Advanced Knowledge Base

Advanced knowledge-base – upgraded version

Version 1

03 2021

Including: Chapter on *Circular Economy Maturity Index for cities*

D.T2.3.2:

Advanced knowledge-base

Upgraded version

A.T2.3.2 upgraded version

Including chapter on:

Circular Economy Maturity Index for cities

Issued by:	**Partner Nr. 10 – BWCON**
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31.03.2021	v. 1.0	Content outline issued by PP10

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I. Introduction – Advanced Knowledge Base in CITYCIRCLE

Keywords in the CITYCIRCLE project are amongst others *knowledge-base* and *capacity building* (toolbox-train the trainers).

The goal in this context is to develop a comprehensive shared Knowledge-Base taking into account the needs of the project partners. The knowledge will be documented and the transfer will be ensured through training sessions, webinars, mentoring, etc.

The following outputs - besides trainings and mentoring of different regional stakeholder groups, accelerator managers, staff members, etc. - are foreseen:

- a ***Starter Kit*** - objective to raise awareness and increase knowledge - presenting generic knowledge relating to the principles of the CE and tools for promoting and implementing the CE;
- an ***Advanced Knowledge-Base***, *including CE Maturity Index*. This knowledge-base will especially take into account the requirements of the hubs, i.e. addressing targeted technology areas or value chains, critical materials, methodologies, technology and market readiness levels, etc.

The ***Advanced Knowledge-Base*** will be the focus of this paper from the second chapter onwards. The following first chapter describes which basic documents/ materials have already been developed.

1. The *Starter KIT* – available documents/ materials

The ***Starter Kit*** has been published in September 2019:

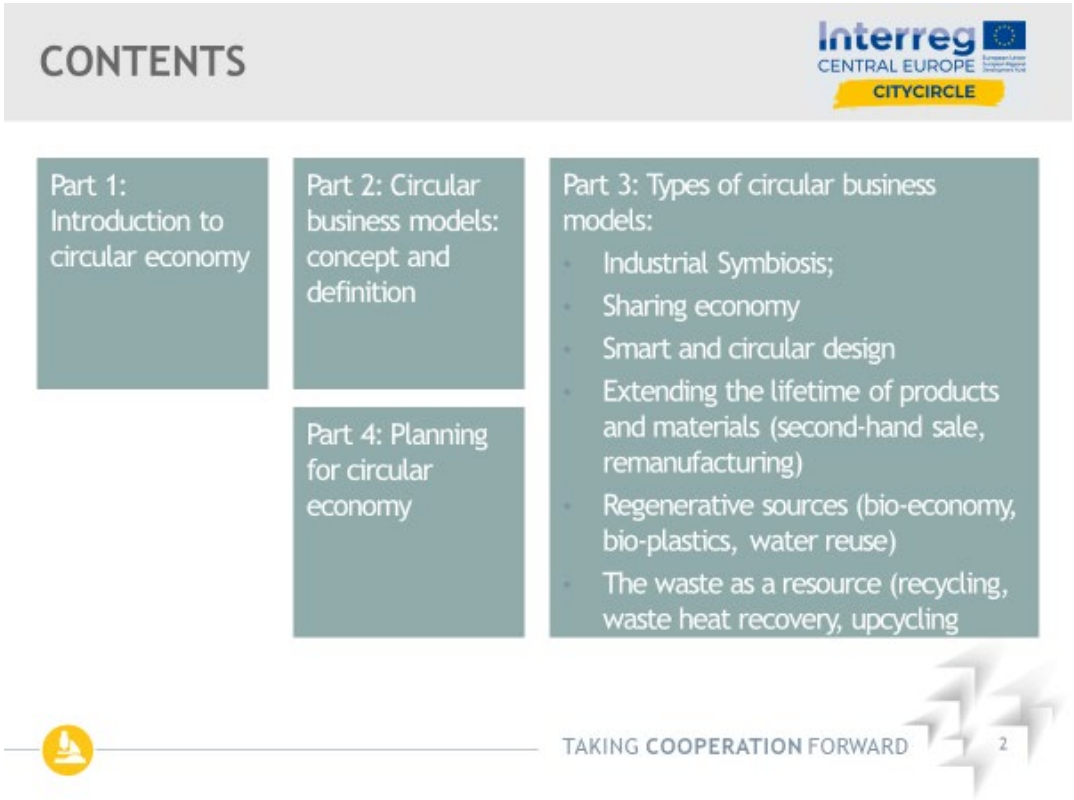
> "This Starter Kit has been developed within the CITY CIRCLE project. It is targeted at urban practitioners and policy makers and is meant to introduce concepts and notions related to the circular economy. The Starter Kit does not have the ambition to cover all sectors of the economy which are of relevance of the circular economy. Its scope has been agreed with the participants in the project and covers sectors close to their reality. These could be subsequently explored more in-depth." (p 5)

The ***Starter Kit*** is available on the project website: https://www.interreg-central.eu/Content.Node/CITYCIRCLE/D.T2.1.1-Starter-Kit.pdf:

The content is the following:

The essential contents of the ***Starter Kit*** were bundled in a presentation, also available on the CITYCIRCLE website (also in all other languages).

It is structures as follows:



This presentation – called basic material – was delivered to all project partners around mid-November 2019. The project partners in turn presented this to their respective regional stakeholders in the framework of a regional workshop.

2. The Advanced Knowledge-Base – Understanding, objective and development procedure

2.1 The Advanced Knowledge-Base in the Application

In the application version/ content and delivery month of the *Advanced Knowledge-Base* are described as follows:

Advanced knowledge-base
Initial version of the advanced knowledge-base Upgraded version of the advanced knowledge-base addressing specific topics (concrete value chains, specific technology development…) taking into account the scope of the hub/accelerator concepts developed for each target region. (online tool and files) (p 43) Delivery month: 06.2020
Upgraded version of the advanced knowledge-base Upgraded version of the advanced knowledge-base addressing specific topics identified by the hub/accelerators in their initial implementation phase and integrating their field experience. (online tool and files) (p 43) Delivery month: 03.2021
Final version of the advanced knowledge-base Ongoing improvement of the knowledge-base through the integration of new materials, including 6-monthly feedback loops with each hub/accelerator. A final public version will be delivered and endorsed by CE hubs. (online tool and files) (p 43) Delivery month: 03.2022

The final version shall include a Circular Economy Maturity Index (CEMI):

Circular Economy Maturity Index
Description of deliverable Circular economy maturity index for cities enabling self-assessment and the identification of improvement potential. The maturity index shall be multi-dimensional and address economic, societal and environmental aspects. (online tool, files for printing) (p 45) Delivery month: 03.2022

2.2 Advanced Knowledge-Base

With regard to the actual Advanced Knowledge-Base and its development, we would first like to state that we regard it as a *living document*, which fills with information and knowledge during the project period according to the 3 steps - initial, upgraded, final and always in between - depending on the progress of the project.

When the application says

> A knowledge-base will be developed in the form of electronic documents (presentations, videos, case studies) and encompass good practices, methodologies related to the circular economy (business models, technologies, capabilities…).

then we would like to make it very clear at this point that we are aiming for a well-organized and structured knowledge platform in order to make the information more accessible and usable.

We would also like to make it very clear that this Advanced Knowledge Base is intended to encourage "snooping" on the web. Thus, many links are given, described and websites shown to invite you to take a closer look at the topics in order to find out for yourself which websites are best suited for me.

The CITYCIRCLE Knowledge Base is targeted especially at urban practitioners and policy makers.

In analogy to the development the Starter Kit, the Advanced Knowledge Base cannot pursue the objective of presenting the entire subject area of CE. It does not have the ambition to cover all sectors of the economy which are of relevance of the circular economy. Its scope will be agreed with the project partners and cover sectors close to their reality.

2.3 Initial version – Understanding and development procedure during COVID-19

The CITYCIRCLE project partners kept their project rolling throughout COVID-19 time and lockdowns across Europe although this could not be 100% in all places. Nevertheless, it was not possible to prevent some activities from being somewhat delayed.

For the initial version of the Advanced Knowledge Base this means that we have slightly changed the procedure compared to the initially planned one.

This applies in particular to the work at CEMI.

- ***Circular Economy Maturity Index for Cities***

As mentioned in the previous section, only the final version of the AKB will contain explanations of the CEMI. We have preferred to deal with this deliverable already now:

- on the one hand, because the preparation of the topic could be carried out largely independently of the project partners and they could therefore deal with their own upcoming deliverables in this new Corona time;

- on the other hand, this proved to be advantageous in that the status of work in this area could be examined in detail at an early stage and can therefore be updated and adapted to project-specific requirements comparably easy in the further course of the project.
- Moreover, the project partners can deal with this topic at an early stage.

The information concerning the CEMI is the final chapter in this initial version.

As CE was already defined in the Starter Kit, it will not be discussed in the following.

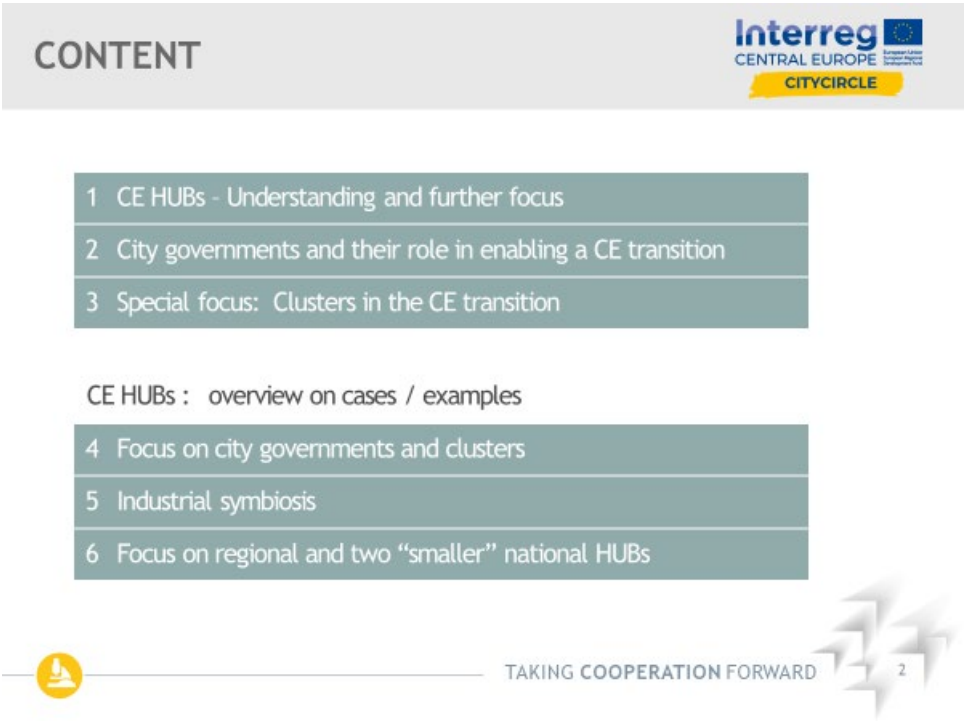
- ***"Knowledge-Bases" on Circular Economy***

But due to the diversity of the CE topic as well as the large number of institutions/ players and corresponding websites, the following chapter will first provide an overview. This should give the reader an orientation support and show what information can be found where and finally support the decision which one/ ones are best for me to follow in the future.

Chapter II provides an overview on "Knowledge-Bases" as well as in-depth information on the content of the websites. The information will be permanently updated - if necessary.

- ***Circular Economy HUBs – presentation, trainings/ webinars and materials***

For the moment a chapter on Circular Economy Hubs follows. An information package on the topic HUBs was provided upfront the trainings/ webinars to the project partners with the following content:

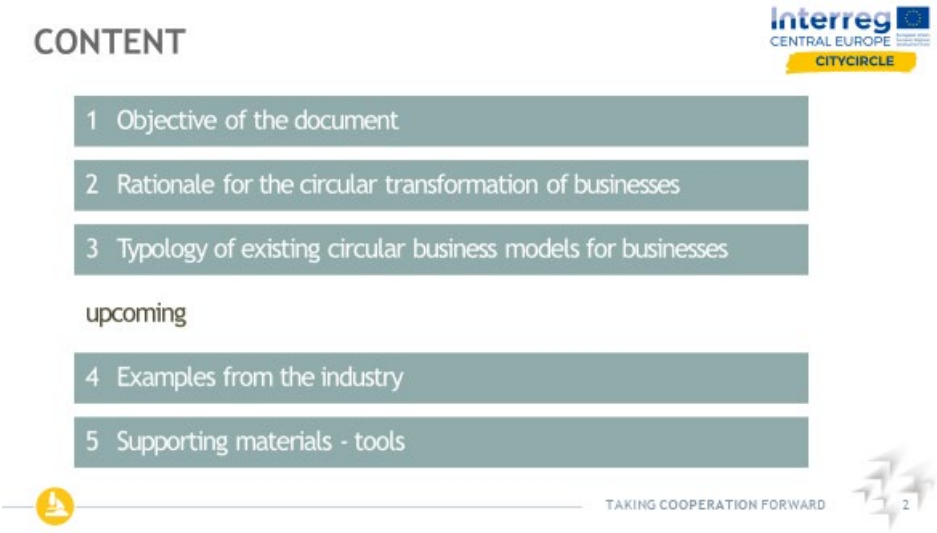


In this chapter only the central content from the *CITYCIRCLE HUBs* presentation is presented.

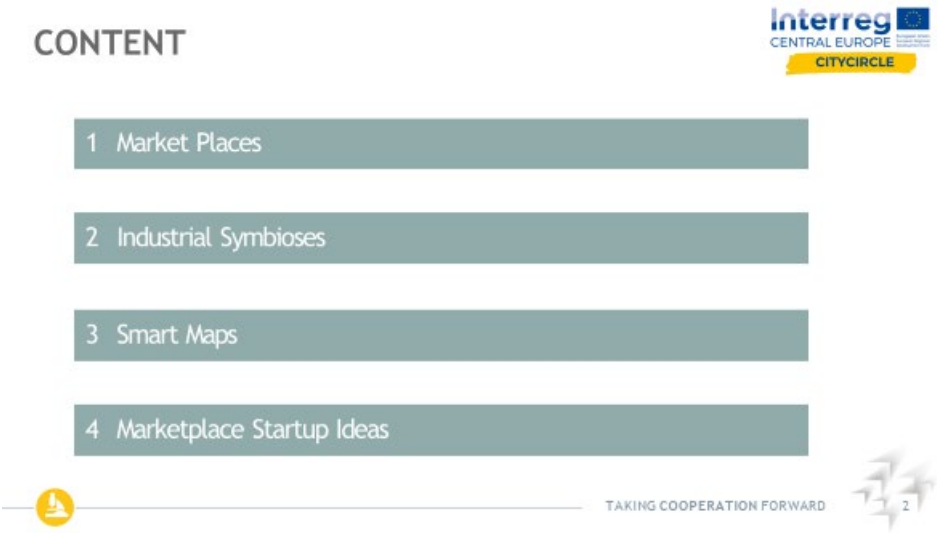
This content is complemented by the 3 webinars on good practices on "How to setup CE HUBs" practices from Maribor (Slovenia), Flanders (Belgium) and Kemi (Finland).

- ***Circular Business Models, Industrial Symbiosis, Marketplaces***

An information package on the topic CIRCULAR BUSINESS MODELS FOR SMEs is currently being developed – the content and status end of July 2020 is described:



For the next two chapters an information package MARKETPLACES/ INDUSTRIAL SYMBIOSIS was provided upfront the trainings/ webinars to the project partners:



In both cases new content has been added to the Knowledge Base:

- ***Topics addressed by the CITYCIRCLE project partners during the implementation of their Circular Economy Pilot Projects***

5 Pilot Actions are to be implemented in the 5 Central European Cities and Regions, each one with different thematic focus, to demonstrate the potentials benefits of the CE for the sustainable development of local and regional economies.

In this chapter the central content of the topics addressed are/ will be presented as well as references. The search on references will be continued.

2.4 Upgraded version – addressing specific topics identified by the hub/ accelerators

Compared to the initial version of the Advanced Knowledge Base, the following additions can be found in this upgrade version

- an overview on Circular Economy City (Models)
- an overview of business models for SMEs

An update on the Partner Pilots shall be provided in a further version of the Advanced Knowledge Base (expected date: October 2021), which was initially not foreseen. This enables to take into account the minor delays in the project implementation due to the COVID-19 impact on project activities on the local level.

- ***Circular Economy City (Models)***

This content/ chapter was requested by the partners to get a deeper insight into the key sectors of greatest potential for circular innovations in cities.

It has been incorporated into Chapter III of the initial knowledge base – which was dedicated to the topic of

III. Circular Economy HUBs – presentation, trainings/ webinars and materials

now it has been supplemented by the explanations on city

III. Circular Economy HUBs / Circular Economy City (Models) – presentation, trainings/ webinars and materials

The explanations on the hubs in the initial knowledge base - chapters III.1, 2 and 3 have been merged into one chapter III.1. The new information on the Circular Economy City (Models) has been introduced as chapter 2. Another small - non-content-related - change concerns the previous chapters III.4 and 5, which have been merged into one in this version - III.3 Trainings/ webinars.

- ***Business models for SMEs***

This chapter of the Advanced Knowledge Base does not look at circular economy from a societal point of view but presents an overview of arguments making it potentially **economically rationale and sensible for each single business to engage into its own circular transition.**

II. “Knowledge-Bases” on Circular Economy

1. “Knowledge-Bases” – Overview

1.1 “Knowledge-Bases” - central institutions / players dealing with CE

European Commission	
European Circular Economy Action Plan https://ec.europa.eu/environment/circular-economy/  	**A new Circular Economy Action Plan for a Cleaner and More Competitive Europe** The European Commission has adopted a new Circular Economy Action Plan - one of the main blocks of the European Green Deal, Europe’s new agenda for sustainable growth.
#CEstakeholderEU ***European Circular Economy Stakeholder Platform*** https://circulareconomy.europa.eu/platform/	A joint initiative by the European Commission and the European Economic and Social Committee: The virtual platform is a space to exchange and interact. It is a valuable resource to find good practices, publications, information about events, networks, … . Via submission forms information can be uploaded. In a discussion forum an exchange with other stakeholders is possible. A newsletter informs about all ongoing activities of the Platform.
 	
Urban Agenda for the EU	The CE Partnership aims to stimulate the re-use, repair, refurbishment and recycling of existing materials and products to promote new growth

https://ec.europa.eu/futurium/en/circular-economy URBAN AGENDA FOR THE EU – WORKING TOGETHER FOR BETTER CITIES – CIRCULAR ECONOMY	and job opportunities. The focus will be on: waste management (turning waste into resources), the sharing economy, and resource efficiency.

EIB _ European Investment Bank	
Circular economy – one initiative of the EIB https://www.eib.org/en/about/initiatives/circular-economy/index.htm	EIB supports the CE through awareness raising, advisory support and finance. For further reading the website offers publications – guides, studies, books - related to the CE, including the guide The 15 circular steps for cities.
Circular City Funding Guide  	The Urban Agenda Partnership for CE initiated the Guide; EIB experts were mobilised and funded by the European Investment Advisory Hub." The Circular City Funding Guide supports municipalities, businesses, and other urban actors in creating circular cities.

OECD	
The Circular Economy in Cities and Regions http://www.ecd.org/cfe/regionaldevelopment/circular-economy-cities.htm	This OECD programme supports cities and regions in their transition towards circularity by offering information - case-studies, communications and articles and information about conferences are provided.

OECD iLibrary https://www.oecd-ilibrary.org/	Offers search results for the following CE categories; 

Ellen MacArthur Foundation	
Ellen MacArthur Foundation https://www.ellenmacarthurfoundation.org/	Chis website provides a range of reports, frameworks, and other publications related to the CE. Topics range from plastics to fashion and food, presenting which issues should be tackled and how cities can contribute to this.
Circular Economy in Cities https://www.ellenmacarthurfoundation.org/our-work/activities/circular-economy-in-cities	

ACR+	
ACR _ Association of Cities and Regions for sustainable Resource management https://www.acrplus.org/en/	ACR+ is an international network of cities and regions sharing the aim of promoting a sustainable resource management and accelerating the transition towards a CE on their territories and beyond.
Circular Europe Network (CEN) https://www.circular-europe-network.eu/	Through CEN, best practices are shared from cities and regions throughout Europe. Factsheets describe the nature of the projects and the actors that are involved.

1.2 Other Circular City initiatives, networks, resources, …

"Momentum is building around circular economy in cities. In addition to the Ellen MacArthur Foundation's Systemic Initiatives (for plastics, fashion, and food), multiple other organisations are integrating circular economy into their programmes and tools.

This reference page provides an interactive overview of the relevant resources, tools, and initiatives from our partners and other organisations in the field."

https://www.ellenmacarthurfoundation.org/our-work/activities/circular-economy-in-cities/other-networks-resources

Circular City initiatives, networks, resources, …	
http://www.eurocities.eu/ http://www.eurocities.eu/eurocities/issues/circular-economy-issue	EUROCITIES is a partner of the **urban agenda partnership on CE** as well as being part of the coordination group of the **CE stakeholder platform**. EUROCITIES facilitate sharing of knowledge among cities on CE best practises and case studies. Advocates and represents cities' interest in CE towards the EU institutions. Among its 140 EUROCITIES members, the EUROCITIES task force on CE is a dedicated expert group of cities which meets frequently to share knowledge on their progress towards a more circular city. The meetings are an opportunity to learn from best practises and to exchange on how to overcome barriers posed by the linear economy model.
https://www.circle-economy.com/ https://www.circle-economy.com/programmes/cities	The CIRCLE ECONOMY member community is an active group of businesses and institutions that have a shared ambition to make the CE a reality. CIRCLE ECONOMY offers insights, reports and publications as well as a knowledge hub, where it is possible to explore, search, and find inspiring examples of the CE in practice.

	The CIRCLE CITY PROGRAMME accelerates the transition towards circular cities throughout the following core services: ◦ **Circle City Scan -** is a fact-based innovation and transformation process based on a local multi-stakeholder model that aims to develop practical and scalable solutions in cities to accelerate the transition to a circular economy. ◦ **Thriving Cities Initiative** - is designed to be a journey for cities to explore and embrace a vision for a thriving city that appreciates what makes cities unique while understanding its global influence and responsibility. ◦ **Capacity Building and Empowerment** – transformative change towards truly circular cities requires engagement and action throughout the city. ◦ **Measuring Circular Employment in Cities** - Support cities answer questions related to where there is potential for the CE to create jobs, and what skills are needed to execute them using our circular employment metrics and methodologies. Measuring the current state of circular jobs of a city or region can help to inform education, training, and talent policy in order to foster a CE that works for all.
Circularity Gap Report Initiative CGRi https://www.circularity-gap.world/	In context with CIRCLE ECONOMY the **CGRi** – Circularity Gap Report Initiative – has to be mentioned. In 2017 they recognised the need to measure the CE. In 2018 the first report was published, the second in 2019 followed by the 2020 report. Also country reports can be ordered – Austria and the Netherlands already did this; one for Norway is announced.
C40 CITIES https://www.c40.org/	**C40** is a network of the world's megacities committed to addressing climate change. C40 supports cities to collaborate effectively, share knowledge and drive meaningful, measurable and sustainable action on climate change. **C40** has multiple research projects and networks exploring how city governments can take a lead in the transition to a CE, and provides tools, knowledge sharing and support

	for cities to plan, measure and implement action.
 https://www.circulareconomyclub.com/ https://www.circulareconomyclub.com/circular-cities-week/	The **Circular Economy Club (CEC)** is the international non-profit network of over 4,500 CE professionals and organisations from over 140 countries. CEC is driven by more than 280 Organizers around the globe. These volunteers have opened CEC chapters in their cities in order to raise awareness of the CE and bring together the local community to start proposals for the design and implementation of a local CE strategy. Yearly CEC organises its inaugural "Circular Cities Week" decentralized global event. In 2019 this was celebrated from Oct. 28 to Nov. 3. The goal: to push, with a united voice, for the design and implementation of circular economy strategies in cities worldwide. Over 80 CEC Chapters signed up to organize workshops to identify opportunities and next steps to encourage implementation of the circular economy in their cities.
 https://fab.city/	**Fab City Network** - Core to the initiative is a network of cities, regions and countries that have pledged to work towards producing everything they consume by 2054. The initiative is enabling this shift away from the industrial paradigm of Product-in Trash-out, by enabling the return of manufacture to cities supported by a Data-in Data-out urban model. Citizens, FabLabs and City officials collaborate locally to implement new urban models through interventions in governance and policy.

1.3 Project Funding Programmes

Project funding programmes

Interreg Europe - https://www.interregeurope.eu/

Interreg Central Europe - https://www.interreg-central.eu/Content.Node/home.html

Interreg Danube Transnational Programme - http://www.interreg-danube.eu/

Interreg Baltic Sea Region - https://www.interreg-baltic.eu/home.html

…

URBACT Driving change for better cities

https://urbact.eu/

https://urbact.eu/circular-economy

"URBACT's mission is to enable cities to work together and develop integrated solutions to common urban challenges, by networking, learning from one another's experiences, drawing lessons and identifying good practices to improve urban policies."

URBACT topics are:

Concerning CE URBACT writes: "Cities are heavily dependent on external resources to meet the demands of their citizens. At the same time, cities are also responsible for the largest amount of generated waste. Urban administrations therefore have a crucial role in the development of the circular economy, where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimised."

Information concerning the following topics are provided:

<table>
<tr><td colspan="2">

- Related networks
- Related good practices
- Latest activities
- Events

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ESPON EUROPEAN UNION
Co-financed by the European Regional Development Fund
Inspire Policy Making with Territorial Evidence

https://www.espon.eu/

CE – CIRCTER

https://www.espon.eu/circular-economy

https://www.espon.eu//sites/default/files/attachments/CIRCTER%20Policy%20guide.pdf

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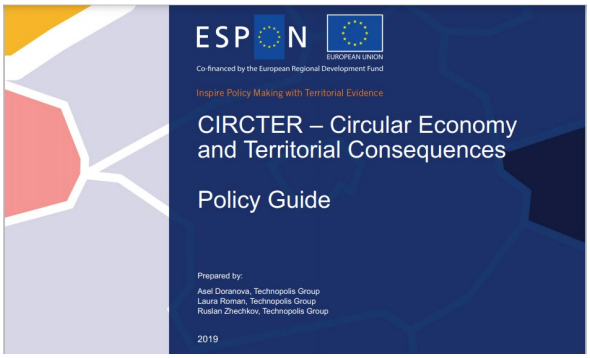
ESPON delivers territorial evidence for actual policy needs in various areas. The subjects of the user oriented research projects are defined by the European Union, the 32 member states of the ESPON programme or even directly by local authorities via so called analysis proposals. This is to guarantee a high usability for the European policy makers who can use ESPON evidence as input to e.g. local development plans.

ESPON projects are divided into long term general "Applied Research Projects" and more specific "Targeted Analyses".

One of Applied Research Projects was dealing with CE: CIRCTER - Circular Economy and Territorial Consequences. A Policy Guide was published in October 2019:



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2. In depth information on "knowledge" bases

2.1 European Commission

2.1.1 European Circular Economy Action Plan

https://ec.europa.eu/environment/circular-economy/

A new Circular Economy Action Plan for a Cleaner and More Competitive Europe

"The European Commission has adopted a new Circular Economy Action Plan - one of the main blocks of the European Green Deal, Europe's new agenda for sustainable growth.

The new Action Plan announces initiatives along the entire life cycle of products, targeting for example their design, promoting circular economy processes, fostering sustainable consumption, and aiming to ensure that the resources used are kept in the EU economy for as long as possible.

It introduces legislative and non-legislative measures targeting areas where action at the EU level brings real added value."

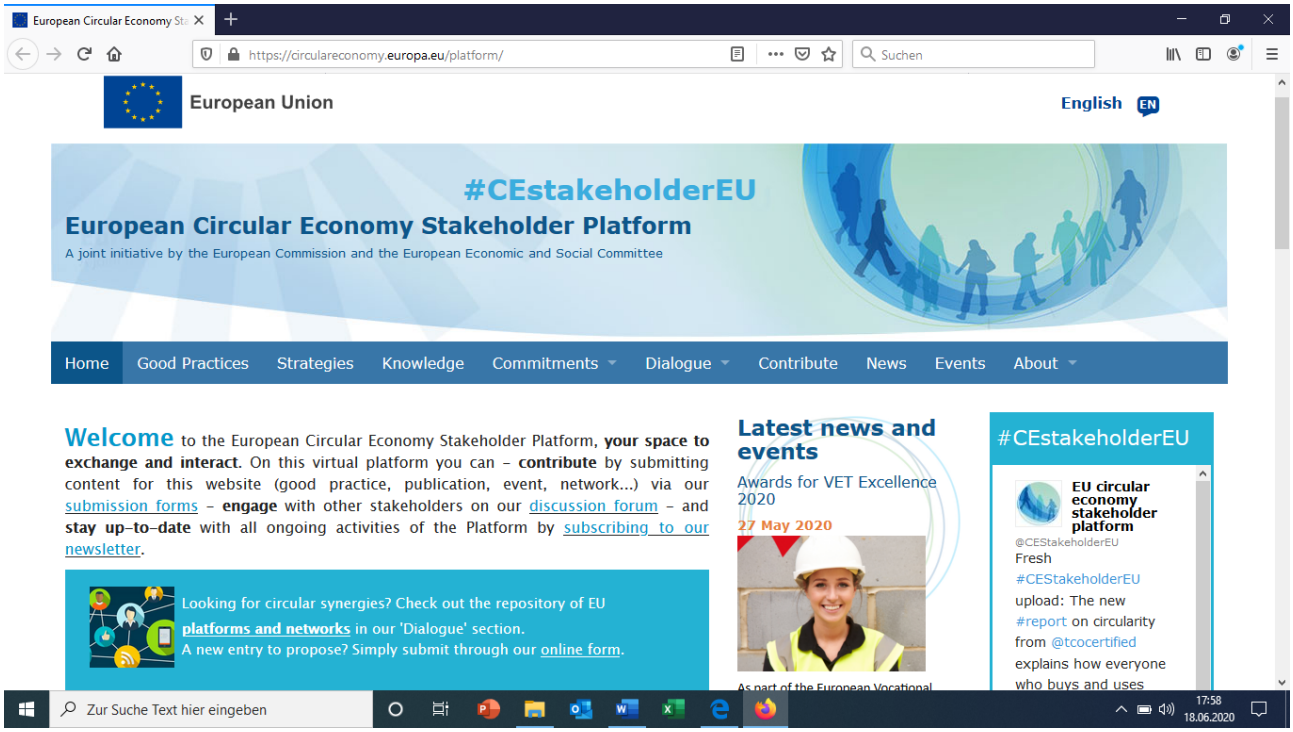
2.1.2 European Circular Economy Stakeholder Platform

https://circulareconomy.europa.eu/platform/

A joint initiative by the European Commission and the European Economic and Social Committee:

The virtual platform is a space to exchange and interact. It is a valuable resource to find good practices, publications, information about events, CE networks, … . Via submission forms information can be uploaded. In a discussion forum an exchange with other stakeholders is possible.

A newsletter informs about all ongoing activities of the Platform.



The following information is provided and can be searched by … :

Good Practices	**Search by …**
… relevant practices, innovative processes and 'learning from experience' examples. … All information is provided by the stakeholders themselves who remain responsible for accuracy and veracity of the content. … # 362	… key area … sector … country … type of organisation or company … type of funding … identified challenge … scope
Strategies	**Search …**
… find existing strategies for the transition to a CE adopted at national, regional or local level by public authorities. … # 35	… key area … sector … country … scope
Knowledge	**Search …**
… find knowledge such as studies, reports, presentations and position papers, … submitted by stakeholders.	… type … key area … sector

… # 221	… country … scope
Commitments	**Search …**
… to become circular … # 4	… key area … sector … country … scope
Pledges	**Search …**
… collected under the European Strategy for Plastics in the CE. In January 2018, the European Commission invited stakeholders to submit voluntary pledges to use or produce recycled plastics. The target is that 10 million tonnes of recycled plastics find their way into products in the EU by 2025. … # 46	… type of plastic material … type of pledger … market area
European Circular Economy Networks / Platforms	**Search …**
… different ones – e.g. educational / training, interest group, knowledge community, national or regional, … … # 74	… platform type … key area … sector … country … scope
News	**Search …**
… sorted according to date of publication. … # 218	… key area … sector … country … news type … scope
Events	**Search …**
… calendar of upcoming events on the CE, sorted chronologically. … # 17	… event type … country … key area … sector … scope

2.1.3 Urban Agenda for the EU > Circular Economy

https://ec.europa.eu/futurium/en/circular-economy

The CE Partnership aims to stimulate the re-use, repair, refurbishment and recycling of existing materials and products to promote new growth and job opportunities. The focus will be on: waste management (turning waste into resources), the sharing economy, and resource efficiency.

Members are:

Members		
Urban Areas	**Member States**	**Other participants**
▪ Oslo (NO, Coordinator) ▪ Flemish Region (BE) ▪ Kaunas (LT) ▪ Porto (PT) ▪ Prato (IT) ▪ The Hague (NL)	▪ Finland ▪ Greece ▪ Poland ▪ Slovenia	▪ European Commission (DG REGIO, DG ENV, DG CLIMA, DG GROW, DG RTD) ▪ Council of European Municipalities and Regions (CEMR) ▪ EUROCITIES ▪ European Investment Bank (EIB) ▪ URBACT ▪ Association of Cities and Regions for sustainable Resource Management (ACR+)

Information can be found on the topics news and events (upcoming and past). A library is provided as well as a blog.

2.2 EIB _ European Investment Bank

2.2.1 Circular economy – one initiative of the EIB

https://www.eib.org/en/about/initiatives/circular-economy/index.htm

"In a circular economy, the value of products and materials is maintained for as long as possible. Waste and resource use are minimised and when a product reaches the end of its life, it is used again to create further value.

The transition towards a circular economy can help reduce environmental impact, but also bring major economic benefits, contributing to innovation, growth and job creation.

The EU bank embraces the potential of a circular economy and we support the public and private sector in their circular transition."

