promotes a seasonal harvest market and creates interactions with local producers. REKO (*rejäl konsumtion*, fair consumption) is a model for trading between a group of producers and a group of consumers. Within REKO, consumers order food from local producers directly, without intermediaries or administrative costs. REKO operates via closed Facebook groups, via which consumers and producers co-ordinate orders and deliveries. Pre-ordered products are distributed from a specified meeting place, usually once a week. In 2015, approximately 100 000 additional members joined in more than 100 REKO "rings" (Facebook groups) and the turnover was estimated at EUR 8 million. The model is spreading throughout Finland and other Nordic countries. In addition to the REKO-ring for consumers, there is an initiative in Sweden to create a REKO-ring for restaurants and other companies (REKO, 2019[30]).

Building sector

The building sector in Umeå holds strong circular potential. Umeå is the only city in Västerbotten Region in which the population is projected to grow. As a consequence, and during the next three decades, a total of 60 000 new homes will be built. This is an opportunity to move from "business as usual" to a more circular approach whereby materials from demolitions and secondary construction materials can be used in combination with energy and water efficiency in buildings. Some examples of Cradle-to-Cradle constructions (Box 2.2) are already taking place in Umeå. The municipality of Umeå, in co-operation with several actors,[6] is planning the University City district where nine innovative climate-smart solutions are being tested between 2019-24. The municipality has set the target of all building materials suitable for reuse in city-owned properties (e.g. doors, windows, etc.) being sorted before demolition by 2020. Several initiatives have developed material passports to identify what kind of materials are used in buildings and contribute to their reuse after demolition (Box 2.3). The construction experience of the Green Zone, an eco-friendly and energy-efficient services area could be a source of inspiration for the building sector in Umeå. It is one of the first examples of circular use of materials and resources in the construction sector. It was developed 20 years ago when there was yet no explicit mention of the term "circular economy". The project applies various forms of cleantech (e.g. recovery of excess heat and cold, green roofs, solar panels, reusable and recyclable materials and filters purifying indoor air).

Box 2.2. The Cradle to Cradle approach for the building sector

Cradle to Cradle is a design concept developed in the 1990s by architect William McDonough and chemist Michael Braungart, which promotes the use of construction materials and products that are recyclable in order to respond to the challenges of waste reduction and health protection. To achieve this goal, this approach enables the design of products that can be reintroduced into new manufacturing processes after their use, adopting a different way of thinking about the design, materials and flows employed for product durability.

Since 2010, the Cradle to Cradle Products Innovation Institute manages the Cradle to Cradle Certified™ Product Standard, providing designers and manufacturers with information on product materials and manufacturing processes. It measures five key aspects: material health, material reuse, renewable energy and carbon management, water stewardship and social fairness. The product receives a grade in each category (basic, bronze, silver, gold or platinum). The product's overall qualification is equal to the lowest grade received in any of the mentioned categories. This is as a way to incentivise continuous improvements in all categories.

Some cities have already made some progress in this area:

- In 2018, the city and county of San Francisco adopted a new regulation requiring all carpet installed in city-funded construction projects to be of Cradle to Cradle Certified Product Standard. This initiative intends to address San Francisco's priorities for sustainability and material health, including the avoidance of chemicals of concern, appropriate durability, carbon impact and the use of fibre and supporting materials that contain recycled content and are themselves recyclable.
- In 2007, the city of Venlo (Netherlands) made a commitment whereby all new city buildings were to be designed by Cradle to Cradle principles and, as a result, the new city hall, built in 2016, was designed employing this method. In order to observe the benefits of the new building, measurements such as air quality and temperature were taken from the previous building and will be compared with the new one in a forthcoming comparative study. It has already been observed that the new building's facade absorbs 30% of sulphur and nitrogen oxides from the building's surroundings and in terms of economic benefits, the project is estimated to deliver a 12.5% return on investment by 2040.

Source: Cradle to Cradle Products Innovation Institute (2019[31]), *Cradle to Cradle Certified*™, http://www.c2ccertified.org/ (accessed on 30 April 2019); EPEA GmbH (2019[32]), *EPEA GmbH Website*, https://epea-hamburg.com/ (accessed on 30 April 2019).

Box 2.3. Material passports for circular buildings

In 2016, the Swedish Environmental Research Institute created a logbook or inventory to identify the building materials and hazardous substances used in the construction of new buildings in the city. The logbook is a web-based tool where suppliers and manufacturers of construction products can register the chemical characteristics of their products and is used to document and monitor the hazardous substances used in buildings. The system is validated by third-party audits of the companies responsible for the registration.

Other cities, regions and countries use material passports for circular buildings. Material passports are digital sets of data describing defined characteristics of materials and components in products and systems that give them value for present use, recovery and reuse. These passports are based on Cradle-to-Cradle design and can be introduced by clients and be used by architects and contractors for renovation and construction projects.

For example, with the objective of stimulating reuse, the city of Amsterdam has introduced material passports as one of the main action points of its circular economy action agenda in 2016. As such, construction companies using material passports are entitled to discounts on plots.

At a national level, the Dutch government has offered deductions (up to 75% of investment costs) to 310 eligible green investments that use material passports.

The Flemish public waste agency (OVAM), in collaboration with the Walloon Public service (SPW) and Brussels Environment Agency (Brussels Environment), developed an online open-access calculation tool called Tool to Optimise the Total Environmental Impact of Materials (TOTEM). The TOTEM helps architects, designers and builders assess the environmental impact of building materials to increase the material and energy performance of buildings.

Source: Circle Economy et al. (2016[33]), *Circular Amsterdam: A Vision and Action Agenda for the City and Metropolitan Area*, https://www.circle-economy.com/news/amsterdams-pioneering-journey-to-become-100-circular-by-2050 (accessed on 30 April 2019); Luscuere, L. (2016[34]), "Materials Passports: Optimising Value Recovery from Materials", http://dx.doi.org/10.1680/jwarm.16.00016; Netherlands Enterprise Agency (2014[35]), *Tax Relief Schemes for Environmentally Friendly Investment (Vamil and MIA)*, http://www.rvo.nl (accessed on 29 April 2019); TOTEM (2020[36]), *Tool to Optimise the Total Environmental Impact of Materials*, http://www.totem-building.be/pages/welcome.xhtml (accessed on 25 January 2020); Swedish Environmental Research Institute (2016[37]), *Options for Increased Low-risk Recycling of Building Products*, http://www.ivl.se (accessed on 25 January 2020).

Places: Fostering urban-rural synergies for the circular economy

To reach economy of scale, water and waste services are operated across several municipalities. Since 2016, Umeå's public waste and water company, Vakin, started acting as water provider in the municipality of Vindeln[7] (Sweden) and has broadened its responsibilities with the mandate of promoting capacity development in the region. This includes working with key stakeholders to assure the maintenance and development of an integrated system for waste and water management. The company has also specialised in the development of capacity building tools and the introduction of digital technologies to bridge territorial gaps. For example, virtual reality tools have been developed to facilitate the operation and maintenance works in the water and sewage business in faraway municipalities. This is an ongoing pilot programme financed by Vinnova (18 months long).

Economic activities carried out in the region have great potential for the circular economy. Great extensions of native forests, bio-economy and farming provide important available resources that can create opportunities for collaboration within the circular economy approach. Mining activities pose the question of extraction and final use of resources. Strengthening the urban-rural connection could have a key role to play to further the circular transition.

Governance challenges to design and implement the circular transition

Mostly, the challenges cities and regions are facing in building circular economies are not of a technical but an economic and governance nature. Technical solutions exist and are well known. However, to implement them, information and financial resources are needed, as well as an updated legal framework. Often, a holistic vision is still missing because of siloed policies. Cultural barriers are still a very important obstacle (OECD, forthcoming[13]). Key governance challenges to design and implement the circular transition in Umeå, Sweden, are presented below.

While the Strategic Plan 2016-28 states that Umeå will be a leader in a circular economy (Municipality of Umeå, 2016[9]), further clarity would be needed in terms of: how to make the most of the synergies across existing policies (e.g. green, smart, and sustainable ones), available funds and which mechanisms to put in place for the city to achieve this goal.

Clarifying the role of the municipality in designing and implementing a circular economy strategy can build leadership and trust. The mandate in terms of who is responsible for the design and implementation of a circular economy strategy amongst the city administration is still to be defined. While stakeholders appreciate that the municipality is taking the initiative of enhancing the circular economy culture, there is little understanding of the role of the municipality itself. A lack of leadership could lead to fragmented initiatives on the circular economy and weak accountability. Therefore, clarifying who will do what would serve as a reference for various stakeholders in identifying the focal point (office/departments) to go to for projects and investments.

Several departments are likely to get involved in circular economy-related activities, therefore co-ordination should be strengthened. As a holistic concept, the circular economy implies that municipal departments will have to co-ordinate to avoid duplications and grey areas. Given the culture of horizontality characterising day-to-day activities within the municipality, there are currently no designated co-ordination mechanisms for the circular economy amongst departments in Umeå. However, three Committees of the City Council Executive Board in particular can play a role in the implementation of a circular economy strategy: the Business Development and Executive Committee, the Planning Committee and the Sustainability Committee. In addition, there are several independent political committees, notably the Technical Board, the Building Board and the Environment Board that will have responsibilities in relation to specific circular economy activities.

There is no dedicated budget for the circular economy. However, several funding sources can be considered for circular economy projects, even though circularity is not one of their specifications. Dedicated funds are promoting the green transition: from the national funding schemes for cities, such as the Climate Leap (*Klimatklivet*) and Urban Environment Deals (*Stadsmiljöavtalet*) to “environmental boosts”, micro-funds for associations working on the green transition. The allocation of funds may face difficulty in relation to the fuzziness of the concept of the circular economy. Most policies refer to “resource efficiency” as an objective, but not to the “circular economy”.

Co-ordination with national and regional government would be needed to align goals and actions. Umeå is currently not part of the National Delegation for the Circular Economy but could be in the future. Västerbotten Region promotes collaboration across municipalities through thematic networks and some of the thematic groups may in the future be devoted to the circular economy as a cross-cutting issue. Västerbotten Region co-ordinates five networks in five areas: water and sewage, waste, planning and building permits, environmental inspections and fire brigade. These networks emerge from the opportunity to learn from the work carried out by the municipalities in these sectors and from the need for collaboration. Managers of each area meet between two and six times a year. They exchange experiences and learn from one another. The objective of these networks is to discuss thematic issues, plan activities and achieve better results than they would get on their own. Examples of these initiatives include the organisation of courses and seminars for employees, the development of common technical solutions and the designation of working groups to work on specific topics.

The issue of scale is important when taking into account the impacts of economic activities within urban and rural areas. The circular economy implies a rethinking of processes along value chains, whether production, distribution and consumption of products and services. As such, city boundaries might be too limited for taking into account the input/output of resources, materials and energy when it comes to food, construction and waste management. The city of Umeå is the only urban area in a rural region. In a sparsely populated area, reaching economy of scale is not easy, while transport and transaction costs can be high. Small municipalities usually lack capacity and infrastructure. For example, the public operator Vakin, since

2017, has provided waste and water services[8] to one additional municipality, Vindeln, beyond Umeå, operating in this instance at the regional level. Umeå and five other small municipalities are about to bring forward a common waste plan. However, opportunities for the circular economy at the regional level (e.g. focusing on bio-economy, agriculture, the forestry and mining sectors) are still to be evaluated.

Matching human and technical capacities to needs brought about by the circular economy is key for the municipality to lead and manage the transition process. The circular economy is a relatively new concept for the city that has relied so far on external consultants for carrying out investigations and ad hoc studies. Building capacities within the municipality and matching human and technical resources to needs could enhance the legitimacy of the municipality to lead and manage the transition towards the circular economy. On the other hand, there are several initiatives in place to build capacity and knowledge of the circular economy, organised by not-for-profit and public organisations. However, while informative, workshops and events may often remain at a very high level, while businesses would benefit from more specific and practical input, including through peer-to-peer learning. In some research areas, including design, there is still room for improvement towards sustainability and circularity.

The concept of the circular economy is not yet clear to some stakeholders. Many stakeholders use the concept of the circular economy as a synonym for recycling. There is a form of scepticism across stakeholders that have been implementing environmental and sustainable practices and do not see the value added in the circular economy approach. There is a lack of adequate information about the opportunities brought about by the circular economy. To accelerate the circular economy transition it would be important analyse costs and benefits of various activities and sectors. Poor awareness of circular economy practices amongst key players can hinder opportunities for scaling them up.