EIB's circular support
▪ **Awareness raising** *develop and share knowledge on the circular economy transition by* ○ improving the framework conditions for financing (e.g. through involvement in multi-stakeholder circular economy fora), ○ facilitating knowledge sharing and capacity building (e.g. in conferences), ○ preparing studies to identify market barriers and funding gaps, ○ preparing circular economy guidance material and documents.
Advisory support *help circular businesses mitigate risks and improve the investment readiness of their projects:* ○ support in circular economy project pipeline development,

- review circular projects, identification of gaps/weaknesses, advise on improvements,
- advise on financing options within and outside the EIB Group,
- facilitate contacts to relevant market actors.

Finance

provide finance to circular economy projects/promoters with a typically higher risk profile:

- leveraging horizontal (market) studies to further define funding gaps,
- recommending internal EIB-managed instruments and/or Investment Platforms (IP), where necessary,
- structuring/implementing Investment Platforms that mobilise public/private investors.

Types of CE projects
Circular design and production Smart design and production that reduce waste and recycle materials at the beginning of a product's lifecycle are essential to ensure circularity. Strategies: reduce, recycle
Circular use and life extension Business models that increase the value and use of a product during an extended life are essential to shift to a circular economy. Over time, extending product life through proper care and repair reduces the need for people to buy more. Strategies: reuse, repair, repurpose, refurbish, remanufacture
Circular value recovery Value recovery models aim to maximise recovery and recycling of a product after its end-of-life stage. The value recovery models reduce waste and conserve resources. Strategies: recycle, recover
Circular support Business models that increase the value and use of a product during an extended life are essential to Support and facilitation of all circular strategies in all lifecycle phases. Strategies: reduce, recycle, reuse, repair, repurpose, refurbish, remanufacture, recover

2.2.2 EIB publications _ further reading – guides, studies, books and stories

Guides, studies, books
EIB _ 15 May 2020 **The EIB Circular Economy Guide - Supporting the circular transition.**
EIB _ 29 January 2020 **Circular Economy Overview 2020.** https://www.eib.org/en/publications/circular-economy-overview-2019
EIB _ 16 October 2019 **The Joint Initiative on Circular Economy.** https://www.eib.org/en/publications/joint-initiative-on-circular-economy "The European Union produces about 2,5 billion tons of waste per year. The Joint Initiative on Circular Economy (JICE) is a partnership between the European Union's largest national promotional banks and institutions and the European Investment Bank to invest at least €10 billion in the circular economy by 2023. This will support projects that prevent and eliminate waste, increase resource efficiency and promote circular business models. Eligible projects can be submitted to the respective JICE partners."
EIB _ 16 October 2019 **The Joint Initiative on Circular Economy.** https://www.eib.org/en/publications/joint-initiative-on-circular-economy "The European Union produces about 2,5 billion tons of waste per year. The Joint Initiative on Circular Economy (JICE) is a partnership between the European Union's largest national promotional banks and institutions and the European Investment Bank to invest at least €10 billion in the circular economy by 2023. This will support projects that prevent and eliminate waste, increase resource efficiency and promote circular business models. Eligible projects can be submitted to the respective JICE partners."
EIB _ 16 October 2019 **The Joint Initiative on Circular Economy.** https://www.eib.org/en/publications/joint-initiative-on-circular-economy "The European Union produces about 2,5 billion tons of waste per year. The Joint Initiative on Circular Economy (JICE) is a partnership between the European Union's largest national promotional banks and institutions and the European Investment Bank to invest at least €10 billion in the circular economy by 2023. This will support projects that prevent and eliminate waste, increase resource efficiency and promote circular business models. Eligible projects can be submitted to the respective JICE partners."
EIB _ 6 December 2018 **The 15 circular steps for cities** https://www.eib.org/en/publications/circular-economy-15-steps-for-cities

"This document outlines problems facing many linear cities today, and argues the case for circular change. It highlights elements that make cities suitable as both cradles and catalysts for a circular transition. The document also provides concrete guidance on how a linear city can start the circular journey, presented in the form of 15 circular steps."
EIB _ 10 December 2015 **Access-to-finance conditions for projects supporting Circular Economy** https://www.eib.org/en/publications/access-to-finance-conditions-for-financing-the-circular-economy "This study, carried out under the InnovFin Advisory mandate, reviews the access-to-finance conditions for the circular economy, in particular three key circular economy business model transitions, and proposes potential solutions that could catalyse investments into the sector."

Highlighted stories
EIB _ 12 December 2019 **Turning reindeer feed into sweets this Christmas**
EIB _ 18 July 2019 **Bread, trains and exfoliating creams**

2.2.3 Circular City Funding Guide

"The Guide was initiated as one of the actions under the Urban Agenda Partnership for CE. The Guide was developed by external service providers and EIB experts mobilised and funded by the European Investment Advisory Hub."

"The Circular City Funding Guide supports municipalities, businesses, and other urban actors in creating circular cities. As an introduction and for context, the Guide describes the potential and benefits of the CE in an urban context.

The main focus of the guide is to

1) provide information on financing and funding sources that are available for circular initiatives and projects, and
2) provide guidelines for setting up funding programmes to support the transition to a CE.

While the name of the guide includes funding, i.e. grant and subsidy types of financial support, the guide itself also covers different types and sources of financing such as debt, equity, and guarantees."

"The **aim** of the Guide is, therefore, **to share knowledge, best practices, and information on circular solutions**, and **on ways to finance the preparation and implementation of such solutions**. The content of the Guide is prepared following an extensive review of existing literature and other resources on this topic. Since the body of knowledge is rapidly growing, we appreciate getting suggestions for updates. Sharing learnings, questions, success stories and anything else around financing of circular economy initiatives in cities is also possible in the LinkedIn group."

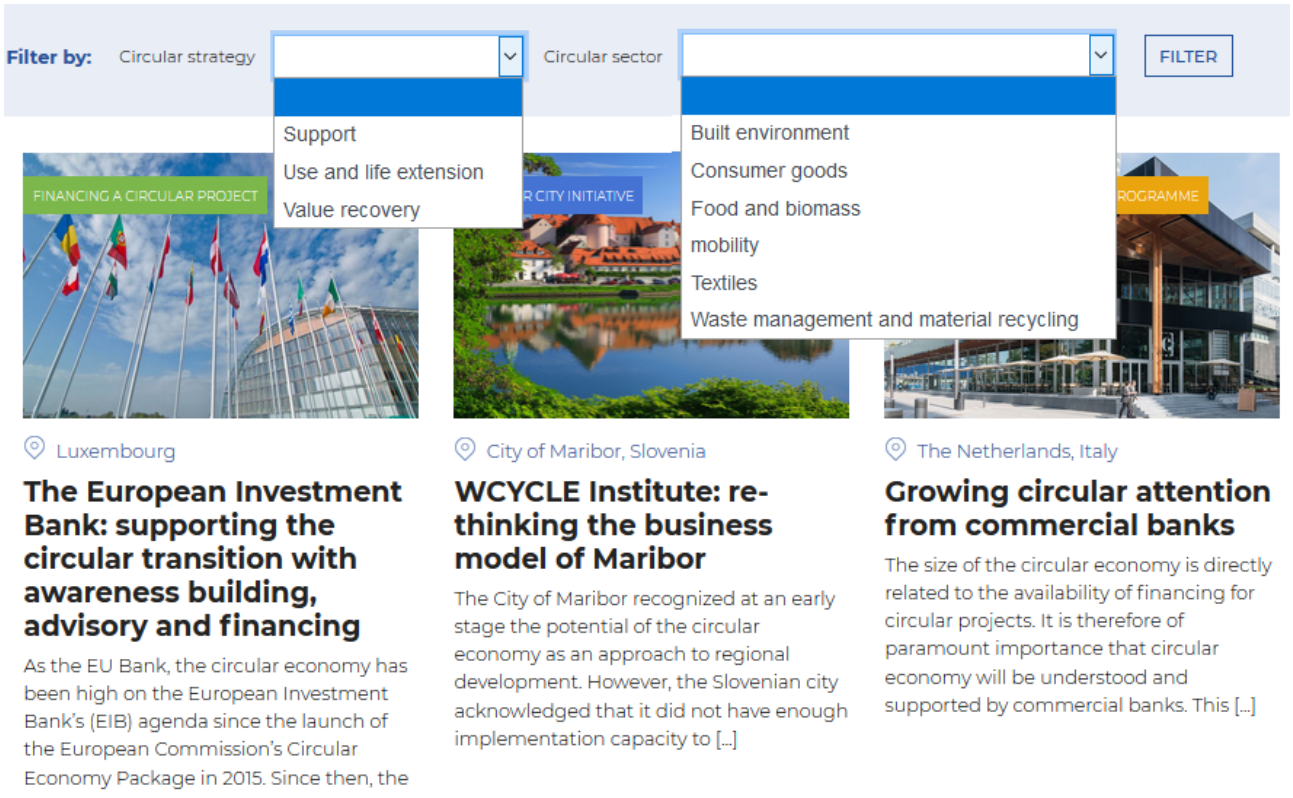
Closer look on **RESOURCES,** which encompasses:

- **Case studies**
- **Library**
- Circular city glossary
- Circular city resources

- **Case studies**

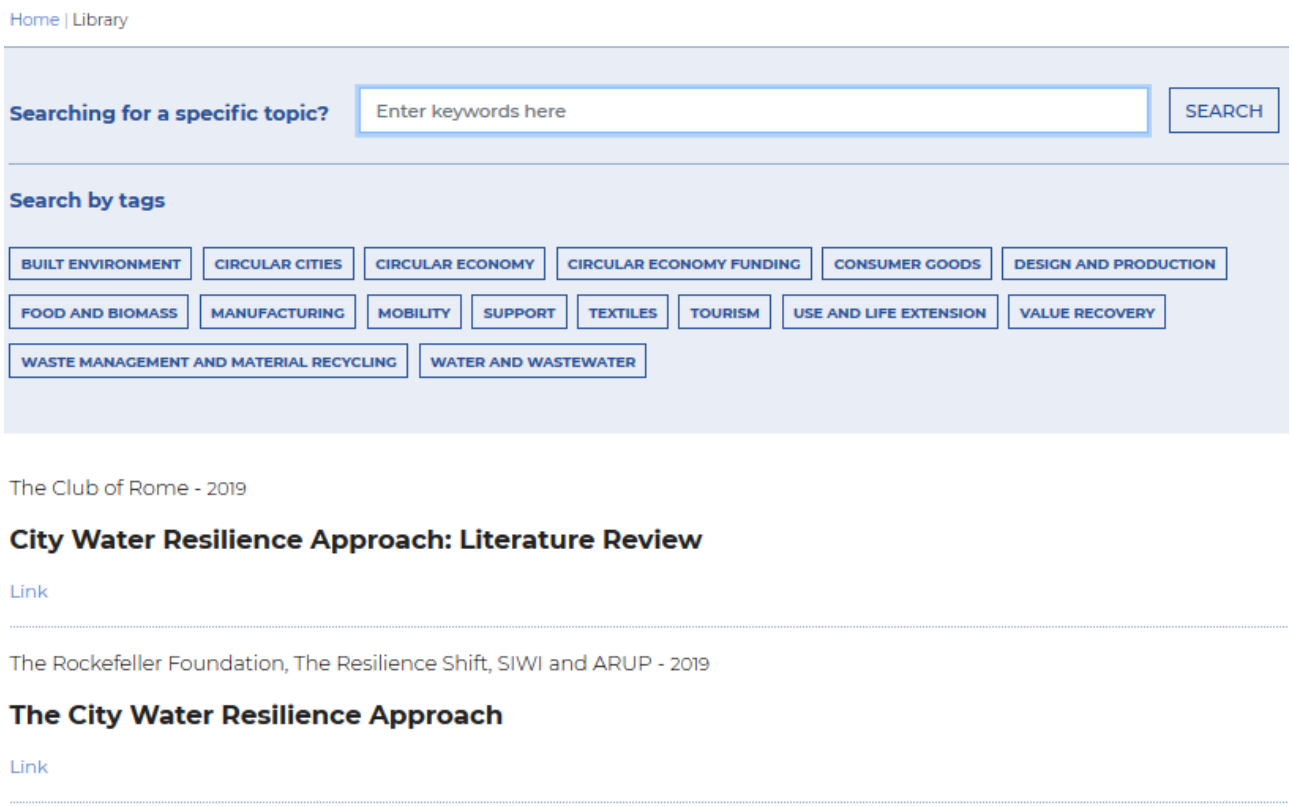
"This part of the Circular City Funding Guide contains a series of case studies that illustrate different practical implications of the CE. These cases come from cities and organisations in different parts of Europe, and cover both funders and fund-seekers."

The following filters can be set:



- **Library**

The library offers a lot of search possibilities:



2.3 EIT Climate KIC

2.3.1 Circular Economy _ one area of focus

https://www.climate-kic.org/areas-of-focus/circular-economy/

"EIT Climate-KIC empowers entire countries, regions, industries and communities to implement a bold transition towards circular economy. To us, this means combining a portfolio of tailored actions **across policy, finance, education, entrepreneurship** and **innovation** to change whole systems from linear to circular."

"The CE is a powerful tool to help communities transition to climate-friendly, regenerative and resilient economies.

We contribute to these systems change by:

- Reshaping **European policy** and public funding
- Supporting the transformation of the **private financial sector**
- Orchestrating all actors needed for **systemic transformation**
- Producing **thought leadership** on Circular Economy transition
- Developing scientific methodologies for **participatory engagement**
- Transforming industrial **value chains**

- Building **networks of actors** to address specific challenges"

2.3.2 Circular Cities Project (Start: April 2018 – December 2019)

https://nordic.climate-kic.org/success-stories/circular-cities-project/

"Cities across Europe now unite in a project with the aim of developing a shared circular economy approach to urban development. The aim of the project is to identify best practices and act as city role models to engage other cities on the track towards circularity."

Several reports have been produced:

- The challenges and potential of circular procurements in public construction projects
- Municipalities as drivers for circular economy in refurbishment and construction projects
- Municipality-led circular economy case studies
- Transforming Municipality Districts into Learning Centres of Circular Economy
- Circular Cities – A practical approach to develop a city roadmap focusing on utilities

Three webinars have been produced:

https://vimeo.com/showcase/6625715

Engage with Circular Economy…

Climate-KIC

Circular Cities Webinar 1: Connecting start-ups and Cities Hosted by Cleantech Bulgaria and 2Ei Veolia....

Engage with Circular Economy…

Climate-KIC

Circular Cities Webinar 2: Circular Economy in Cities Hosted by the City of Helsinki and C40 Cities, with...

Engage with Circular Economy…

Climate-KIC

Circular Cities Webinar 3: Circular Materials Hosted by the City of Copenhagen and the City of Malmö. Webi...

2.4 OECD

2.4.1 The Circular Economy in Cities and Regions

http://www.ecd.org/cfe/regionaldevelopment/circular-economy-cities.htm

Transitioning to a circular economy is key for a prosperous, inclusive and sustainable future.

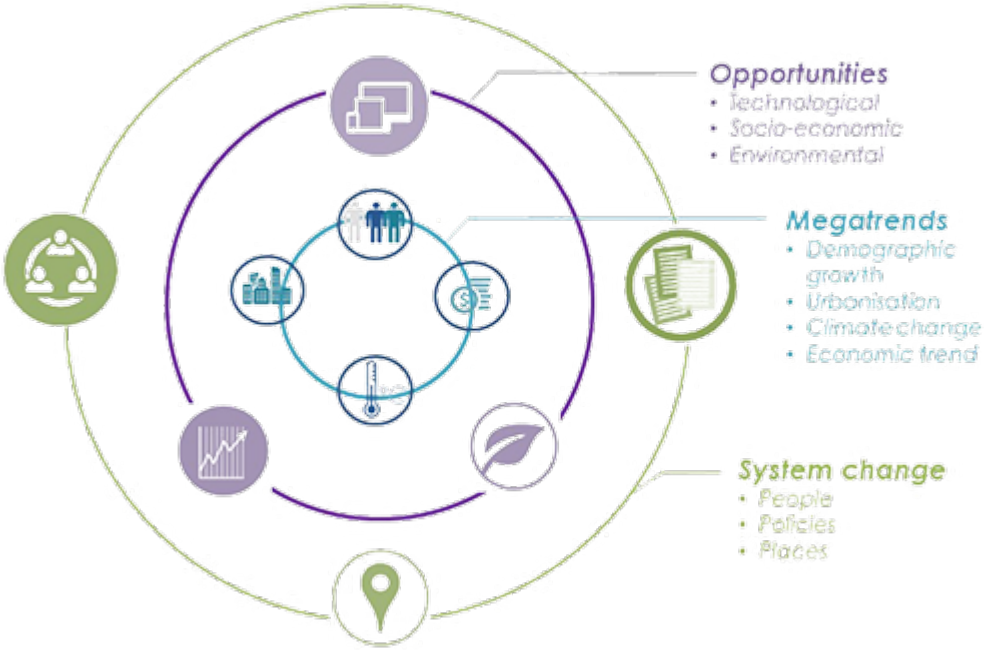
"Today, cities demand almost two-thirds of global energy, produce up to 80% of greenhouse gas emissions and 50% of global waste. The circular economy can provide a policy response to cope with the above challenges, as a driver for economic growth, jobs and environmental quality.

Cities and regions have a key role to play as promoters, facilitators and enablers of circular economy. Adequate economic and governance conditions should be in place to unlock its potential."

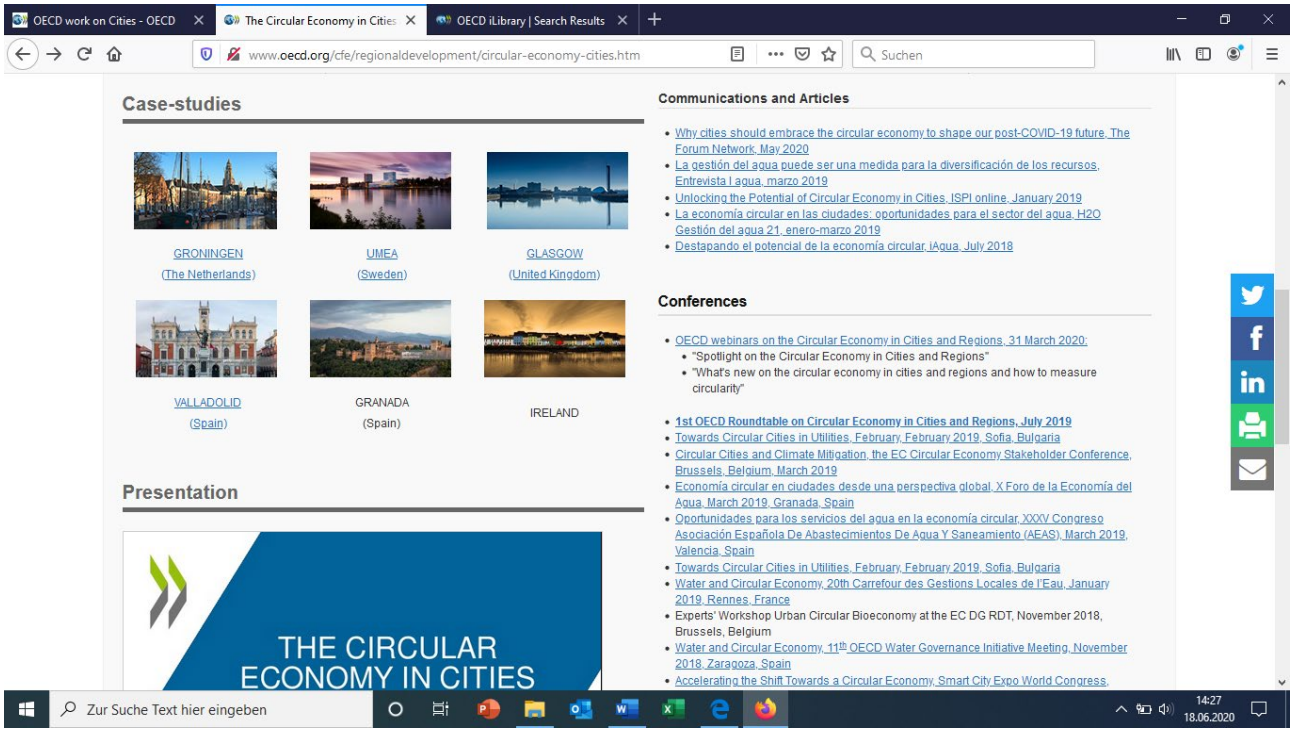
"The OECD Programme on the CE in Cities and Regions supports cities and regions in their transition towards a circular economy, through:

- *Measuring*: developing an indicator framework for decision making and evaluation of CE strategies
- *Learning*: engaging multi-level dialogues in cities and regions to identify challenges and opportunities
- *Sharing*: favouring peer-to-peer learning, best practice and lessons from international experience"

The conceptual framework for CE in cities and regions :

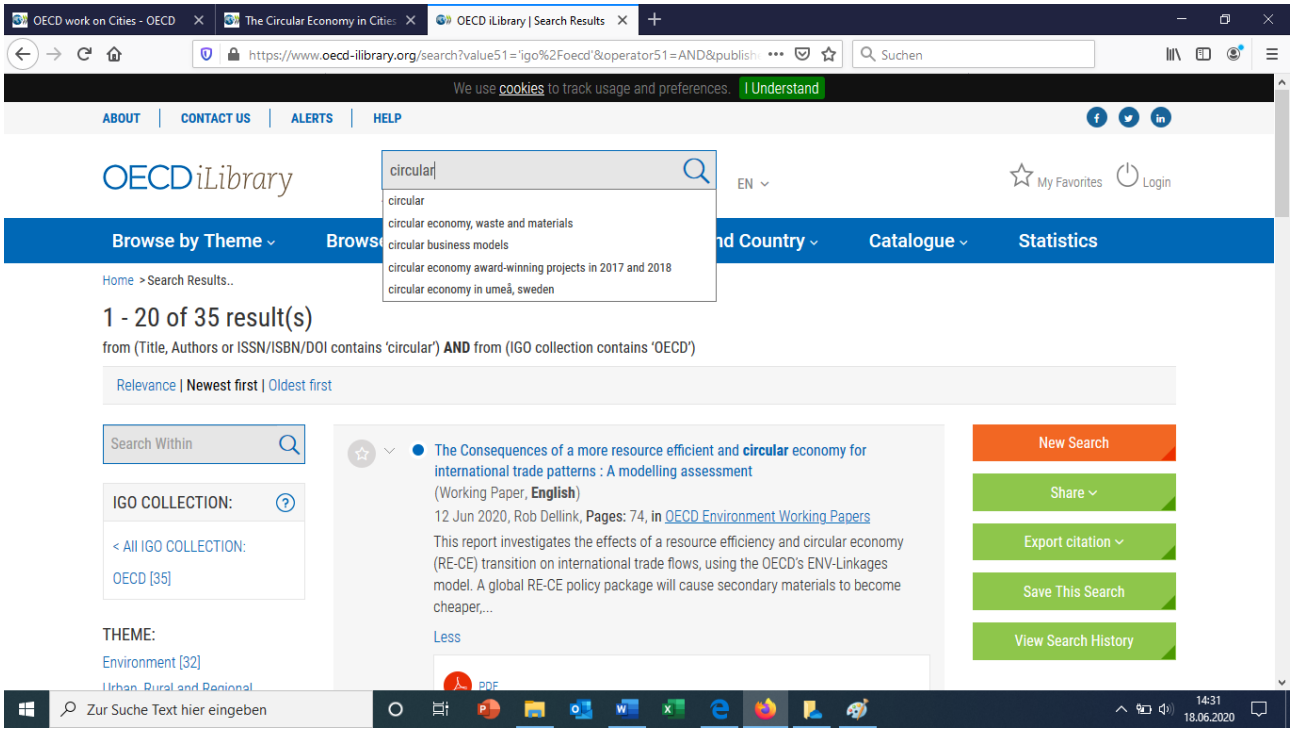


Via website case-studies, communications and articles and information about conferences are provided:



2.4.2 OECD iLibrary

Searching for CIRCULAR in the OECD iLibrary the following categories are given:



2.5 Ellen MacArthur Foundation

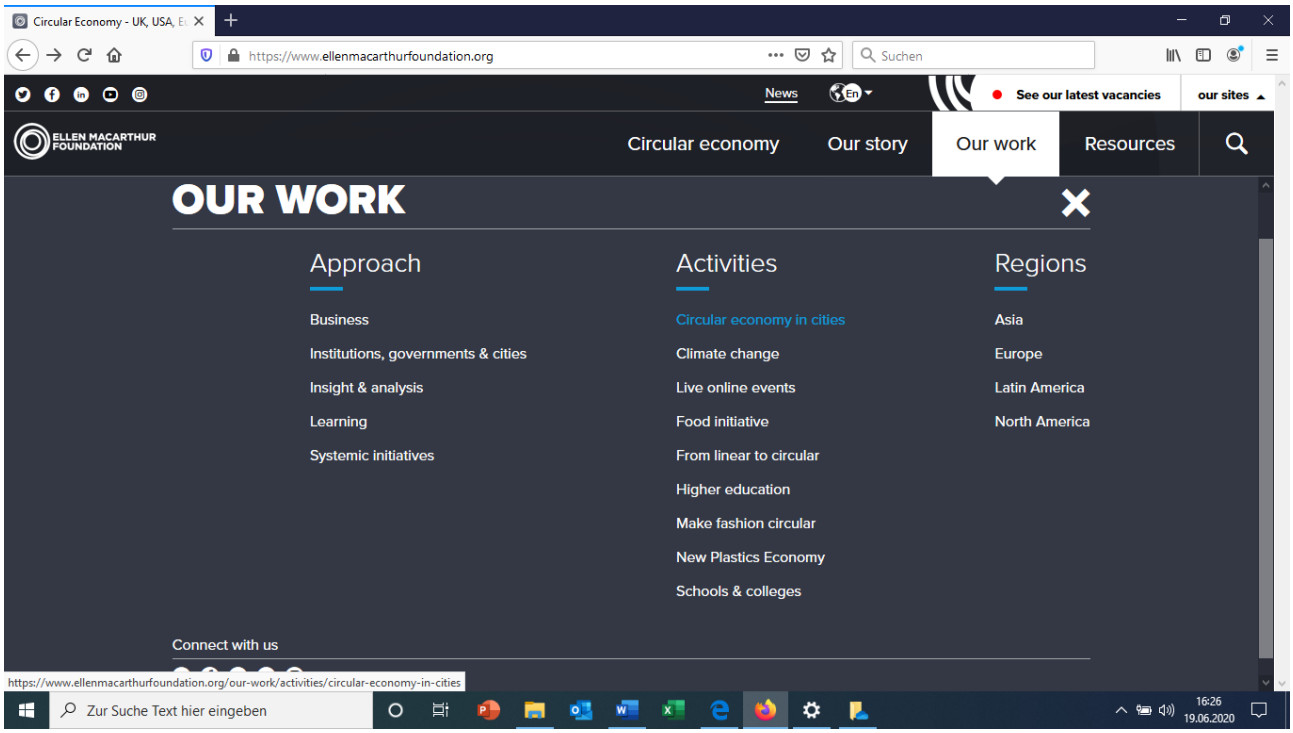
2.5.1 Ellen MacArthur Foundation

https://www.ellenmacarthurfoundation.org/

The Ellen MacArthur Foundation was launched in 2010 to accelerate the transition to a CE. Since its creation the charity has emerged as a global thought leader, establishing the CE on the agenda of decision makers across business, government, and academia. With the support of its strategic partners, the Foundation's work focuses on six interlinking areas:

- **Learning** - Developing the vision, skills and mindsets needed to transition to a CE
- **Business** - Catalysing circular innovation and creating the conditions for it to reach scale
- **Institutions, Governments and Cities** - Creating the enabling conditions for a circular economy to thrive
- **Insight and Analysis** - Providing robust evidence about the benefits and implications of the transition
- **Systemic Initiatives** - Transforming key material flows to scale the CE globally
- **Communications** - Engaging a global audience around the CE

The Foundation's work is shown on the following screenshot:

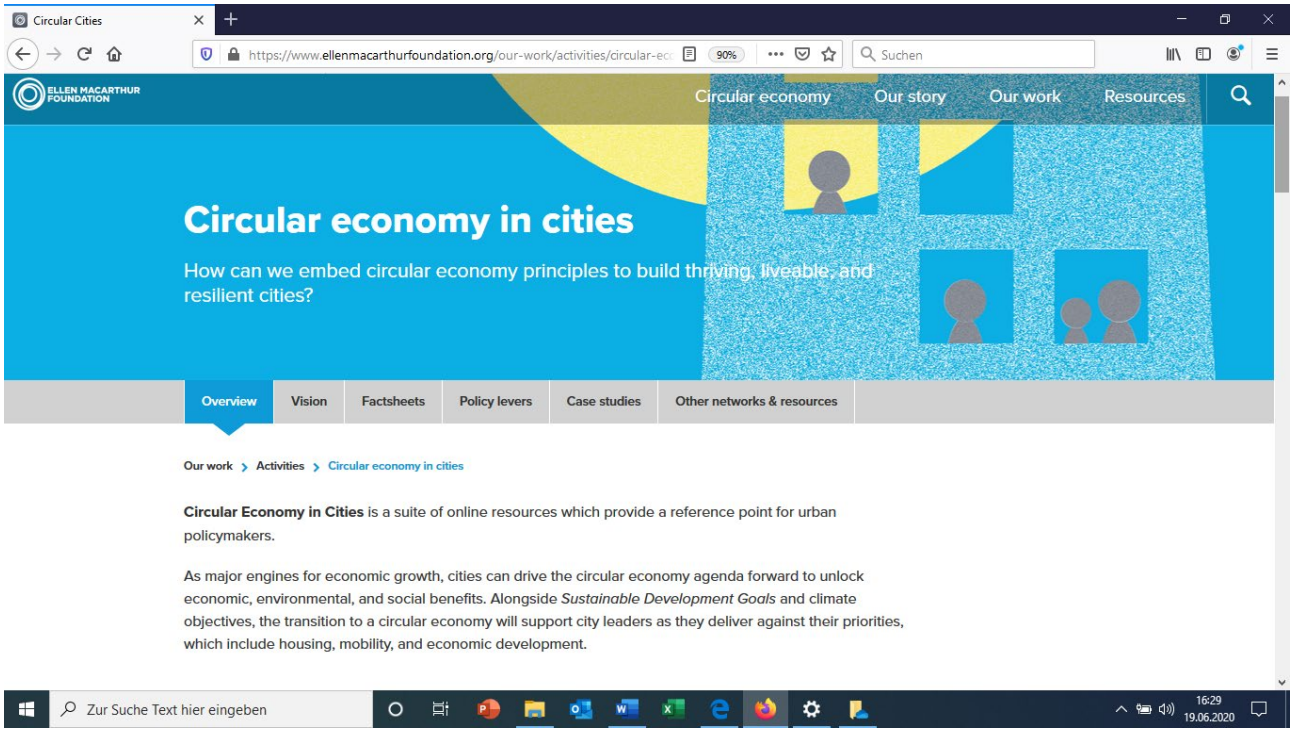


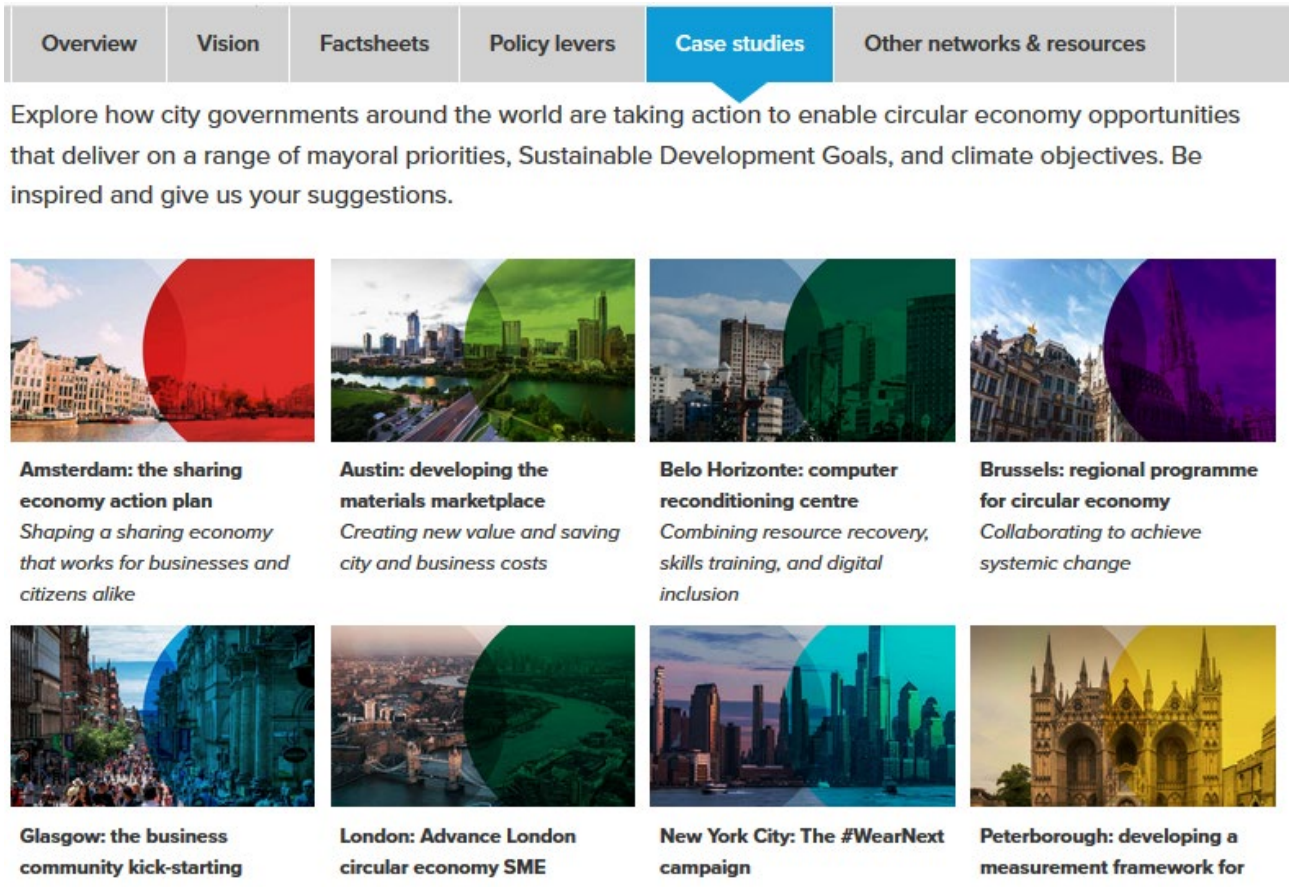
2.5.2 Circular Economy in Cities

https://www.ellenmacarthurfoundation.org/our-work/activities/circular-economy-in-cities

The question is: "How can we embed circular economy principles to build thriving, liveable, and resilient cities?"