Robust and updated data should inform policymaking and implementation. The municipality and the municipal utility companies monitor a variety of data that could be used to make decisions and implement them. However, it is still to be clarified how to relate them to the circular economy. Data are generally available on energy consumption, air quality, waste and recycling. Data on transport, CO2 emissions, district heating and share of renewables, as well as the share of renewable energy involved in the district heating system, should be updated.

There are some regulatory barriers common to other municipalities and others more specific to Umeå's context. In general, as in other cities and regions, regulatory barriers are related to the definition of waste (each material is considered waste once it has been collected), which hinders the reuse of some materials that are being considered as waste because they could generate environmental and health issues. Other regulatory barriers are related to the use of second-hand materials, land allocation for experimentation, water reuse, and material from construction and demolition.

New forms of business models are flourishing but there is still untapped potential to be exploited. Innovative business models in Umeå go from product-as-a-service projects (e.g. solar panel renting schemes) to the promotion of local food production and consumption by getting producers and consumers together (e.g. REKO-ring project) or sharing initiatives (e.g. U-bike cargo bike sharing). Nonetheless, there is an important untapped potential to put in place a circular economy system that would move from a downstream focus on waste management to upstream processes, including circular design. Some barriers to unlocking new business models' potential to thrive are: i) the lack of financial support for pilot projects; ii) the allocation of existing funds supporting linear production processes that could be partly redirected to innovative circular business models (e.g. in the agriculture sector); and iii) the lack of physical spaces for experimentation. Box 2.4 presents examples of circular business models in cities and regions.

The municipality's Green Public Procurement in Umeå is not yet fully implemented. The municipal tender for the refurbishment of the Maja Beskowskolan School aimed to comply with the environment building (*Miljöbyggnad*) standards established by the Sweden Green Building Council. The local government is advancing in the incorporation of circular economy principles into its procurement procedures and has committed to reduce the climate impact produced by its purchasing decisions, aiming to be climate neutral by 2030 (Municipality of Umeå, 2016[38]). Finally, the municipality foresees the use of Life Cycle Analysis

(LCA) to factor in cost-effectiveness and efficient use of the resources in proposed projects. In practice, though, LCA is not widely used. In 2019, the municipality of Umeå joined the "Climate Considerations in Procurement" project, funded by the Swedish Energy Agency (Municipality of Umeå, 2019[39]). The project is expected to carry out several actions in view of climate considerations and the promotion of circular goods and services in the procurement process of the municipality of Umeå.

Box 2.4. Examples of business models for the circular economy in cities

Several circular business models are applied in cities and regions. They consist of circular supply and collaborative consumption models, service systems, resource recovery business models, hire and leasing:

- Circular supply models replace traditional input with secondary materials. For example, in 2018, the city of San Francisco (United States) approved that all carpets installed in city departments would have a Cradle-to-Cradle design. This initiative was approved as part of its objective of reducing the amount of discarded carpets sent to landfill.
- Collaborative Consumption is based on the rental or sharing of products or services across citizens. For example, the city of Seoul launched in 2012 the "Sharing City, Seoul" project through which it created almost 100 sharing models, including shared bicycles and parking spaces. Almost half of the cities and regions responding to the survey expressed that their circular economy strategies have incorporated collaborative consumption and production models such as sharing economy, product-as-a-service, crowdfunding, etc. A total of ten cities stated that they plan to include them in the short term and four do not foresee that possibility. Several cities have sharing mobility in place (e.g. Milan, Paris).
- The service system model involves paying for the service rather than for the ownership of the product. Amsterdam Airport Schiphol rents light as a service instead of the traditional model of buying light bulbs: with this model, Schiphol pays for the light it uses while Philips continues to own the installation and is responsible for performance and durability.
- The resource recovery business model transforms waste into secondary material. The city of Phoenix (United States) has established a partnership with a feed company to divert 34 000 tonnes of palm leaves from landfill annually. The objective of this agreement is to transform this waste into an ingredient for livestock feed, resulting in a reduction of the city's annual disposal cost.
- Hiring or leasing products serves to lengthen product lives for repeated use according to the original objective of their use, before being turned into different products through recycling when possible. For example, for the celebration of the 2020 Olympic Games, the city of Tokyo (Japan), aims to rent materials, leasing them after the games. The circular economy will play a role in the upcoming 2024 Olympic Games that will take place in Paris (France). Beyond leasing, the city has convened and advocated to include circular economy and solidarity in their public procurement process and to connect major companies with small entrepreneurs that are experts in specific topics (OECD, forthcoming[13]).

Source: Ellen MacArthur Foundation (2017[40]), *Selling Light as a Service*, http://www.ellenmacarthurfoundation.org/case-studies/selling-light-as-a-service (accessed on 28 January 2020); OECD (2018[41]), *Business Models for the Circular Economy*, OECD, Paris, https://www.oecd.org/environment/waste/policy-highlights-business-models-for-the-circular-economy.pdf; GreenBiz (2015[42]), "The 5 business models that put the circular economy to work", http://www.greenbiz.com/article/5-business-models-put-circular-economy-work (accessed on 7 November 2019); Waste and Resources Action Programme (2019[43]), *Innovative Business Models*, http://www.wrap.org.uk/content/innovative-business-models-old (accessed on 28 January 2020); C40 Cities (2018[44]), *Municipality-led Circular Economy Case Studies*, Climate KIC; CEC (2019[45]), *Renting Lighting: Schiphol Airport*, Circular Economy Club, http://www.circulareconomyclub.com/solutions/renting-lighting-schiphol-airport/ (accessed on 28 January 2020); Zink, T. and R. Geyer (2017[46]), "Circular economy rebound", http://dx.doi.org/10.1111/jiec.12545; OECD (forthcoming[13]), *The Circular Economy in Cities and Regions*, Synthesis Report, OECD Publishing, Paris.

References

BIC Factory (2019), *Homepage*, https://bicfactory.se/ (accessed on 28 January 2020). [19]

C40 Cities (2018), *Municipality-led Circular Economy Case Studies*, Climate KIC. [44]

CEC (2019), *Renting Lighting: Schiphol Airport*, Circular Economy Club, http://www.circulareconomyclub.com/solutions/renting-lighting-schiphol-airport/ (accessed on 28 January 2020). [45]

Circle Economy et al. (2016), *Circular Amsterdam: A Vision and Action Agenda for the City and Metropolitan Area*, https://www.circle-economy.com/news/amsterdams-pioneering-journey-to-become-100-circular-by-2050 (accessed on 30 April 2019). [33]

Coompanion (2019), *Coompanion Sverige*, https://coompanion.se/english (accessed on 28 January 2020). [20]

Cradle to Cradle Products Innovation Institute (2019), *Cradle to Cradle Certified*™, https://www.c2ccertified.org/ (accessed on 30 April 2019). [31]

EC (2019), "Press release: Waster water: Commission decides to refer Sweden to court", European Commission, https://ec.europa.eu/commission/presscorner/detail/en/IP_19_4258 (accessed on 28 January 2020). [47]

EC (2010), *The Smart Guide to Innovation-Based Incubators (IBI)*, European Commission. [48]

Ellen MacArthur Foundation (2019), *Cities and Circular Economy for Food*, https://www.ellenmacarthurfoundation.org/assets/downloads/Cities-and-Circular-Economy-for-Food_280119.pdf (accessed on 6 November 2019). [28]

Ellen MacArthur Foundation (2017), *Selling Light as a Service*, http://www.ellenmacarthurfoundation.org/case-studies/selling-light-as-a-service (accessed on 28 January 2020). [40]

EPEA GmbH (2019), *EPEA GmbH Website*. [32]

Esam AB (2015), *Consultants for Sustainable Development*, https://esam.se/ (accessed on 14 February 2020). [10]

eXpression Umeå (2019), *Homepage*, https://expressionumea.se/ (accessed on 29 January 2020). [17]

Green Umeå (2020), *Sustainable Initiatives*, https://www.greenumea.se/en/sustainable-initiatives/sustainable-restaurants/ (accessed on 25 January 2020). [29]

Green Umeå (2019), *We Are a Part of Green Umeå*, https://www.greenumea.se/en/about-green-umea/we-are-green-umea/we-are-a-part-of-green-umea/ (accessed on 14 November 2019). [11]

GreenBiz (2015), "The 5 business models that put the circular economy to work", http://www.greenbiz.com/article/5-business-models-put-circular-economy-work (accessed on 7 November 2019). [42]

Harris, S. et al. (2018), *A Roadmap for Increased Uptake of Industrial Symbiosis in Sweden*. [1]

ISO (2015), *ISO 14000 – Management environnemental*, http://www.iso.org/fr/iso-14001-environmental-management.html (accessed on 29 January 2020). [49]

Luscuere, L. (2016), "Materials Passports: Optimising Value Recovery from Materials", http://dx.doi.org/10.1680/jwarm.16.00016. [34]

Madaster (2019), *About Us*, https://www.madaster.com/en/about-us (accessed on 30 April 2019). [50]

Ministry of Enterprise and Innovation (2015), *A rural development programme for Sweden*, https://www.government.se/4adb0c/contentassets/3d8c0f8317224257859ba46dea31a374/a-rural-development-programme-for-sweden (accessed on 5 March 2020). [3]

Municipality of Umeå (2019), *Climate considerations in procurement*, https://www.umea.se/umeakommun/byggaboochmiljo/samhallsutvecklingochhallbarhet/klimatmiljoochhallbarhet/klimathansyniupphandling.4.4d71e54016e3fbe68b9126e3.html (accessed on 5 March 2020). [39]

Municipality of Umeå (2019), *Tomtebo Beach - A New Neighborhood with People and Sustainability in Focus*, http://www.umea.se/umeakommun/byggaboochmiljo/ (accessed on 28 January 2020). [22]

Municipality of Umeå (2018), *EGCA 2018, Umeå, Sweden 10. Eco-innovation and Sustainable Employment 10A Present Situation*. [27]

Municipality of Umeå (2018), *EGCA 2018, Umeå, Sweden 7. Waste Production and Management*. [25]

Municipality of Umeå (2016), *Purchasing and Procurement Policy*. [38]

Municipality of Umeå (2016), *Strategic Plan 2016-2028*, https://www.umea.se/download/18.25332a9916cb14274219795/1567417715728/UK_Oversiktsplan_2018-SVE_low_resolution.pdf (accessed on 14 November 2019). [9]

Netherlands Enterprise Agency (2014), *Tax Relief Schemes for Environmentally Friendly Investment (Vamil and MIA)*, http://www.rvo.nl (accessed on 29 April 2019). [35]

Network for sustainable construction and real estate management in cold climates (2013), *Umeå. More sustainable buildings*, http://hallbarahus.se/wp-content/uploads/2019/02/NHB_Broschyr_April_2013.pdf (accessed on 5 March 2020). [21]

North Sweden Cleantech (2019), *About Us*, https://northswedencleantech.se/en/about-us/ (accessed on 28 January 2020). [23]

OECD (2019), *Linking the Indigenous Sami People with Regional Development in Sweden*, OECD Rural Policy Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264310544-en. [24]

OECD (2019), *OECD Survey on the Circular Economy in Cities and Regions*, OECD, Paris. [12]

OECD (2018), *Business Models for the Circular Economy*, OECD, Paris, https://www.oecd.org/environment/waste/policy-highlights-business-models-for-the-circular-economy.pdf (accessed on 7 November 2019). [41]

OECD (2016), *Water Governance in Cities*, https://www.oecd-ilibrary.org/governance/water-governance-in-cities_9789264251090-en (accessed on 6 February 2020). [14]

OECD (forthcoming), *The Circular Economy in Cities and Regions*, Synthesis Report, OECD Publishing, Paris. [13]

Official Journal of the European Union (1991), *Council Directive 91/271/EEC of 21 May 1991 Concerning Urban Waste-water Treatment*, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A31991L0271 (accessed on 28 January 2020). [51]

REKO (2019), *Homepage*, http://www.ekonu.fi/reko-2/ (accessed on 28 January 2020). [30]

Riksdag (2018), *A Coherent Policy for Sweden's Rural Areas - For a Sweden that Holds Together*. [4]

RISE (2019), "VTT and RISE strengthening collaboration in bio- and circular economy", https://www.ri.se/en/press/vtt-and-rise-strengthening-collaboration-bio-and-circular-economy (accessed on 25 January 2020). [7]

Ronneby Municipality (2019), *Ronneby Municipality with a Circular Guide on the Development of Circular Municipalities in the Nordic Countries.*. [54]

SundaHus (2019), *SundaHus Environmental Data*, https://www.sundahus.se/tjanster/miljodata/ (accessed on 25 January 2020). [52]

Sweden Green Building Council (2019), *What is Environmental Building?*, https://www.sgbc.se/certifiering/miljobyggnad/vad-ar-miljobyggnad/ (accessed on 25 January 2020). [53]

Swedish Environmental Research Institute (2016), *Options for Increased Low-risk Recycling of Building Products*, http://www.ivl.se (accessed on 25 January 2020). [37]

Swedish Society for Nature Conservation (2016), *Umeå: Miljöcafé*, http://www.naturskyddsforeningen.se/vad-du-kan-gora/kalender/umea-miljocafe-1 (accessed on 29 January 2020). [15]

Tillväxt verket (2019), "Focus on three areas of choice for circular economy", http://www.mynewsdesk.com/se/tillvaextverket/pressreleases/fokus-paa-tre-omraaden-i-vaegval-foer-cirkulaer-ekonomi-2850461 (accessed on 25 January 2020). [2]

TOTEM (2020), *Tool to Optimise the Total Environmental Impact of Materials*, http://www.totem-building.be/pages/welcome.xhtml (accessed on 25 January 2020). [36]

Umeå Biotech Incubator (2019), *Homepage*, https://www.ubi.se/ (accessed on 29 January 2020). [18]

Umeå Municipality (2018), *EGCA 2018, Umeå, Sweden 7. Waste production and management 7A. Present Situation*. [26]

Uminova Innovation (2019), *Homepage*, http://www.uminovainnovation.se/ (accessed on 29 January 2020). [16]

Västerbotten Region (2019), *Summary of Stakeholder Consultation Towards the New Regional Development Strategy*. [8]

Vinnova (2019), *Key Enabling Technologies for Biobased Products - Joint Call Sweden-Finland*, https://www.vinnova.se/en/calls-for-proposals/the-strategic-innovation-program-bioinnovation/enabling-technologies/ (accessed on 25 January 2020). [6]

Vinnova (2019), *Tomorrow's Sustainable Economy*, https://www.vinnova.se/en/m/circular-and-bio-based-economy/ (accessed on 25 January 2020). [5]

Waste and Resources Action Programme (2019), *Innovative Business Models*, http://www.wrap.org.uk/content/innovative-business-models-old (accessed on 28 January 2020). [43]

Wille, D. (2013), *Environmental Profile of Building Elements*, OVAM, https://www.ovam.be/sites/default/files/FILE1368696514672Environmental_profile_buildig_elements_LR.pdf (accessed on 6 November 2019). [55]

Zink, T. and R. Geyer (2017), "Circular economy rebound", *Journal of Industrial Ecology*, Vol. 21/3, pp. 593-602, http://dx.doi.org/10.1111/jiec.12545. [46]

Notes

[1] Since 2015, USBE's environmental management system has gained ISO 14001 certification, a set of standards that certifies environmental responsibilities for companies and organisations (ISO, 2015[49]).

[2] An incubator is a place whereoffers the support given to the entrepreneur from the start-up stage to the expansion phase are carried out. In an incubator, the would-be entrepreneurs and the existing SMEs find a suitable placespace, in terms of facilities and expertise, to address their needs and develop their business ideas, and transformtransforming them into sustainable realities (EC, 2010[48]).

[3] A co-operative economic association is a legal entity of at least three people where all members have a vote and decide jointly on the size of the start-up capital and how to allocate surplus.

[4] A collaboration project between the municipality of Umeå, HSB, NCC, PEAB, Riksbyggen, Rikshem, Skanska, Slättö, Umeå Energi, Upab and Vakin.

[5] The Sámi people has an estimated population of around 20 000 to 40 000. It has lived for time immemorial in the area that currently extends throughout the northern half of Sweden, Norway's coast and inland areas, northern Finland and the Kola Peninsula in Russia (OECD, 2019[24]).

[6] Umeå University, Region Västerbotten, Akademiska Hus, RISE, Umeå Energi and Upab.

[7] Vindeln is a municipality of 6 000 inhabitants. Vakin receives EUR 1 million in annual revenues for the service while, in Umeå, it generates EUR 23 million per year (interviews in Umeå, 2019).

[8] Since 2015, the European Commission has formally notified Sweden for not ensuring wastewater treatment in 13 towns, including 2 municipalities located in Västerbotten County (Official Journal of the European Union, 1991[51]). In 2019, the issue still affects ten municipalities in the country and three municipalities in Västerbotten County (Robertsfors, Lycksele, Malå). In July, the European Commission referred Sweden to the Court of Justice on this issue (EC, 2019[47]).

3 Policy recommendations and actions for a circular economy in Umeå, Sweden

In response to the challenges identified in Chapter 2, this chapter suggests some policy recommendations to implement a circular economy in the city of Umeå, Sweden. The policy recommendations are accompanied by a list of actions for concrete implementation, accordingly to international practices.

Introduction

A total of 18 recommendations have been identified accordingly to the role of the city as promoter, facilitator and enabler of the circular economy (Table 3.1). These recommendations are accompanied by a set of actions aiming at supporting Umeå's transition to a circular economy. The proposed actions are indicative and based on international practices while taking into account the local context. These international practices carried out in the field of the circular economy by cities, regions and national governments can serve as inspiration for the implementation of the recommendations. As such, they are not expected to be replicated in Umeå but rather provide the municipality with a set of examples for the development and implementation of the suggested actions.

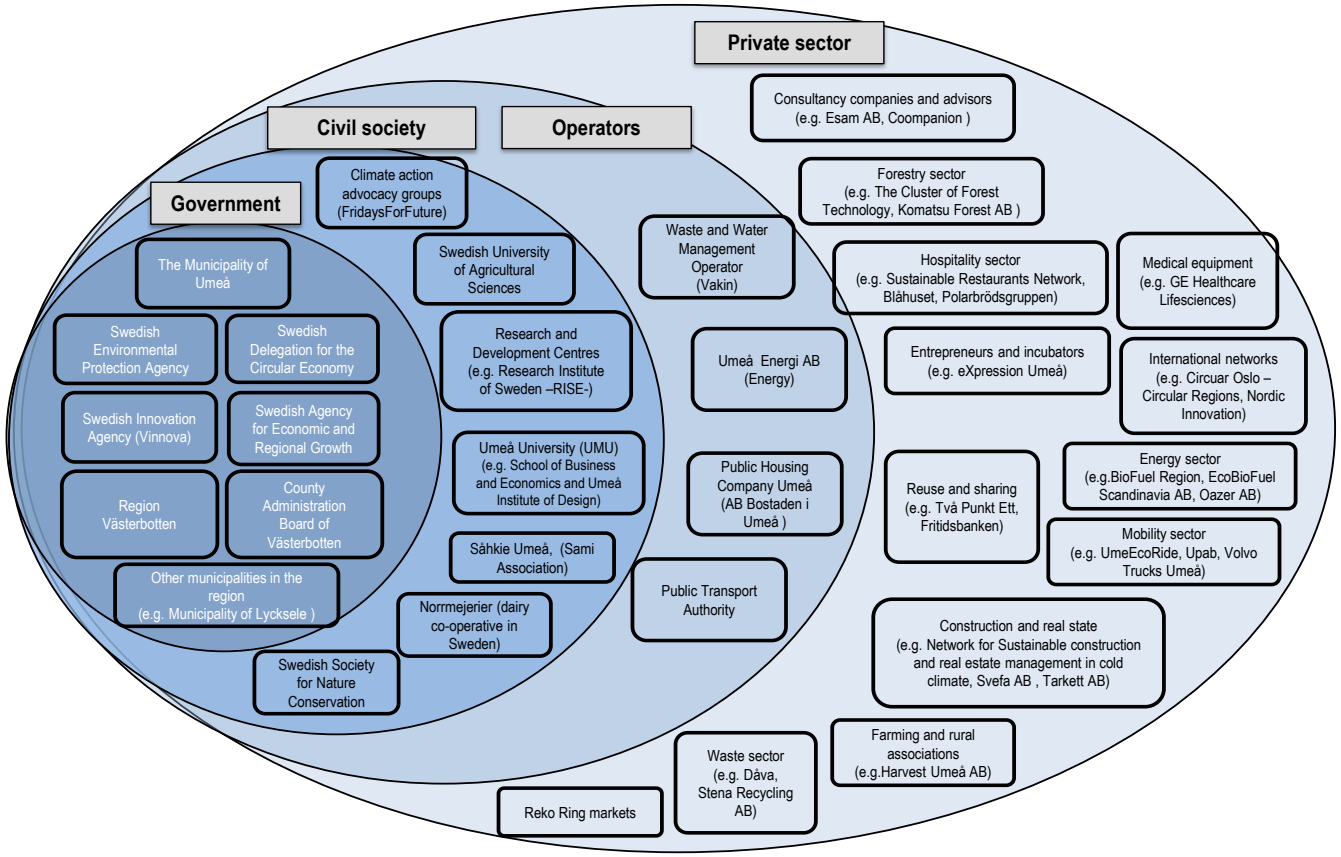
Table 3.1. Policy recommendations for the circular economy in Umeå, Sweden

Promoter	Facilitator	Enabler
Map existing circular initiatives	Set up co-ordination mechanisms within the municipality	Identify the regulatory instruments that need to be adapted to foster the transition to a circular economy
Perform a urban metabolism analysis	Facilitate co-ordination with the national government	Identify fiscal and economic tools for the circular economy
Link the circular economy with existing long-term plans	Facilitate co-ordination with the region	Implement Green Public Procurement (GPP)
Develop a strategy on the circular economy	Facilitate collaboration with universities, existing businesses and start-ups	Foster capacity building for the circular economy
Promote circular economy practices through guidelines for specific sectors	Facilitate territorial linkages between urban and rural areas	Develop a monitoring and evaluation framework for a circular economy strategy
Map future jobs and skills		
Promote circular businesses through labels, certifications and awards		
Promote a circular economy culture		

It is important to note that:

- Actions are neither compulsory nor binding: Identified actions address a variety of ways to implement and achieve objectives. However, they are neither compulsory nor binding. They represent suggestions, for which adequacy and feasibility should be carefully evaluated by the municipality of Umeå in an inclusive manner, involving stakeholders as appropriate. In turn, the combination of more than one action can be explored, if necessary.
- Prioritisation of actions should be considered: Taking into account the unfeasibility of addressing all recommendations at the same time, prioritisation is key. As such, steps taken towards a circular transition should be progressive.
- Resources for implementation should be assessed: The implementation of actions will require human, technical and financial resources. When prioritising and assessing the adequacy and feasibility of the suggested actions, the resources needed to put them in practice should be carefully evaluated, as well as the role of stakeholders that can contribute to the implementation phase.
- The proposed actions should be updated in the future: New potential steps and objectives may emerge as actions start to be implemented.
- Several stakeholders should contribute to their implementation: Policy recommendations and related actions should be implemented as a shared responsibility across a wide range of actors. The stakeholder groups contributing to this report and to the identification of the actions are represented in Figure 3.1. They have a key role as "do-ers" of the circular economy system in Umeå, Sweden, along with other stakeholders that will be engaged in the future.

Figure 3.1. Stakeholders map in Umeå, Sweden



Note: This stakeholder's map is based on the 102 stakeholders that took part during the OECD mission to Umeå, Sweden (18-21 March 2019) and the policy seminar (23 October 2019).

The city of Umeå can play a role as promoter, facilitator and enabler of the circular economy strategy. Cities act as *promoters* when they identify priorities, promote concrete projects and engage stakeholders; they are *facilitators* when fostering co-operation between stakeholders, citizens and levels of government. The city's *enabler* role entails setting the necessary conditions for the circular economy (e.g. updating regulatory frameworks, catalysing funds, etc.). In order to boost the circular economy in Umeå, the municipality could implement the recommendations detailed in this section.