Ellen MacArthur Foundation developed a vision, offers factsheets for the interrelated urban systems – buildings, mobility and products, deals with policy levers (see chapter xxxxxx), publishes case studies.


Circular Cities
https://www.ellenmacarthurfoundation.org/our-work/activities/circular-ec
Suchen
ELLEN MACARTHUR FOUNDATION
Circular economy
Our story
Our work
Resources
Circular economy in cities
How can we embed circular economy principles to build thriving, liveable, and resilient cities?
Overview
Vision
Factsheets
Policy levers
Case studies
Other networks & resources
Our work › Activities › Circular economy in cities
Circular Economy in Cities is a suite of online resources which provide a reference point for urban policymakers.
As major engines for economic growth, cities can drive the circular economy agenda forward to unlock economic, environmental, and social benefits. Alongside Sustainable Development Goals and climate objectives, the transition to a circular economy will support city leaders as they deliver against their priorities, which include housing, mobility, and economic development.
Zur Suche Text hier eingeben
16:29
19.06.2020


Overview
Vision
Factsheets
Policy levers
Case studies
Other networks & resources
Explore how city governments around the world are taking action to enable circular economy opportunities that deliver on a range of mayoral priorities, Sustainable Development Goals, and climate objectives. Be inspired and give us your suggestions.
Amsterdam: the sharing economy action plan
Shaping a sharing economy that works for businesses and citizens alike
Austin: developing the materials marketplace
Creating new value and saving city and business costs
Belo Horizonte: computer reconditioning centre
Combining resource recovery, skills training, and digital inclusion
Brussels: regional programme for circular economy
Collaborating to achieve systemic change
Glasgow: the business community kick-starting
London: Advance London circular economy SME
New York City: The #WearNext campaign
Peterborough: developing a measurement framework for

2.6 ACR+'s Circular Europe Network

2.6.1 ACR _ Association of Cities and Regions for sustainable Resource management

https://www.acrplus.org/en/

"ACR+ is an international network of cities and regions sharing the aim of promoting a sustainable resource management and accelerating the transition towards a CE on their territories and beyond.

ACR+ is open to other key players in the field of material resource management such as NGOs, academic institutions, consultancy or private organisations."

"ACR+, the Association of Cities and Regions for sustainable Resource management, wants to support local and regional authorities in being ambitious on CE and will therefore support and help them to adopt aspiring CE strategies. That is why ACR+ decided to launch a specific project on CE planning by cities and regions: the Circular Europe Network (CEN)."

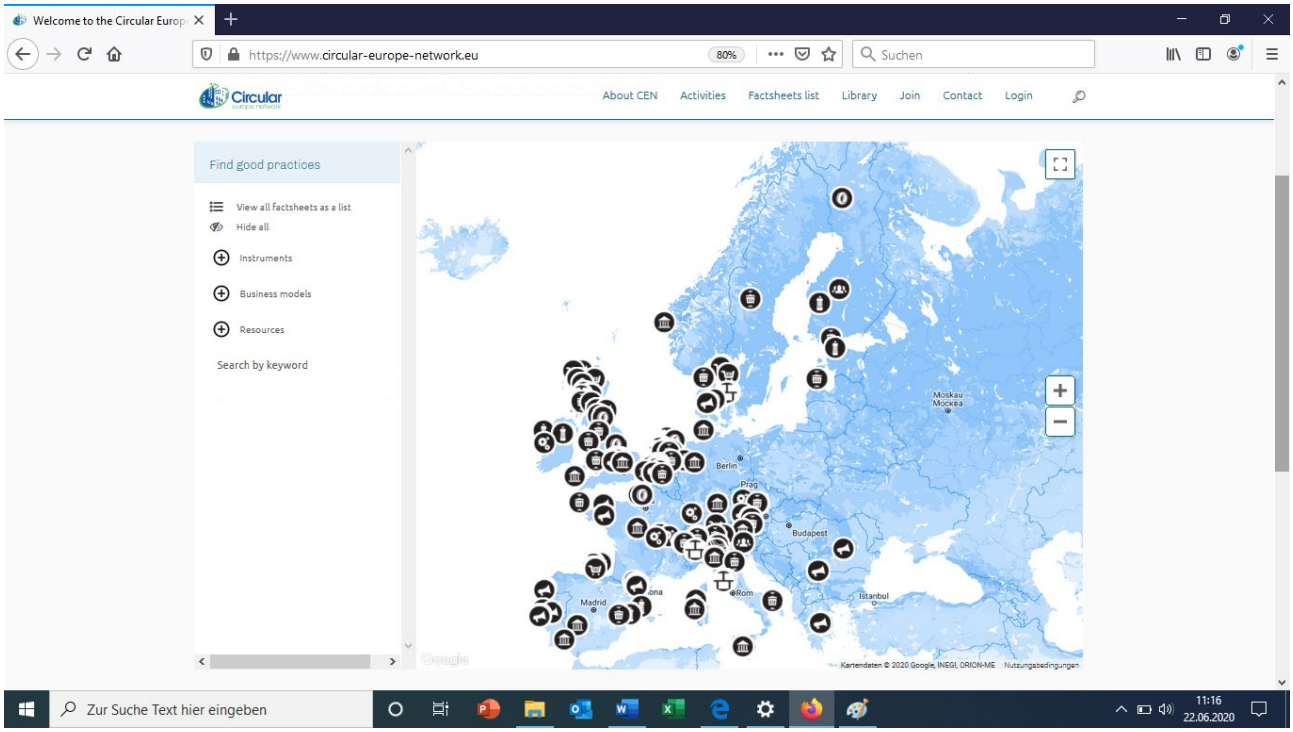
2.6.2 Circular Europe Network (CEN)

https://www.circular-europe-network.eu/

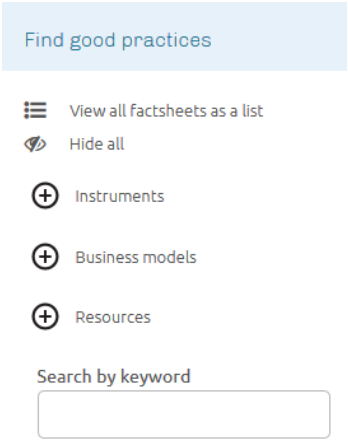
The CEN "gathers ACR+ members committed to improve their resource strategies and strengthen the sustainable development of their territory. The Circular Europe Network builds on the expertise of European front runners within the ACR+ network in order to gather, analyse and exchange information on efficient circular economy strategies implemented by cities and regions.

Based on ACR+ vision for CE, CEN aims to work on the priorities defined by its members, delivering methodological tools and access to good practices on those priorities. The CEN currently focuses of the governance of CE, public procurement and indicators to monitor CE transition."

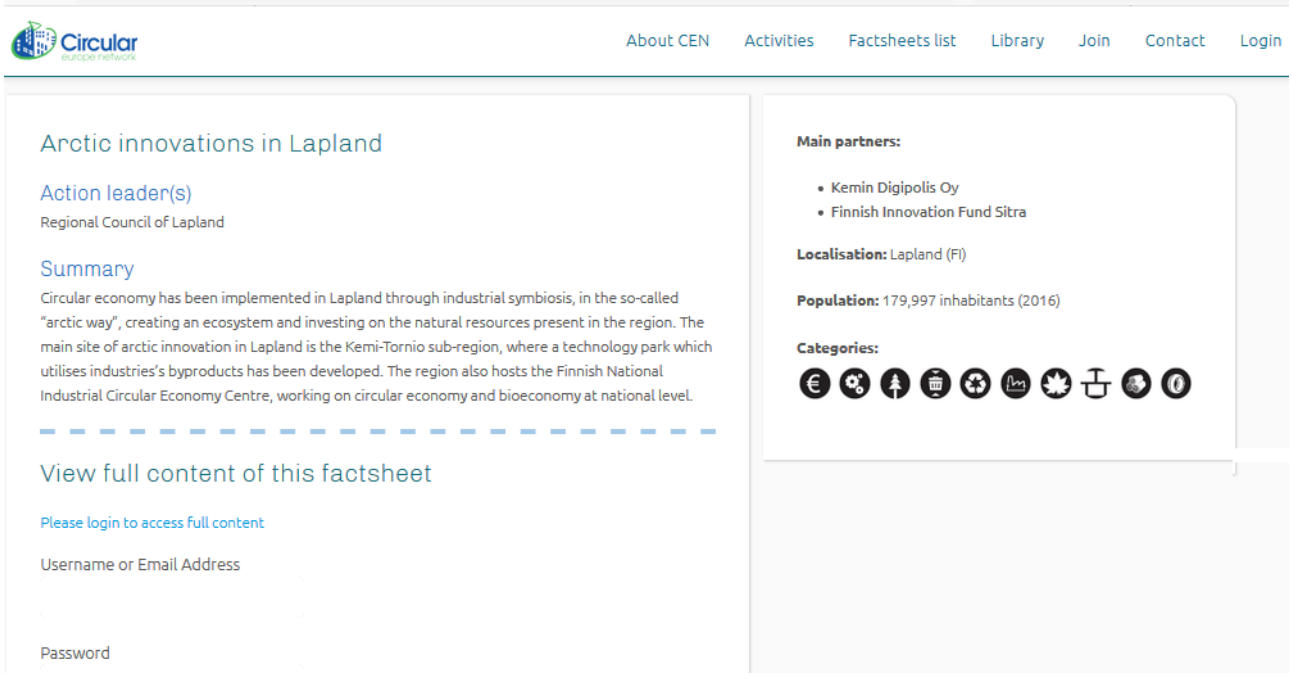
Through CEN, best practices on CE from cities and regions are shared. The cases can be browsed on a map and by category. Factsheets describe the nature of the projects and the actors that are involved.



The following search functions are offered:



A factsheet looks like this – to view the full content a login is necessary:



2.7 World Business Council for Sustainable Development _ WBCSD

2.7.1 WBCSD _ circular economy

https://www.wbcsd.org/

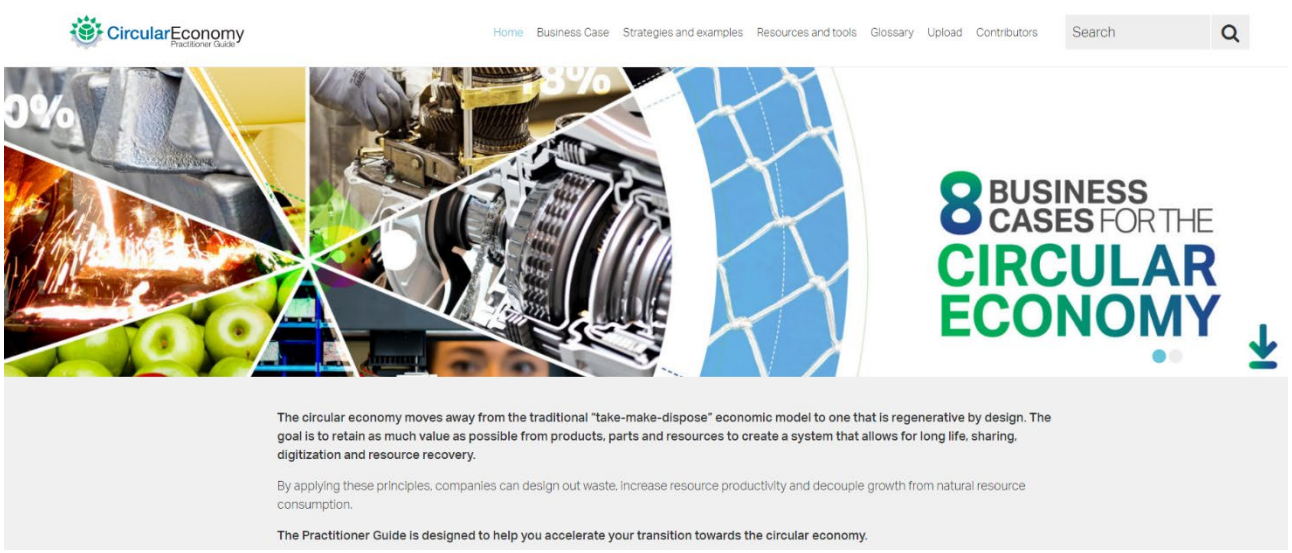
"Under the leadership of WBCSD's Executive Committee, over three dozen member companies from 16 countries, representing more than ten industry sectors and with a combined USD $2 trillion in annual revenue, have signed up to lead this project. To help guide and inform these efforts, WBCSD has also assembled an external review committee comprised of a diverse collection of global thought-leaders and experts. The result is a collective, business-led effort to shape how business can help to unlock the transformations that are needed to allow over 9 billion people to live well, within the boundaries of the planet by mid-century."

https://www.wbcsd.org/Overview/About-us/Vision-2050-Refresh

2.7.2 WBSCD _ Circular Economy Practitioner Guide

https://www.ceguide.org/

The Circular Economy Practitioner Guide is designed to help in the acceleration of the transition towards circularity. The website offers resources related to different stages of the production phase and shares circular strategies and business cases.

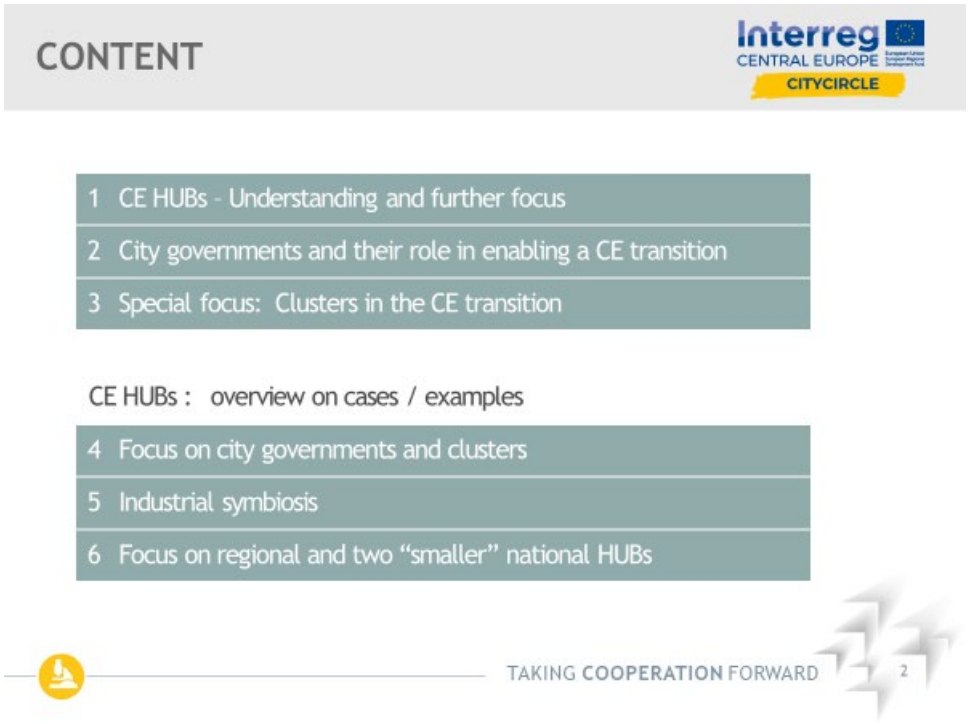

CircularEconomy
Practitioner Guide
Home
Business Case
Strategies and examples
Resources and tools
Glossary
Upload
Contributors
Search
8 BUSINESS CASES FOR THE CIRCULAR ECONOMY
The circular economy moves away from the traditional "take-make-dispose" economic model to one that is regenerative by design. The goal is to retain as much value as possible from products, parts and resources to create a system that allows for long life, sharing, digitization and resource recovery.
By applying these principles, companies can design out waste, increase resource productivity and decouple growth from natural resource consumption.
The Practitioner Guide is designed to help you accelerate your transition towards the circular economy.

III. Circular Economy HUBs / Circular Economy City (Models) – presentation, trainings/ webinars and materials

An information package on the topic HUBs was provided upfront the trainings/ webinars to the project partners:

- CITYCIRCLE presentation ***WP T2 – CE Hubs – Examples, Structure & Services, Economic Sustainability*** – https://www.interreg-central.eu/Content.Node/CITYCIRCLE/D.T2.2.4-CE-HUBS-2020-03-30.pdf

The content is the following:



In the following chapters only the central content from the *CITYCIRCLE HUBs* presentation is presented here.

This content is complemented by the 3 webinars on good practices on "How to setup CE HUBs" practices from Maribor (Slovenia), Flanders (Belgium) and Kemi (Finland).

1. Circular Economy Hubs

1.1 Circular Economy HUBs - Understanding in CITYCIRCLE

- **Application - Objectives, project relevance & approach**

Objective 1	Specific objectives
Setting-up quadruple-helix CE hubs in partner cities - non-metropolitan cities of Central Europe in order to establish linkages among key CE stakeholders (companies, public administration, universities and citizens).	All partner cities are dedicated to improve their innovative capacities by interlinking key innovation actors (public administration, companies, public utilities, R&D institutions, end-users) into CE hubs. These new innovation networks (or existing networks transformed) will provide a space for designing new solutions in the CE field – material, waste, water, energy, soil,

	food circles supported by business models (PPPs, new value-chains, new services, policy solutions…). …
Objective 2	**Specific objectives**
Enabling and facilitating the innovation processes in CE cities by educating quadruple-helix stakeholders and providing tools for the management of efficient CE innovation processes and to deploy CE solutions.	Since the concept of CE is new to many stakeholders in partner cities, building a knowledge base in newly-established hubs is necessary to enable them to work in the field. A set of tools will be provided to equip hubs with guidelines at the development of CE solutions. They will provide instructions and tips on how to design value-chains in CE and will also give RIS3 national strategy framework and showcases from all partner countries.
Project relevance	
By establishing CE quadruple-helix hubs as local innovation networks of private and public institutions in partner cities, CITYCIRCLE will provide innovation systems to facilitate innovation and transfer of technology, services and business models. By providing hubs with tools and knowledge, the project will enable the hubs to generate innovative solutions in CE in their urban ecosystems in a long-run.	
Project approach	
CITYCIRCLE will provide cities with organizational infrastructure (quadruple-helix circular economy hubs), knowledge and tools (implementation kit, trainings) and assistance with design of local CE solutions - a bottom-up support to their RIS3 and their physical implementation on a project level. Thus, CITYCIRCLE is placing the cities and their administrations in a heart of CE ecosystems and is introducing cross-sectorial horizontal approach with quadruple-helix partnership management structure.	

- **Circular Economy HUBs in non-metropolitan cities of Central Europe**

CE HUB _ Understanding	
▪ Where ?	▪ Peripheral urban centres = non-metropolitan cities of Central Europe
▪ Who ?	▪ quadruple-helix - establish linkages among key CE stakeholders ➔ **public administration**, companies, public utilities, universities, R&D institutions, citizens
▪ What ?	▪ improve innovative capacities ▪ cross-sectorial horizontal approach
▪ By establishing CE quadruple-helix HUBs as local innovation networks of private and public institutions in partner cities. ▪ These new innovation networks (or existing networks transformed) will provide a space for designing new solutions in the CE field – material, waste, water, energy, soil, food circles supported by business models (PPPs, new value-chains, new services, policy solutions…).	
▪ CITYCIRCLE will provide cities with organizational infrastructure (quadruple-helix CE HUBs), knowledge and tools (implementation kit, trainings) and assistance with design of local CE solutions - a bottom-up support to their RIS3 and their physical implementation on a project level.	

1.2 Classification of cities when examining literature, cases and examples

- **Why is a classification of cities needed ?**

"Cities are different. So are solutions."

"The prospect of urban innovation excites the imagination.
But dreaming up what a "Circular City" will look like in some gleaming future is,
by its nature, a utopian exercise. The fact is that no two cities are same,
what's appealing for the young in Copenhagen
certainly won't help millions of workers in Dhaka or Lagos."

cscp I Bertelsmann (2019), p 21

- **Different classification approaches**

Different classification approaches exist, one is e.g.

- **Circular Economy city framework – four quadrants**

cscp I Bertelsmann (2019) use four segments following two distinctions:

- legacy vs. pioneering cities, and
- developed vs. emerging economies.

and use the framework to document how various cities across the globe are in-corporating principles of CE into a city framework.

Figure 1: Four quadrants – integration of CE principles into a city framework

Source: cscp I Bertelsmann (2019), p 21

In the quadrant *emerging economy and pioneering* the city of Maribor is included because of their initiative:

> "The city of Maribor in Slovenia is redirecting its operations, the performance of its businesses and citizens, toward the efficient resource management model."

Figure 2: Emerging economy and pioneering city

Source: cscp I Bertelsmann 2019, p 21

- **City levels – capitals, major cities, capitals**

The Ellen MacArthur Foundation (March 2019) uses in their publication "City Governments and their Role in Enabling a Circular Economy Transition – an Overview of Urban Policy Levers" the following classification of city levels:

- Capitals
- Major cities
- Smaller cities

They included "Over 100 cases from more than 70 cities around the world … to provide short, practical examples of the various policy steps …" (Ellen MacArthur Foundation March 2019: p 9.). Also mentioned are the regional and national level.

- **References**

Books/ articles/ papers
cscp I Bertelsmann (2019) Monitor Sustainable Municipalities. Report 2019: Key topic Circular Economy. Gütersloh, Germany: November 2019. https://www.bertelsmann-stiftung.de/fileadmin/files/Projekte/Monitor_Nachhaltige_Kommune/MNK_Bericht2019_CircularEconomy_englisch_2.pdf
Ellen MacArthur Foundation (March 2019) City Governments and their Role in Enabling a Circular Economy Transition – an Overview of Urban Policy Levers. https://www.ellenmacarthurfoundation.org/assets/downloads/CE-in-Cities_Policy-Levers_Mar19.pdf

1.3 Enablers of CE transition to a Circular City

1.3.1 City governments and their role

"City governments have a key role to play in building thriving, liveable, resilient cities that are regenerative by design." (Ellen MacArthur Foundation (March 2019)

In our presentation "CE HUBs" we introduced three approaches for city governments:

- **Ellen MacArthur – Urban policy levers**
- **European Investment Bank – The 15 circular steps for cities**

and the

- **Urban Agenda for the EU – Circular City Governance – A first guide for poliy makers**

  "Circular Economy is a hot topic for local policy makers. But frontrunners confirm: from first interest to the implementation of a circular strategy is a huge step. The current cases and studies mostly focus on facts and results, but what is usually missing is the governance aspect. How can cities support circular models within their current governance? This web page acts as a first guide for policy makers who want to explore circular city governance."

What can a local authority do?

REORGANISE YOUR CITY

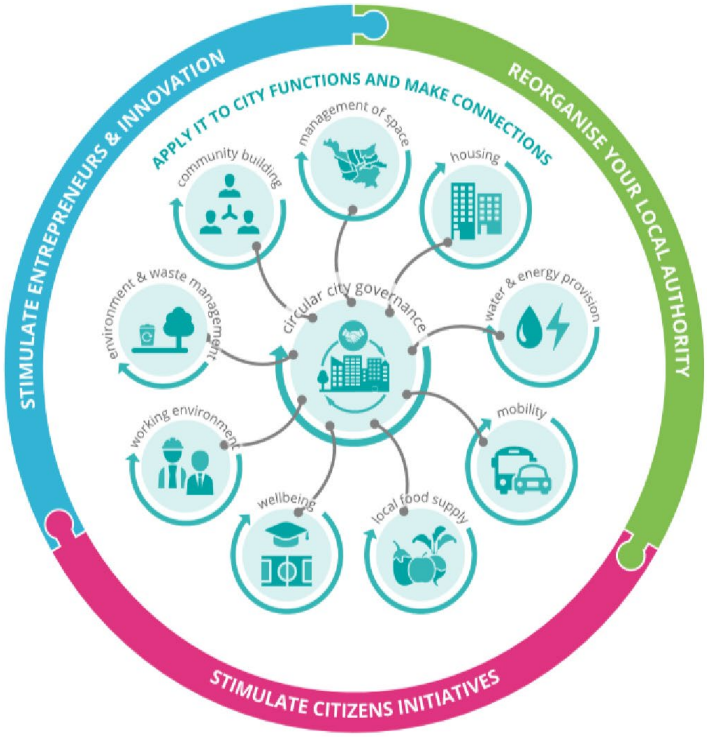
1. Create common long term ambition , with political support & use it in your branding
2. Set up cooperation between city departmants and appoint a coordinator
3. Act circular (circular procurement, futureproof urban planning, sustanable building,...)
4. Get insights in your resources (waste, water, materials,...)

STIMULATE CITIZENS INITIATIVES

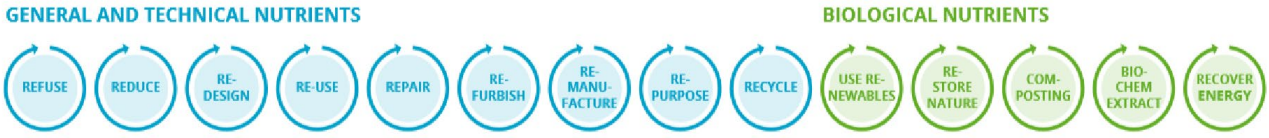
5. Promote sharing & functional economy
6. Raise awareness and coach citizens
7. Support bottom up initiatives through legislation, funding, cooperation, communication,...

STIMULATE ENTREPRENEURS & INNOVATION

8. Stimulate local symbioses through (business park) networks, smart technologies,...
9. Create incentives to attract circular business (offer space, taxes, subsidies,...)
10. Communicate success stories



Circular strategies to focus on



Books/ articles/ papers
European Investment Bank (Dec 2018) The 15 circular steps for cities. https://www.eib.org/attachments/thematic/circular_economy_15_steps_for_cities_en.pdf
Ellen MacArthur Foundation (March 2019) City Governments and their Role in Enabling a Circular Economy Transition – an Overview of Urban Policy Levers. https://www.ellenmacarthurfoundation.org/assets/downloads/CE-in-Cities_Policy-Levers_Mar19.pdf
Urban Agenda for the EU Circular City Governance – A first guide for policy makers. https://vlaanderen-circulair.be/circulargovernance/index.html

1.3.2 Clusters and their role

"With at least 250 green clusters the European clusters have a high potential for pushing the CE forward faster and more efficient.

A new study from Denmark documents that many clusters have an active role in the transition towards a CE. In total 2/3 of the Danish clusters are involved in CE – also indicating that clusters not directly related to the classical green sectors are working with CE in their sectors." (Nielsen & Nielsen (Sept 2019)

Clusters are powering the circular transition by …

- … building bridges to circular knowledge
- … putting circular policy into action
- … supporting to get access to circular funding for SME
- … following sustainable development goals
- … supporting circular public procurement

Books/ articles/ papers
Nielsen, K.; Nielsen, M.D. (Sept 2019) Clusters in the Circular Economy. Building Partnerships for Sustainable Transition of SMEs. https://www.clustercollaboration.eu/sites/default/files/news_attachment/clusters_in_circular_economy_0.pdf

1.3.3 Circular Economy HUBs _ Cases / examples transforming municipality districts into learning centres of CE

1.3.3.1 Circular Cities Project at EIT Climate-KIC

Books/ articles/ papers
EIT CLIMATE-KIC (2019) Transforming Municipality Districts into Learning Centres of Circular Economy. https://www.climate-kic.org/wp-content/uploads/2019/06/Learning-Centres-of-Circular-Economy.pdf

"The aim of this publication is to showcase how different municipalities create innovation platforms where entrepreneurs, NGOs and community groups can turn different waste streams into new products, new design, new innovative ideas and how these efforts can generate work and at the same time minimise waste." (p 3)

The report showcases 13 (14) examples of specific CE HUBs at a district and area level to explain how cities across Europe concrete circular economic concepts have been designed and executed, including a detailed explanation for the potential CE business cases and technologies which can cascade circular business opportunities.

2 pages per case with the following outline

- Who was the team?
- What was the vision/goals?
- What is the local waste recycling context?
- How did you do it? (your approach)
- What was done? (activities)
- What was achieved? (impact)
- What were the challenges?
- Next steps
- City Contact Details
- Summary
- Time period
- Information source

The cases are :

CE topic	Where ?	What ?
Product reuse & remanufacture	• Gothenburg, Sweden • Berlin, Germany • Hjorring, Denmark	CURE Pathfinder project – Centres for Urban Remanufacture Repos project – People, preservation, purpose: Reuse of large household appliances
Sustainable living & construction	• Trondheim, Norway • Malmö, Sweden • Maribor, Slovenia	Experimental housing at Svarlamon Sege Park – Urban district for circular living CINDERELA – Resource efficient construction sector
Waste systems	• Maribor, Slovenia • Trento, Italy	Sorting plant for mixed municipal waste Greencycle: introducing a Cesystem to Alpine Space to achieve low carbon targets
Engagement hubs and urban labs	• Trondheim, Norway • Copenhagen, DK • Helsinki, Finland • Utrecht, Netherlands	City libraries as platforms for repair, exchange and lend Circular South Harbour Smart Kalasatama Werkspoorkwartier: Creative circular manufacturing
Food and agriculture	• Aarhus, Denmark • Maribor, Slovenia	From Grounds to Gourmet Urban soil 4 food

The study is rounded off with findings, barriers to successful implement circular learning centre as well as key learnings.

Books/ articles/ papers
EIT CLIMATE-KIC (2018) Municipality-led circular economy case studies. https://www.climate-kic.org/insights/municipality-led-circular-economy-case-studies-c40/

Published in collaboration with C40, this project publication provides a unique overview of concrete circular economy initiatives from cities through 40 examples from around the world. It showcases how cities today are viably putting the circular economy concept into practice to realise systemic change on a district and city level, which can then be scaled-up, not only regionally, but internationally as well.

City-wide circular strategy

Urban refurbishment

Procurement

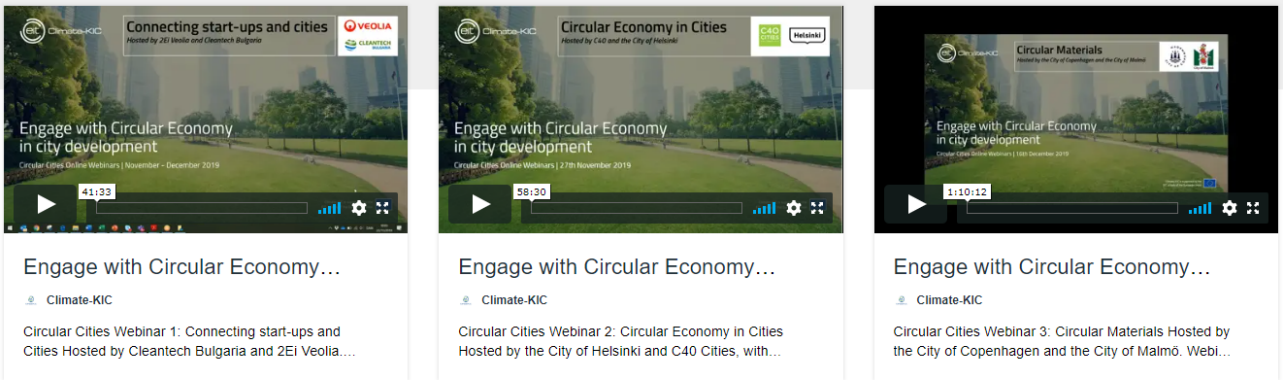
Utilities

Civic waste

More reports have been produced
EIT CLIMATE-KIC (June 2019) The challenges and potential of circular procurements in public construction projects. https://www.climate-kic.org/wp-content/uploads/2019/06/Procurements-in-Public-Construction-v2.pdf
EIT CLIMATE-KIC (November 2019)

Municipalities as drivers for circular economy in refurbishment and construction projects. https://nordic.climate-kic.org/wp-content/uploads/sites/15/2018/05/Municipalities-as-drivers-for-circular-economy.pdf
EIT CLIMATE-KIC (December 2019) Circular Cities - A practical approach to develop a city roadmap focusing on utilities. https://nordic.climate-kic.org/wp-content/uploads/sites/15/2018/05/Circular-Economy-and-Utilities_FINAL.pdf

3 webinars have been recorded



https://vimeo.com/showcase/6625715

1.3.3.2 IMPACT HUB - Entrepreneurial Networks as Drivers for Positive Change

https://impacthub.net/

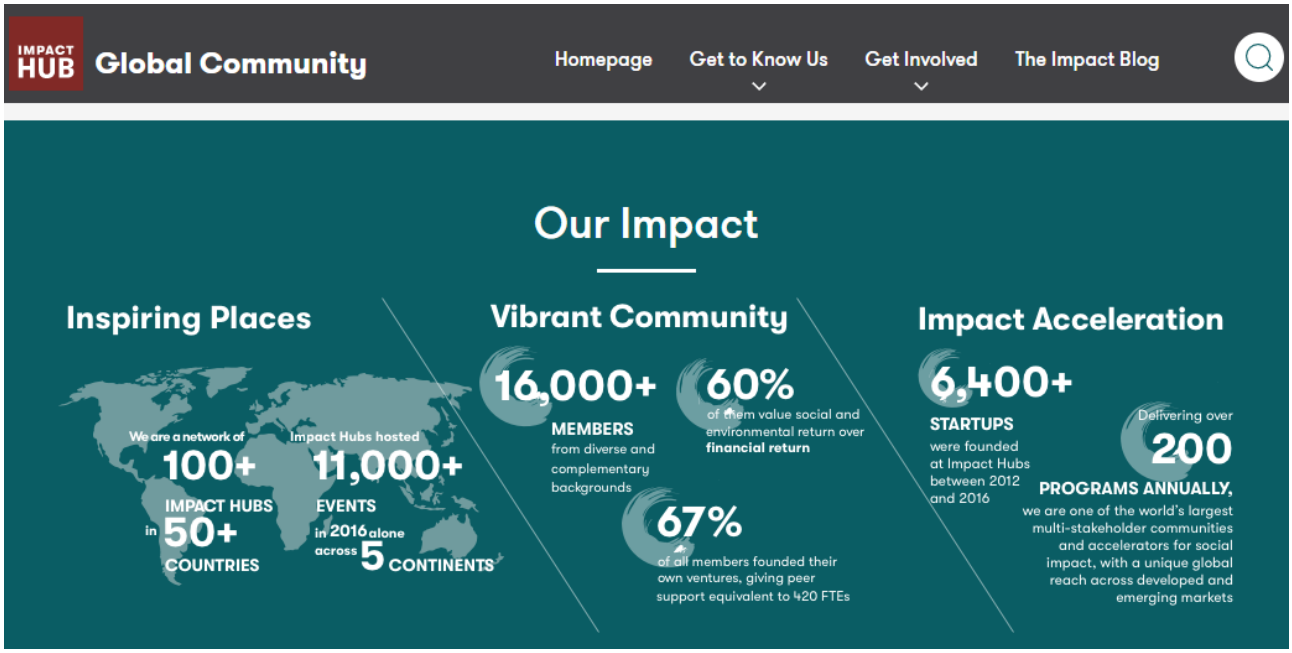
"We are one of the world's largest networks focused on building entrepreneurial communities for impact at scale — home to the innovators, the dreamers and the entrepreneurs who are creating tangible solutions to the world's most pressing issues."