Promoting a vision and a strategy for the circular economy

The city of Umeå can promote the circular economy, building on a strong political willingness and the existence of a dynamic business community. In order to boost the circular economy in Umeå, the municipality could implement the recommendations detailed in this section.

Map the existing circular initiatives

There are several circular-related initiatives in various sectors, from food to transport or construction. Mapping them would allow the city to: i) obtain deeper understanding of circular economy-related initiatives; ii) identify those sectors where circular initiatives are taking place at all stakeholder levels, as well as the gaps; iii) learn from success and failure; iv) develop an understanding of what the circular transition means for each sector; and v) explore potential cross-sector synergies and their common features. Some examples of mapping circular initiatives include: the city of Austin (United States) that created a directory of businesses that allows customers to participate in the circular economy (Austin's Circular Economy Story, 2020[1]). In the region of Flanders (Belgium), Circular Flanders is mapping the range of financing instruments available for the circular economy (OVAM, 2019[2]). Circular Oslo – Circular Regions applies a multi-stakeholder methodology and technology to map circular initiatives and identify environmental, economic and social impact. This methodology will be replicated within the Circular Regions Network and the data collected will be open source (Circular Oslo-Circular Regions, 2020[3]).

Key actions

- Collect information on existing circular economy-related initiatives, such as projects, programmes, plans and roadmaps in various sectors (e.g. food, waste, water, transport, etc.), which implement, for example:
  - Regenerative design.
  - Sustainable production practices based on minimising raw material extraction.
  - Short mile distribution practices.
  - Sustainable consumption patterns aiming at minimising waste production.
- Identify the stakeholders involved in these activities and possible linkages amongst them.
- Identify both urban and rural initiatives enabling regional collaborations and the replication of best practices for scaling impacts.
- Explore different ways to conduct the mapping, for example through:
  - An online platform to upload initiatives and projects in the field of the circular economy. This could take the form of an open-source database to be able to research any aspects from the circular initiatives (e.g. sectors, yeas, actors involved, etc.). A communication campaign to reach out to all stakeholders might be needed.
  - Offline platforms, gathering input from stakeholders through regular meetings, surveys, interviews and public consultations.
- Continuously monitor circular economy events/seminars organised in the city.

- Update and share the information collected through the mapping process.

Perform a urban metabolism analysis

Mapping material and energy flows within the municipality can help improve the planning and decision-making process for better use of resources and more efficient logistics. This is an opportunity to involve the universities and connect them with the territory and the circular economy. The city of Paris (France) and the city of Rotterdam (Netherlands) are cases where local authorities have conducted a metabolism analysis, identifying priority flows that highly impact the metabolism of the city and insights for the future sustainable design of the city (Circular Metabolism, 2017[4]; Municipality of Rotterdam, 2013[5]).

Key actions

- Collaborate with universities and research and development (R&D) centres to carry out an urban metabolism study.
- Evaluate the scale of the analysis at the metropolitan and regional levels, with the collaboration of competent authorities.
- Identify concrete follow-up actions to reduce resource consumption and negative output, such as pollution. In the case of water, materials, energy, for example, digital solutions can be applied (e.g. water meters, mobile data applications for mobility solutions, applications for energy saving), in addition to appropriate policies.
- Communicate and distribute the results of the metabolism flow analysis (e.g. through public exhibitions).
- Conduct the metabolism flow analysis regularly (e.g. once a year or biannually), in addition to updating regularly environmental and climatic studies.

Link the circular economy with existing long-term plans

Synergies across climate adaptation policies and plans, mobility, land use and service provision could benefit from the implementation of circular economy principles, whereby resources are used at their foremost and waste minimised. Having a general overview of all the circular economy-related plans, strategies, policies and programmes could foster coherence across all the sectors and synergies across responsible bodies. For example, Sweden's Rural Policy incorporates the circular economy in one of its four objectives (Ministry of Enterprise and Innovation, 2015[6]).

Key actions

- Identify existing initiatives and targets that can be achieved through a circular economy.
- Identify synergies across existing and future initiatives in Umeå on climate change, rural policies, land use, waste management amongst others and their respective targets that can be achieved through applying circular economy principles, such as:
  - Reduction of extractive material.
  - Extension of the use and life cycle of products and materials.
  - Regeneration of natural systems.
- Contact project officers of existing initiatives to identify links with the circular economy.
- Organise workshops and ad hoc meetings to align interest across the different initiatives.
- Link the circular economy with available indicators from other existing initiatives.
- Identify potential overlaps between existing initiatives and a potential circular economy strategy.

Develop a strategy on the circular economy

Common objectives and a strong narrative on the circular economy strategy could help co-ordinate existing initiatives. The vision could take the form of a strategy. In this case, clear and shared objectives, targets and budget should be defined. The strategy could benefit from stakeholder engagement from phase zero. For example, designers, among others, could help frame the type of upstream activities needed to prevent waste production and increase the durability of products, goods and services. Once developed, measurable targets should be linked to objectives. Examples of measurement frameworks for a circular economy applied at the city level include*: Measuring the Circular Economy Developing: An Indicator Set for Opportunity Peterborough* (Morley, Looi and Zhao, 2018[7]), *Indicators for a Circular Economy* (Vercalsteren, Christis and Van Hoof, 2018[8]), and the *Circular Economy Framework Monitoring Report*, Greater Porto Area, Portugal (LIPOR, 2019[9]). There are several examples of cities and regions that have developed a circular vision and that could serve as inspiration for Umeå in the design and implementation of its strategy, such as those listed in

Table 3.2.

Table 3.2. Circular economy initiatives at the subnational level

City	Country	Initiative
Amsterdam	Netherlands	"Amsterdam Circular 2020-25" (2019)
Barcelona Metropolitan Area (AMB)	Spain	Circular economy promotion programme AMB circular (2019): i) Industrial Symbiosis Metropolitan Project ii) Platform of Natural Resources iii) Circular Economy Table
Brussels Capital Region	Belgium	Regional Programme for the Circular Economy 2016-20 (PREC)
Flanders	Belgium	Circular Flanders, 2016
Nantes	France	Circular Economy Roadmap Nantes (2018) (*Feuille de route Economie circulaire Nantes Métropole*)
Paris	France	Circular Economy Plan 2017-20 (2017) (*Plan économie circulaire de Paris 2017-2020*)
Rotterdam	Netherlands	Rotterdam Circularity Programme 2019-23
Scotland	United Kingdom	*Making Things Last: A Circular Economy Strategy for Scotland* (2016)
Tilburg	Netherlands	Tilburg Circular Agenda 2019
Valladolid	Spain	Valladolid Circular Economy Roadmap (2017-18)

Source: OECD (forthcoming[10]), *The Circular Economy in Cities and Regions*, Synthesis Report, OECD Publishing, Paris.

Key actions

Engage stakeholders:

- Engage key stakeholders to co-design a shared circular economy vision that reflects their needs and concerns (OECD, 2015[11]):
  - Map all stakeholders that have a stake in the outcome or are likely to be affected, as well as their responsibility, core motivations and interactions.
  - Define the ultimate line of decision-making, the objectives of stakeholder engagement and the expected use of input.
  - Use stakeholder engagement techniques, ensuring the effective representation of all stakeholders in the process.

  - Allocate proper financial and human resources and share needed information for result-oriented stakeholder engagement.
  - Regularly assess the process and outcomes of stakeholder engagement to learn, adjust and improve accordingly.
  - Embed engagement processes in clear legal and policy frameworks, organisational structures/principles and responsible authorities.
  - Customise the type and level of engagement to the needs and keeping the process flexible to changing circumstances.
  - Clarify how the inputs will be used.
  - Communicate clearly on the responsibility of each actor in the municipality.
- Organising communication campaigns and activities in the city to raise awareness among stakeholders on the circular economy's objectives and benefits and how citizens can contribute.
- Creating participation spaces for citizens and stakeholders throughout the different implementation phases of the circular economy strategy. Instruments that can be used to share the ownership of the circular economy transition with stakeholders include:
  - Multi-stakeholder fora.
  - Workshops.
  - Breakfast meetings on the circular economy.
  - Co-creation methodologies.
  - Feedback loops.

Define goals and actions

- Define result-oriented and realistic objectives, and ensure that they are coherent with the national and regional levels.
- Define short-, medium- and long-term targets and sub-targets for the circular strategy (e.g. quantity of circular economy-related projects, number of circular buildings to be constructed, etc.).
- Align the objectives of the circular economy strategy with the goals of existing policies (e.g. energy transition, climate change, smart city and urban planning).
- Identify key sectors (e.g. urban regeneration, tourism, construction, waste, etc.) that could generate relevant economic, environmental and social impacts, establish priorities and possible partners.
- Identify activities that can be relevant in shifting from a linear to a circular system (e.g. eco-design, services rather than ownership).
- Design a set of actions to implement the defined objectives, set their expected outcomes and allocate a budget and (human and technical) resources to each of the actions.

Develop a financial plan

- Design a set of actions for the achievement of objectives, define their expected outcomes and allocate a budget and resources to each of the actions.
- Develop a financial plan for the implementation of the strategy
- Identify and communicate the costs (environmental, social and opportunity costs) and benefits of circular activities compared to linear approaches (baseline scenario or no action taken).

Monitoring, evaluation and communication

- Regularly monitor the progress of the strategy's implementation; evaluate its impacts to make improvements and communicate the results to the public. The indicators proposed in by the OECD (forthcoming[10]) can be taken into account:

  Setting the strategy

  - No. of public administrations/departments involved in the design of the circular economy imitative.
  - No. of actions identified to achieve the objectives.
  - No. of circular economy projects to implement the actions.
  - No. of staff employed for the circular economy initiative's design within the city/region/administration.
  - No. of stakeholders involved to co-create the circular economy imitative.
  - No. of projects financed by the city/regional government/Total number of projects.
  - No. of projects financed by the private sectors/Total number of projects.

  Implementing the strategy

  - Waste diverted from landfill (T/inhabitant/year or %).
  - CO_2 emission avoided (T CO_2/capita or %).
  - Raw material avoided (T/inhabitant/year or %).
  - Use of recovered material (T/inhabitant/year or %).
  - Energy savings (Kgoe/inhabitant/year or %).
  - Water savings (ML/inhabitant/year or %).

Promote circular economy practices, through guidelines for specific sectors

There is a growing interest among entrepreneurs from different sectors on the transition from the linear to the circular economy. This is the case of the construction, food and waste sectors, for example. However, it is often the case that regulation, economic and financial instruments, as well as data are unknown or uncertain. The municipality could clarify, through guidelines for several sectors, the opportunities and practicalities that could help promote the transition. Designing these guidelines may help identify those sectors with a higher impact on the circular economy.

Key actions

- Based on the mapping of circular economy-related initiatives (as above), develop guidelines for specific sectors to share with entrepreneurs and other actors. For example, guidelines for each sector could foresee information on existing regulation, spaces for experimentation, incentives, certifications, economic instruments, fiscal tools, etc.
- Organise networking events/fora to foster collaboration and exchange of good practices among companies from the same sector.

Map future jobs and skills

There are two kinds of major issues related to jobs in Umeå: first, besides the presence of renowned universities, students leave the city after completing their studies for more appealing job opportunities, mainly in the capital. Second, while there is a demand for low-skilled jobs, there is not enough workforce to meet it. Mapping job opportunities for the circular economy would help match supply and demand in the job market of the city and its surrounding areas. This exercise would provide the municipality with an

overview of the future employment situation and identify the most vulnerable sectors. Some international experiences are the following: the city of Paris (France) has already conducted research on the current levels of circular economy jobs at the local level (City of Paris, 2019[12]); the city of Toronto (Canada), measures the social impact of the circular economy through three indicators: the number of green jobs created, the number of city staff trained in GPP and asset/sharing utilisation activities (OECD, 2019[13]). Furthermore, Amsterdam (Netherlands) and London (United Kingdom) are good examples of cities undertaking efforts to identify jobs related to the circular economy:

- In 2015, the London Waste and Recycling Board (LWARB) published the study *Employment and the Circular Economy – Job Creation Through Resource Efficiency*, which counted 46 700 jobs in circular economy activities in 2013 (2015[14]). The report forecasts the number of net circular jobs that could be created in the city by 2030, accordingly to the level of job specialisation. The study clusters the following levels depending on the needed skills:
  - High skilled occupations are defined as managers, directors and senior officials; professional occupations; and associate professional and technical positions.
  - Medium skilled jobs are identified as administrative and secretarial roles; skilled trade occupations; and process, plant and machine operatives.
  - Low-skilled positions are associated with sales and customer services and elementary occupations.
- The Amsterdam Metropolitan Area (AMA), Netherlands, has published the *Circular Jobs & Skills in the Amsterdam Metropolitan Area* report, which identifies 140 000 circular jobs (Circle Economy/EHERO, 2018[15]). The study identifies six groups of skills relevant to future circular jobs: basic skills (capacities that facilitate acquiring new knowledge); complex problem solving (abilities to solve new, complex problems in real-world settings); resource management skills (capacities for efficient resource allocation); social skills (abilities to work with people towards achieving common goals); systems skills (capacities to understand, evaluate and enhance “sociotechnical systems”); and technical skills (competencies to design, arrange, use and repair machines and technological systems).