IMPACT HUBs offer:

- Community and Workspace
- Startup Support
- Programs and Events

IMPACT HUBs use the global Sustainable Development Goals (SDGs) as a lens through which to view our impact in the world.

See some figures :



For more information :

Books/ articles/ papers
IMPACT HUB 2019 2019 Impact Report: Networks as drivers for positive change. http://www.bepartofthechange.impacthub.net/

Important to mention – everybody can …

- … join the network
- … become a member
- …. partner with IMPACT HUB
- … open an IMPACT HUB

2. Circular Economy City (Models)

2.1 European Circular Cities Declaration – launch in October 2020

The *European Circular Cities Declaration* https://circularcitiesdeclaration.eu/ was launched at the 9th European Conference on Sustainable Cities & Towns in Mannheim, Germany beginning of October 2020.

> *"Signatories recognise the need of accelerating the transition from a linear to a circular economy in Europe, and are committed to act as ambassadors and champion a circular economy that leads to a resource-efficient, low-carbon and socially responsible society, in which resource consumption is decoupled from economic growth."* (https://circularcitiesdeclaration.eu/news?c=search&uid=g7h2Qk2o)

The Declaration has been developed by a broad group of European organisations committed to enabling the transition to CE at the local level, including

ICLEI – Local Governments for Sustainability	Circular Flanders	CSCP
ECERA	European Investment Bank (EIB)	Ellen McArthur Foundation
Eurocities	LWARB	UN Environment Programme
WCYCLE Institute		

The following 28 cities signed the declaration:

Bergen (NO)	Budapest (HU)	Copenhagen (DK)	Eskilstuna (SE)
Florence (IT)	Freiburg im Breisgau (DE)	Ghent (BE)	Grenoble (FR)
Guimarães (PT)	Helsinki (FI)	Høje-Taastrup (DK)	Lappeenranta (FI)
Leuven (BE)	Ljubljana (SI)	Malmö (SE)	Maribor (SI)
Mechelen (BE)	Oslo (NO)	Oulu (FI)	Prague (CZ)
Prato (IT)	Roskilde (DK)	Seville (ES))	Tampere (FI)
Tirana (AL)	Turku (FI)	Umeå (SE)	Wiltz (LU)

As of today (mid-March 2021), 12 more cities have signed the declaration:

Espoo (FI)	Murcia (ES)	Genoa (IT)	Águeda (PT)
Mikkeli (FI)			Albergaria-a-Velha (PT)
			Braga (PT)
			Loures (PT)
			Mangualde (PT)
			Mealhada (PT)
			Melgaço (PT)
			Porto (PT)

Signing the Circular Cities Declaration offers many benefits to cities and regions. Signatories will become part of a powerful, unified group of cities that will help raise awareness of the long-term political, societal, environmental and financial benefits of the circular economy, and contribute to the development of a supportive political framework.

Other benefits include:

- International profiling and a platform to showcase activities globally through print, online media and/or key events
- Sharing and developing capabilities with like-minded cities to implement a circular economy
- Accessing advice and support in the development of a circular economy
- Opportunities for city-to-city cooperation to push rapid and effective implementation on the ground
- Demonstrating leadership and commitment at the sub-national level to a productive, liveable and resilient Europe
- https://circularcitiesdeclaration.eu/about/why-and-how-to-sign

The Declaration can be found here: https://circularcitiesdeclaration.eu/fileadmin/user_upload/Images/Pages_Images/Circular_City_Declaration/CircularCitiesDeclaration.pdf

European Circular Cities Declaration

Name of City

In light of the socio-economic impact of the current crisis and of the ongoing climate emergency, we take this opportunity to commit to a circular recovery and a more resilient future. A systemic shift to a regenerative economic model is fundamental to achieving climate neutrality, fostering a thriving society, and keeping resource consumption within planetary boundaries.

A circular city is one that promotes the transition from a linear to a circular economy in an integrated way across all its functions in collaboration with citizens, businesses and the research community. This means in practice fostering business models and behaviour which decouple resource use from economic activity by maintaining the value and utility of products, components, materials and nutrients for as long as possible, in order to close material loops and minimise harmful resource use and waste generation. Through this circular transition, we seek to improve human wellbeing, reduce emissions, protect and enhance biodiversity, and promote social justice, in line with the Sustainable Development Goals.

We believe that

- Transitioning from a linear to a circular economy is central to our efforts to decouple economic growth from resource use, and achieve a climate neutral, fair and prosperous society
- Local and regional governments have a critical role to play in achieving the systemic and transformative change required and must work actively with all levels of government and stakeholders from civil society, the private sector and the research community in this mission
- Providing a shared, common vision of a circular city can help ensure we are all travelling in the same direction

The Declaration is open for signing by local and regional governments. The signatories commit to using the levers at disposal coherently (https://circularcitiesdeclaration.eu/about/why-and-how-to-sign):

1. Establishing clear circular economy goals and strategies
2. Raising awareness of circular practices
3. Engaging local stakeholders
4. Embedding circularity principles in urban planning and asset management
5. Leveraging public procurement
6. Applying economic incentives to encourage circular behaviour
7. Fostering an enabling local regulatory framework
8. Collaborating with national governments and European institutions
9. Monitoring the progress made
10. Reporting to ICLEI on progress

2.2 Circular Economy - a need for better knowledge in cities (URBAN AGENDA for the EU)

URBAN AGENDA
URBAN AGENDA for the EU Circular Economy – ACTION PLAN https://ec.europa.eu/futurium/en/system/files/ged/ua_ce_action_plan_30.11.2018_final.pdf

The Action Plan (URBAN AGENDA) starts with the following

> *"European cities are uniquely positioned to address complex problems through practical experimentation and innovation. The transition to a circular economy requires multi-level governance and new visions of what the city of the future could look like." (p 4)*

This said and taking into account the following:

> *"The Partnership has not elaborated an overall plan for introducing the circular economy at a city level, but has rather focused on specific actions and recommendations that would fit into already existing plans for most cities." (p 6)*

the Partnership proposed several actions concerning regulation, funding and finally knowledge.

Concerning *knowledge* the Partnership proposed as a first action to prepare a blueprint for a …

2.2.1 Circular City Portal - blueprint

> *"With this action we would like to (i) consolidate, compile and guide cities to relevant information and resources freely available on the development of the circular economy in cities and (ii) promote the further development, dissemination and sharing of new information and know-how on the subject with a focus on practical implementation issues. The main aim of the action is to contribute to the creation of an openly shared knowledge basis that would inspire and guide cities in their journey towards a circular economy." (p 28)*

The objectives were defined as follows:

- "Guiding cities to innovative ways of governance which can help in the implementation of a long term circular strategy. This can be in the form of an 'easy starting kit to circular economy';
- Searching for partners who can bring cities together to exchange experiences and to learn from each other. This can involve existing city networks but also educational institutes who, for instance, wish to set up a circular academy. This action answers to the need of cities to meet in person with other cities, a need arising from the stakeholder workshops organised as part of the action and arising from the public feedback;
- The circular city portal will also have an online pillar. This will not result in an altogether new platform, but in cooperation with the Commission and the European Economic and Social Committee the action group will enter dialogue with cities in order to optimise the existing European Circular Economy Stakeholder Platform to better match urban needs." (p 30)

The online platform should

i. „serve(s) as a central point of access for information, dedicated to the promotion of the circular economy in cities, that is freely available from vario (p us sources including institutional websites and platforms in the public space, thus allowing interested cities and other stakeholders an easier and quicker access and navigation to the relevant information and tools they need;

ii. promote(s) the further development, dissemination and sharing of new bespoke information, tools and know-how, by and among cities with the aim to contribute to the creation of an openly shared knowledge basis that would inspire and guide cities in their journey towards a circular economy." (p 30)

„focus on providing practical implementation oriented "do-it-yourself" guidance, based on case studies of best practices from across the EU, on various aspects of circular city developments covering e.g. policy/strategy development, project preparation and implementation, monitoring and evaluation, public awareness raising and stakeholder involvement, access to funding/financing, and so on." (p 30)

Later on, it was decided not to create this one-stop shop for cities transitioning to circular economy. Instead of the cooperation with the European Circular Economy Stakeholder Platform - https://circulareconomy.europa.eu/platform/ - should be further developed in this direction.

2.2.2 More knowledge actions planned

In addition to the Circular City Portal, the following knowledge measures were planned:

- Promote Urban Resource Centres for waste prevention, re-use and recycling
- Develop a 'Circular Resource Management' Roadmap for cities
- Develop a Collaborative Economy Knowledge Pack for cities
- Manage the re-use of buildings and spaces in a circular economy
- Develop City Indicators for Circular Economy
- Circular Economy Financial Incentives - Develop a "Pay-as-you-throw" toolkit with coaching

2.3 Circular Economy in Cities – CE topics

As with the CE definition in general and for cities in particular, there is (still) no clear systematic breakdown for the CE topics in cities. The following five give an overview of the subdivisions, with the first column reflecting the City Circle Partners' topics:

City Circle Partners - topics	EU	Circular Cities Declaration	EIT Climate-KIC	EIT Climate-KIC	Circular Economy Club
	Circular Economy Action Plan		**Transforming Municipality Districts into Learning Centres of Circular Economy.**	**Municipality-led circular economy case studies.**	**Circular cities week report.**
	https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf	https://circularcitiesdeclaration.eu/cities-and-the-circular-economy/key-sectors	https://www.climate-kic.org/wp-content/uploads/2019/06/Learning-Centres-of-Circular-Economy.pdf	https://www.climate-kic.org/wp-content/uploads/sites/15/2018/12/Municipality-led-circular-economy-case-studies-compressed-ilovepdf-compressed.pdf	https://drive.google.com/file/d/1BrnX9KX1II6rHESQP8Kg0RkjW5PXJILG/view
Advanced manufacturing and ICT	batteries & vehicles	built environment	food and agriculture	city-wide circular strategy	agriculture
Agriculture and food industry	construction & building	electronics & ICT	engagement hubs and urban labs	civic waste	buildings
Management of land - industrial sites, public spaces	electronics and ICT	energy	product reuse & remanufacture	procurement	built environment, manufacturing, universities, technology, leisure, retail
Waste management and reuse	food, water & nutrients	organic material & biowaste	sustainable living & construction	urban refurbishment	construction & tech
waste-waste water-waste energy	packaging	packaging & plastics	waste systems	utilities	education
	plastics	textiles			energy
	textiles	water			fashion / textiles
					fast manufacturing consuming goods
					food & beverages
					hotels
					manufacture
					mobility
					packaging
					plastics & metals
					recycling
					services
					shoe sector
					tourism
					transport
					urban innovation & digitalization
					water

The key sectors for the CE transition identified in the URBAN AGENDA Circular Economy Action Plan, for example, were selected as follows: "These sectors are key because they have the greatest potential for circular innovations, as well as the greatest environmental impact and resource demand." (https://circularcitiesdeclaration.eu/cities-and-the-circular-economy/key-sectors)

The inserted yellow markings show the range of the topics "BUILDING" in the broadest sense. This topic is of special interest for the project partner *Kranj, Slovenia* – dealing with management of land (industrial sites, public spaces) on the principles of CE; setting-up the network of land-owners and users to develop joint urban regeneration process.

As already mentioned in Chapter 2.2, the *URBAN AGENDA Partnership*, in the context of "need for better knowledge in cities", also envisaged a knowledge measure in the field of "Manage the re-use of buildings and spaces in a circular economy".

The *URBAN AGENDA Partnership on the Sustainable Use of Land and Nature-Based Solutions* started the activities in 2017, the work on the knowledge base mid 2018 and published the Handbook 2020:

Handbook 2020 *(finished on December 2019)*
URBAN AGENDA PARTNERSHIP ON CIRCULAR ECONOMY SUSTAINABLE & CIRCULAR RE-USE of spaces & buildings https://ec.europa.eu/futurium/en/system/files/ged/sustainable_circular_reuse_of_spaces_and_buildings_handbook.pdf

The *URBAN AGENDA Partnership on the Sustainable Use of Land and Nature-Based Solutions* describes the necessity of actions as follows:

> "The establishment of this particular network was a response to the growing need for better urban management and the acknowledgment of the benefits of using nature-based solutions to address the challenges of cities in a context of scarce land resources. (…) The sustainable land use in Europe is a vast topic, encompassing issues such as land take, soil consumption, urban sprawl, as well as the re-use of existing spaces and buildings. The partnership agrees that the latter is crucial in order to achieve sustainable land use goals in Europe. Yet, the practice is still not widely acknowledged nor followed. Similarly to other natural resources, land is not infinite, thus we need to think more carefully of how we manage and use it. As the urban sprawl phenomena, meaning the scarcity of available land in cities, brings about burdensome and costly consequences, re-using existing buildings emerges as a valid alternative. Promoting re-use practices will help to ensure more sustainable urbanization, with multiple benefits not only for managing authorities, but also for citizens. In particular, within the partnership, the action on Urban Circular Re-use of buildings and spaces is led by INCASÒL." (Handbook 2020, p 10 f)

2.4 Sustainable landuse, spaces and buildings

After having already introduced the Handbook 2020 published by the *URBAN AGENDA Partnership on the Sustainable Use of Land and Nature-Based Solutions* – this will be presented in more detail in chapter 4.1.

As a lot of best practices in the Handbook 2020 can be found in the *URBACT _ (Re)making the city* website (http://remakingthecity.urbact.eu/). This one will be briefly described in chapter 4.2.

In 4.3 more information from institutions dealing with this topic will be provided.

2.4.1 Handbook 2020 _ Sustainable and circular re-use of spaces and buildings

2.4.1.1 Aim and content

***Handbook 2020** (finished on December 2019)*
URBAN AGENDA PARTNERSHIP ON CIRCULAR ECONOMY SUSTAINABLE & CIRCULAR RE-USE of spaces & buildings https://ec.europa.eu/futurium/en/system/files/ged/sustainable_circular_reuse_of_spaces_and_buildings_handbook.pdf
"This handbook can be a useful tool to lay the foundations for an overall strategy that looks at a new model of urban re-use management following the principles of the circular economy. In fact, disused and underutilized spaces and buildings in all European cities can become opportunities for new jobs, the promotion of a collaborative economy, social innovations and start-ups. The book intends to serve as a stimulus and an incentive for strategic planning at the urban level, especially carried out by public authorities, but also supported by the regional and the national level. With a wide review and analysis of good practices of urban re-use offered by the handbook, cities may learn about the different solutions that can be adopted, taking into account their specific urban features." (p 9)

The following figure shows the contents of the Handbook 2020:

Index

a. Chapter "2. Urban circular re-use: a framework"

- **Background**

"Contemporary cities, for various reasons, are increasingly subject to transformations that continue to produce empty spaces. Urban planning is not just about physically recovering spaces but also about responding to widespread and changing social, cultural and environmental needs. Urban authorities, therefore, find themselves having to rethink their urban planning strategies, and to adopt new philosophies to conceive the city of the future as an opportunity for local development through a new approach of "urban re-use management" that paves the way for the transformation of our cities into "circular cities". (p 22)

- **Objective**

"To achieve this goal the idea is to promote a new model of city governance through the creation of a management capacity able to map disused/underused buildings and spaces, draw up a reusability index, and match these spaces with the various subjects able to transform them into new studios, start-ups, lodging, laboratories, creative residences, etc., giving life to new creative and innovative hubs." (p 22)

- **Procedure**

Practices of sustainable and circular re-use of abandoned or underused properties usually follow the steps of planning cycles - mapping (1) activating, envisioning, experimenting (2), decision-making, financing (3), monitoring and evaluation (4) - which are presented and underlaid with good practices from cities in Europe.

b. Chapter "3. Management models and tools for urban circular re-use"

"European cities started to develop a number of policies to facilitate the circular re-use of vacant properties, to develop new uses and functions for vacant and underused areas, as well as to give visibility to development projects. Such policies include a variety of approaches, such as creating transparency in public and private real estate management, mediating between property owners and potential users, designing incentives for the re-use of vacant spaces, relaxing regulations and granting permissions, or providing funding and guarantees for loans. While these policies correspond largely to their specific political, economic, social and cultural contexts, they converge in their attempt to include emerging actors in the governance of urban development and to create a better connection between citizen and community initiatives and owners of unused public and private properties." (p 34)

"Several cities, regions and or countries have started to generate several management models to manage the urban circular re-use of properties." (p 34)

2.4.1.2 Projects, studies and initiatives taken into account

"The work carried out within the partnerships includes the exploration of a series of strategies, actions, studies and guidelines used as a basis for setting up a reference knowledge base on the topic of the re-use of underused or abandoned spaces and buildings." (p 14)

c. European URBACT projects

URBACT projects		
Project	**Partners**	**What ?**
2ND CHANCE (2016-2018)	• Naples, Italy • Dubrovnik, Croatia • Maribor, Slovenia • Lublin, Poland • Chemnitz, Germany • Brussels, Belgium • Caen, France • Liverpool, United Kingdom • Gijon, Spain • Porto, Portugal • Genoa, Italy	"Most European cities have to deal with the urban "voids", abandoned places or underutilized premises often located in the proximity of the city centre. These sites frequently have a negative impact on the surrounding environment. On the other hand, they present a great opportunity: they can be used to complete a compact settlement structure or to provide space for the necessary functions in the city. Within this project, self-organized groups implemented ideas and new housing models that can restore these places." (p 14) http://urbact.eu/2nd-chance
REFILL	• Ghent, Belgium • Nantes, France • Athens, Greece • Cluj-Napoca, Romania • Ostrava, Czech Republic • Poznań, Poland • Riga, Latvia • Helsinki, Finland • Bremen, Germany • Amersfoort, Netherlands	"(Re-use of empty spaces as a driving force for innovation at the local level). The network outlines the concept of temporary re-use of vacant spaces by "urban pioneers", meaning entrepreneurs and initiatives that start from the bottom. These individuals often face various social challenges and create new opportunities for social innovation in cities. The cities involved in this network have already experimented the concept of temporary re-use of vacant spaces with different approaches and governance methods." (p 14) http://urbact.eu/Refill
SUB>URBAN	• Antwerp, Belgium • Casoria, Italy • Solin, Croatia • Baia Mare, Romania • Vienna, Austria • Brno, Czech Republic • Oslo, Norway	"(Reinventing sub-urban areas) Sub>urban network focuses on i) increasing population densities within city borders instead of expanding urban territory; ii) uncovering new planning practices, processes, instruments and partnerships to achieve the best possible local outcome; iii) strengthening regional coordination between historic inner cities, suburbs and greater metropolitan areas." (p 14)

	• Dusseldorf, Germany • Barcelona Metropolitan Area, Spain	http://urbact.eu/sub.urban

d. Studies and initiatives at local level

Studies and initiatives	
SKIRA **ATLAS OF RECYCLED LANDSCAPES**	"The study reflects on the recovery and reinvention of the landscape showcasing all the potential for land re-use. It analyses many projects carried out all around the world dealing with land recovery. The latter succeeded in recovering portions of land which have undergone the process of industrialization and other transformation phenomena that compromised their original quality in the last century. These areas include reclaimed land, abandoned mines, former landfills, terrains vague, and unused areas later recognized as spaces that could bring new social, economic and environmental added value." (p 15) http://www.skira.net/books/atlante-dei-paesaggi-riciclati
NOVOID	"The Project intends to consider the qualities of the abandoned and degraded spaces in the city and to positively contemplate their value and potentialities. The goal is to debate and test innovative city planning and architectural solutions driven by low-cost, flexibility, ephemerality and sustainability criteria." (p 15) http://www.ceg.ulisboa.pt/novoid/
TEMPORARY USES FOR EMPTY SPACES (BARCELONA PROVINCIAL CONCIL)	"As a result of the experiences that emerged from the economic crisis, the Barcelona Provincial Council (Diputació de Barcelona) published a document establishing the strategies for the re-use of underused or abandoned spaces and buildings. The latter aims to exemplify the great diversity of initiatives and possibilities offered by this new way of managing certain spaces and by the new forms of interaction between administration and citizenship which these practices trigger. The document also contains an adaptation and activation protocol for empty spaces, which aims to help local bodies to make the most of these unused spaces." (p 15) http://www1.diba.cat/llibreria/pdf/55963.pdf
CRITERIA & SUB-CRITERIA FOR DETERMINING URBAN BROWNFIELD AREAS - DUO2 -	"The paper provides a theoretical and methodological definition of the term 'unrevitalized areas' and a comprehensive definition of the criteria and sub-criteria for determining and categorising such spaces within the limits of urban settlements of particular city municipalities, following the provisions of the Statistical Office of the Republic of Slovenia.

(FACULTY OF ARCHITECTURE - UNIVERSITY OF LJUBLJANA, SLOVENIA)	Enumerating, defining, categorizing and analysing existing unrevitalized areas in eleven city municipalities will yield directly applicable results in order to apply financial measures." (p 16) https://www.gov.si/assets/ministrstva/MOP/Dokumenti/Urbani-razvoj/33c2a93f51/studija_duo.pdf
RECYCLE ITALY	"One of the first objectives of this research is to construct an articulated knowledge framework on the theme of recycling linked to the regulations, the methods, and rules of the restoration activity. The most common disciplines within the project, are architectural and urban planning. In recent years those sectors found a common field of work around the concept of landscape, with the contribution of landscape architecture." (p 16) http://recycleitaly.net/il-progetto/
REUSE ITALY	"The book written by Giovanni Campagnoli shows that there are over six million urban empty spaces in Italy that no longer are functional for any type of use (i.e. former railway stations, former factories, barracks, empty shops, ghost towns, goods confiscated to the mafia, etc.). Being able to re-use even a small number of these spaces, entrusting them to cultural and social start-ups, can become a low-cost lever to promote youth employability." (p16) http://www.riusiamolitalia.it/

2.4.1.3 Best practices …

e. … of vacant buildings management (p 54 – 55)

BRUSSELS (BELGIUM)	**Bourse d'Achat for empty properties, for collective purchase of vacant real estate** "The project matched abandoned industrial buildings with people searching for living accommodations and workspaces at affordable prices." Source: URBACT, 2019 http://remakingthecity.urbact.eu/sales-bourse-for-empty-properties-brussels-belgium--41.case
THE NETHERLANDS	**Crowdbuilding, online platform to re-use vacant buildings** (run by a cooperation of architects) Source: URBACT, 2019 http://remakingthecity.urbact.eu/crowdbuilding-netherlands--30.case
CHEMNITZ (GERMANY)	**Public Consulting Agency to connect owners of neglected houses with new users** "The "Housing agency" is a consulting service supporting the match making between abandoned tenement heritage buildings with people looking for living accommodation and work space at affordable prices." Source: URBACT, 2019 http://remakingthecity.urbact.eu/public-consulting-agency-chemnitz-germany--40.case
LEIPZIG (GERMANY)	**Acquisition of new tenants for vacant buildings**

	"Haushalten e.V. is a registered private association working for the preservation and rehabilitation of endangered and abandoned heritage buildings in Leipzig. The tenants, called "house guardians", are free to use their craft and arts skills to design and refurbish the buildings as they prefer." Source: URBACT, 2019 http://remakingthecity.urbact.eu/guardian-houses-leipzig-germany--32.case
LIVERPOOL (UK)	**The use of costed options appraisals to identify optimum uses for vacant buildings** The costed option appraisal is a method of determining the most profitable development options for any given building. In short, the technique involves estimating the value of a property after restoration and subtracting the cost of renovation works to identify the most cost-effective option. Source: URBACT, 2019 http://remakingthecity.urbact.eu/costed-options-appraisal-liverpool-great-britain--29.case

f. … of temporary use of buildings (p 56 - 60)

AMERSFOORT (THE NETHERLAND)	**Organize match making, non-profit bridging between temporary use demands with vacant spaces availability in the city** "Most of the empty spaces in Amersfoort are private properties. Amersfoort initiated a network with the help of Matchpoint to match companies, non-profit organisations and real estate owners." Source: URBACT, 2019 http://remakingthecity.urbact.eu/matchpoint-organize-match-making-amersfoort-netherlands--57.case
ANTWERPEN (BELGIUM)	Creative entrepreneurs as seeds of change in fertile soils of (sub)urban shopping areas Supporting pop-up shops is not an innovative solution for transforming run-down neighbourhoods into vibrant city districts. Many local authorities experimented pop-up policies. However, the integrated multi-stakeholder approach, which brings together different government levels, entrepreneurs, non-profit actors and local inhabitants, experimented in Antwerp's Oud Berchem neighbourhood, has proven to be an effective as well as inspiring methodology to transform a depleted shopping area into a lively centre for creativity. The activities of Pop-up-to-Date pivot around the conversion of vacant commercial properties into springboards for creative entrepreneurship. Source: URBACT, 2019 http://remakingthecity.urbact.eu/pop-up-to-date-antwer-belgium--85.case
CAEN (FRANCE)	**Territorial marketing actions to attract people to "invade" the underused peninsula** Source: URBACT, 2019 http://remakingthecity.urbact.eu/territorial-marketing-actions-caen-france--45.case
GHENT (BELGIUM)	**Social and cultural temporary use pilot projects to experiment and orient redevelopment of industrial brownfield areas** Source: URBACT, 2019

	http://remakingthecity.urbact.eu/de-site-and-dok-two-iconic-temporary-use-based-redevelopment-processes-ghent-belgium--50.case
GIJON (SPAIN)	**Involving citizens in the reactivation of the former tobacco factory** Source: URBACT, 2019 http://remakingthecity.urbact.eu/participa-tabacalera-gijon-spain--38.case
OSTRAVA (CZECH REPUBLIC)	**Analysis of interest for temporary use** Source: URBACT, 2019 http://remakingthecity.urbact.eu/analysis-of-interest-for-temporary-use-ostrava-czech-republic--67.case
NANTES (FRANCE)	**Slow urban planning through temporary use incubators** **Source: URBACT, 2019** **http://remakingthecity.urbact.eu/slow-urban-planning-through-temporary-use-incubators-nantes-france--61.case**
OSLO (NORWAY)	**Vollebekk Fabrikker** … is a newly established temporary project in the eastern part of Oslo, located in an old industrial area that soon will be transformed into a new residential area. LINK: https://vollebekkfabrikker.no/
RIGA (LATVIA)	**The Free Riga model, go-between organization scouting cultural project to match vacant spaces opportunities offered by private and public owners** **Source: URBACT, 2019** http://remakingthecity.urbact.eu/the-free-riga-model-riga-latvia--65.case

g. … of re-use of buildings (p 61 – 65)

BOLOGNA (ITALY)	**Co-housing project** http://www.terranuova.it/MappaEcovillaggi/Cohousing/Mura-San-Carlo
LONDON (UK)	**Acme Studios** http://www.acme.org.uk/
CLUJ (ROMANIA)	**Temporary use in disused factory building** Source: URBACT, 2019 http://remakingthecity.urbact.eu/fabrica-de-pensule-cluj-rumania--51.case

GHENT (BELGIUM)	**De wasserij** Source: Ghent DE WASSERIJ dia1803a: 444, 446, 465, 482, 494
LISBON (PORTUGAL)	**Chapitò** http://chapito.org/
LJUBLJANA (SLOVENIA)	**Rog factory project** http://urbact.eu/squatting-cultural-use-toward-commons-case-rog-factory-ljubljana
MARIBOR (SLOVENIA)	**Student workshop & idea competition for the re-use of a former prison** Source: URBACT, 2019 http://remakingthecity.urbact.eu/the-former-prison-kpd-maribor-slovenia--44.case
NAPLES (ITALY)	**Reactivating the ex-Military Hospital SS Trinita delle Monache** Source: URBACT, 2019: Re-making the city. Online webtool http://remakingthecity.urbact.eu/ss-trinitA-delle-monache-complex-naples-italy--43.case
PORTO (PORTUGAL)	**Critical Concrete, refurbishment of social relevant spaces** Source: URBACT, 2019 http://remakingthecity.urbact.eu/critical-concrete-porto-portugal--35.case
POZNAN (POLAND)	**Preferential rent for vacant spaces to accommodate cultural and creative stakeholders in the dismissed Lazarz's neighbourhood** Source: URBACT, 2019 http://remakingthecity.urbact.eu/lazarz-s-open-zone-for-culture-poznan-poland--63.case

h. … of urban regeneration (p 66 – 69)

ANTWERPEN (BELGIUM)	**Multi-plot development in the hybrid environment and fragmented ownership of Lageweg** "In this project, the city government has to assume the role of facilitator to engage all stakeholders in supporting a co-creative vision, also ensuring that the owners contribute to the project. At the same time, it is necessary to safeguard the common interest. This will lead to a sustainable form of urban renewal." (p 66) Source: URBACT, 2019 http://remakingthecity.urbact.eu/lageweg-antwerp-belgium--98.case
BARCELLONA (SPAIN)	**Hangar**

	"Hangar is a former warehouse, located in an industrial area in the Poblenou district, on the outskirts of Barcelona. Dismissed in the 80s at the same time as other sites in the city, it remained empty for many years. In the early 1980s, the Federació Sindical d'Artistes Plastics de Catalunya asked the City of Barcelona for permission to use the old port warehouses for workshops and artistic activities. Hangar was opened in 1997." https://hangar.org/en/
HELSINKI (FINLAND)	**Kaapeli** "The Kaapelitehdas was a former factory of electric and telephone cables built in 1939 in Tallberginkatu. Once ceased its activities in the mid-1980s, it was occupied by artists looking for spaces. Later the occupiers founded an association, the Pro Kaapeli, and developed an alternative project to recover buildings and to promote cultural activities. In 1991 the management of the building was taken over by the city of Helsinki, which started the reconversion of the cable factory in the largest multi-functional cultural centre in Europe." https://www.kaapelitehdas.fi/en
DUISBURG (GERMANY)	**Landschaftspark** "In the summer of 1994 the Duisburg-Nord Country Park, a former steel industrial area located along the Emscher river in the Ruhr region. was opened as a multifunctional park combining industrial and cultural heritage." https://www.landschaftspark.de/en/
Leipzig (GERMANY)	**The reactivation of the Schaubühne Lindenfels through community shares** "Schaubühne Lindenfels is a charitable, non-profit stock company founded by theatre actors, which uses its stocks as community shares to acquire funds for the rehabilitation of the building." Source: URBACT, 2019 http://remakingthecity.urbact.eu/schaubAhne-lindenfels-leipzig-germany--42.case
VERBANIA (ITALY)	**Re-use Verbania** "The project is an urban regeneration experiment aiming at youth employability." https://www.riusiamolitalia.it/ita/04_azioni_e_progetti.aspx
MARSEILLE (FRANCE)	**La Friche project** "The former tobacco factory, built in 1848, is located in the Belle de Mai district to the north-west of the Marseille station. In 1992, after the dismantling of the factory, a group of artists started to recover a part of the structure to promote a cultural project for the neighbourhood." http://www.lafriche.org/en/
VILAFRANCA DEL PENEDES (SPAIN)	**From empty housing to social inclusion** "In a context of high poverty, social exclusion and an increasing number of empty housing units, the Vilafranca Inclusion programme deals with the renovation and rehabilitation of vacant housing for social purposes." Source: URBACT, 2019 http://remakingthecity.urbact.eu/from-empty-housing-to-social-inclusion-vilafranca-del-penedes-spain--106.case

2.4.2 URBACT _ (Re)making the city (http://remakingthecity.urbact.eu/)

A lot of the beforementioned best practices were taken from the *URBACT _ (Re)making the city* website.

The "(Re)making the City online tool was created in order to promote and disseminate innovative planning approaches towards the rehabilitation of underused spaces. Such problem is faced by different European cities, but also from urban areas from all over the world.

By breaking down the causes of urban underuse and vacancy, five main challenges stood out:

- **abandoned and derelict structures** that have fallen out of use for more than two years
- areas that contain a **large proportion of vacant buildings** and inefficient land use
- **segregated areas** partially in ruins, with low living conditions, due to different reasons
- **monofunctional areas** that lack any kind of mix, in terms of use and urban typology
- structures that are condemned thanks to **environmental and unsustainable issues"** (http://remakingthecity.urbact.eu/about.php)

The online database looks like this:


URBACT
(RE)MAKING THE CITY
Search
OK
ABOUT
SOLUTIONS
BLOG
CONTRIBUTE
UNDERUSED BUILDINGS
UNDERUSED AREAS
RUNDOWN SEGREGATED AREAS
MONOFUNCTIONAL AREAS
ENVIRONMENTAL UNSUSTAINABLE AREAS / BUILDINGS
MAPPING
ACTIVATING
ENVISIONING
EXPERIMENTING
DECISION-MAKING
FINANCING
MAINSTREAMING
EVALUATING
Website Map | Legal Mentions | Partners
URBACT
Driving change for better cities
European Union
European Regional Development Fund

2.4.3 More information

2.4.3.1 EIT Climate-KIC studies

Books/ articles/ papers
EIT CLIMATE-KIC (2019) Transforming Municipality Districts into Learning Centres of Circular Economy. https://www.climate-kic.org/wp-content/uploads/2019/06/Learning-Centres-of-Circular-Economy.pdf

CE topic	Where ?	What ?
Sustainable living & construction	• Trondheim, Norway	Experimental housing at Svarlamon http://experimentalcities.com/experimental-housing-at-svartlamon-2017/
	• Malmö, Sweden	Sege Park – Urban district for circular living https://www.formdesigncenter.com/en/utstallningar/shareful-sege-park/
	• Maribor, Slovenia	CINDERELA – Resource efficient construction sector https://www.cinderela.eu/News/CINDERELA-conference-Establishing-a-Blueprint-for-a-resource-efficient-construction-sector

Books/ articles/ papers
EIT CLIMATE-KIC (2018) (in collaboration with C40) Municipality-led circular economy case studies. https://www.climate-kic.org/insights/municipality-led-circular-economy-case-studies-c40/

CE topic	Where ?	What ?
Urban refurbishment	• Houston, USA	Re-use warehouse for construction materials https://www.houstontx.gov/solidwaste/reuse.html
	• Paris, France	3D mapping project supporting policies for low carbon building

	• Sydney, Australia	Co-creating industry guidelines for circular office refurbishments
	• Vienna, Austria	Supporting dismanting services for large industrial buildings

2.4.3.2 EU projects

EU projects		
Project	**Partners**	**What ?**
CINDERELA - New CE Business Model for more sustainable urban construction 06.2018 – 05.2022	•	"The CINDERELA project aims to untap this potential by developing and demonstrating a new business model (CinderCEBM) to assist companies in setting up successful circular economy business cases based on waste-to-resource opportunities. The business model will be accompanied by a "one-stop-shop" (CinderOSS) service offering all that companies need to know for manufacturing and application of SRM-based construction materials in buildings and civil engineering works." https://www.cinderela.eu/The-project/About

2.4.3.3 Ellen MacArthur Foundation et al

Books/ articles/ papers
Ellen MacArthur Foundation, CE 100, Co.Projects, Built Environment Case Studies CIRCULARITY IN THE BUILT ENVIRONMENT: CASE STUDIES A COMPILATION OF CASE STUDIES FROM THE CE100. April 2016. https://www.ellenmacarthurfoundation.org/assets/downloads/Built-Env-Co.Project.pdf

Contents

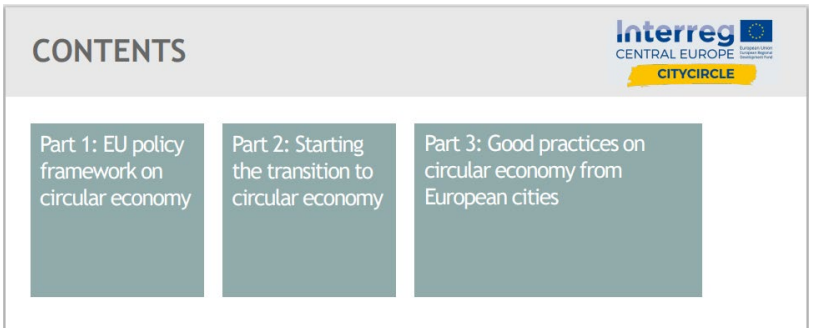
3. Trainings/ webinars

3.1 The Role of Cities in CE – "How cities around Europe cope with the transition to CE and what they have done"

This training/ webinar ties in directly with the previous chapter and the CITYCIRCLE HUBs presentation, embeds the content in a larger context and enriches it with good practices:

Topic	*The Role of Cities in Circular Economy*
Presenter	**Venelina Varbova**
Institution	**GreenEdge Consulting**
Date	**2020-02-28**
Presentation	**The Role of Cities in Circular Economy** (links in the presentation are active) https://www.interreg-central.eu/Content.Node/CITYCIRCLE/2020-02-26-Presentation-Webinar-Kranj.pdf

The content of the training/ webinar is the following:



Part 1 deals with the topics:

- EU GREEN DEAL
- Revised Waste Framework Directive (2018)
- Upcoming Circular Economy Action Plan (2020)- plastics, food waste, critical raw materials, construction and demolition, as well as biomass and bio-based products
- European Strategy for Plastics in a Circular Economy (2018)

Part 2:

- Framework of CE
- Good practice - Amsterdam

Part 3 provides some good practices:

- Linked to two priority areas of the Slovenian roadmap to CE (manufacturing industry, food systems)
- Industrial symbiosis
- Solutions for healthy food systems
- Urban agriculture

The presentation ends withs conclusions and sources for further information.

3.2 CE HUBs – three good practice cases on "How to setup CE HUBs"

Three webinars on good practice examples were held in April/ May on the topic of CE Hubs. Representatives of the following regions agreed to present and answer questions in a webinar:

- Circular economy in …
    - … Maribor, Slovenia
    - … Flanders, Belgium
    - …. Kemi, Finland

In the following sections basic data for each presentation/ webinar as well as further reading notes will be given.

3.2.1 Circular economy in Maribor, Slovenia

The case **Maribor, Slovenia** has been chosen for a training/ webinar because it is often cited in different CE contexts.

In the CITYCIRCLE HUBs presentation e.g. it is mentioned

- in the chapter on the CITIES CLASSIFICATION _ emerging economy / pioneering city (p 26 – 27). The city of Maribor in Slovenia is redirecting its operations, the performance of its businesses and citizens, toward the efficient resource management model.
- in the EIT Climate-KIC report:

CE topic	*Project*
Sustainable living & construction	**CINDERELA – Resource efficient construction sector**
Waste systems	**Sorting plant for mixed municipal waste**
Food and agriculture	**Urban soil 4 food**

- See CITYCIRCLE HUBs presentation especially p 55 – 60.

Topic	*Circular economy in Maribor, Slovenia*
Presenter	**Igor Kos**
Institution	**WCYCLE Institute Maribor** https://wcycle.com/
Date	**2020-04-09**
Presentation	**Circular economy in Maribor-Slovenia** (links in the presentation are active)
Webinar	Soon available on CityCircle's website: https://www.interreg-central.eu/Content.Node/CITYCIRCLE.html

Further readings – Maribor and Slovenia *(mentioned in the presentation)*
Wcycle Institue Maribor (2018) Wcycle Institue Maribor (2018): Strategy for the transition to circular economy in the municipality of Maribor. Maribor: July 2018. https://www.circularchange.com/s/The-Strategy-for-the-transition-of-the-City-of-Maribor-to-the-circular-economy.pdf (https://www.circularchange.com/news/the-strategy-for-the-transition-of-the-city-of-maribor-to-the-circular-economy)
Ministry Slovenia (2018) Ministry of the Environment and Spatial Planning of the Republic of Slovenia (2018): Roadmap towards the circular economy in Slovenia. Ljubljana: April 2018. https://circulareconomy.europa.eu/platform/sites/default/files/roadmap_towards_the_circular_economy_in_slovenia.pdf
Further readings *(website search)*
Cooperative city magazine (2019) Creating soil from urban waste – experience of Maribor. https://cooperativecity.org/2019/07/03/creating-soil-from-urban-waste-experience-of-maribor/
Wcycle Institue (2018) Project WCYCLE Model of Urban Circular Economy for Municipality of Maribor, Slovenia. Ljubljana: July 2018. https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1534408182.pdf (similar: https://www.newbusinessmodels.info/dl/cityasab/Kos04.10.18.pdf)
Wcycle Institute – Interview with Igor KOS (2018).

Urban Agenda for the EU: https://ec.europa.eu/futurium/en/circular-economy/interview-igor-kos-wcycle-institute-maribor
Wcyle Institute: re-thinking the business model of Maribor. **Circular City Funding Guide:** https://www.circularcityfundingguide.eu/case-studies/wcycle-institute-re-thinking-the-business-model-of-maribor/
Wcycle in Maribor - circular economy cluster of local public utility companies. Factsheet visible for members of the Circular Europe network: https://www.circular-europe-network.eu/factsheets/wcycle-in-maribor/
Further readings – articles
N. Cudecka-Purina, D. Atstaja & R.Vesere (2019) The goals of waste framework directive as mechanism securing transition to circular economy. In: International Scientific Conference: New Challenges of Economic and Business Development – 2019: Incentives for sustainable economic growth. Proceedings; Riga – University of Latvia: May 2019; p 171 – 181. https://www.bvef.lu.lv/en/conf/previous-conferences/2019-incentives-for-sustainable-economic-growth/
D. Kralj, M. Tramšek & M Homšak (2017) A Circular Economy – An Attractive Challenge. In: WSEAS TRANSACTIONS on BUSINESS and ECONOMICS; vol. 14; p 120 – 128. https://pdfs.semanticscholar.org/8363/24ae452158c736e8eae70a4bf41cd4822ac3.pdf

3.2.2 Circular economy in Flanders, Belgium

The case **Flanders, Belgium** has been chosen as training/ webinar because it already has a longer history dealing with these kind of topics and also has an interesting approach. Let's have a brief look into the history (see: https://www.vlaanderen-circulair.be/en/about-us):

- In 2006, at the initiative of the OVAM – the Public Waste Agency of Flanders –, a small group of committed people were brought together to discuss the necessity of making our materials management more sustainable.
- Until 2012 a thinktank and informal network at OVAM made contributions to the first change in mentality among a broader group of stakeholders: the emphasis was no longer on looking for ways to limit waste, but rather on dealing with materials in a more intelligent way, including manufacturing and consuming differently.
- The achievements and specific projects that were set up and carried out from 2012 to 2015 under the umbrella of the Flanders' Materials Programme were the first step towards a CE in Flanders.
- In early 2016, the OVAM received the Circular Awards for the work that it has done together with all the stakeholders in the Flanders' Materials Programme.

This is the starting point of the CITYCIRCLE HUBs presentation, see p 95 – 105.

Today „Circular Flanders is the hub and the inspiration for the Flemish circular economy. It is a partnership of governments, companies, civil society, and the knowledge community that will take action together. These organisations are the core of our partnership. Each one has committed to carrying out a specific action.“ https://circular-impacts.eu/library/1786

Topic	*Circular economy in Flanders, Belgium*
Presenter	**Veerle Labeeuw**
Institution	**Circular Flanders** https://vlaanderen-circulair.be/en
Date	**2020-05-06**
Presentation	**Circular Flanders: Boosting circular economy in Flanders** (links in the presentation are active)
Webinar	Soon available on CityCircle's website: https://www.interreg-central.eu/Content.Node/CITYCIRCLE.html

Further readings – VISION 2050
Vision 2050. A long-term strategy for Flanders. ▪ Jan 2019 - https://www.vlaanderen.be/publicaties/vision-2050-a-long-term-strategy-for-flanders-0 (long version - 104 pages) ▪ Dec 2019 - https://www.vlaanderen.be/publicaties/vision-2050-a-long-term-strategy-for-flanders (short version - 36 pages) ▪ 2016 - http://financeflanders.be/sites/default/files/atoms/files/Vision_2050_eng.pdf (short version - 24 pages)
Retrospective Report 2017 - 2019 *Circular Flanders – Retrospective Report 2017 – 2019; an overview of our activities for the CE in Flanders - first period.* The Circular Flanders Report is an interactive PDF; on 104 pages an overview of the work carried out during 2017 – 2019 is given.
Circular Flanders. Together towards a circular economy. Circular Flanders Kick-off Statement. Circular Flanders Kick-off Statement. ▪ Pdf for screen viewing: https://www.vlaanderen-circulair.be/src/Frontend/Files/userfiles/files/Circular%20Flanders%20Kick-Off%20Statement.pdf
Websites

Circular Flanders ▪ https://www.vlaanderen-circulair.be/en
CE Center – Circular Economy Policy Research Centre ▪ https://ce-center.vlaanderen-circulair.be/en

Further readings *(website search)*
Case study: Belgium: Flanders Materials Programme. Flanders Public Waste, Materials & Soil Agency. The Flanders Materials Programme (FMP) combines an ambitious long-term vision, a 45-item plan of concrete actions and the development of policy-relevant research. It aims to streamline the many public and private initiatives in the field of sustainable materials management into a coherent whole. https://www.ellenmacarthurfoundation.org/case-studies/belgium-flanders-materials-programme
Further readings – articles/ books
Deckmyn, S. (2018) Circular Flanders: Adaptive Policy for a Circular Economy. In: Lehmann, H.: Factor X: Challenges, Implementation Strategies and Examples for a Sustainable Use of Natural Resources. Springer International Publishing. https://www.springerprofessional.de/circular-flanders-adaptive-policy-for-a-circular-economy/15095678

3.2.3 Kemi, Finland - Digipolis

The case **Kemi, Finland - Digipolis** has been chosen as training because

- The aim of Digipolis Circular and Bioeconomy Centre is to generate a model of industrial symbiosis built around the CE. Its founders and co-actors are Digipolis, the City of Kemi and Lapland University of Applied Sciences.
- Digipolis has already been established in 1993.
- The next steps – new openings - have been:
    - 2008-2016 Expertise on Arctic conditions & Industry, novel wood constructions: CLT development platform
    - 2012- Ecosystem of the Arctic Industry - Innovation Platform
    - 2014- Arctic Industry and Circular Economy Cluster management
    - 2016- Digipolis chosen as key actor in national circular economy roadmap and implementation of the key project activities

Some words about Finland: Finland is a forerunner in the CE – the first country in the world to draw up a national road map for the Circular Economy Action Programme, whose goal was to create a

common vision for society to promote CE and to define the most effective means for achieving the vision. This was already in 2016 under the leadership of Sitra, the Finnish Innovation Fund. In March 2019 an updated version has been published – *Finland's road map to the CE 2.0* – which shows the route until 2025.

CITYCIRCLE HUBs presentation, see p 120 - 124.

Topic	***Circular economy in Kemi, Finland***
Presenter	**Tuomas Pussila**
Institution	**The Circular and Bioeconomy Centre** https://www.digipolis.fi/en/teollinenkiertotalous
Date	**2020-04-15**
Presentation	**Circular Economy in Finland and industrial symbiosis as a regional driver**
Webinar	Soon available on CityCircle's website: https://www.interreg-central.eu/Content.Node/CITYCIRCLE.html

Further readings – Digipolis *(website search)*
Digipolis – Kemi Technology Park https://www.digipolis.fi/en/front-page
Digipolis (November 2018) The Circular Economy Centre is turning into a national success story. https://www.digipolis.fi/news/the-circular-economy-centre-is-turning-into-a-national-success-story
SITRA Competence and training centre for industrial symbiosis in Kemi-Tornio. The Kemi-Tornio region has a well-functioning model for the industrial circular economy. In order for the operating model to spread throughout Finland, Sitra will co-operate with experts and education providers in the region. https://www.sitra.fi/en/projects/competence-training-centre-industrial-symbiosis-kemi-tornio/
SITRA Finnish road map to a circular economy 2016-2025. The world's first national road map to a circular economy was published in autumn 2016. The road map's second edition updates Finland's plans to reform its economic model to ensure successful sustainability. https://www.sitra.fi/en/projects/leading-the-cycle-finnish-road-map-to-a-circular-economy-2016-2025/

Further readings
Digipolis (Mai 2020) Webinar: Learning from Lapland: Digipolis and the circular economy in Finland. Circular Economy in Finland and industrial symbiosis as a regional driver. https://vimeo.com/415565074 https://tevi.co.uk/introducing-digipolis-a-leading-circular-economy-cluster-in-northern-finland/
Digipolis (April 2017) Modern Cluster of Arctic Industry – Sustainable utilisation of artic natural resources. Kemi-Tornio region and Lapland: Arctic Hub of industrial symbiosis - Arctic Industry and Circular Economy Cluster. https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/Remix%20Digipolis%20Cluster%20&%20%20Industrial%20Symbiosis%20%203.4.2017.pdf
Digipolis Good Practice: Kemi-Tornio Industrial Symbiosis https://www.interregeurope.eu/policylearning/good-practices/item/2046/kemi-tornio-industrial-symbiosis/
Circular and Bioeconomy Centre Good Practice: Circular and Bioeconomy Centre: promoting industrial symbiosis in Lapland. https://circulareconomy.europa.eu/platform/en/good-practices/circular-and-bioeconomy-centre-promoting-industrial-symbiosis-lapland
Further readings – articles/ books
Nordic Council of Ministers (2017) Nordic Bioeconomy: 25 cases for sustainable change. https://books.google.de/books?id=gwwLDgAAQBAJ&pg=PA55&lpg=PA55&dq=digipolis+kemi+finnland&source=bl&ots=dwxFYXwbnw&sig=ACfU3U0mtOg3g2BdAOkGiZogAEhg1PLb4g&hl=de&sa=X&ved=2ahUKEwjxqeqa3rrqAhWUh1wKHWhNB6wQ6AEwBHoECBwQAQ#v=onepage&q=digipolis%20kemi%20finnland&f=false

IV. Circular Business Models, Industrial Symbiosis, Marketplaces

Circular Business Models	"Circular business models represent fundamentally different ways of producing and consuming goods and services. They have the potential to drive the transition towards a more resource efficient and circular economy and, in doing so, significantly reduce the environmental pressure resulting from economic activity." OECD (2018): Business Models for the Circular Economy - Opportunities and Challenges from a Policy Perspective. Paris. https://www.oecd.org/environment/waste/policy-highlights-business-models-for-the-circular-economy.pdf
Industrial Symbiosis	"Industrial symbiosis is a collaborative approach concerning physical exchange of materials, energy, and services among different firms: accordingly, wastes produced by a given firm are exploited as inputs by other firms. This approach is able to generate remarkable environmental benefits, since it allows to reduce the amount of wastes disposed of in the landfill and the amount of primary inputs used by the industrial sector. It has been proved that the economic logic is the basis of symbiotic exchanges. Through industrial symbiosis, firms are interested to achieve competitive advantage coming from lower production costs and revenue increase. Therefore, the first requirement for the establishment of a symbiotic relationship is its economic sustainability for all the firms involved." Albani, V. & Fraccascia, L. (2015): The industrial symbiosis approach: A classification of business models. In: Procedia Environmental Science, Engineering and Management 2 (2015) (3) 217-223.
Secondary Marketplaces	"Secondary material marketplaces are online or brick-and-mortar forums that facilitate the exchange of secondary raw materials. These marketplaces allow secondary material suppliers and buyers to find each other on a web-based platform. The concept evolved out of industrial symbiosis thinking and gained traction with the arrival of the internet in the 1990s. WBCSD is aware of over 100 marketplaces currently operating globally. Most marketplaces operate at a municipal or regional level as challenges arise with the expansion of geographical coverage (i.e. regulations, economic viability, etc.). Less than half of the marketplaces observed today operate as a private organization, meaning most require government or foundational resources to sustain. The privatized marketplaces finance themselves through advertising, memberships, transaction fees, subscriptions and consulting services." https://www.ceguide.org/Strategies-and-examples/Dispose/Secondary-material-marketplaces

1. Circular Business Models for SMEs

This chapter of the Advanced Knowledge Base does not look at circular economy from a societal point of view, but presents an overview of arguments making it potentially **economically rationale and sensible for each single business to engage into its own circular transition.**

Several aspects can be highlighted:

- **Reduce dependance on scarce / non-renewable resources**
  The scarcity of resources can tangibly impact a business and brings major risks:
  - Resources costs volatility: scarce resources are more likely to become expensive and financially impact a business' profitability
  - Supply unsure: the supply of scarce resources might become difficult or impossible, making a business model obsolete.
- Contribution to mitigate climate change can help to **reduce the climate-related risks** for each business (e.g. storms, floods, …).
- Preempting regulatory pressures down the line can help businesses gain a **competitive advantage** and move ahead of its competitors.
- **Improved customer interaction and loyalty:** the expectations of customers are changing and they are increasingly considering environmental aspects in their decision-making. Engaging into a circular economic model can help to increase the loyalty of customers thnks to improved personalization, customization and retention.
- **Increase the attractiveness of the brand:** both customers' and investors' expectations are rising. Going circular might help one's brand to become more attractive.
- **Increase in productivity:** the circualr transformation brings often less product complexity, more manageable life cycles and an increased digitalisation. Ll those elements can contribute to an increased productivity.

1.1 Business models – a typology

Over the past five to ten years, a strongly increasing number of projects and publications address the definition of practicable business models for companies. We display in the following some of the most prominent ones:

- The cycles approach from Ellen Mac Arthur Foundation in *Towards the circular economy – Economic and business rationale fo an accelerated transition* (2013)
- The 5 business models for circular economy from Accenture, as described in the *Waste to Wealth – The Circular Economy Advantage* book (2015)

- The 9R framework from Potting et al. (2017)

Considering the stroong momentum of circualr economy in economic development policies, new and improved models are constantly being worked on and this dicument will require regular updates.

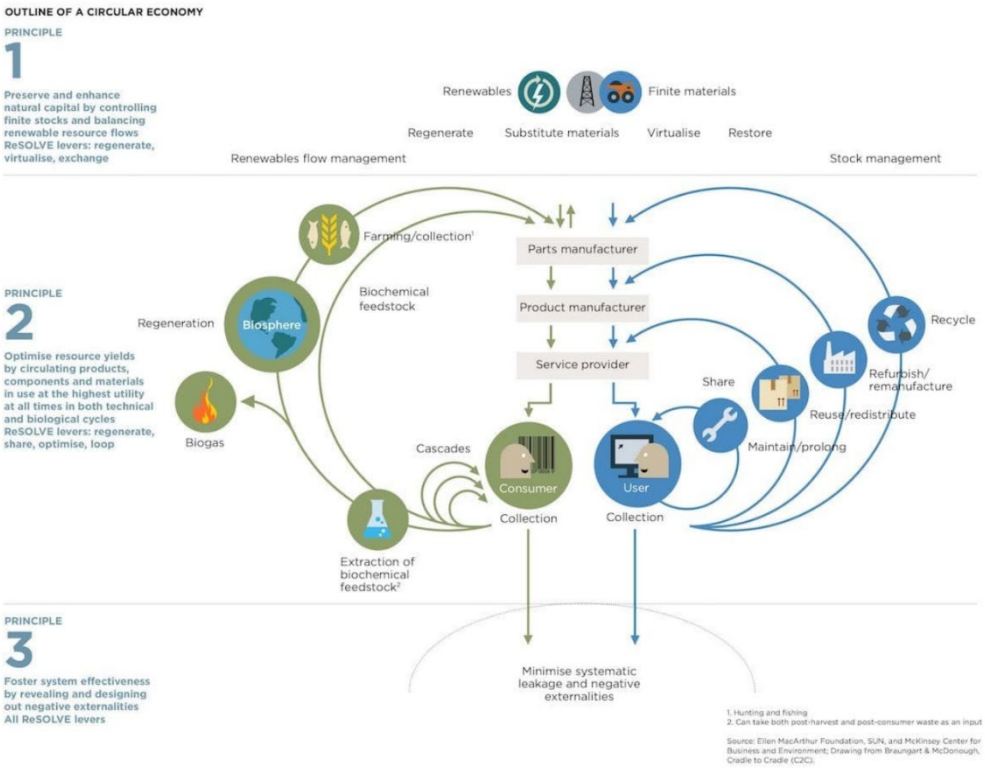
1.1.1 From linear to circular - Ellen Mac Arthur Foundation

For the Ellen Mac Arthur Foundation, “the circular economy refers to an industrial economy that is restorative by intention; aims to rely on renewable energy; minimises, tracks, and eliminates the use of toxic chemicals; and eradicates waste through careful design.”

The circular economy draws a sharp distinction between the consumption and use of materials: circular economy advocates the need for a ‘functional service’ model in which manufacturers or retailers increasingly retain the ownership of their products and, where possible, act as service providers—selling the use of products, not their one-way consumption. This shift has direct implications for the development of efficient and effective take-back systems and the proliferation of product- and business-model design practices that generate more durable products, facilitate disassembly and refurbishment, and consider product/ service shifts, where appropriate.

The following figure illustrates how technological and biological nutrient-based products and materials cycle through the economic system, each with their own set of characteristics.

Figure 3: The Circular Economy System Source Ellen Mac Arthur Foundation (2013)



1.1.2 Five business models for circular growth - Accenture

The approach of the consulting company Accenture builds on the model developed by Peter Lacy and Jakob Rutqvist[1], and taking into account some of the most recent approaches to considering circular economy as an opportunity for creating economic and social value:

Types of waste to be eliminated	
	• Wasted resources are materials and energy that cannot be continually regenerated, but instead, are consumed and forever gone when used. • Products with wasted lifecycles have artificially short working lives or are disposed of even if there is still demand for them from other users. • Products with wasted capability sit idle unnecessarily; for instance, cars typically sit unused for 90 per cent of their lives. • Wasted embedded values are components, materials, and energy that are not recovered from disposed of products and put back into use.
Business models	
	• Circular Supply-chain

[1] Source: Waste to Wealth. The Circular Economy Advantage, Peter Lacy and Jakob Rutqvist 2015

	• Recovery and Recycling • Product Life-extension • Sharing Platform • Product as a Service
Technologies	
	• Engineering technologies: modular design, advanced recycling technology, life and material sciences technology… • Digital technologies: big data, machine to machine, mobile technologies… • Hybrid Technologies: Trace and return systems, 3D printing…
Circular capabilities:	
	Technologies alone will not give companies what they need to excel in their chosen circular business models. They must be paired with a range of new capabilities across the organizations that are vital to developing and institutionalizing new ways of working. • Circular networks/ecosystems • Designing for Many Lifecycles and Users • Circular Supplies • Continuous Customer Engagement • Opportunity-Driven Take-Back

Figure 4: Circular economy framework for businesses
Source: Peter Lacy and Jakob Rutqvist

Five business models are derived from this anaylsis:

1. Circular Supply-Chain

When a company needs resources that are scarce or environmentally destructive, it can either pay more or find alternative resources. The Circular Supply-Chain introduces fully renewable, recyclable or biodegradable materials that can be used in consecutive lifecycles to reduce costs and increase predictability and control.

2. Recovery & Recycling

The Recovery & Recycling model creates production and consumption systems in which everything that used to be considered waste is revived for other uses. Companies either recover end-of-life products to recapture and reuse valuable material, energy and components or they reclaim waste and by-products from a production process.

3. Product Life-Extension

Consumers discard products they no longer value—because the products are broken, out of fashion or no longer needed. But many of these products still hold considerable value, and the Product Life-Extension model seeks to recapture it. By maintaining and improving products through repairs,

upgrades, remanufacturing or remarketing, companies can keep them economically useful for as long as possible.

This means shifting from merely selling things to actively keeping them alive and relevant. It also means moving customers from transactions to relationships, tailoring upgrades and alterations to specific needs.

4. Sharing Platform

In developed economies, up to 80 percent of the things stored in a typical home are used only once a month.5 The Sharing Platform model—increasingly assisted by new forms of digital technology—forges new relationships and business opportunities for consumers, companies and micro-entrepreneurs, who rent, share, swap or lend their idle goods. Fewer resources go into making products that are infrequently used, and consumers have a new way to both make and save money.

5. Product as a Service

If manufacturers and retailers would have to bear the "total cost of ownership", many would immediately adjust their focus to longevity, reliability and reusability. When consumers lease or pay for products by use through the Product as a Service model, the business model fundamentally shifts—in a good way. Performance trumps volume, durability tops disposability, and companies have an opportunity to build new relationships with consumers. Koninklijke Philips NV is using "lighting as a service" to charge by output instead of unit sales.

The following figure illustrate those five business models and their appplication on productive value chains.

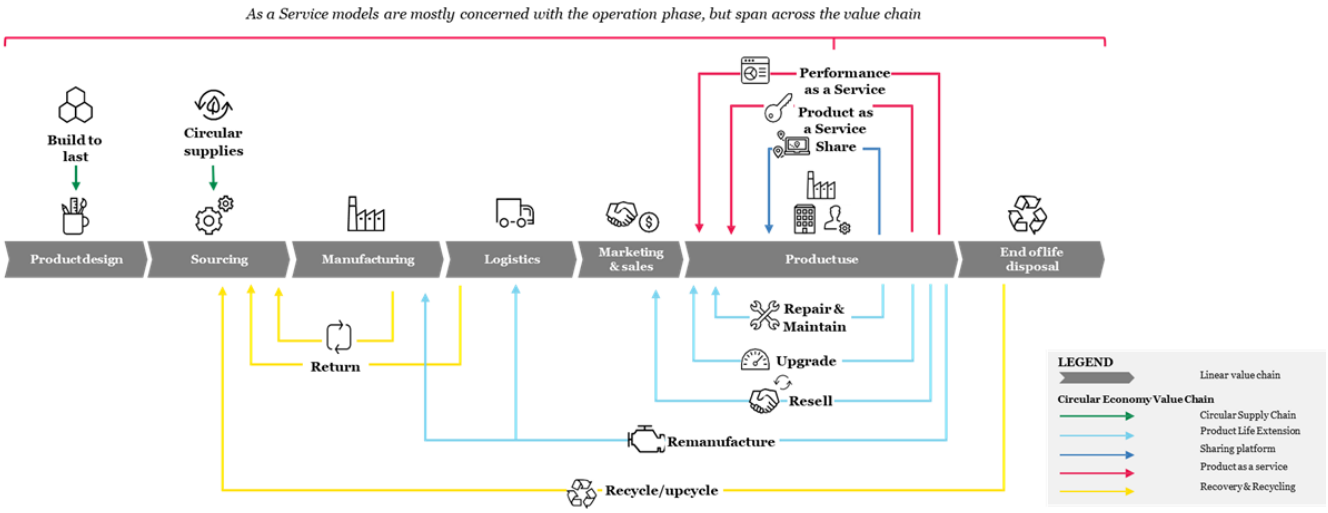


Figure 5: Circular value chains
Source: Accenture

1.1.3 9R framework – Potting at al. (2017)

The model suggested by the PBL Netherlands Environmental Assessment Agency (2017) is presented in the figure below. The model which defines ten strategies for circularity that can be used to build a successful circular product and material flows across the EU. Each strategy is based on making use of different business models, infrastructures, relationships with different stakeholders, and potentially also policies.

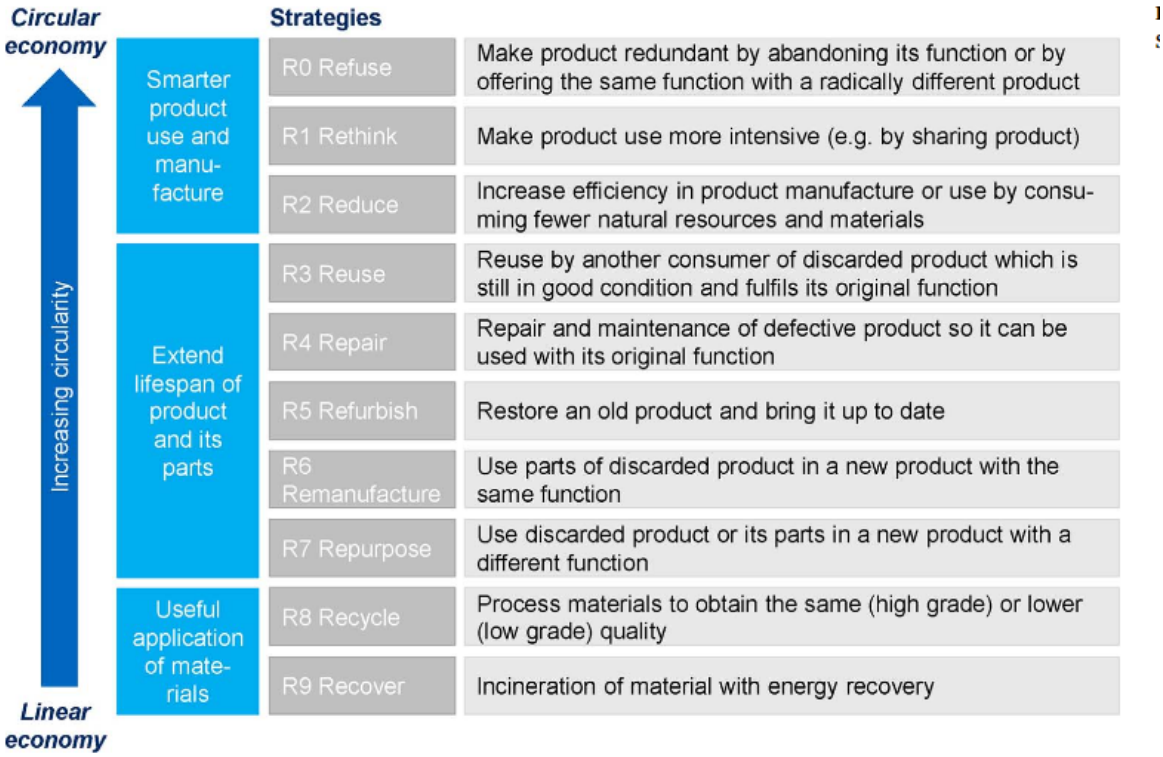


Figure 6: 9R framework
Source: based on Potting et al. (2017)

Smarter product use and manufacture

- **R0 Refuse:** Refuse the use of raw materials, design production processes to avoid waste. On consumers' side it is about choosing to buy and use less, reject packaging waste.
- **R1 Rethink:** Make product use more intensive (e.g. through sharing products, or by putting multi-functional products on the market). This strategy engages producers in a process of re-designing or 'rethinking' their products, in order to minimise the environmental footprint and reduce the amount of resources used in the production process.

  - Product as a service;
  - Sharing of assets;
  - Industrial symbiosis;
  - Performance-based input sharing.

- **R2 Reduce:** Increase efficiency in product design or manufacturing by using fewer natural resources and materials as inputs. The strategy of reducing the products' ecological footprint by increasing resource efficiency can involve different levels of ambition in the transformation of the products.
  - Deploying different processes or technologies that use less energy, water, raw materials, etc.,
  - Re-organising logistical chains and suppliers (e.g. buying from more local suppliers).

- **Strategies extending the lifespan of products and its parts**
  - **R3 Reuse** of discarded products by another consumer. This strategy is key to supporting material flows in the economy, and advocates the designing of products with longer lifespans, more robust composition, and which are easily repaired.
  - **R4 Repair** and maintenance of a defective product so it can be used for its original purpose, and
  - **R5 Refurbish** to bring an old product up to date are further strategies that can be used along the same thinking lines of prolonging the lifespan of products.
  - **R6 Remanufacturing** or using parts of a discarded product in new products with the same functions.
  - **R7 Repurposing** or using parts of a discarded product in a new product with different functions.