Key actions

- Carry out specific studies and research aimed at detecting future job opportunities in the city, for example, jobs in rental, repair, industrial and regenerative design, digital innovation, education, professional services, etc.
- Distinguish jobs by type of skills required, for example from basic to high skills (low wage job category to managerial positions) or accordingly to the skills specifically required (e.g. technical, social, etc.).

Promote circular businesses through labels, certifications and awards

The municipality could consider introducing a label for circular activities located in Umeå, whether for food (e.g. restaurants), construction or other sectors. The introduction of these labels could be a means to incentivise businesses to produce according to circular economy principles while providing consumers with information to make conscious consumption choices. Criteria for labelling could be formulated following detailed studies by universities and research centres. Awards can also incentivise businesses, non-governmental organisations (NGOs) and civil society to contribute to the transition to a circular economy. Several examples are illustrated in Box 3.1.

Key actions

- Consider developing a local label or certification for products, initiatives or organisations that are implementing circular practices in Umeå, defining common guidelines for circular economy products and processes at a local level.
- Collaborate with local universities and research centres to analyse the criteria for circular labels or certifications.
- Select sectors in order to undertake pilot experiments on circular labels and/or certificates.
- Engage a dialogue with the private sector in order to discuss the development of a local declaration for businesses and organisations to express their commitment to the circular transition.
- Organise a call for projects or a challenge to stimulate circular businesses that could be awarded according to innovative ideas and results.

Box 3.1. Examples of labelled products for the circular economy

Certifications are created to assure stakeholders and clients that products and services meet requirements linked to the circular economy. Both the private sector and national and subnational authorities are taking steps in this regard to develop and introduce labels for the circular economy:

- **OrganiTrust®**, a worldwide certification body, issues certificates on the circular economy in the following sectors: food contact materials, personal care and cosmetics, furniture, children toys, textiles and fabrics, electronics, building materials, medical safety equipment and household chemicals and detergents. In addition, it also provides this qualification to some service activities, which include transport, construction, telecommunications, cleaning and parking. Once the product or service has achieved the certification, it must be renewed annually.
- The **Amsterdam Made Certificate** was developed upon request of Amsterdam City Council (Netherlands). Its main objective consists of informing consumers about products that are made in the Amsterdam area, while seeking to boost creativity, innovation, sustainability and craftsmanship.
- The French roadmap for the circular economy, **50 Measures for a 100% Circular Economy**, launched by the Ministry for an Ecological and Solidary Transition (*Ministère de la Transition Écologique et Solidaire)* in 2018, includes the deployment of voluntary environmental labelling in five pilot sectors (furnishing, textile, hotels, electronic products and food products).
- The **White Paper on the Circular Economy of Greater Paris** (2015[16]) contemplates 65 proposals, including the design and use of circular economy labels. More precisely, it aims to provide higher visibility of existing environmental labels, such as the French NF Environment (a collective certification label for producers that comply with environmental quality specifications) and the European ecolabel, as well as the development of a quality label for second-hand products. The city of Paris is also advancing in the creation of the "NF Habitat HQE" certification, specific for the construction sector. The certification aims to define a "circular economy profile" adding new specific requirements. Besides meeting all mandatory requirements established in the NF HQE Base, construction projects should reach at least 40% of the points established in the "circular economy profile" to be considered circular (e.g. inclusion of a waste management plan, use of recycled materials, development of life-analysis calculations, eco-certification of wood, considering deconstruction processes, establishing synergies with local actors in the surrounding areas, among others).

Source: French Government (2018[17]), *50 Measures for a 100% Circular Economy*, http://www.ecologique-solidaire.gouv.fr/sites/default/files/FREC%20-%20EN.pdf (accessed on 6 June 2019); Amsterdam (2019[18]), *Homepage*, http://www.amsterdammade.org/en/ (accessed on 6 June 2019); Paris City Council (2015[16]), *White Paper on the Circular Economy of Greater Paris*, https://api-site.paris.fr/images/77050 (accessed on 11 June 2019); Organi Trust (2019[19]), *Circular Economy and Organic Certification*, https://organitrust.org/ (accessed on 11 June 2019); HGB-GBC (2017[20]), *Circular Economy for HQE Sustainable Construction*.

Promote a circular economy culture

Creating participation spaces to involve citizens, businesses and other relevant actors in public debates and events could raise awareness, stimulate ideas and collaborations. In addition, it would be an opportunity to encourage citizens to embrace sustainable consumption choices in their daily lives. There are several successful examples of promoting the circular economy culture and raising awareness such as: the organisation of a circular weekend in Valladolid, Spain (Circular Weekend, 2019[21]); the organisation of visits to schools in Finland for raising awareness and increasing knowledge of the circular economy among students between the ages of 13 and 16 (Sitra, 2019[22]); and a showroom and educational activities in Germany to spread knowledge on the circular economy and Cradle to Cradle (Cradle to Cradle NGO, 2019[23]).

Key actions

- Launch communication campaigns to show the impacts of the circular economy (compared to a linear system) and communicate on how citizens and different actors can contribute to it.
- Create a dedicated website in order to share knowledge and good practices concerning the circular economy.
- Organise events for knowledge sharing, networking and the promotion of the circular economy at the local level, as well as conferences and seminars at schools and universities in order to raise awareness among children and students in Umeå.
- Share success stories with the citizens (e.g. through social media, newspapers, television).
- Use social media to provide quick updates and information on the topic and related events.
- Make citizens active players in the transition towards the circular economy through co-creation workshops, surveys and contests to identify circular solutions in a range of sectors, from food to sustainable mobility, as well as to gather inputs for new ideas and practices.
- Organise co-creation thematic workshops to gather inputs from citizens. Instruments for stakeholders engagement include:
  - Multi-stakeholder fora.
  - Workshops.
  - Breakfast meetings on the circular economy.
  - Co-creation methodologies.
  - Feedback loops.

Facilitating multilevel co-ordination for the circular economy

The municipality can facilitate collaborations and co-operation among a wide range of actors to make the circular economy happen on the ground. Ways forward are presented below.

Set up co-ordination mechanisms within the municipality

Co-ordination across municipal departments is needed to set priorities and make investment decisions. Also, municipal departments could strengthen collaboration with the City Council Executive Board's Committees (the Business development executive Committee; the Planning Committee; and the Sustainability Committee) and several independent political committees (e.g. Technical board, the Building board and the Environment board) that will be involved in specific circular economy activities. Co-ordination across these bodies and municipal departments would be needed to avoid duplications or grey areas. Different cities are advancing co-ordination through the creation of dedicated horizontal working groups (Melbourne, Australia, Toronto, Canada and Oulu, Finland); establishing specific teams in charge of coordinating their circular transition (Brussels, Belgium, Paris, France, Amsterdam and Rotterdam, Netherlands, London, United Kingdom, Ljubljana, Slovenia); or setting-up a co-ordination body between the city and the metropolitan area (Metropolitan Area of Barcelona, Spain) (OECD, forthcoming[10]).

Key actions

- Identify how several municipal departments can relate to the circular economy in their policies (e.g. public procurement, environment, innovation, etc.).
- Consider appointing a person or a workgroup responsible for co-ordinating the work on the circular economy with a clear mandate over all departments in the municipality to set short-, medium- and long-term goals for the co-ordinator/workgroup, monitor progress and evaluate impacts. Define the ways for co-ordination:
  - Ad hoc meetings.
  - Permanent working group on the circular economy.
  - A technical and political board.
  - Formal or informal fora that gather all municipal departments.
  - Periodical communications on circular economy activities.

Facilitate co-ordination with the national government

Co-ordinating with the national government would help align local and national strategies and objectives and ensure consistency amongst objectives. The National Delegation on the Circular Economy will also support this process and may involve subnational governments in the future. For example, the National Delegation on the Circular Economy will also support this process and may involve subnational governments in the future. The Public Waste Agency of Flanders (OVAM) took the initiative in 2018 to set up a national platform for the circular economy, through which the top levels of federal and regional environment departments, economy/innovation departments and finance departments meet twice a year to decide on common action in priority policy fields (OECD, forthcoming[10]), In Spain, the Spanish national strategy created an inter-ministerial body that includes the national government, the autonomous regions and the local governments through the Spanish Federation of Municipalities and Provinces (FEMP).

Key actions

- Several options can be considered to co-ordinate local and national government, such as:
  - A dedicated forum for aligning interests across local and national authorities.
  - Regular meetings between representatives of different departments and agencies in order to provide the opportunity for communication and dialogue.
  - Regular co-ordination groups/meetings with the National Delegation on the Circular Economy.
  - Seminars and workshops together with the national government.

  - Contracts/deals with the national government as tools for dialogue, for experimenting, empowering and learning. The Green Deal Circular Procurement (Box 3.2) is an agreement between organisations that aims to encourage the purchase of goods that are produced in a circular way.
- In addition, the municipality could:
  - Identify the areas where the national contribution is needed to carry out circular initiatives at a local level.
  - Actively participate in public consultations at the national level, when appropriate.
  - Proactively propose circular economy-related actions to the National Delegation on the Circular Economy.
  - Share information with national authorities about local needs preferences, ongoing activities and outcomes.

Facilitate co-ordination with the region

A number of strategies at the regional level, including on food, regional development and transport, could benefit from exchanges with the municipality of Umeå in order to harmonise objectives and enhance the effectiveness of the implementation of policies and programmes at the local and regional levels. Moreover, it could ensure consistency between local and regional initiatives and identify potential mismatches between local and regional needs. Västerbotten Region co-ordinates five networks, gathering municipal public officials and a range of stakeholders to find solutions to common problems concerning waste, water and sewage, planning and building, environment and emergency services. As such, the networks could be a useful platform to advance co-ordination actions related to the circular economy. As an example of multilevel co-ordination, the Brussels Region Regional Programme for the Circular Economy 2016-20 is co-ordinated by three Ministers and four regional administrative bodies (Government of the Brussels-Capital Region, 2016[24]).

Key actions

- Strengthen co-ordination frameworks between the municipality and the region to work on the circular economy, considering the following options:
  - Bodies between regional and local authorities that can take the form of committees, commissions, agencies or working groups.
  - Ad hoc meetings for city-region co-ordination.
  - Network on the circular economy that includes representatives from the region and from all municipalities in Västerbotten.
  - Co-operation agreements between Umeå, the region of Västerbotten and other municipalities of the region for the implementation of joint projects on the circular economy.
  - Joint actions between the municipality and the region and implementation of pilot projects.
  - Joint roadmap with the region of Västerbotten for co-ordination, harmonisation of objectives and improvement of implementation of policies.
- Include circular economy as a key topic on the existing sectoral networks co-ordinated by the region of Västerbotten (e.g. waste, environment, water and sewage).
- Explore inter-municipal collaboration opportunities in order to detect common needs within the region.

Facilitate collaboration with universities, existing businesses and start-ups

Collaboration with key stakeholders would build knowledge on the circular economy and identify synergies. Further engagement with the academic sector can be considered to build knowledge on circular dimensions that can help the city to identify key sectors and opportunities such as bio-economy and circular design. For example, the city of Amsterdam has been working in triple helix (government, business and academia) and quadruple helix (incorporating citizens to the previous groups) collaboration in different projects, including the circular neighbourhood (e.g. Buiksloterham) (Amsterdam Smart City, 2019[25]). In Paris (France), the Paris & Co incubator merges big and small companies and start-ups work together, exchanging ideas and testing pilots (OECD, forthcoming[10]; Paris&Co, 2020[26]). Furthermore, Circular Oslo-Circular Region (Norway) developed an open-source toolkit for cross-sectoral partnerships (Circular Oslo-Circular Regions, 2020[27]).