Useful application of materials

- **R8 Recycling: T**reating waste to generate secondary raw materials as inputs for processed materials.
- **R9 Recover:** Incineration of materials with energy recovery. Incineration of materials is a waste-treatment technology, based on the combustion of waste that is used for energy recovery. It is one of the last waste management resorts used before landfilling

1.2 Examples from the industry

The following table provides indicative examples of circular business models. This overview will be maintained

Waste as a resource

- Bumble Bee Bags give reflective vests a second life (Germany)
- ECOPLAST FIBER JSC recycles PET bottles into flakes and fibers (Bulgaria)
- Kunst vom Rand e.V. design various products, e.g. out of fire hoses, old books and can tabs (Austria)
- LAVU collects and processes cooking oil which is used as bio-diesel (Austria)
- New Seed upcycles used climbing gear and gives them a new life e.g. as chalkbags, belts or jewellery (Germany)
- 110 2.0 UPCYCLING UNIFORM gives used police uniforms a second life as bags, backpacks or blankets (Germany)
- Rebeutel manufactures reusable fruit and vegetable bags out of discarded curtains in social institutions (Germany)
- Finlayson, Finlayson produces rag rugs from old sheets and towels from old jeans
- InterFace, InterFace is a flooring company that offers Carpets as a service and is on a mission to run their business in a way that is restorative to the planet and creates a climate fit for life
- Kompotoi, Kompotoi produces, sells and rents out wooden toilets and turns the “Human Output” into a soil conditioners
- Leadax, Leadax offers lead composed from a stream of waste that can be re-cycled
- Schijvens, Schijvens designes, manufactures, reuses and rents out corporate clothing for the retail, logistical, construction, industrial and facility services.
- Tarkett Restart, Tarkett Restart is a program to recycle and reuse carpets
- Aquafil , Aquafil produces fashion of ocean plastic
- Betolar, Betolar turns different industrial waste streams into low carbon construction materials
- Cirplus, Cirrplus runs a global marketplace for circular plastics
- Ecolan, Ecolan receives ash from power plants and directs it for use as a raw material either for tree fertilisers or earthwork products
- Eko-Expert, Eko-Expert is utilising surplus mineral wool and turns it into recycled mineral wool for insulation materials
- Helsieni, Helsieni grows oyster mushrooms on used coffee grounds
- ICL Phosphate Recycling Unit, ICL Fertilizers Europe replaces phosphate rock with recovered and recycled phosphates
- Infinited Fiber, Infinited Fiber harnesses recycled fibres for reuse and makes new raw materials for textile products from them
- Kaffeeform, Kaffeeform uses a sustainable material made from used coffee grounds and other renewable resources to produce coffee cups
- KarmaTea, KarmaTea produces circular tea
- Kekkilä, Kekkilä manufactures compost fertiliser from organic waste
- Kierrätyskeskus, The Helsinki area recycling centre provides craft supplies made from surplus materials
- Lovia, Lovia manufactures luxury designer clothing & accessories from surplus materials
- Merijaan, Merijaan upcycles plastic waste in to new products
- Netlet, Netlet collects useful surplus materials from building sites free of charge and sells them on
- Pa-Ri Materia, Pa-Ri Materia receives, refurbishes and sells large volumes of used office furniture
- Pure Waste, Pure Waste recycles waste from the textile industry into new material and garments
- Remake Ekodesign, Remake produces ranges of clothes of recycled materials

- Signify, Signify offers 3D printed luminaires based on recycled materials
- SOEX / I:CO, I:CO is a provider for collection, reuse and recycling of used clothing and shoes
- Soilfood, Soilfood extracts more value out of the side streams of industrial and agricultural processes by making recycled nutrients and soil improvers from them
- St1 , St1 takes organic waste and residues from various industries and uses them to produce ethanol, which can be used as a petrol substitute
- Stuffstr, Stuffstr reduces waste by dramatically increasing the reuse of unused stuff
- Suomen Savupiipputeollisuus, Suomen Savupiipputeollisuus manufactures chimney bricks primarily out of locally created industrial by-products
- Tracegrow, Tracegrow makes organic fertilizer out of micronutrients extracted and purified from used alkaline batteries
- Umicore, Umicore provides recycling of Materials especially Metalls
- UpCircle, UpCircle creates Cosmetics from waste
- UPM Raflatac, UPM Raflatac's RafCycle service turns waste into raw material for paper and biocomposites
- Wear2go, Wear2go provides an alternative for the removal of end-of-life textiles
- Wilco Design GmbH Flugzeugmöbel, Flugzeugmoebel.de is a service by Wilco Design that turns aircraft parts into design furniture
- Wimao, Wimao manufactures biocomposite products from recycled materials
- Worn Again Technologies, Worn Again Technologies' separates, decontaminates and extract polyester polymers and cellulose and turns them back into new textile raw materials

Reuse & Repair & Product-life Extension

- Jausnwrap: Beeswax cloth food wraps as a natural alternative to plastic wrap and aluminium foil for food storage (Austria)
- Recycle it has, besides an e-waste recycling plant, an online shop for refurbished second-hand electronics (Germany)
- Refurbed is the online-marketplace for refurbished electronics that sells like-new products with at least one year of warranty and a sustainable footprint (Austria)
- Repair Café International is the key driver behind the successful concept of Repair Cafés where things are repaired together; several hundreds of places exist in 33 countries, e.g. in Austria, Germany, Romania and Slovenia (global)
- Reparatur- und Service-Zentrum R.U.S.Z is a social enterprise in Vienna and Graz for repairing, renting and selling (second hand) electric and electronic equipment (Austria)
- Rosenbauer provides general overhaul of fire-fighting vehicles and retrofits them with new equipment (Austria)
- The Coffee Jacket upcycles original used coffee bags to become extraordinarily unique design jackets. (Germany)
- Waste Management Corporation of Munich (AWM) runs an online exchange platform and a second-hand store called *Halle 2* where used goods can be purchased, repair cafés are organised and auctions are made (Germany)
- 3 Step IT, 3 Step IT leases office equipment to organisations and sells it after the leasing period
- Gispen, Gispen produces and reuses durable furniture

- iittala, iittala buys used crockery from consumers and sells them on at a higher price than they purchased them for
- Lorenz, Lorenz is developing, producing, remanufacturing and reusing high-quality water meters
- Nudie Jeans, Nudie jeans offers long lasting jeans from organic cotton, repair service, recycling and a 2nd hand option
- Patagonia, Patagonia produces, sells and repairs long lasting clothing
- Ponsse, Ponsse refurbishes used forestry equipment parts and sells them to its customers with warranty coverage
- Shiftphones, SHIFTPHONE is a modular smartphone
- Valtra, Valtra remanufactures gearboxes for tractors
- AfB, AfB extends the lifetime of laptops and smartphones by refurbisment, recycling and remarketing
- Battery Intelligence, Battery Intelligence provides a platform for remote battery fleet monitoring, optimal and responsible battery use, and predictive maintenance
- Brink Industrial, Brink Industrial is a one-stop shop business for product development, engineering, manufacturing and finishing of long lasting products
- Ebay / Ebay Kleinanzeigen, ebay is a platform for selling used products
- EkoRent, EkoRent buys used electric cars from Western countries and sells them to taxi companies to run a taxi platform in Nairobi
- Ekox, Ekox services IT equipment for reuse, resell and rent
- Emmy.fi, Emmy.fi sells and buys used clothes
- Excess Materials Exchange, Excess Materials Exchange provides a matching platform to find new high-value reuse options for materials or (waste) products for companies
- Fairphone, Fairphone develops smartphones that are designed and produced with minimal environmental impact
- Fixfirst, Fixfirst is an independent service to repair home appliances
- IKEA, IKEA is on a journey to make more of its products easier to repair, disassemble, reassemble and reuse
- Kaputt.de, Kaputt.de is a marketplace for repair shops for smartphones, tablets, laptops and coffee machines
- Kleiderkreisel by Vinted, Kleiderkreisel is an online marketplace for selling and sharing fashion, accessories and cosmetics
- Kokkola LCC, Kokkola LCC repairs worn or rusty equipment components for industrial companies by means of laser coating
- Konecranes, Konecranes' Lifecycle Care service concept extends the life cycle of industrial equipment and maximises their safety and productivity
- Labdoo, Labdoo.org is a non-profit collaborative social network which brings recycled Laptops loaded with educational applications to schools throughout the world without incurring any economic cost and without generating additional CO2 emissions to the Planet
- Lunette, Lune Group manufactures menstrual cups that replace disposable sanitary products
- Mädchenflohmarkt, Mädchenflohmarkt runs an online second hand market place for designer fashion
- Netflea, Netflea.com allows users to sell high volumes of used goods
- Rebuy, Rebuy is a marketplace for second hand articles
- Recommerce Swiss, Recommerce Swiss buys smartphones, refurbishs and sells them
- Saltrex, Saltrex provides a B2B auction platform for all parties with an interest in surplus, secondary or distressed commodities and cargo
- Sellpy, Sellply is an online second hand shop
- Swap.com, Swap.com offers an easy way to sell and buy pre-owned goods online

- Swappie, Swappie services and sells used smart phones
- Swishi, Swishi is an online marketplace connecting Offers with Wanted listings, showing new ways to exchange value and extend product lifecycles
- Taitonetti, Taitonetti sells high-quality refurbished computers
- Thredup, ThredUP is an online thrift store where you can buy and sell high-quality secondhand clothes
- Varusteleka, Varusteleka is an army and outdoor store from Finland. They buy used items and sell them forward,
- Virrat, SR-Harvesting disassembles tractors that are beyond repair, repairs and checks the parts, and then sells them with a warranty
- Zadaa, Zadaa is a marketplace for selling and buying secondhand clothing

Renewable resources

- alvari designs and produces customisable furniture from local resources and offers a take-back system to its customers (Germany)
- GreenLab utilizes cocoa waste material for production organic fertilizer (Germany)
- TRIGEMA produces biodegradable, Cradle to Cradle® certified shirts (Germany)
- Adidas Futurecraft, Adidas Futurecraft is a running shoe produced from one garment only designed for recycling and accompanied by a take back program
- Dycle, Dycle is producing compostable diapers, runs a diapers collection system and converts diapers waste into black soil
- Green Recycled Organics GRo, GRO-Holland uses coffee residue as a growth substrate for oyster mushrooms, which it sells back to the cafes that provide the coffee residue
- Betulium, Betulium provides renewable, biodegradable, and high-performance water-based cellulose materials to replace or supplement synthetic organic polymers
- BioBound, BioBound produces bio based concrete
- Forchem, Forchem refines crude tall oil into different renewable products
- Funghi Famers, Funghi Farmers is a sustainable oyster mushroom cultivation using recycled coffee waste from local Geneva businesses
- Honkajoki, Honkajoki uses animal-based waste and refines them into raw materials for products such as pet food and biofuels
- Hubus, Hubus sells boxes for worm composting transforming biological waste in to new soil
- Jarmat, Jarmat produces biodegradable lubricating oil from the side streams of the forest sector
- Lifecykel, Lifecykel offers products from mushrooms
- Montinutra, Montinutra is producing health-promoting products out of the by-products of the forest industry
- My boo, My boo manufactures and sells bicycles made of bamboo
- Neustark, Neustark enables circular and carbon neutral production of concrete by turning CO2 into minerals
- Orange Fiber, Orange Fiber manufactures textile fabrics from citrus-fruits by-products,
- Renewcell, Renewcell's recycling technology dissolves used cotton and other natural fibers into a new, biodegradable raw material
- Spinnova, Spinnova produces textile fibre from cellulosic mass without dissoluble chemicals

Product as a service

- Kleiderei rents fashionable clothes (Germany)
- ReCup implements coffee-to-go with returnable cups incl. a practical deposit system (Germany)
- TURTLEBOX rents stable, reusable moving boxes (Germany)
- 24 Rental Network, 24 Rental Network provides renting of shared cars
- BlueMovement, BlueMovement offers home appliances as a service
- Bundles, Bundles offers home appliances as a service
- Elite Smart Lease, Elite Smart Lease is a mattresses as a service paid by the occupation of the bed
- Encore, Encore provides its customers with loading pallets as a service
- Fluid Intelligence, Fluid Intelligence offers an oil-monitoring system or lubrication as a service
- Foodduck, Foodduck is a spread dispenser leased to cafetarias to reduce packaging and food waste
- Gerrard Street, Gerrard Street offers Headphones as a service
- Grover, Grover is a renting platform for consumer electronics
- Home spring NL, Homespring provides furniture as a service
- Innorent, Innorent builds, rents out and supplies to its customers movable facilities to be used as sports halls, shops or industrial halls
- Kleiderei, Kleiderei provides a Fashion Subscription
- Lem-Kem, Lem-Kem offers lighting as a service
- Lindström, Lindström provides work uniforms as a service
- Livingpackets, Livingpackets produces reusable and smart package boxes that are offered as Packaging as a Service
- Lyfa, Lyfa offers online grocery shopping and delivery service with zero waste
- Martela, Martela sells life cycle management of work environments and office furniture as a service
- Mitsubishi M Use, Mitsubishi offers Elevators as a service
- Naps Aurinkovoimala, Naps Aurinkovoimala provides solar power as a service to companies
- Oioioi, Oioioi rents out organic clothing for baby's first year
- Papillon, Papillon project by BSH rents out Bosch home appliances to poor people in Belgium
- RePack, RePack provides packaging as a service or reusable and returnable delivery packaging service for e-commerce
- Solnet, Solnet offers solar energy as a service
- Tamturbo, Tamturbo sells compressed air as a service
- Teil.style, Teil.Style is a clothing subscription
- The Green House Utrecht, The Green House is a circular restaurant where chefs prepare the most delicious food using ingredients from the restaurant's own urban farm and the Utrecht region
- TouchPoint, TouchPoint offers work clothes as a service, made of textile and plastic waste
- Valtavalo, Valtavalo provides LED lighting as a service
- Vapaus.io, Vapaus.io leases shared-use bicycles, electric cars and other vehicles to companies

Resource Efficiency & Waste Prevention

- The German Sustainable Building Council develops and promotes solutions for the sustainable design, construction and use of buildings and districts (Germany)
- Kirchdorfer Zementwerk Hofmann Gesellschaft m.b.H gas reduction process DeCONOx, replacement of fossil fuels by alternative fuels (Austria)
- PAINTINBOX produces 100% recyclable, solvent free, water based wall paint in a low-emission packaging (Germany)
- rutaNatur is a packaging-free organic grocery shop (Germany)

- SENSONEO provides smart enterprise-grade waste management solutions for cities and businesses to cost-effectively manage the waste lifecycle and improve the environment and well-being of people (Slovakia)
- VAUDE's "Green Shape" Label offers functional, environmentally friendly mountain sports equipment and clothing made from sustainable materials (Germany)

Sharing Platforms

- Airbnb, Airbnb is a platform for flat sharing
- AirFaas, Combi Works runs AirFaas, a platform for production equipment
- Blablacar, Blablacar is an online marketplace for carpooling
- Blox Car, Blox Car enables people to rent their car out on an hourly, daily or weekly basis
- Cine.equipement, Cine.equipement is a marketplace for film equipement
- Couchsurfing, CouchSurfing is a global homestay and social networking service accessible, part of the gift economy where hosts are not allowed to charge for lodging
- eRENT , eRENT is a Track & Rent Platform for equipment management
- Flinc, Flinc is a Ridesharing platform for employees of bigger companies
- Getaround, Getaround offers private peer-to-peer carsharing
- Gloveler, Gloveler is a booking platform for private apartments
- Kiertonet, Kiertonet by Kiertoa Oy is an online auction platform, where public-sector organisations can easily sell goods, property, equipment and machinery they no longer need
- MaaS Global, MaaS Global combines public transport, taxis and the use of private cars in a single service based on a monthly charge
- Nettix , Nettivuokraus.com offers a central marketplace where private individuals and companies can rent goods as an alternative to ownership
- Sharetribe, Sharetribe offers a technology to easily establish a marketplace website to rent or sell underused goods or facilities
- Skipperi, Skipperi offers a peer-to-peer boat-hire service
- SnappCar, SnappCar offers a platform for private carsharing

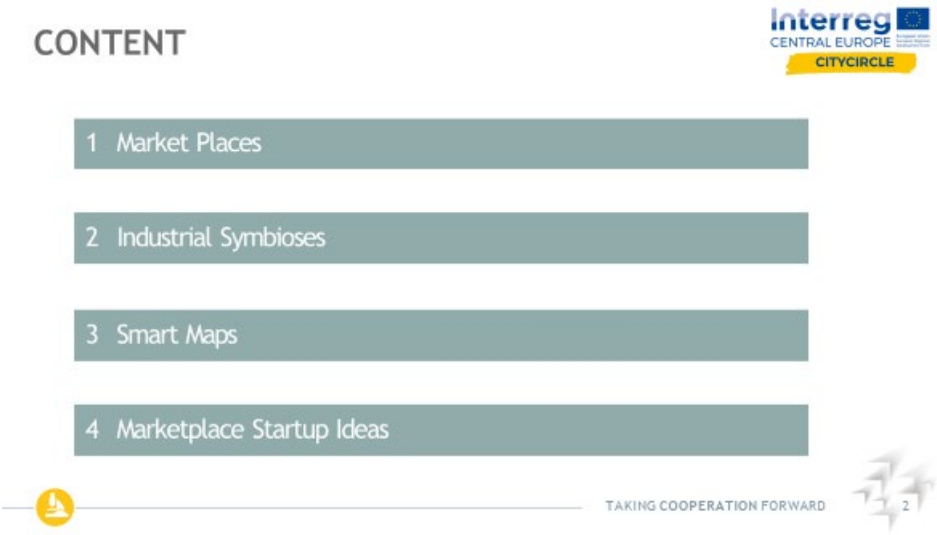
2. Industrial Symbiosis

An information package on the topic MARKETPLACES/ INDUSTRIAL SYMBIOSIS was provided upfront the trainings/ webinars to the project partners:

- CITYCIRCLE presentation ***WP T2 – CE Marketplaces – information package***

  Soon available on CityCircle's website: https://www.interreg-central.eu/Content.Node/CITYCIRCLE.html

The content is the following:



In the following chapters only the central content from the *CITYCIRCLE MARKETPLACES / INDUSTRIAL SYMBIOSIS* presentation is presented here.

In the case of Industrial Symbiosis new content has been added to the Knowledge Base:

- In chapter IV.2.2 Industrial Symbiosis project examples from EU funded H2020 are presented in kind of factsheet form. These projects offer a lot of interesting information within their resources/ outcomes/ downloads/ … sections like e.g. training modules, webinars, presentations, documentations, … .
- In chapter IV.2.3 two recent publications on mapping/ fostering Industrial Symbiosis have analysed Industrial Symbiosis initiatives/ networks in Europe. These have been displayed on a map and described in more detail in table format in an annex. The interested reader will

find a variety of information and links.
Furthermore two of the analysed examples will be described in more detail:

- Kalundborg, DK (see the following chapter IV.2.3.2)
- Kemi-Tornio (see chapter III.5.3 before)

- In chapter IV.2.4 finally more links on Industrial Symbiosis are provided. This section can and will be extended.

2.1 Industrial Symbiosis - definition

"Industrial symbiosis is a form of brokering to bring companies together in innovative collaborations, finding ways to use the waste from one as raw materials for another.

The word "symbiosis" is usually associated with relationships in nature, where two or more species exchange materials, energy, or information in a mutually beneficial manner.

Local or wider co-operation in industrial symbiosis can reduce the need for virgin raw material and waste disposal, thereby closing the material loop – a fundamental feature of the circular economy and a driver for green growth and eco-innovative solutions. It can also reduce emissions and energy use and create new revenue streams.

However, in order to make industrial symbiosis a wide-spread commercial reality, more needs to be done to manage the flow of waste material from different sectors and industries, and there is still much to understand about:

- environmental and societal impacts
- harmonization of technologies, processes, policies
- civil society engagement to a circular economy at EU level
- waste resources information
- waste treatment technologies
- business models and coordination between value chain actors."

https://fissacproject.eu/en/what-is-industrial-symbiosis/

2.2 Industrial Symbiosis project examples – EU funded H2020

"There are several initiatives focused on the industrial symbiosis, such as the following EU funded H2020 projects that are developing specific platforms aimed at facilitating and boosting the processes: SHAREBOX; EPOS; MAESTRI; SYMBIOPTIMA; SCALER; FISSAC; SPRING; URBANREC; PAPERCHAIN." (ACR+ Sustainable construction guidelines for public authorities (December 2019, p 27)

Factsheets for these projects have been developed (see chapters 2.1.1. – 2.1.8) - except for SPRING – Setting the Framework for Enhanced Impact of SPIRE Projects. "Project SPRING's objective was to increase progression towards the SPIRE goals and enhance project return on investment by addressing the needs and barriers of those who make the decisions to adopt process innovations in industry. It did this by providing guidance to project participants, decision makers in industry and broader SPIRE stakeholders to:

1. Improve the articulation of the value of project exploitable outputs
2. Improve the articulation of industry needs and barriers-to-uptake of exploitable outputs
3. Improve the mapping of project value to industry needs
4. Identify policy gaps and recommendations to improve project impact"

https://www.spire2030.eu/spring

The above-mentioned projects provide a lot of interesting information within their resources/ outcomes/ downloads/ … sections like e.g training modules, webinars, presentations, documentations, … .

In the *CITYCIRCLE MARKETPLACES / INDUSTRIAL SYMBIOSIS presentation* we already presented FISSAC and PAPERCHAIN in brief on p 38 – 43 and 44 – 47.

2.2.1 SHAREBOX – Secure sharing

SHAREBOX	***http://sharebox-project.eu/***
Duration	▪ 1 September 2015 – 31 August 2019
Partners	▪ IRIS TECHNOLOGY SOLUTIONS, SOCIEDAD LIMITADAStrane Innovation (Coordinator) ▪ + 16 participants
Objectives	"To develop and bring to market a secure platform for the flexible management of shared process resources with intelligent decision support tools. To provide plant operations and production managers with the robust and reliable real-time needed to optimise symbiotic connections (plant, energy, water, residues and recycled materials) with other companies in a symbiotic ecosystem." http://sharebox-project.eu/#overview
Resources	http://sharebox-project.eu/resources/

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The influence of knowledge in the design of a recommender system to facilitate industrial symbiosis markets

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A literature survey of information systems facilitating industrial symbiosis identification

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PUBLIC DELIVERABLES

- Communication Report
- Training Report
- CEN Workshop Agreement for Industrial Symbiosis
- Sharebox On-site validation and impact assessment (report)
- Implementation and trials of the Sharebox Platform in real Industrial Symbiosis networks (presentations)
- The recommender canvas: a model for developing and documenting recommender system design (report)
- The effects of stocking configurations in industrial symbiotic networks (report)
- Environmental Benefits of a Circular Economy: Connecting Waste Type and Geographic Proximity (poster)
- Public Policies creating barriers to the Circular Economy/Policies to improve incentives for Circular Economy in Europe
- Integration of Input-Output modelling with Game-Theory for behaviour-driven operations of Industrial Symbiosis networks (report)
- An ABM-based Industrial Symbiosis network design (report)
- The influence of knowledge in the design of a recommender system to facilitate Industrial Symbiosis markets (report)
- On the non-technical barriers to Industrial Symbiosis (report)

Training tool	http://sharebox-project.eu/training-tool/ "With the interactive material available in this section you will be able to get: ◦ A solid understanding of the concept of Industrial Symbiosis, including economic benefits and cross-sectoral opportunities. ◦ Knowledge about SHAREBOX and its functionalities that support identification and evaluation of synergy opportunities and the process of creating synergies. ◦ Tips to handle the SHAREBOX software in an effective way."
▪ **Presentation 1**	Industrial Symbiosis and its Benefits
▪ **Presentation 2**	Basic functionalities of SHAREBOX
▪ **Presentation 3**	Evaluating IS and Cost Allocation
▪ **Presentation 4**	How AI can support end-users evaluating IS potential
▪ **Presentation 5**	Water treatment and filtering technologies in the context of industrial symbiosis
▪ **Presentation 6**	Symbiotic exchange of energy: Technologies and management

2.2.2 EPOS – Symbiosis in industry

EPOS	***https://www.spire2030.eu/epos*** ***Enhanced energy and resource Efficiency and Performance in process industry Operations via onsite and cross-sectorial Symbiosis***
Duration	▪ 1 October 2015 – 30 September 2019
Partners	▪ University Gent (Coordinator) ▪ + 14 participants
Objectives	"With the **aim of reinforcing competitiveness of the EU industry**, it is the ambition of the EPOS partners to **gain cross-sectorial knowledge** and **investigate cluster opportunities** using an **innovative Industrial Symbiosis (IS) platform** to be developed and validated during the project. The main objective is to enable cross-sectorial IS and provide a wide range of technological and organisational options for making business and operations more efficient, more cost-effective, more competitive and more sustainable across process sectors. The expected impact is clearly in line with the SPIRE roadmap - and sector associations, city councils (in the districts where EPOS is deployed), the SPIRE PPP as well as standardisation bodies are committed to participate in the EPOS transdisciplinary advisory board." https://www.spire2030.eu/epos
Outcomes - Publications	

▪ **Insights**	▪ EPOS insights are publications summarising the most relevant outcomes of the EPOS project. ▪ The overall aim of the EPOS project is to enable cross-sectorial IS and provide a wide range of technological and organisational options for making business and operations more efficient, more cost-effective, more competitive & more sustainable across process sectors. ▪ **19 insights**
Technology Watch	▪ The technology watch is the EPOS "eye" on what it is going on around the world that is of interest for the project. ▪ **19 technology foci**

2.2.3 MAESTRI – Resource and Energy Efficiency for Process

MAESTRI	***https://maestri-spire.eu/project/***
Duration	▪ 1 September 2015 – 31 August 2019
Partners	▪ INSTITUTO DE SOLDADURA E QUALIDADE, Portugal (Coordinator) ▪ + 15 participants
Objectives	"The MAESTRI project aims to advance the sustainability of European manufacturing and process industries. This is done by providing a management system in the form of a flexible and scalable platform, and to guide and simplify the implementation of an innovative approach, the Total Efficiency Framework. The overall aim of this framework is to encourage a culture of improvement within process industries by assisting the decision-making process, supporting the development of improvement strategies and helping define the priorities to improve the company's environmental and economic performance. Its development and validation will be achieved through application in four real industrial settings across a variety of activity sectors."
Downloads	https://maestri-spire.eu/downloads/ ◦ Technical Materials ◦ Communication Materials ◦ Research Papers ◦ Training Courses
Training courses	https://maestri-spire.eu/downloads/training-courses/ ""Total Efficiency Manager 4.0" training is addressed to the industrial community and to all stakeholders wishing to apply MAESTRI managerial tools and methods to their professional contexts. The goal is to provide you with an integrated approach to Total Efficiency for process industries based on four pillars: IoT, Industrial Symbiosis, Eco-efficiency, Lean Management. At the end of the course you will acquire the necessary skills to implement Total Efficiency Framework within your own company."
▪ **Course 1**	Introduction to the MAESTRI Total Efficiency Approach

▪ **Course 2**	Industrial applications of IoT in the MAESTRI Total Efficiency Framework
▪ **Course 3**	Eco-efficiency procedures and methodologies
▪ **Course 4**	Introduction to Industrial Symbiosis
▪ **Course 5**	Management System: Lean and Eco-Lean applications within the Total Efficiency Framework

2.2.4 SYMBIOPTIMA – Human-mimetic approach to the integrated monitoring, management and optimization of a symbiotic cluster of smart production units

SYMBIOPTIMA	***https://cordis.europa.eu/project/id/680426*** ***http://www.symbioptima.eu***
Duration	▪ 1 September 2015 – 28 February 2019
Partners	▪ SPIRAX-SARCO LIMITED, GB (Coordinator) ▪ + 17 participants
Objectives	"SYMBIOPTIMA developed an integrated Energy and Resource Management System (ERMS), which offers tools for production scheduling and demand response management and for Life Cycle Sustainability Assessments (LCSAs). It also created hardware for modular 'plug and play' monitoring of production plants, as well as an integrated toolset for all thermal energy sources, flows and sinks. Additionally, to maximise the reuse of waste, it developed a unique de-polymerisation process for plastics (PET)." PDF: https://cordis.europa.eu/article/id/401310-securing-europes-industrial-future-through-key-enabling-technologies-and-dedicated-research

2.2.5 SCALER - SCALing European Resources with industrial symbiosis

SCALER	***https://www.scalerproject.eu/*** ***Helping industries increase efficiency through resource sharing***
Duration	▪ 1 November 2017 – 31 October 2020
Partners	▪ EIT Climate-KIC ▪ Strane Innovation ▪ University of Cambridge ▪ iSQ

	▪ Quantis
Objectives	"SCALER provides mechanisms to accelerate the journey towards efficient and quick implementation of industrial symbiosis in the European process industry. We do this by developing action plans and adapted solutions to industrial stakeholders and communities. We work closely with a wide range of stakeholders including industrial networks, consultancies, researchers and policy makers at various geographic and politic levels, to deliver practical tools and guidelines for industry actors engaging in resource efficiency, reuse and sharing. To achieve this goal, SCALER is developing a set of reports and guides, based on research and consultation with active players in the field of industrial symbiosis." https://www.scalerproject.eu/about-scaler/objectives
Resources	
▪ **Guides & Outlooks**	▪ **Quick Guides – Helping industries increase efficiency through resource sharing** (February 2020) https://www.scalerproject.eu/wp-content/uploads/2020/02/SCALER-Quick-Guides.pdf ▪ **Synergies Outlook – List of 100 potential synergies to increase industrial resource sharing** (February 2020) https://www.scalerproject.eu/wp-content/uploads/2020/02/SCALER-Synergies-Outlook.pdf ▪ **Guidelines for industrial symbiosis** (June 2020) https://www.scalerproject.eu/wp-content/uploads/2020/06/PART-C.pdf
▪ **Reports**	▪ **Lessons learnt and best practices for enhancing industrial symbiosis in the process industry.** (September 2018) https://www.scalerproject.eu/wp-content/uploads/2019/07/Lessons-Best-practices-SCALER-D2.2.pdf «This report provides an evidence base of best practices in IS. Bringing together multiple research methods to build a rich picture and triangulate findings, the study casts light on the various approaches that companies choose to adopt. » ▪ *Chapter 3. Best practices in industrial symbiosis: lessons learnt from twenty-five crossindustry case studies* The analysis and synthesis of existing case studies offers a valuable means of not only understanding the broader landscape of a phenomenon, but also the underlying principles. In relation to this project, twenty-five case studies were reviewed by the authors. This helped build a rich picture across multiple geographies of IS at different stages in their evolution and led to the identification of the triggers, enablers and barriers to the implementation of IS. The case study review is designed to complement the other components of this work package (literature review and survey). Together these provide a portfolio of best practices for scaling IS. (p 27f) In Appendix 1 (p 79f) the 25 cross-industry case studies/ best practices are displayed in table format : location, original source, case narrative, industry insights (non-technological, technological): ◦ **Taranto industrial district, Puglia region, Italy** - Steel, oil refining, cement, power generation ◦ **Relvão Eco Industrial Park, Municipality of Chamusca, Portugal** - Urban waste, non hazardous industrial waste landfill, plastics recycling ◦ **Kalundborg, Denmark** - Power generation, oil refining, biotechnology, plasterboard, soil remediation, waste management

	◦ **Humber region, UK** - Power generation, fuel manufacturing, food processing, chemicals ◦ **Spremberg, Germany** - Paper and pulp, energy production ◦ **Italy & Spain** (ENEA) - Poultry farming, leather tanning ◦ **Fife, Scotland, UK** - Beverage production, firewood production ◦ **Bussi sul Tirino, Abruzzo Region, Italy** - Basic chemicals, pesticides, silicates, power generation and distribution ◦ **Humberside, UK** - Oil and gas ◦ **West Midlands, UK** - Plastics manufacturing, food processing, automotive ◦ **Merseyside, UK** - Chemicals, oil, gas and service providers/utilities to these. ◦ **Norrköping, Sweden** – Biofuels ◦ **Trowbridge, UK** - Food manufacturing and energy generation ◦ **Province of Foggia, Italy** - Agriculture and energy ◦ **Ballymena, Northern Ireland, UK** (Michelin) ◦ **Newtownards, Northern Ireland, UK** - Aerospace, tarpaulin manufacturing ◦ **Norfolk, UK** - Sugar production ◦ **Helsingborg, Sweden** - Energy, waste treatment ◦ **Linköping, Sweden** - Bio-based production ◦ **China** – Smelting ◦ **Nanning, China** - Sugar production ◦ **Kawasaki Eco-town, Japan** - Steel, chemical, cement, nonferrous metal processing and paper making ◦ **Liuzhou city, China** - Iron/steel, cement ◦ **Ulsan, Korea** - Energy generation, water supply and treatment, petrochemicals, chemicals, nonferrous metals ◦ **Kwinana Industrial Area, Australia** - Alumina, nickel, iron, oil refinery, alumina and aluminium, pigment, cement, chemicals, fertiliser, power generation, water supply and treatment
▪ **More Reports**	▪ **Intermediaries and key enabling technologies for the ideation and implementation of industrial symbiosis** (December 2018) https://www.scalerproject.eu/wp-content/uploads/2019/07/Intermediaries-Technologies-SCALER-D2.1.pdf ▪ **How to create incentives for industrial symbiosis while preventing and mitigating implementation risks** (March 2019) https://www.scalerproject.eu/wp-content/uploads/2020/06/PART-C.pdf ▪ **Pathways to increase industrial symbiosis including tools & methods for stakeholders** (June 2019) https://www.scalerproject.eu/wp-content/uploads/2019/07/Pathways-to-increase-industrial-symbiosis-SCALER-D2.4.pdf ▪ **Technology database for synergy setups – technology database template and guide fpr upgrading** (June 2019)

	https://www.scalerproject.eu/wp-content/uploads/2019/10/Technology-database-for-synergies-setup-SCALER-D3.2.pdf ▪ **Synergies environmental impact assessment – industrial symbiosis potential and impacts** (June 2019) https://www.scalerproject.eu/wp-content/uploads/2019/10/Synergies-environmental-impact-assessment-SCALER-D3.3.pdf ▪ **Synergies socio-economic impact assessment – industrial symbiosis potential and impacts** (September 2019) https://www.scalerproject.eu/wp-content/uploads/2019/10/Synergies-socio-economic-impact-assessment-SCALER-D3.4.pdf ▪ **Quantified potential of industrial symbiosis in Europe** (May 2020) https://www.scalerproject.eu/wp-content/uploads/2020/06/D3.5_SCALER_Quantified-potential-of-industrial-symbiosis-in-Europe_v1.0.pdf ▪ **Overall strategy and recommendations to foster a wide application of industrial symbiosis at local, regional and European level** (May 2020) https://www.scalerproject.eu/wp-content/uploads/2020/06/D4.1_SCALER_Overall_strategy_and_recommendations_v1.0.pdf
▪ **External resources**	SCALER believes in the importance of information sharing to increase the uptake of IS. Check out the below initiatives to gain access to project results, publications and tools for IS and resource efficiency.