Key actions

- Explore opportunities to sign collaboration agreements between the municipality and the university to work on prioritised areas related to the circular economy at the local level.
- Identify possible pilots and experimentations that would involve research and development (R&D) departments and university departments, based on identified needs of the municipality.
- Collaborate with universities to implement the circular economy in existing educational programmes.
- Organise matchmaking events with business actors from different sectors to start a pilot on circular business models.
- Collect academic and business proposals to put in place circular activities with social impact and consider support for implementation (e.g. fostering the adoption of shared mobility plans at the company level).
- Create interactive online platforms of information to encourage stakeholders to exchange with each other on their needs and monitor the activities and updates of the platform.
- Create co-working spaces for cross-fertilisation amongst several actors.

Facilitate the territorial linkages between urban and rural areas

The forestry, bio-economy and farming sectors could further incorporate circular economy principles to their activities (e.g. sewage sludge is being used as fertiliser in an experimental way in the forest) while strengthening the connection between city and rural areas. The food strategy, currently under development at the regional level, is an opportunity to improve the co-ordination between urban and rural areas and encourage the creation of local production and distribution of food networks. A stronger connection between urban and rural areas may result in a better understanding of the challenges and opportunities for these areas in their transition towards a circular economy. By strengthening the dialogue between rural and urban areas, it would develop a better knowledge of the benefits of their collaboration. For example, in the city of Kitakyushu (Japan), a food recycling loop between rural-urban areas has been established and in Tampere (Finland), rural-urban partnerships have been established related to the biogas sector. The partnership works as a hub that brings together and connects different actors (e.g. farms, power plant operators and logistics) that have not been in contact before (OECD, forthcoming[10]).

Key actions

- Foster urban-rural partnerships for collaboration in specific sectors (e.g. food, forest, bio-economy) (OECD, 2013[28]):
    - Clarify the partnership objectives, actions and roles of key urban and rural actors.

  - Create circular loops in the bio-economy sector; use of organic waste as fertiliser; last-mile distribution, etc.
  - Share the knowledge and exchange good practices from the urban-rural partnership.
  - Evaluate the results of the partnership.
- Launch communication campaigns in urban and rural areas to present their role in the circular economy transition, the potential benefits of co-operation and to explain how each individual can play a role in the circular transition.

Enabling the economics and governance conditions for the uptake of the circular economy

Making the circular economy happen is about enabling the necessary governance and economic conditions. As such, the city government could:

Identify the regulatory instruments that need to be adapted to foster the transition to a circular economy

The transition to a circular economy would require proper regulation in some sectors such as waste, water, food, and building and construction, to name but a few. Identifying available tools such as specific requirements for land use, environmental permits (e.g. for decentralised water, waste and energy systems), regulation for pilots and experimentation, would clarify potential regulatory uncertainties across different legal entities, gaps and future needs. For example, in the Netherlands, the legal and regulatory framework at the local and regional levels is expected to adapt to the National Circular Economy Strategy (OECD, forthcoming[10]).

Key actions

- Build a dialogue between the city council, civil society and private sector to identify the main regulatory and legal barriers and identify the sectors where action can be taken (e.g. energy system, the definition of waste and second-hand materials) through ad hoc meetings.
- Identify regulatory gaps and obstacles, which may go beyond the local sphere as per competency of other levels of governments.
- Establish a dialogue with regional and national government to exchange about potential regulatory obstacles that can encourage the transition towards a circular economy.
- Share with the regional and national regulatory authorities the main regulatory barriers and potential solutions identified.
- Advise companies on consultations concerning circular economy-related legislation.
- Hold a proactive role in the definition of new legislation instead of being a follower of actions from the national government.
- Identify areas for opportunities to set specific requirements on land allocation (e.g. energy use, water requirements, demolition, circular construction).

Identify fiscal and economic tools for the circular economy

Economic and fiscal tools can incentivise or disincentivise behaviour to move from a linear to a circular economy. For example, they can affect production modalities and consumption patterns. There is a range of practices in this area, such as the Dutch government's DIFTAR system (a recollecting scheme based

on differentiated tariffs that aims to provide incentives to improve waste separation at source) and discounts on waste fees to businesses in Milan (Italy) and San Francisco (United States).

Key actions

- Explore the measures that the municipality can apply according to its fiscal competencies. A variety of fiscal and economic tools have been identified from international practices, such as (OECD, forthcoming[10]):
  - Tax reductions on second-hand materials that have already been taxed.
  - Reduction of VAT/taxes as appropriate.
  - Discount on waste fees according to preselected criteria.
  - Differentiated tariffs for waste separation and recycling.
  - Grantns to finance circular economy initiatives.
  - Creation of legislative and normative incentives such as rewarding companies through corporate income tax (e.g. based on the waste generation level, water and energy consumption, use of recycled materials as raw materials).

Implement Green Public Procurement

Public procurement is a powerful tool cities can use to promote eco-efficiency and eco-design, reducing the negative environmental impacts of public purchases at the local level. Some international examples can provide inspiration concerning innovative procurement for the circular economy. Box 3.2 presents examples of Green Public Procurement (GPP) experiences. The creation of a monitoring and evaluation framework for GPP will help analyse the procurement policy results, enabling the city to incorporate the lessons learned in the design of new procurement policies and regulations. For instance, the city of Ljubljana (Lithuania) has included some environmental requirements in its tenders; in Paris (France), local authorities have adopted a scheme for responsible public procurement and the city of Toronto (Canada) (OECD, forthcoming[10]), has developed a Circular Economy Procurement Implementation Plan and Framework to use its purchasing power as a driver for waste reduction, economic growth and social prosperity (City of Toronto, 2018[29]).

Key actions

- Include circular criteria in technical specifications, procurement selection and award criteria, as well as in contract performance clauses (e.g. reuse, durability, reparability, second-hand or remanufactured products).
- Adapt the public procurement evaluation system, favouring the social and environmental ratings in comparison with the price criteria.
- Establish clear requirements in tenders in order to foster the change of materials, quality and maintenance (e.g. use of secondary materials in publicly purchased goods).
- Apply life-cycle analysis approach and develop criteria to evaluate the life cycle of the assets used by each municipal service and use them to perform analysis of infrastructure, solutions and suppliers to foster more sustainable solutions in municipal services.
- Provide training for staff responsible for the inclusion of GPP.

Box 3.2. Green Public Procurement for the circular economy: Examples from cities

In OECD member countries, public procurement accounts for approximately 12% of gross domestic product (GDP). Sub-national governments, including cities, are responsible for around 63% of public procurement. Almost all OECD countries have developed strategies or policies to support Green Public Procurement (GPP). High-impact sectors are: buildings, food and catering, vehicles and energy-using products.

According to the European Commission (EC, 2016[30]), the impact of public procurement on the transition to a circular economy is worth around EUR 2 trillion in the European Union, around 14% of GDP. There are several examples of GPP that include circular criteria:

- Public procurement for circular economy building developments: Amsterdam (Netherlands) has developed its *Roadmap for Circular Land Tendering* (2017[31]) that includes 32 performance-based indicators for circular economy building developments.
- Public procurement to encourage the use of circular business models: The city of Zurich (Switzerland) took the decision to lease printing equipment rather than buying it outright, thus only paying per page printed and incentivising better printer performance and energy use.
- Public procurement to promote "product as a service" schemes: The municipality of Bollnäs (Sweden) has applied what the local government calls "functional public procurement" (*funktionsupphandlingen*) to rent light as a service in municipal pre-schools and schools. The service is provided by a start-up that received support from Umeå's BIC Factory business incubator.
- Public procurement to stimulate social and institutional innovation: The region of Flanders (Belgium) implemented the Green Deal Circular Procurement (GDCP) between 2017 and 2019. Inspired by the Dutch Green Deal on Circular Purchasing (launched in 2013), the joint project was signed by 162 participants (companies and organisations), the Flemish Minister of Environment and its initiators Circular Flanders, The Shift, the Association of Flemish Cities and Municipalities (VVSG) and the Federation for a Better Environment (BBL). In total, 108 purchasing organisations, local authorities, companies, financial institutions and 54 facilitators have been involved. During the 2 years of the initiative, the signatories of the GDCP have conducted more than 100 circular procurement pilot experimentations, building knowledge and experience, and testing tools and methodologies and new forms of chain co-operation.

Some of the obstacles identified in pursuing GPP include: the perception that green products and services may be more expensive than conventional ones; public officials' lack of technical knowledge on integrating environmental standards in the procurement process; and the absence of monitoring mechanisms to evaluate the achievements of the goals.

Source: OECD (2015[32]), *OECD Recommendation of the Council on Public Procurement*, http://www.oecd.org/gov/ethics/OECD-Recommendation-on-Public-Procurement.pdf (accessed on 6 June 2019); Municipality of Amsterdam (2017[31]), *Roadmap Circular Land Tendering*, https://amsterdamsmartcity.com/projects/roadmap-circular-land-tendering (accessed on 28 January 2020); EC (2017[33]), *Public Procurement for a Circular Economy: Good Practice and Guidance*, http://europa.eu/contact (accessed on 7 November 2019); Municipality of Bollnäs (2018[34]), "New light with many advantages", https://www.bollnas.se/index.php/88-aktuellt/2525-nytt-ljus-med-manga-foerdelar (accessed on 28 January 2020); The Shift (2019[35]), *Green Deal Circular Procurement in Flanders*, https://theshift.be/en/projects/green-deal-circular-procurement-in-flanders (accessed on 28 January 2020); OVAM (2020[36]), *Green Deal Circular Purchasing*, http://www.vlaanderen-circulair.be/nl/onze-projecten/detail/green-deal-circulair-aankopen (accessed on 5 February 2020); OECD (forthcoming[10]), *The Circular Economy in Cities and Regions*, Synthesis Report, OECD Publishing, Paris.

Foster capacity building for the circular economy

Within the municipality of Umeå, capacities can be built in order to design, set and implement circular economy policies that would require new skills, technical competencies and a holistic approach. At the same time, collaborations with universities could be set up to build capacities for entrepreneurs and provide them with the necessary tools to foster the circular transition in the city. For instance, the Chamber of Commerce of Glasgow (United Kingdom) provides capacity-building programmes for businesses aiming to transition to a circular economy (Zero Waste Scotland, 2020[37]).

Key actions

- Review and analyse the required skills and capacities for carrying out all activities associated with designing, setting, implementing and monitoring the circular economy strategy, such as:
  - Setting circular economy plans/programmes that are realistic, result-oriented, tailored and coherent with national and regional objectives.
  - Co-ordinating across different levels of government, ensuring complementarities and achieving economies of scale across boundaries.
  - Engaging stakeholders in the planning process of circular economy strategy.
  - Ensuring adequate financial resources by linking strategic plans to multi-annual budgets and mobilising private sector financing.
  - Allocating adequate human resources.
  - Collecting and analysing data, monitoring progress and carrying out evaluations.
- Develop, in collaboration with the university for example, targeted capacity-building programmes for public officials and entrepreneurs.

Develop a monitoring and evaluation framework for a circular economy strategy

Once in place, the circular economy strategy would benefit from the existence of a monitoring scheme, as it will help to identify how “circular” the city is, what works, what does not work and what can be improved. The proposed OECD indicators for the evaluation of the circular economy strategy in cities and regions, detailed in Box 3.3, could be helpful in this regard.

Key actions

- Identify available indicators and data for the monitoring of progress and assessment of results of the circular economy strategy.
- Create a monitoring and evaluation framework, considering environmental (e.g. resources, waste and circulation processes), flows (e.g. water, energy, products, food, transportation, information, people) and social (e.g. number of circular jobs created) indicators.
- Generate open data sources if possible (e.g. the publication of consistent and up-to-date information about how people and public vehicles move around the city and other forms of open data can boost the development of innovative start-ups).
- Collect information on empty buildings, materials used for construction and waste streams and make it publicly accessible.
- Make inventories of circular economy initiatives and update it regularly.
- Make an inventory of laws and regulations that can foster the transition from a linear to a circular economy.
- Use output indicators to evaluate the results of the strategy (e.g. CO2 emission saved, raw material avoided, use of recovered material, energy savings, etc.).