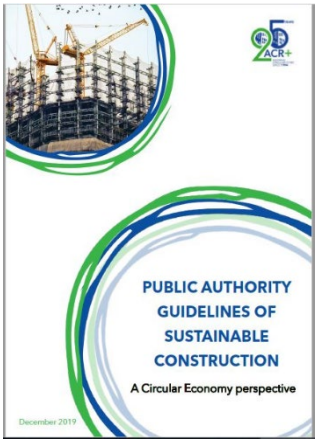
2.2.6 FISSAC - Fostering Industrial Symbiosis for a Sustainable Resource Intensive Industry across the extended Construction Value Chain

NEWS - 2020-04-28

FISSAC as a good practice in the Sustainable construction Guidelines for Public Authorities

"Sustainable construction guidelines for public authorities – A circular economy perspective" aims to ***help public authorities navigate through sustainable construction****, understand what it means and determine how to encourage it. The guidelines are especially targeted at local and regional authorities as they play a* ***crucial role in the whole construction life cycle*** *not only by stimulating innovation and cooperation between all actors but also because they work close to citizens. Unlike most of the literature on the topic, these guidelines are focusing on* ***circularity and material resources efficiency****, instead of covering only energy efficiency extensively. Even more, "Sustainable construction guidelines for public authorities – A circular economy perspective" goes beyond waste to integrate the whole value chain of the construction sector.*

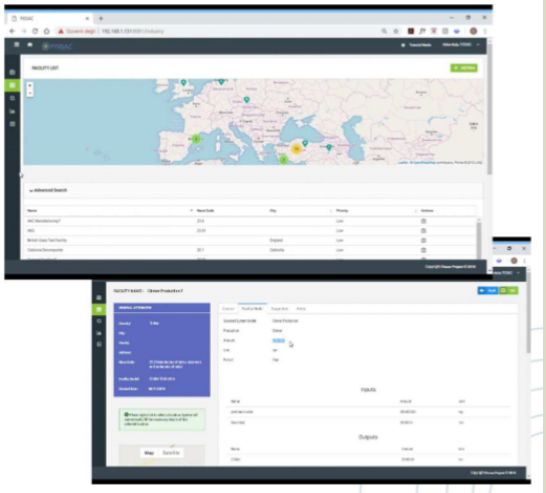
https://www.acrfissplus.org/images/technical-reports/2019_ACR_Sustainable_construction_guidelines_for_public_authorities.pdf



See: *CITYCIRCLE MARKETPLACES / INDUSTRIAL SYMBIOSIS,* p 38 – 43

FISSAC	***http://fissacproject.eu/en/***
Duration	▪ 1 September 2015 – 29 February 2020
Partners	▪ ACCIONA CONSTRUCCION SA, ES (Coordinator) ▪ + 26 participants
Objectives	"The FISSAC project involves stakeholders at all levels of the construction and demolition value chain to develop a methodology and software platform, to facilitate information exchange, that can support industrial symbiosis networks and replicate pilot schemes at local and regional levels. The model will be based on three sustainability pillars: ◦ Environmental (with a life-cycle approach) ◦ Economic ◦ Social (taking into consideration stakeholder engagement and impact on society). The ambition is that the model we create can be replicated in other regions and other value chain scenarios.

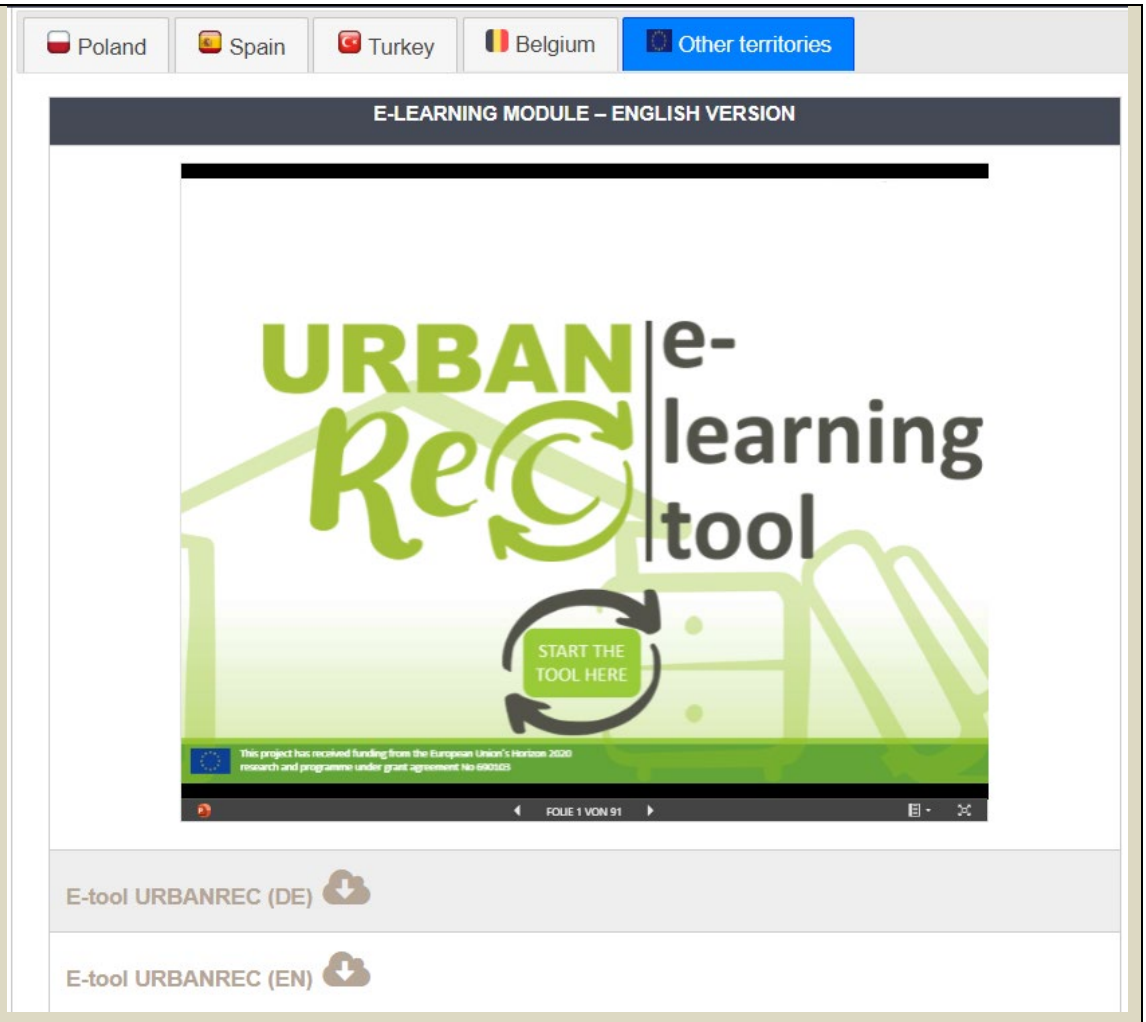
	FISSAC aims to demonstrate the effectiveness of the processes, services, and products at different levels." http://fissacproject.eu/en/project/  http://fissacproject.eu/wp-content/uploads/2020/01/FISSAC-General-presentation.-Final-Conference-2020-_Acciona.pdf
▪ **Pilots/ case studies**	FISSAC Demonstrations **PRE-INDUSTRIAL SCALE DEMONSTRATION** CSA cement and new blended cement Green concrete slab Green precast concrete elements Rubber wood plastic composites **REAL SCALE DEMONSTRATION** Concrete pavement Autoclaved aerated concrete blocks Precast concrete elements Eco-wall and eco-porcelain tiles Innovative wood plastic composites http://fissacproject.eu/en/case-studies/fissac-case-studies/

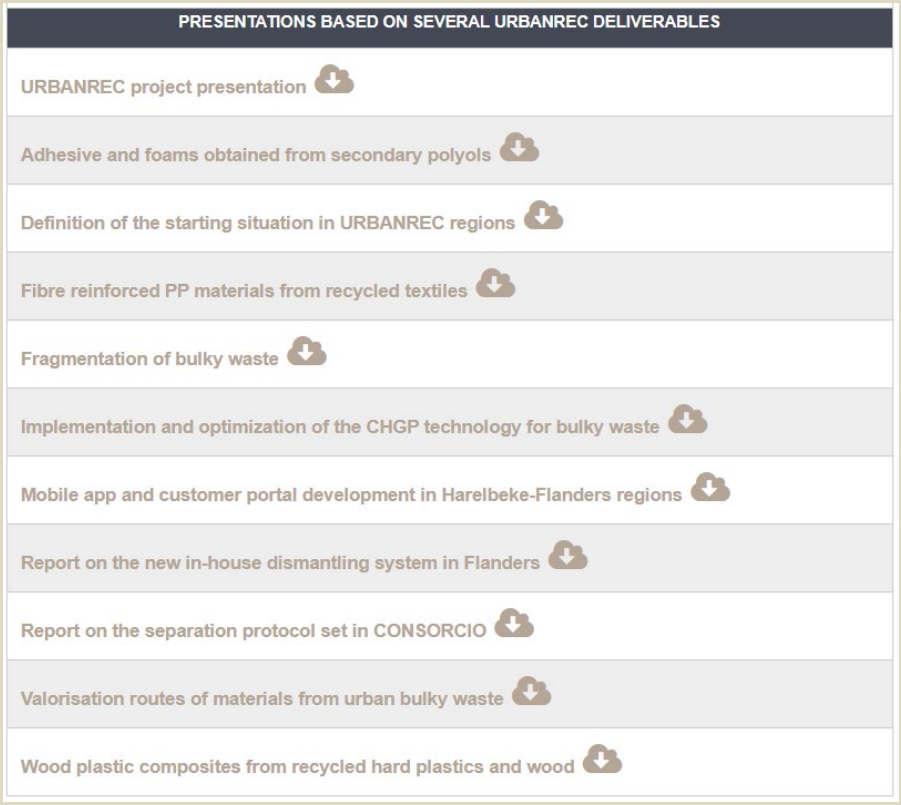
▪ **Living labs**	◦ Within FISSAC nine regional living labs have been established with their own defined purpose and scope. ◦ FISSAC Living Labs engage actors from the construction industry value chain to identify and solve appropriate challenges related to industrial symbiosis in their regions.
▪ **SW platform**	◦ http://fissacproject.eu/wp-content/uploads/2020/01/FISSAC-General-presentation.-Final-Conference-2020-_Acciona.pdf An important objective of the project is the introduction of a model for Industrial Symbiosis. For this, a specific tool is being developed and will be evaluated within the project: the **FISSAC Software Platform**. It will feature amongst others a Life Cycle based Multiple Factor Analysis, network indicators and GIS based capabilities. **Capabilities** ▪ Life-cycle assessment ▪ Life-cycle costing ▪ Material and energy flow analyses ▪ Multi-objective optimization ▪ Visualization & Diagrams ▪ Network analysis through industrial ecology metrics ▪ Graph and network topologies and industrial system modeling ▪ Innovative circular economy and industrial symbiosis indicator-based assessment 
▪ **Webinars**	▪ Industrial Symbiosis Tools and Best practices (23 February 2017) ▪ Social aspects and impact of Industrial Symbiosis (31 May 2018) ▪ Pre-industrial and Industrial scale Demonstrations (15 October 2019) ▪ A new industrial symbiosis platform (26 February 2020)

2.2.7 URBANREC – Bulky Waste Management

URBANREC	***https://urbanrec-project.eu/***
Duration	▪ 1 September 2015 – 29 February 2020
Partners	▪ ACCIONA CONSTRUCCION SA, ES (Coordinator) ▪ + 26 participants
Objectives	"URBANREC will implement an eco-innovative and integral bulky waste management system (enhancing prevention and reuse, improving logistics and allowing new waste treatments to obtain high added value

	recycled products) and demonstrate its effectiveness in different EU regions, including a roadmap to improve Eco-efficiency on European waste management & Pro-active standardization strategy. https://urbanrec-project.eu/
Interactive tool	https://urbanrec-project.eu/pre_tool.php
▪ **Documents**	When opening the container doors you get access to the documents: 
▪ **Training material**	https://urbanrec-project.eu/e-modules.php

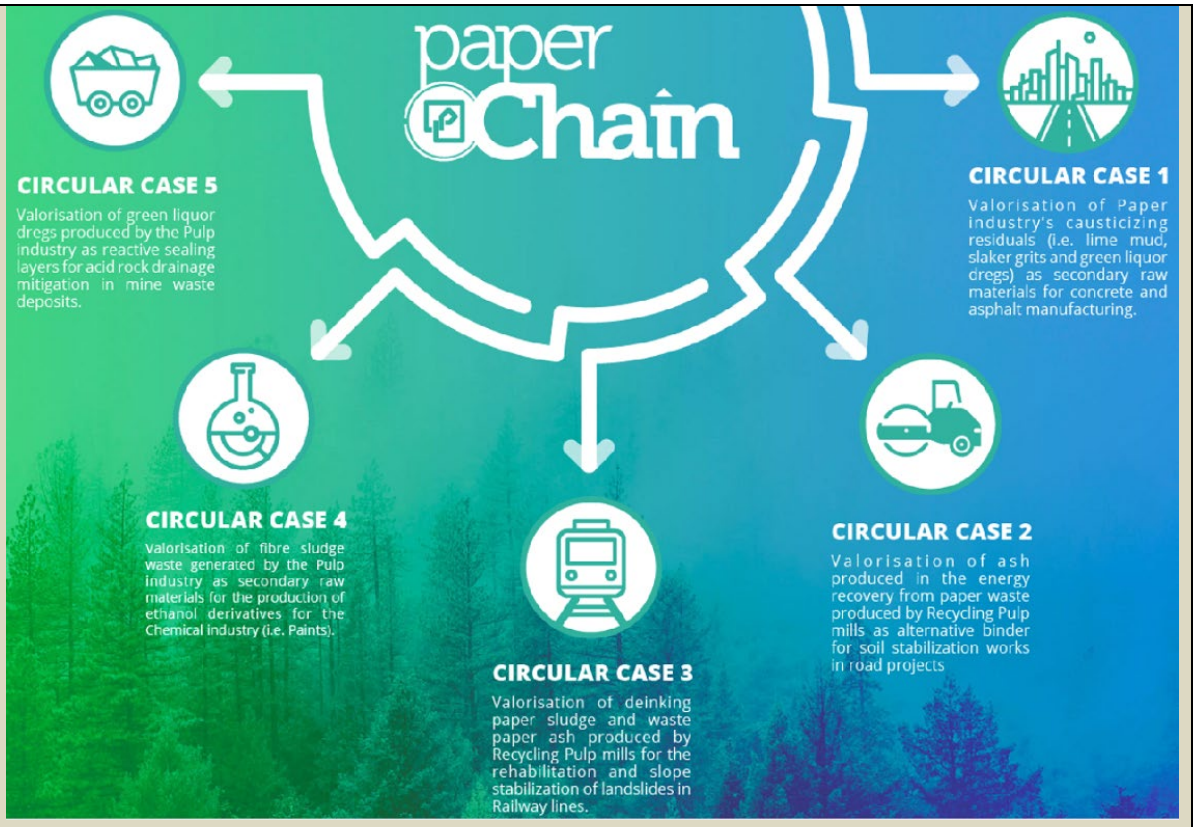

Poland
Spain
Turkey
Belgium
Other territories
E-LEARNING MODULE – ENGLISH VERSION
URBAN ReC
e-learning tool
START THE TOOL HERE
This project has received funding from the European Union's Horizon 2020 research and programme under grant agreement No 690025
FOLIE 1 VON 91
E-tool URBANREC (DE)
E-tool URBANREC (EN)

▪ Presentation	

2.2.8 PAPERCHAIN

See: *CITYCIRCLE MARKETPLACES / INDUSTRIAL SYMBIOSIS, p* 44 – 47.

PAPERCHAIN	***https://www.paperchain.eu/***
Duration	▪ 1 June 2017 – 31 May 2021
Partners	▪ ACCIONA CONSTRUCCION SA, ES (Coordinator) ▪ + 19 participants ▪ +11 third and supporting partners
Objectives	"The overall objective of PAPERCHAIN is to deploy five novel circular economy models centred in the valorisation of the waste streams generated by the Pulp and Paper Industry (PPI) as secondary raw material for a number of resource intensive sectors: construction sector, mining sector and chemical industry. https://www.paperchain.eu/circular-cases/ The following 5 different CE models will be major developed through real scale demonstrators:



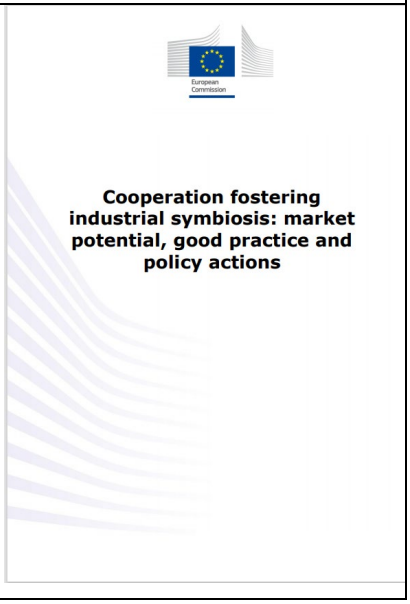
2.2.9 Interreg Europe project: SYMBI - Industrial Symbiosis for Regional Sustainable Growth and a Resource Efficient Circular Economy

SYMBI	*https://www.interregeurope.eu/symbi/*
Duration	▪ 1 April 2016 – 31 March 2021
Partners	▪ Foundation FUNDECYT – Scientific and Technological Park of Extremadura, ES (Lead Partner) ▪ + 9 partners
Objectives	"SYMBI aims at supporting the transition towards a resource-efficient economy through industrial symbiosis, establishing territorial synergies to manage waste and exchange energy & by-products as secondary raw resources." "SYMBI General objective is to empower regions to build sustainable economies, resilient to environmental pressures and climate change. The project will support the implementation of policy instruments and measures for the diffusion of industrial symbiosis, to add value, reduce production costs and relieve environmental pressures through increased resource efficiency and green house gas emissions.

	Furthermore, through the development of the activities, SYMBI will get: ▪ Encourage regional waste transformation systems; ▪ Promote the use of secondary raw materials and the emergence of regional secondary raw materials market; ▪ Prioritize green public procurement; ▪ Unlock investments by regional and local financial actors; ▪ Explore, assess, expand, and enhance current practices in ecosystems of industrial innovation; ▪ Raise public awareness on industrial symbiosis and circular economy." ▪ https://www.interregeurope.eu/symbi/
Good Practices	▪ Nearly 30 good practices have been published: ▪ https://www.interregeurope.eu/symbi/good-practices/
NEWS - 2020-06-28 **SYMBI project has been nominated for RegioStars Award 2020 in the category Sustainable growth: Circular economy for a green Europe.**	

2.3 Industrial Symbiosis Activity in Europe – an overview and cases

2.3.1 A brief overview on two recent publications with a lot of examples mentioned

Two recent publications	
European Commission (2018) Main authors: Teresa Domenech; Asel Doranova; Laura Roman; Matthew Smith; Irati Artola Cooperation fostering industrial symbiosis: market potential, good practice and policy actions. Final report. Brussels. https://op.europa.eu/en/publication-detail/-/publication/174996c9-3947-11e8-b5fe-01aa75ed71a1/language-en/format-PDF	

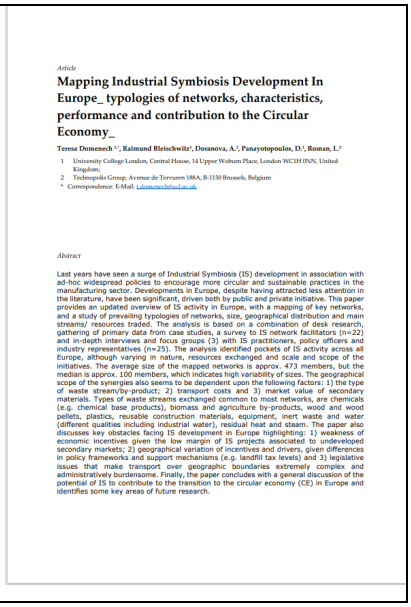
Domenech (2918/ 2019)

Teresa Domenech; Raimund Bleischwitz; Asel Doranova; Panayotopoulos, D.; Laura Roman (2018/ 2019)

Mapping Industrial Symbiosis Development In Europe_ typologies of networks, characteristics, performance and contribution to the Circular Economy_

Article

https://discovery.ucl.ac.uk/id/eprint/10056364/1/final%20submitted_openaccess-RCR.pdf



Article

Mapping Industrial Symbiosis Development In Europe_ typologies of networks, characteristics, performance and contribution to the Circular Economy_

Teresa Domenech [1,*], Raimund Bleischwitz[2], Doranova, A.[2], Panayotopoulos, D.[1], Roman, L.[2]

1 University College London, Central House, 14 Upper Woburn Place, London WC1H 0NN, United Kingdom;
2 Technopolis Group, Avenue de Tervuren 188A, B-1150 Brussels, Belgium
* Correspondence: E-Mail: t.domenech@ucl.ac.uk

Abstract

Last years have seen a surge of Industrial Symbiosis (IS) development in association with ad-hoc widespread policies to encourage more circular and sustainable practices in the manufacturing sector. Developments in Europe, despite having attracted less attention in the literature, have been significant, driven both by public and private initiative. This paper provides an updated overview of IS activity in Europe, with a mapping of key networks, and a study of prevailing typologies of networks, size, geographical distribution and main streams/ resources traded. The analysis is based on a combination of desk research, gathering of primary data from case studies, a survey to IS network facilitators (n=22) and in-depth interviews and focus groups (3) with IS practitioners, policy officers and industry representatives (n=25). The analysis identified pockets of IS activity across all Europe, although varying in nature, resources exchanged and scale and scope of the initiatives. The average size of the mapped networks is approx. 473 members, but the median is approx. 100 members, which indicates high variability of sizes. The geographical scope of the synergies also seems to be dependent upon the following factors: 1) the type of waste stream/by-product; 2) transport costs and 3) market value of secondary materials. Types of waste streams exchanged common to most networks, are chemicals (e.g. chemical base products), biomass and agriculture by-products, wood and wood pellets, plastics, reusable construction materials, equipment, inert waste and water (different qualities including industrial water), residual heat and steam. The paper also discusses key obstacles facing IS development in Europe highlighting: 1) weakness of economic incentives given the low margin of IS projects associated to undeveloped secondary markets; 2) geographical variation of incentives and drivers, given differences in policy frameworks and support mechanisms (e.g. landfill tax levels) and 3) legislative issues that make transport over geographic boundaries extremely complex and administratively burdensome. Finally, the paper concludes with a general discussion of the potential of IS to contribute to the transition to the circular economy (CE) in Europe and identifies some key areas of future research.

In the article the authors wrote in the abstract:

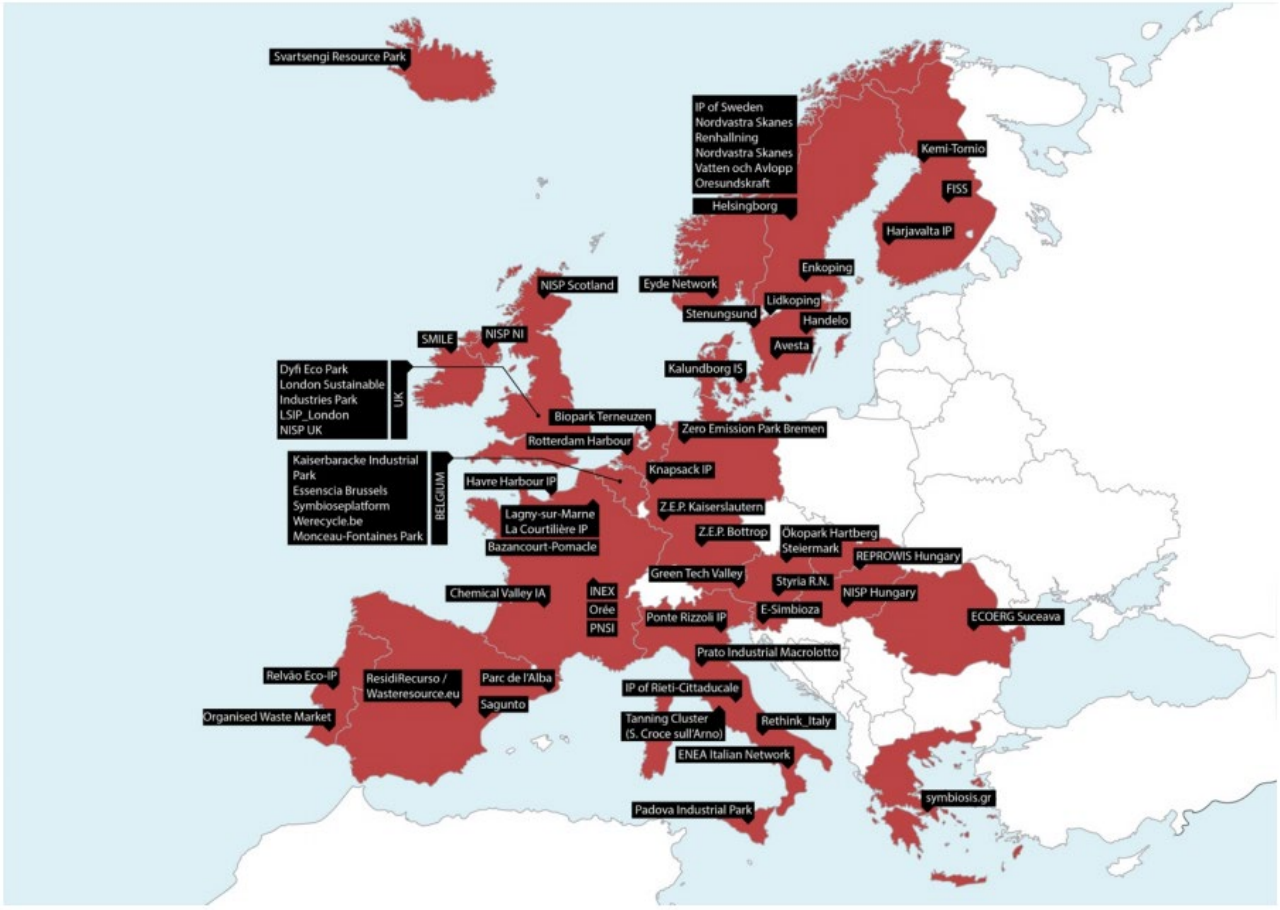
> "Last years have seen a surge of Industrial Symbiosis (IS) development in association with ad-hoc widespread policies to encourage more circular and sustainable practices in the manufacturing sector. Developments in Europe, despite having attracted less attention in the literature, have been significant, driven both by public and private initiative."

They continue:

> "This paper provides an updated overview of IS activity in Europe, with a mapping of key networks, and a study of prevailing typologies of networks, size, geographical distribution and main streams/ resources traded. The analysis is based on a combination of desk research, gathering of primary data from case studies, a survey to IS network facilitators (n=22) and in-depth interviews and focus groups (3) with IS practitioners, policy officers and industry representatives (n=25). The analysis identified pockets of IS activity across all Europe, although varying in nature, resources exchanged and scale and scope of the initiatives."

The IS networks are displayed in the following figure (analogue in the European Commission report on p 27):

Figure 2: Mapping of IS networks in Europe



and described in more detail in table format at the end of the article (analogue in the European Commission report on p 132 - 142):

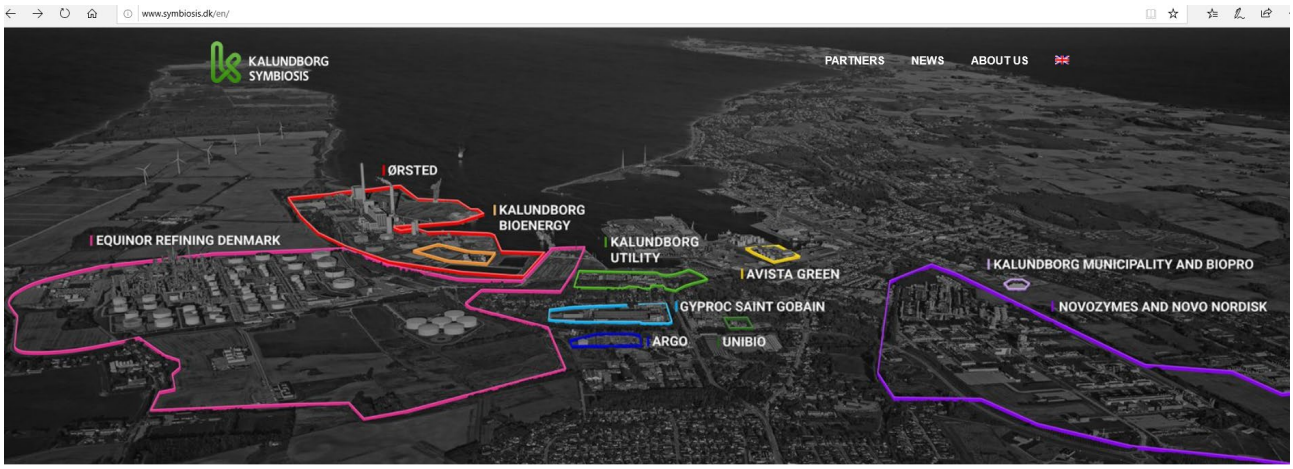
- Country
- Network
- Network size
- Network scope (local/ regional/ national)
- Number of IS synergies identified
- Number of IS synergies completed
- Facilitated/ planned/ self-organised
- Economic benefits quantified
- Social benefits (job creation)
- Environmental benefits quantified
- Further references to primary data collection

The first two described in each publication are Kalundborg, DK and Kemi-Tornio, FI. These have been presented in CITYCIRCLE presentations and also in this paper:

- Kemi-Tornio (see chapter 5.3)
- Kalundborg (see next chapter)

For more information on the other IS initiatives/ networks see the publications and mentioned references; see also in chapter 2.1.5 about SCALER project in the report "**Lessons learnt and best practices for enhancing industrial symbiosis in the process industry.** (September 2018) https://www.scalerproject.eu/wp-content/uploads/2019/07/Lessons-Best-practices-SCALER-D2.2.pdf, where in chapter 3 *Best practices in industrial symbiosis: lessons learnt from twenty-five crossindustry case studies* have been analysed and displayed in appendix 1.

2.3.2 Kalundborg Symbiosis



Winner of
WIN-WIN GOTHENBURG SUSTAINABILITY AWARD 2018

See: *CITYCIRCLE MARKETPLACES / INDUSTRIAL SYMBIOSIS, p* 48 - 50

For in-depth information see http://www.symbiosis.dk/en/.