- Self-assess how "circular" the city is by using the OECD self-assessment framework (OECD, forthcoming[10]).
- Incorporate the information system into the online circular economy information platform that should be regularly updated and easily accessible.
- Share with citizens and stakeholders the outcomes and impacts of the strategy through a website.

Box 3.3. The proposed OECD Circular Economy Scoreboard for Cities and Regions

The proposed OECD Circular Economy Scoreboard for cities and regions consists of a self-assessment of key governance conditions to evaluate the level of advancement towards a circular economy in cities and regions. It is composed of ten key dimensions, whose implementation governments and stakeholders can evaluate based on a scoreboard system, indicating the level of implementation of each dimension (Newcomer, In progress and Advanced).

Table 3.3. OECD Circular Economy Scoreboard for Cities and Regions

	Level of advancement		
	Newcomer	In progress	Advanced
Circular economy framework	The city/region is planning to develop a circular economy strategy but has not started yet.	The circular economy strategy is under development.	Existence of a circular economy strategy with specific goals and priorities, actions, sectors and a monitoring framework.
Co-ordination mechanisms	There are no co-ordination mechanisms in place but under development.	Existence of dialogues across levels of government, but not focused on the circular economy.	Co-ordination mechanisms across levels of governments to set and implement a circular economy strategy or initiative are well established and functioning.
Policy coherence	The circular economy initiatives are still not aligned with other related policy areas (e.g. climate change, sustainable development and air quality).	The circular economy initiatives are aligned with some specific related policy areas (e.g. climate change, sustainable development and air quality) but they are still fragmented.	Existence of overall policy coherence between circular economy initiatives and related policy areas (e.g. climate change, sustainable development and air quality).
Economy and finance	No current financial instruments in place but planned.	Existence of a budget dedicated to environmental spending that is foreseen to be used also for circular economy projects.	Existence of a funding programme and economic incentives for circular economy projects with specific objectives, prioritised sectors and a monitoring framework of the outcomes.
Innovation	There are no spaces to test and pilot but planned.	Design of spaces to test and pilot circular economy projects under development.	Existence of spaces to test and pilot circular economy projects.
Stakeholder engagement	Existence of an initiative for the mapping of the most relevant stakeholders in the city/region.	Existence of a dialogue with stakeholders for the design and implementation of the circular economy strategy.	Existence of participation spaces for stakeholders through which input is used for the design and implementation of circular strategies.
Capacity building	Existence of capacity building programmes on green and sustainable economy fields.	Existence of capacity building programmes for activities associated with designing, setting and implementing a circular economy initiative.	Regular capacity building programmes for activities associated with designing, setting, implementing and monitoring the circular economy strategy.
Green Public Procurement	Green Public Procurement is being developed.	Existence of a green procurement model including environmental criteria (e.g. reduction of CO2 emissions).	Existence of a circular public procurement framework (e.g. waste diversion from procurement activities, raw materials avoided and percentage of recycled content).

Data and information	Identification of data on waste management and information campaigns to prevent waste generation.	Existence of data on waste management and information campaigns on the circular economy.	Existence of an information system on the circular economy. Data are publicly available and citizens and business informed of the opportunities related to circular business models and behaviours.
Monitoring and evaluation	No monitoring or evaluation framework in place.	Existence of a monitoring and evaluation framework that includes environmental aspects.	Existence of a monitoring and evaluation framework that includes environmental, economic and social aspects.

According to the self-evaluation, the city/region will identify its own level of advancement toward the transition to a circular economy, identify gaps and set its own targets for improvement. The methodology for self-assessment consists in a scoreboard system that can indicate the level of advancement of circular cities and regions towards the transition. Sub-indicators to better specify each dimension are under development and will be tested in the case studies of the OECD Programme on the Circular Economy in Cities and Regions.

Source: OECD (forthcoming[10]), *The Circular Economy in Cities and Regions*, Synthesis Report, OECD Publishing, Paris.

References

Amsterdam Made (2019), *Homepage*, http://www.amsterdammade.org/en/ (accessed on 6 June 2019). [18]

Amsterdam Smart City (2019), *Circular Buiksloterham*, https://amsterdamsmartcity.com/projects/circulair-buiksloterham (accessed on 6 June 2019). [25]

Austin's Circular Economy Story (2020), *Welcome to Austin's Circular Economy Story!*, https://kumu.io/ARRCircularEconomy/austins-circular-economy-story (accessed on 13 February 2020). [1]

Circle Economy/EHERO (2018), *Circular Jobs and Skills in the Amsterdam Metropolitan Area*, https://assets.website-files.com/5d26d80e8836af7216ed124d/5d26d80e8836af6ddeed12a2_Circle%20Economy%20-%20Circular%20Jobs%20and%20Skills%20in%20the%20Amsterdam%20Metropolitan%20Area.pdf (accessed on 5 February 2020). [15]

Circular Flanders (2019), *Indicators for a Circular Economy*, https://vlaanderen-circulair.be/en/summa-ce-centre/publications/indicators-for-a-circular-economy (accessed on 7 November 2019). [38]

Circular Metabolism (2017), *The Circular Economy Plan of Paris*, http://www.circularmetabolism.com/input/11 (accessed on 13 February 2020). [4]

Circular Metabolism (2017), *The Circular Economy Plan of Paris*, https://www.circularmetabolism.com/input/11 (accessed on 3 December 2019). [40]

Circular Oslo-Circular Regions (2020), *About Circular Regions*, https://circularoslo.com/about-circular-oslo-norway/ (accessed on 12 February 2020). [3]

Circular Oslo-Circular Regions (2020), *Partnership Methodologies and Toolkit*, https://circular-regions.gitbook.io/partnership-methodologies-and-toolkit-for-collabor/methodology (accessed on 12 February 2020). [27]

Circular Weekend (2019), *Emprendedores y economía circular*, http://circularweekend.org/ (accessed on 13 February 2020). [21]

City of Paris (2019), *Quantifier les emplois de l'économie circulaire de Paris - synthèse*. [12]

City of Toronto (2018), *Circular Economy Procurement Implementation Plan and Framework*. [29]

Cradle to Cradle NGO (2019), *Homepage*, https://c2c-ev.de/ (accessed on 13 February 2020). [23]

EC (2017), *Public Procurement for a Circular Economy: Good Practice and Guidance*, European Commission, http://europa.eu/contact (accessed on 7 November 2019). [33]

EC (2016), *Green public procurement drives the circular economy | Environment for Europeans*, https://ec.europa.eu/environment/efe/news/green-public-procurement-drives-circular-economy-2016-09-05_en (accessed on 6 March 2020). [30]

Ellen MacArthur Foundation (2019), *Denmark: Public Procurement as a Circular Economy Enabler*, https://www.ellenmacarthurfoundation.org/case-studies/denmark-public-procurement-as-a-circular-economy-enabler (accessed on 28 January 2020). [39]

French Government (2018), *50 Measures for a 100% Circular Economy*, http://www.ecologique-solidaire.gouv.fr/sites/default/files/FREC%20-%20EN.pdf (accessed on 6 June 2019). [17]

Government of the Brussels-Capital Region (2016), *Regional Programme for the Circular economy 2016-2020 (PREC)*. [24]

HGB-GBC (2017), *Circular Economy for HQE Sustainable Construction*. [20]

LIPOR (2019), *Economia Circular: Resíduo como Recurso*, https://lipor.pt/pt/a-lipor/o-negocio/economia-circular-residuo-como-recurso/ (accessed on 6 November 2019). [9]

LWARB (2015), *Employment and the Circular Economy - Job Creation Through Resource Efficiency in London*, London Waste and Recycling Board, http://www.wrap.org.uk (accessed on 12 February 2020). [14]

Ministry of Enterprise and Innovation (2015), *A rural development programme for Sweden*, https://www.government.se/4adb0c/contentassets/3d8c0f8317224257859ba46dea31a374/a-rural-development-programme-for-sweden (accessed on 5 March 2020). [6]

Morley, A., E. Looi and C. Zhao (2018), *Measuring the Circular Economy Developing: An Indicator Set for Opportunity Peterborough*. [7]

Municipality of Amsterdam (2017), *Roadmap Circular Land Tendering*, https://amsterdamsmartcity.com/projects/roadmap-circular-land-tendering (accessed on 28 January 2020). [31]

Municipality of Bollnäs (2018), "New light with many advantages", https://www.bollnas.se/index.php/88-aktuellt/2525-nytt-ljus-med-manga-foerdelar (accessed on 28 January 2020). [34]

Municipality of Rotterdam (2013), *Urban Metabolism – Rotterdam*, http://www.fabrications.nl/portfolio-item/rotterdammetabolism/ (accessed on 13 February 2020). [5]

OECD (2019), *1stOECD Roundtable on the Circular Economy in Cities and Regions - Highlights*, OECD, Paris, http://www.oecd.org/cfe/regional-policy/Round-circul-eco-Highlights.pdf. [13]

OECD (2015), *OECD Recommendation of the Council on Public Procurement*, OECD, Paris, http://www.oecd.org/gov/ethics/OECD-Recommendation-on-Public-Procurement.pdf (accessed on 6 June 2019). [32]

OECD (2015), *Stakeholder Engagement for Inclusive Water Governance*, OECD Studies on Water, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264231122-en. [11]

OECD (2013), *Rural-Urban Partnerships: An Integrated Approach to Economic Development*, OECD Rural Policy Reviews, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264204812-en. [28]

OECD (forthcoming), *The Circular Economy in Cities and Regions*, Synthesis Report, OECD Publishing, Paris. [10]

Organi Trust (2019), *Circular Economy and Organic Certification*, https://organitrust.org/ (accessed on 11 June 2019). [19]

OVAM (2020), *Green Deal Circular Purchasing*, http://www.vlaanderen-circulair.be/nl/onze-projecten/detail/green-deal-circulair-aankopen (accessed on 5 February 2020). [36]

OVAM (2019), *CIRCULAR FLANDERS Together towards a circular economy Kick-off Statement*, https://www.vlaanderen-circulair.be/src/Frontend/Files/userfiles/files/Circular%20Flanders%20Kick-Off%20Statement.pdf (accessed on 6 March 2020). [2]

Paris City Council (2015), *White Paper on the Circular Economy of Greater Paris*, https://api-site.paris.fr/images/77050 (accessed on 11 June 2019). [16]

Paris&Co (2020), *Homepage*, https://www.parisandco.com/ (accessed on 13 February 2020). [26]

Sitra (2019), "Visits to schools to teach pupils about the circular economy", https://www.sitra.fi/en/projects/visits-schools-teach-pupils-circular-economy/#what-is-it-about (accessed on 13 February 2020). [22]

The Shift (2019), *Green Deal Circular Procurement in Flanders*, https://theshift.be/en/projects/green-deal-circular-procurement-in-flanders (accessed on 28 January 2020). [35]

Vercalsteren, A., M. Christis and V. Van Hoof (2018), *Indicators for a Circular Economy*, Circular Flanders, https://vlaanderen-circulair.be/src/Frontend/Files/userfiles/files/Summa%20-%20Indicators%20for%20a%20Circular%20Economy.pdf. [8]

Zero Waste Scotland (2020), *Circular Glasgow*, http://www.zerowastescotland.org.uk/circular-economy/circular-glasgow (accessed on 13 February 2020). [37]

Annex A. Circular economy in Umeå, Sweden

Sector	Name of the project and institution	Description	Dates
Bio-economy	Bioendev – Biocoal through torrefaction	Developer and supplier of high-tech systems for cost-efficient pre-treatment of biomass for use in heat and power generation, conversion to liquid fuels and production of green chemicals.	..
	BioHubPromoter	BioHub is a business centre that accelerates innovative business models in the biorefining industry to foster the transition to bio-economy in the Botnia-Atlantica area. Botnia-Atlantica is a cross-border Interreg programme financing projects between Sweden (Gävleborg County, Västerbotten County, and Västernorrland County), Finland (Central Ostrobothnia, Ostrobothnia and South Ostrobothnia) and Norway (Nordland).	2016
	Bio4Energy – Biorefinery Research Environment	The project aims to create highly efficient and environmentally sound biorefinery processes – including methods and tools for making products such as biofuels, "green" chemicals and new bio-based materials – which draw on biomass sourced from forests or organic waste as a raw material.	2016-20
	Sweden's regional communication platform for bioeconomic development	The platform led by Västerbotten Region encourages co-operation between regions to promote the development of the bio-economy. It supports local firms and developa common position regarding potential regulation changes at the national and European levels.	2016
Capacity Building	SEE – Sustainability week	The Social, Economic, Ecological (SEE) week is a platform to share sustainability projects organised by Västerbotten County, the Regional Council of Västerbotten, Umeå University and the municipalities of Skellefteå and Umeå. In 2018, 134 activities were carried out in Västerbotten with an important focus on sustainable production and consumption, and the circular economy in particular (e.g. Cradle to Cradle initiatives).	2009-ongoing
	Seeing is Believing – Local study visits on the circular economy in Umeå	Promoted by the Municipality of Umeå and the consultancy firm Esam AB, this knowledge-building initiative consists of the organisation of study visits of ongoing examples of circular and sustainable practices. A group of business leaders, developers and decision-makers have participated in two field trips (to GE Healthcare facilities and IKEA's branch in Umeå).	2017- Ongoing
	+Project Umeå School of Business	The business school collaborated within +Project to advance an innovation development programme for small- and medium-sized companies in northern Sweden. It targeted small businesses in the construction industry with a focus on sustainability, new business models and digital manufacturing technology. The programme included five half-day meetings on different topics (e.g. digitalisation, circular economy and sustainable building).	2017
Climate smart solution	RUGGEDISED Project – Umeå Smart City	Project on the smart city that runs in co-operation with the cities of Rotterdam (Netherlands) and Glasgow (United Kingdom). The university district will be transformed into an innovation district where different climate-smart solutions will be implemented in the next 5 years (e.g. smart control of energy use in apartments or 100 renewable energy buildings throughout the university town).	2018- ongoing
	Solar cells renting programme	Umeå Energi offers households within the municipality of Umeå to rent solar cells instead of buying them. The business model change into a service-renting scheme generated great interest.	2018- ongoing

Sector	Name of the project and institution	Description	Dates
Construction	+Project – 3D printing with wood-based material	Researchers from a number of different institutions are developing techniques to address sustainability in future residential buildings, with the aim of using advanced, additive manufacturing technology combined with cellulose-based materials.	2015-18
Mobility	Car-sharing system (*Björkstadens bilpool*)	*Björkstadens bilpool* is a car-sharing initiative created in 2009 by a group of local entrepreneurs that operates in the Ålidhem and Carlshem districts of Umeå.	2009
	Sunfleet car-sharing Umeå	Sunfleet is Umeå's car-sharing system. Municipal authorities use Sunfleet as a way to make more efficient use of mobility options, thus reducing CO2 emissions. The system is available to all residents of the municipality of Umeå.	..
	U-bike	This rental system offers residents the opportunity to borrow electric cargo bikes at low cost. The municipality of Umeå has initiated and runs the project, which is in its first phase and is expected to last for three years.	2017-ongoing
Research and development (R&D)	Algae cultivation Pilot Project (Algae Pilot – VAKIN and RISE Processum)	The project shows that algae cultivation will reduce emissions of carbon dioxide and minimise over-fertilisation of waters. It will also produce energy-rich algae mass, as raw material for biodiesel (algae with high fatty acid content) and animal feed (protein-rich algae).	..
	Green North	Green North aims to generate smart growth and collaboration by bringing together regional assets through common environmental technology innovation and a resource platform that creates knowledge bridges between companies, academia and society.	2016
Resource efficiency	Green Technology and Environmental Economics	Green Technology and Environmental Economics is a research and collaboration platform integrating different disciplines at Umeå University and stakeholders from the water-waste and energy utility companies owned by the municipality. The general objective of this initiative is to build knowledge to improve resource efficiency and urban sustainability in the circular economy.	..
Reuse	Miljötekniskt Center, MTC (Environmental Technology Centre)	MTC owns and manages a large testbed facility for demonstration of new and innovative environmental technology to develop new treatment technologies and find new uses for waste materials.	..
	Returbutiken (second-hand shop)	Internet of Things (IoT) recognition in repairing and reselling used merchandise from recycling centres.	1998-ongoing
	Reuse houses for second-hand products at recycling centres	Vakin has built reuse "houses" that enable the collection of clothes, products, furniture and more for reuse, repair and upcycling. Reuse houses are placed at the entrance of normal recycling centres to encourage citizens to leave useful things there first, instead of at the material-recycling station. The staff employed in these houses are part of VIVA Resurs.	..
	VIVA Resurs	A labour market programme which strengthens individuals' opportunities by employing vulnerable people in rehabilitation programmes. It contributes to a greener city through reuse/recycling by repairing a number of products and goods.	1998-ongoing

Note: ..: not available
Source: Own elaboration based on OECD (2019[1]) OECD Survey on the Circular Economy in Cities and Regions and the interviews held during the two OECD missions to Umeå, Sweden (18 - 21 March 2019 and 23 October 2019).

Annex B. List of stakeholders consulted during the policy dialogue

Institution	Name
AB Bostaden i Umeå (Public housing company Umeå)	Johanne Lindgren
AB Bostaden i Umeå, (Public housing company Umeå)	Josko Lorger
BioFuel Region (Support organisation in the transition to a low carbon biofuel economy)	Johan Lagrelius
BioFuel Region (Support organisation in the transition to a low carbon biofuel economy)	Lena Jonsson
BioFuel Region (Support organisation in the transition to a low carbon biofuel economy)	Simon Oja
Blåhuset, (Hotel and restaurant corporate group)	Anders Samuelsson
Circular Oslo – Circular Regions	Cynthia Reynolds
Coompanion (Business advisors)	Roger Filipsson
County Administration Board of Västerbotten	Elin Söderberg
Cykelstaden Umeå (Part of the Swedish Society for Nature Conservation)	Owen Laws
Dåva – deponi och avfallscenter i Umeå AB (Landfill and waste centre)	Gustaf Sjölund
Dåva – deponi och avfallscenter i Umeå AB (Landfill and waste centre)	Jörgen Aronsson
EcoBioFuel Scandinavia AB (Locally produced energy solutions)	Tord Lindgren
Ecogain (Sustainability consultant firm)	Anders Enetjärn
Esam Ab (Sustainability consultant firm)	Angéla Ekman-Nätt
Esam Ab (Sustainability consultant firm)	Laura Vidje
eXpression Umeå (Corporate incubator for cultural, creative and artistic companies)	Samuel Isaksson
FridaysForFuture (Lobby group for climate action)	Håkan Joëlson
Fritidsbanken (Sharing initiative for sports and hiking equipment)	Johanna Vilhelmsson
GE Healthcare Lifesiences (Remanufacture of medical equipment)	Åke Andersson
Harvest Umeå AB (Urban farming)	Ellen Bergström
Harvest Umeå AB (Urban farming)	Daniel Remes
Komatsu Forest AB (Producer of forest machinery)	Charlotta Östman
Komatsu Forest AB (Producer of forest machinery)	Martin Ärlestig
Municipality of Lycksele	Olle Smeds
Municipality of Lycksele	Eric Lundström
Municipality of Lycksele	Hannah Diverde
Municipality of Lycksele	Tobias Linder
Municipality of Umeå	Lisa Persson
Municipality of Umeå	Maria Svensson
Municipality of Umeå	Agneta Filén
Municipality of Umeå	Anna Olofsson
Municipality of Umeå	Cathrin Alenskär
Municipality of Umeå	Emil Sandström

Institution	Name
Municipality of Umeå	Hans Lindberg
Municipality of Umeå	Lennart Frostesjö
Municipality of Umeå	Johan Sandström
Municipality of Umeå	Jonas Lundh
Municipality of Umeå	Katharina Radloff
Municipality of Umeå	Linda Vestin
Municipality of Umeå	Malin Lagervall
Municipality of Umeå	Märta Streijffert
Municipality of Umeå	Nils Seye Larsen
Municipality of Umeå	Peter Steggo
Municipality of Umeå	Philip Näslund
Municipality of Umeå	Pia Wangbergh
Municipality of Umeå	Susanne Thurén
Network for Sustainable Construction in Cold Climates	Michael Jalmby
Nordic Innovation	Elis Benediktsson
Norra skogsägarna (Member organisation for forest owners)	Pär Lärkeryd
Norrmejerier (Dairy co-operative in Sweden)	Anders Fredriksson
Norrmejerier (Dairy co-operative in Sweden)	Fredrik Andersson
Norrmejerier (Dairy co-operative in Sweden)	Christian Hagelberg
Oazer AB (Hydrogen production and refuelling station)	Boh Westerlund
Polarbrödsgruppen (Swedish bread company)	Karin Bodin
Public Transport Authority	Heidi Törnberg
Rättighetscentrum Västerbotten/Sensus (Antidiscrimination Bureau)	Klara Nygren
RE:Source National Strategic Innovation programme	Johan Felix
Region Västerbotten	Jonna Lidström
Region Västerbotten	Karin Modig
Region Västerbotten	Lena Friborg
Region Västerbotten	Liv Öberg
Region Västerbotten	Lotta Emanuelsson
Region Västerbotten	Riikka Engman
RISE Swedish Research Institute - Processum AB	Jonas Joelsson
RISE, Swedish Research Institute	Stern Hutjes
RISE, Swedish Research Institute	Albert Edman
Såhkie Umeå (Sámi association)	Maja Bonta
Stena Recycling AB (Waste and recycling company)	Patrik Höber
Svefa AB (Real estate advisors)	Magnus Pudas
Swedish Agency for Economic and Regional Growth	Gunilla Nordlöf
Swedish Delegation for Circular Economy	Catrin Gustavsson
Swedish University of Agricultural Sciences	Per Sandström
Swedish University of Agricultural Sciences	Sven Adler
Swedish University of Agricultural Sciences	Camilla Widmark
Swedish University of Agricultural Sciences	Cecilia Palmborg
Tarkett AB (Producer of floor solutions)	Rikard Nystedt

Institution	Name
The Cluster of Forest Technology (Network of forestry businesses)	Linda Nyström
The Cluster of Forest Technology (Network of forestry businesses)	Annelie Lundmark
Två Punkt Ett (Reuse company)	Joel Smedberg
Umeå Energi AB (Energy company)	Magnus Stenvall
Umeå Energi AB (Energy company)	Maria Nordberg
Umeå Energi AB (Energy company)	Henrik Bristav
Umeå Institute of Design	Niklas Andersson
Umeå School of Business and Economics	Herman Stål
Umeå School of Business and Economics	Karl-Johan Bonnedahl
Umeå School of Business and Economics	Hugo Sjövall
Umeå School of Business and Economics/REKO-ring Umeå (Locally produced food)	Maxim Vlasov
Umeå University	Alejandro Eguez
Umeå University	Lars Lindbergh
Umeå University	Linas Majus
Umeå University	Mats Tysklind
Umeå University	Richard Olsson
Umeå University	Thomas Olofsson
UmeEcoRide (Electric pod taxi)	Hanna Sinaie Johansson
Upab (Umeå parking company)	Linda Calmarsson
Vakin (Umeå Water and Waste Company)	Elisabeth Johansson
Vakin (Umeå Water and Waste Company)	Johanna Cory
Vakin (Umeå Water and Waste Company)	Karin Söderström
Vakin (Umeå Water and Waste Company)	Robert Hansson
Vakin (Umeå Water and Waste Company)	Tomas Blomqvist
Volvo Trucks Umeå	Eddy Khier

OECD Urban Studies

The Circular Economy in Umeå, Sweden

This report aims to support the city of Umeå in becoming the leader in the circular economy as stated in its strategic plan for 2016-2028. Umeå's population doubled over the last 50 years, making it one of Europe's fastest growing cities in a sparsely populated region (Northern Sweden). By 2050, the city is expected to reach a population of 200 000 inhabitants, with consequences on housing, use of natural resources and waste production. As such, the local government is developing a model integrating environmental, social and economic aspects within a circular economy approach. This is in line with the Swedish Government's objective to strengthen society's transition to a resource-efficient, circular and bio-based economy.

Consult this publication on line at ***https://doi.org/10.1787/4ec5dbcd-en***.

This work is published on the OECD iLibrary, which gathers all OECD books, periodicals and statistical databases. Visit ***www.oecd-ilibrary.org*** for more information.

ISBN 978-92-64-74497-4

OECD*publishing*
www.oecd.org/publishing