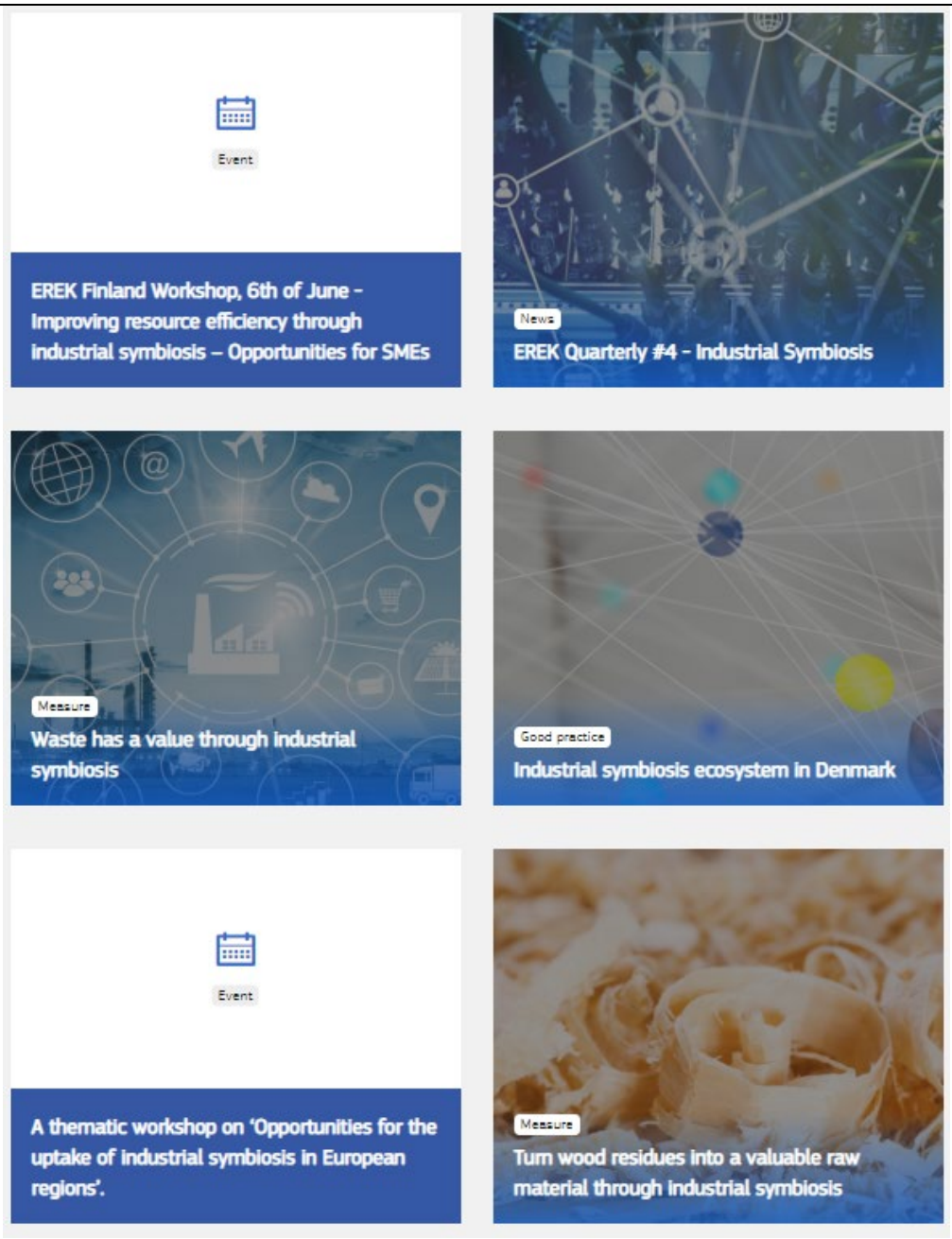
If you search for 'Kalundborg Industrial Symbiosis' in google - there are many many results. Here we give only 3:

Ellen MacArthur Foundation Case study: Kalundborg Symbiosis – Effective industrial symbiosis. https://www.ellenmacarthurfoundation.org/case-studies/effective-industrial-symbiosis
European CE Stakeholder Platform Good Practice: Kalundborg Symbiosis – six decades of a circular approach to production.

https://circulareconomy.europa.eu/platform/en/good-practices/kalundborg-symbiosis-six-decades-circular-approach-production
Wikipedia Kalundborg Eco-industrial Par k. https://circulareconomy.europa.eu/platform/en/good-practices/kalundborg-symbiosis-six-decades-circular-approach-production

2.4 More Links on Industrial Symbiosis- …

2.4.1 EREK	
https://www.resourceefficient.eu/en	**European Resource Efficiency Knowledge Centre** Searching for 'Industrial Symbiosis' offers a lot of hits:



2.4.2 NORDREGIO	
https://nordregio.org/ **Research centre**	Nordregio is an international research centre for regional development and planning, established by the Nordic Council of Ministers (https://www.norden.org/en/nordic-council-ministers). Nordregio's primary research focus and competence areas are: ▪ Regional Rural and Demographic Development ▪ Urban Planning and Sustainable Development

	▪ Regional Innovation and Green Growth ▪ Governance and Policy: Regional Reforms and Strategies Searching for 'industrial symbiosis' leads to some publications, news, a magazine:
Nordregio Policy Brief (January 2019) Industrial Symbiosis in the Baltic Sea Region - Current Practices and Guidelines for New Initiatives. http://norden.diva-portal.org/smash/get/diva2:1288423/FULLTEXT03.pdf (including case studies: ECO3 Platform; Tampere Region (FI), The Paper Province, Värmland (SWE), Trödelag Industrial Symbiosis (IS) Initiative, Tröndelag (NOR)	
Nordregio Policy Brief (April 2016) Industrial Symbiosis – A key driver of Green Growth in Nordic Regions ? http://norden.diva-portal.org/smash/get/diva2:917631/FULLTEXT01.pdf (including case studies: Kalundborg (DK), Kemi-Tornio Region (FI), Svartsengi Resource Park (IS), Eyde Cluster (NOR), Händelö (SWE))	
NORDREGIO NEWS (2016) #1.16 Industrial Symbiosis. http://norden.diva-portal.org/smash/get/diva2:917624/FULLTEXT01.pdf (including case studies: Kalundborg (DK), Kemi-Tornio Region (FI))	
NORDREGIO Report (2015) The potential of industrial symbiosis as a key driver of green growth in Nordic regions. http://norden.diva-portal.org/smash/get/diva2:875756/FULLTEXT01.pdf (including: Country reviews: DK, FI, IS, NOW, SWE and islands; case studies: Kalundborg (DK), Kemi-Tornio Region (FI), Svartsengi Resource Park (IS), Eyde Cluster (NOR), Händelö (SWE))	

2.4.3 Swedish Network for Industrial and Urban Symbiosis

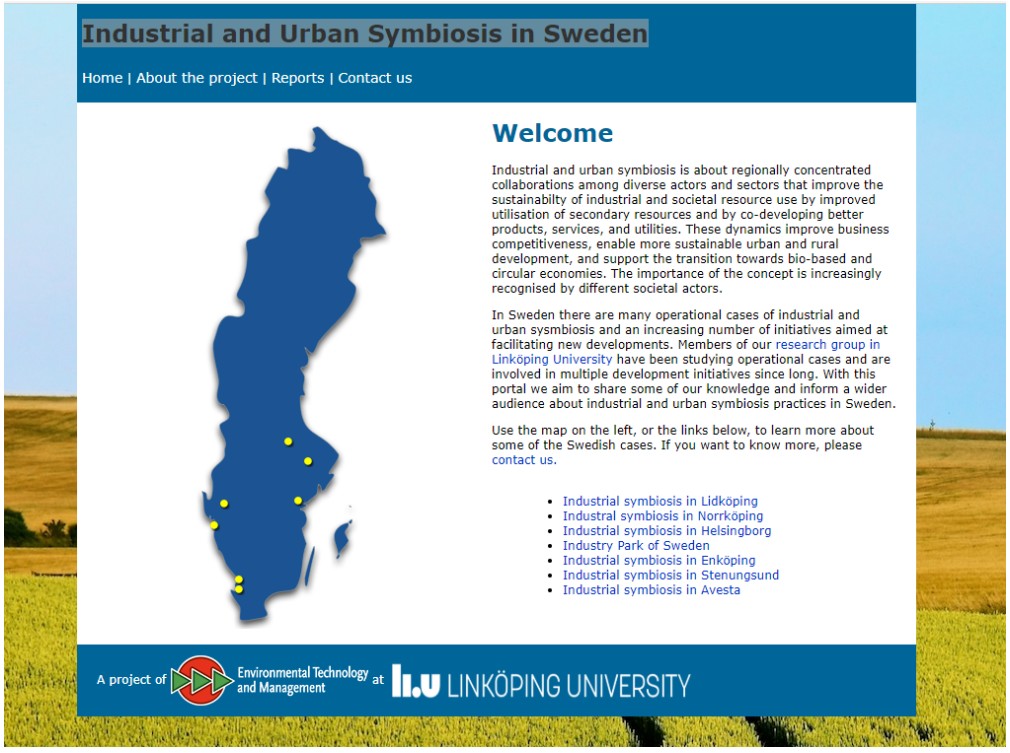
http://industrialsymbiosis.se/ An initiative led by Linköping University	**Advancing next generation resource productivity by collaborative action**

2.4.4 Linköping University – Industrial Symbiosis

https://liu.se/en/research/industrial-symbiosis-

e.g. Industrial and Urban Symbiosis in Sweden

http://www.industriellekologi.se/index.html



3. Marketplaces

As already introduced beginning of chapter 2 an information package on the topic MARKETPLACES/ INDUSTRIAL SYMBIOSIS was provided upfront the trainings/ webinars to the project partners.

The CITYCIRCLE presentation ***WP T2 – CE Marketplaces – information package*** (Soon available on CityCircle's website: https://www.interreg-central.eu/Content.Node/CITYCIRCLE.html) includes some Marketplace examples, which are presented here in the Advanced Knowledge Base in section 3.2 only in tabular form, essentially as a collection of links. Further examples are added in section 3.3. This section can and will be extended.

First - a definition is given in 3.1.

3.1 Marketplaces – definition

One goal of the GREENCYCLE project (https://www.greencycle.si/)- Introducing circular economy system to Alpine Space to achieve low-carbon targets – was to establish a transnational CE marketplace. In this context the following definition was given:

"This document aims to help define a common vision about the specific digital platform build by the GREENCYCLE project, the Circular Economy Marketplace, and the requirements and functionalities that is going to provide.

A marketplace is a site or an online platform (internet) that allows you to make purchases of products or services. It connects Producer and Consumers through the Internet and thereby fosters efficiency in an otherwise inefficient market. A Marketplace is an ecommerce platform that enables Individuals as well as Business to either list their items for sale or set up online storefronts on the marketplace platform and leverage the platform and its services [search, viewing product information, buying, payment, order management, etc]. It can be considered horizontal when they support the exchange of various types of products or services, or vertical, when the platform allows the exchange of only one type of product.

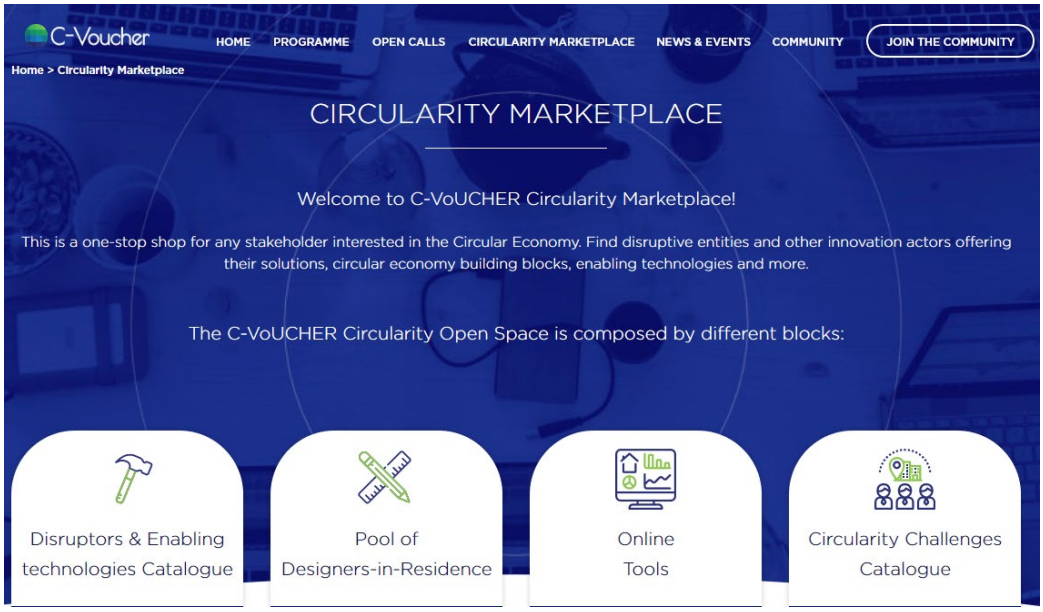
Marketplace also can act as a guarantor in the transaction between sellers and buyers, as long as the duration of the commercial operation. In particular, it pays attention to the registration of operators (sellers / buyers) by applying anti-fraud controls and rules."

https://www.alpine-space.eu/projects/greencycle/deliverables/t4/d.t4.2.2-definition-of-the-functionalities-of-the-platform-v1.1.pdf

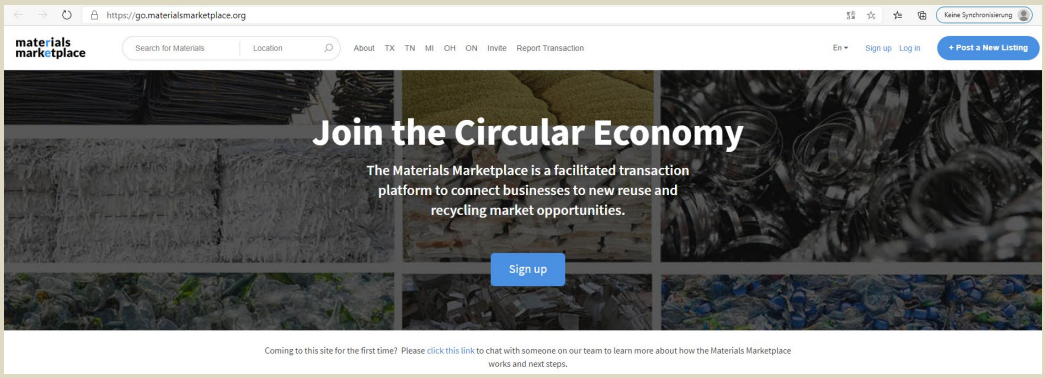
3.2 Marketplaces – presented in the *CITYCIRCLE MARKETPLACES/ INDUSTRIAL SYMBIOSIS* presentation

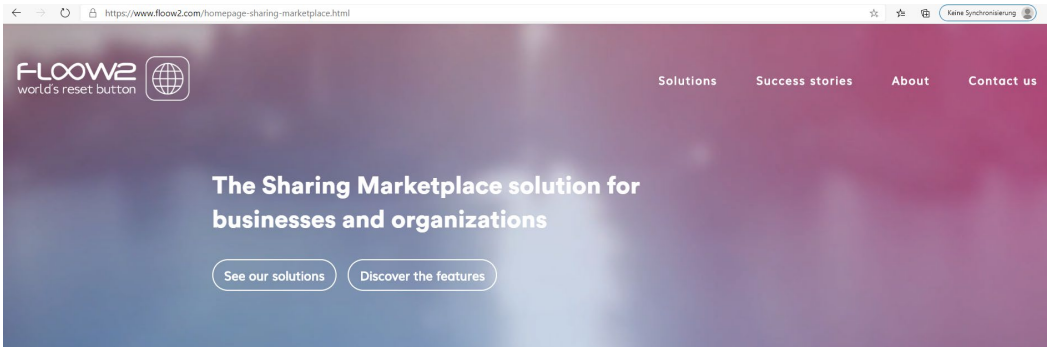
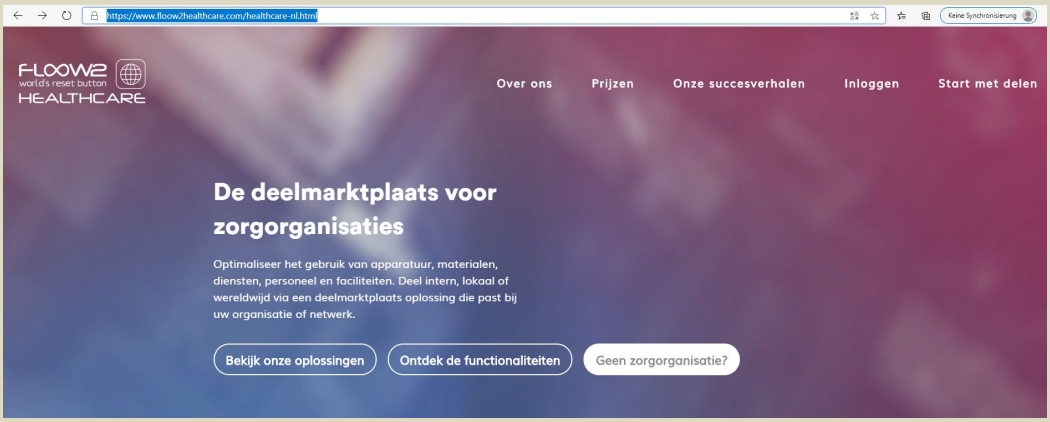
Marketplaces

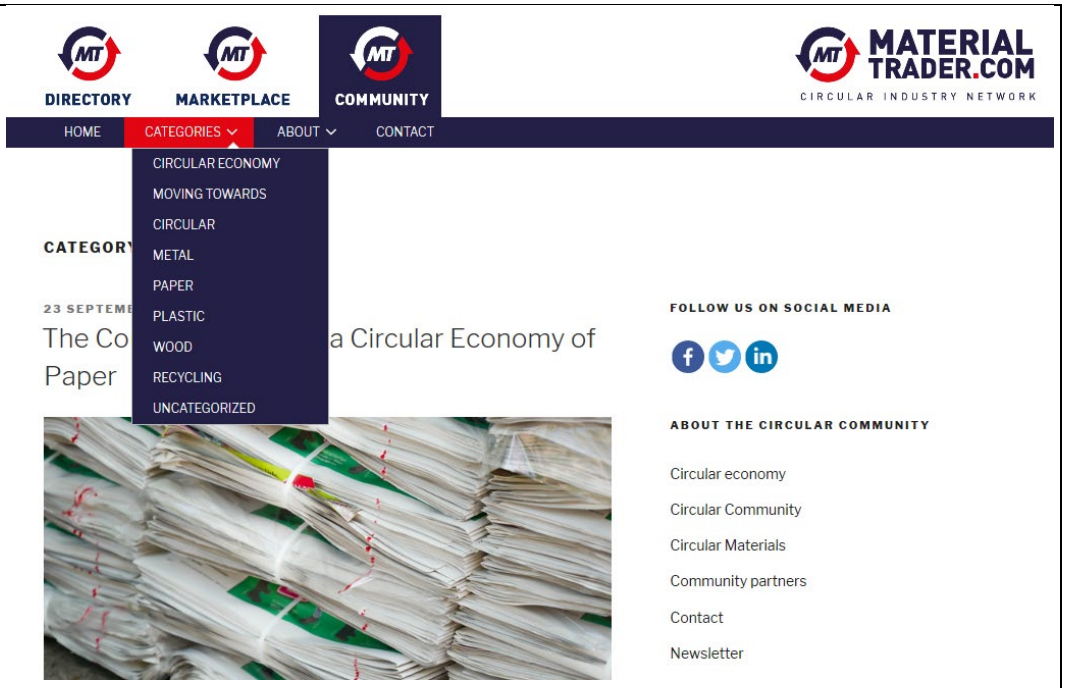
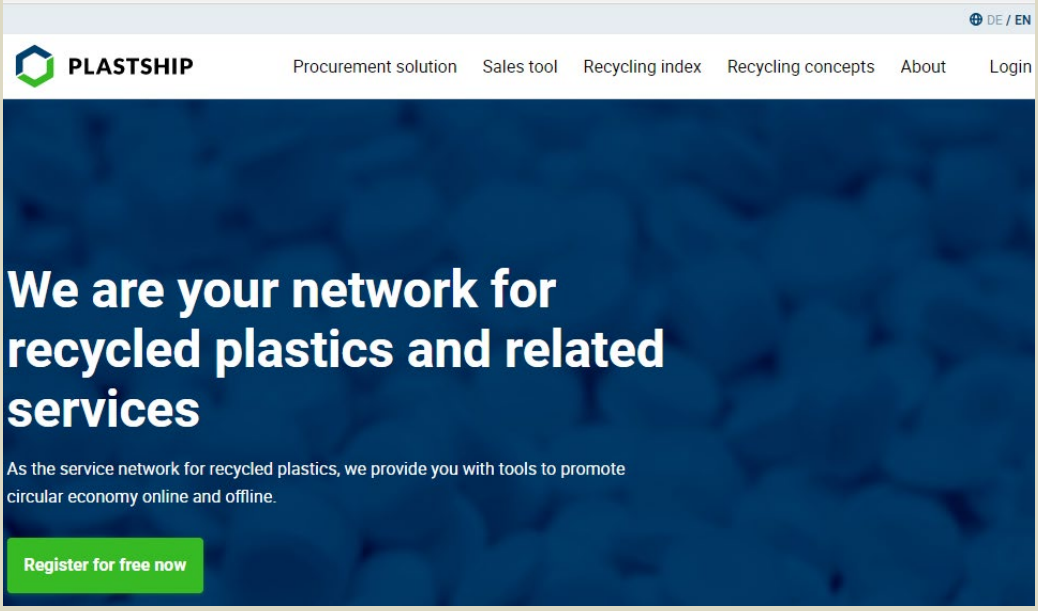
3.2.1 C-Voucher project

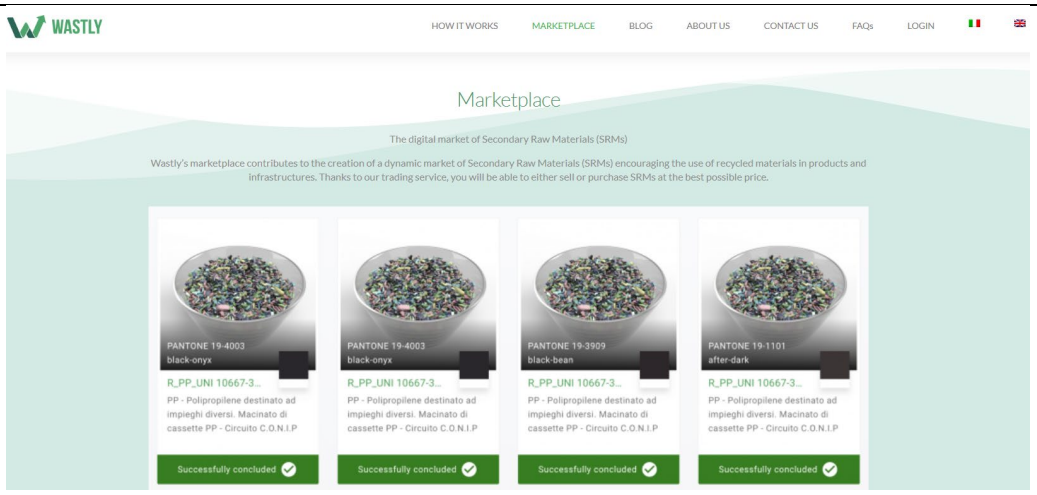
https://c-voucher.com/	**Circularize ValUe CHains across European Regional Innovation Strategies** 

3.2.2 Materials Marketplace

https://go.materialsmarketplace.org/	"The **Materials Marketplace** is an award-winning **regional and national platform** that connects businesses and organizations to develop and scale new reuse and recycling market opportunities. Through our platform, traditional and non-traditional industrial waste streams are matched with new product and revenue opportunities, ultimately enabling the **culture shift** to a **circular**, closed-loop economy. In addition to diverting waste from landfills, these recovery activities generate significant **cost savings**, **energy savings**, and create **new jobs** and business opportunities." (https://usbcsd.org/materials) Meanwhile already in one more site – Austin, Tennessee, Michigan, Ohio and Ontario: 

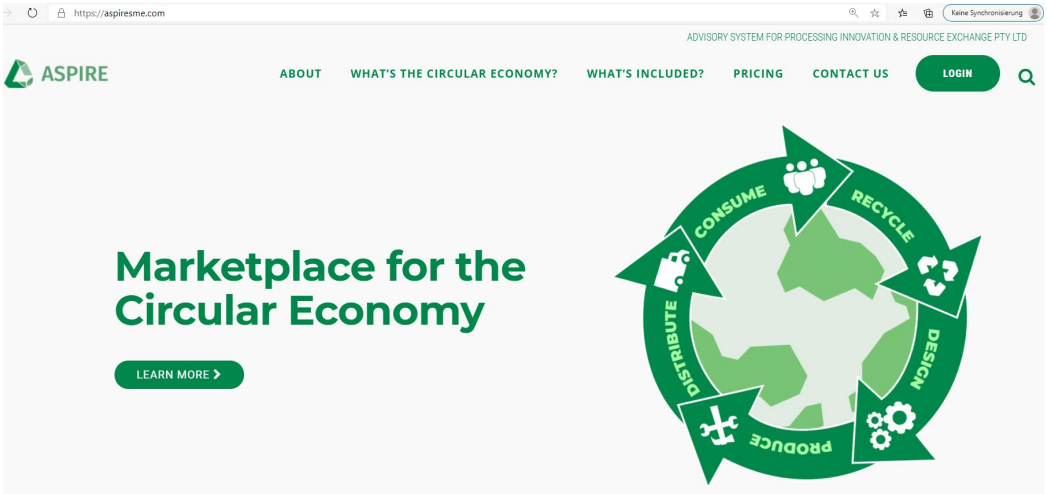
3.2.3 FLOOW2	
https://www.floow2.com/homepage-sharing-marketplace.html	"FLOOW2 is the first business-to-business sharing marketplace that enables companies and institutions to share overcapacity of equipment, knowledge and skills of personnel. Users can register on the platform for free and participants pay a subscription to advertise their equipment on the platform, providing a revenue stream for FLOOW2." https://www.ellenmacarthurfoundation.org/case-studies/business-to-business-asset-sharing 
3.2.4 FLOOW2 Healthcare	
https://www.floow2healthcare.com/healthcare-nl.html	In contrast to the CITYCIRCLE MARKETPLACES/ INDUSTRIAL SYMBIOSIS presentation, the Healtcare section has now been transferred to a separate website, initially in Dutch: 
3.2.5 MATERIAL TRADER.COM	
https://community.materialtrader.com/	**The circular industry network**

	
3.2.6 PLASTSHIP	
https://plastship.com/about	
3.2.7 WASTLY	
https://www.wastly.com/marketplace/?lang=en	The digital market of Secondary Raw Materials (SRMs)

3.3 More Marketplaces - …

More Marketplaces	
Circular Economy Club	**For more marketplaces have a look at – CIRCULAR ECONOMY CLUB** https://www.circulareconomyclub.com/organizations/marketplaces/
PlanetARK https://circular economyhub.org.au/	In the CITYCIRCLE presentation we introduced the  foreseen to be launched in 2020. This hasn't been the case until now. The Recycling hubs are working.
ASPIRE https://aspiresme.com/	**One businesses trash is another businesses treasure.** "ASPIRE was developed in response to a need from Australian businesses and their local councils who were seeking a solution to their ever-growing waste disposal costs. They wanted alternative ways to generate revenue from excess resources that would otherwise end up in landfill.

	ASPIRE transitioned to a commercial operation in 2019 with the endorsement of CSIRO and Data61 and is currently in the process of expanding across local and interstate networks under a new entity. ASPIRE currently works with councils and businesses Australia-wide and a number of corporations to provide them with a new way to solve their waste issues. In March 2020, the new ASPIRE platform was launched offering pioneering, innovative software intelligently matching potential remanufacturers, purchasers and recyclers." https://aspiresme.com/the-aspire-story/ 

V. Topics addressed by the CITYCIRCLE project partners during the implementation of their Circular Economy Pilot Projects

5 Pilot Actions are to be implemented in the 5 Central European Cities and Regions, each one with different thematic focus, to demonstrate the potentials benefits of the CE for the sustainable development of local and regional economies. The pilot projects (PP) reflect the needs and policy priorities of respective target environment, implementing new approaches on technological, societal or economic levels to form new value chains and to initiate the change towards higher circularity.

Target regions/ cities and thematic focus
▪ **Košice, Slovakia –** setting-up value chains in agriculture and forestry industry on CE principles. New value chains (farmers, enterprises) supported by ICT tools to provide business model for organic cycle.
▪ **Varaždin, Croatia -** boosting local economy through innovative approach to waste management and reuse. Innovating new business opportunities originating from waste recycling through public-private co-creation.
▪ **Udine, Italy –** setting-up value chain in waste-waste water-waste energy field on the principles of CE. Integrating different flows and companies into single solution supported by business model and business plan.
▪ **Kranj, Slovenia –** management of land (industrial sites, public spaces) on the principles of CE. Setting-up the network of land-owners and use-rs to develop joint urban regeneration process.
▪ **Dornbirn, Austria –** advanced manufacturing and ICT on the principles of CE. Developed holistic concept for covering the whole chain from manufacturing over compiling the right product data to recycling.

In the context of the PPs, the following steps are to be carried out in detail:

Pilot definition **-** Preparation activities documented in the form of concept and roadmap for implementation.
Implementation of the PPs – Implementation of the activities and timeplan as defined in the roadmap and replanning according the actual development in the local environment, while reported on 6-monthly basis.
Exchange of the experience – Exchange of lessons learnt through various channels – personal and online workshops and online collaboration tools.
Control the process – Monitoring the progress and evaluation of the outcomes, and formulation of the recommendations for others to ensure the replicability of the actions.

In the following 5 chapters the operational set-up of the PPs will be provided in brief. Information on activities and topics such as project management, communication, assumptions, constraints and risk assessment are not considered. Further details – like e.g. characteristics of the respective regions, their current challenges - can be found in the detailed versions of each PP description.

Updates – on the status of implementation, lessons learnt, monitoring and evaluation – will be provided in the next editions of the advanced knowledge base.

1. Agriculture and food industry (Košice, Slovakia)

- **Košice, Slovakia –** setting-up value chains in agriculture and food industry on CE principles. New value chains (farmers, enterprises) supported by ICT tools to provide business model for organic cycle.

1.1 Pilot project – Circular Agri-food value chains

Reference :

Pilot implementation concept **Košice**. D.T3.1.1 – 04 2020.

1.1.1 Pilot project scope

- **Needed actions derived from current challenges**

- Bring together local stakeholders, citizens and institutions to create trust, new links and more efficient exchanges assessing and planning the circular City Region Food System;
- Develop solutions to address gaps in the local food processing, storage and distribution infrastructure by exploring options that could include a food business incubator or the Food-HUB;
- Promote and facilitate all forms of urban and peri-urban agriculture and strengthen relations with all parts of the food system;
- Facilitate local sourcing in public procurement through more effective communication and experience sharing;
- Develop digital platforms where support is given to food-sharing initiatives to promote City Region Food System with attention to reduce food wastage, in particular through the use of ICT;
- Develop initiatives to finance fresh foods and manage public catering services to cook whole foods for nutritional foods and to increase knowledge about nutrition and cooking;
- Facilitate the transition from a charitable food model to a model based on the principles of a fair and sustainable food system
- To reduce food waste in the food system, increase food sharing and recapture in the food chain (e.g. to develop strategies to reduce food packaging in urban shops).

The aim of the CITYCIRCLE pilot is to deliver to proof of the financial, social and environmental potentials behind the CE in the agri-food value chains and and food service sector, to support the process of initiation of the transition towards circularity on all levels – public governance, business sector, innovation creation and lifestyle of citizens.

Within the pilot activities, the comprehensive analysis of the opportunitities in the flow of the agri-food products throughout the food value chain, covering variety of actors, in Košice City Region Food System will be performed with the help of experts. For the consumption level, the processes of the canteens in the responsibility of the Košice Self-governing Region, will be analyzed. The expected output is the in-depth map of the agri-food products flow, with possible loops and other channels, reducing and preventing the level of food waste generated.

For the most impactful areas, the opportunity study will be prepared covering the technical and financial analysis to prove the concept, captured in the interactive ICT based tool for other organizations and actors willing to replicate the pilot cases and to become the part of circular agri-food value chain.

1.1.2 Main goal and specific objectives

Main goal	*To support the decision making processes of the actors of agri-food value chains and food service sector towards implementation of CE solutions and models, by providing them with the proper information, tools, and guidelines to implement the change.*
SO 1	▪ To analyze the state-of-the-art of the CE solutions and models in the field of agri-food value chains and food service sector and their level of impact.
SO 2	▪ To analyze the existing best- and good-practices on EU and global level and its applicability in selected areas of intervention.
SO 3	▪ To conduct the on-the-spot analyses of selected CE solutions and models in the real-life environment of piloting partners.
SO 4	▪ To conclude the key findings in the form of case studies.
SO 5	▪ To formulate the set of recommendations and guidelines for implementation of selected circular economy solutions and models for analogical actors.
SO 6	▪ To create the interactive ICT tool supporting the uptake of recommended CE solutions and models, and enabling the creation of circular value chains in agri-food value chains and food service sector.

1.1.3 Stakeholders and external initiatives

Stakeholder

Košice Self-Govering Region	▪ managing more than ○ 20 cultural, ○ 70 school and 10 social facilities, which will be cooperating within our initiative.
Agro-Food producers and distributors	▪ Agro-Farmers operating in the region ▪ Companies providing food wholesale and distribution ▪ Agro-Food producers ▪ Shops
Food Service sector - made up of companies who provide meals outside of the home	▪ Contract caterers (schools, hospitals, workplaces and care homes) ▪ Communal catering/Public catering ▪ High street eateries (restaurants, café chains and independents.) ▪ Canteens
Consumption	▪ Citizens – consumers ▪ Visitors -food consumers
Managing and controlling authorities – government	▪ Košice Region Office ▪ Košice City Office ▪ State Veterinary and Food Administration of the Slovak Republic ▪ Ministry of Agriculture and Rural Development of the Slovak Republic ▪ Agricultural Paying Agency (APA) ▪ Slovak Agriculture and Food Chamber (SPPK) ▪ Office off Public Health Policy
Expertize providers - R&D, NGOs etc.	▪ Institute of Circular Economy ▪ Institute of Environmental Policy (analytical unit of the Ministry of the Environment of the Slovak Republic) ▪ Circular Slovakia – a platform for circular economy ▪ Farmer network ▪ Community based initiative ▪ Kitchen managers

External initiatives – *able to boost the impact through synergies*
▪ **Circular Slovakia (Platform) -** http://zelene-hospodarstvo.enviroportal.sk/zelene-hospodarstvo/obehove-slovensko/kto-sme ▪ **Employment Cross-border Action plan of the Cserehát micro-region (TAPE) -** http://www.viacarpatia.eu/novinka-11-may-2018-08-40-15 ▪ **From yard to regional development of rural areas (Project) -** http://rozvijamevidiek.sk/ ▪ **Office without trash can (Project) -** https://www.incien.sk/projekty/kancel-bez-kosa/ ▪ **Festival Without Waste (Workshop series) -** https://www.incien.sk/projekty/festivaly-bez-odpadov/ ▪ **Less waste (Expert Advisory Group) -** https://www.menejodpadu.sk/o-nas/ ▪ **WhatCity? (Project) -** https://whatcity.sk/

1.1.4 Pilot activities, milestones/ outputs

Pilot activity	*Description and milestones/ outputs*
1 - State-of-the-art of CE solutions	Analysis of the state-of-the-art of the CE solutions and models in the field of agri-food value chains and their level of impact, taking into account the financial, social and environmental aspect. This will be consulted with experts. The most promising solutions and models will be further analyzed in following activities. ▪ *List of appropriate good- and best- practice CE solutions*
2 – EU and global good- and best-practices	Analysis of existing best- and good-practices on EU and global level and its applicability in selected areas of intervention, taking into account the technical setting and legal aspects. ▪ *List of feasible CE solutions, Opportunity studies*
3 – On-the-spot analyses at piloting partners	The on-the-spot analyses of selected CE solutions and models in the real-life environment of small number of piloting partners (e.g. school canteens, farmers, processing companies, citizens). This will be appointed in the beginning of this activity. ▪ *List of feasible CE solutions, Opportunity studies*
4 – CE use-cases	Conclusion of the key findings and preparation of the case studies to be presented to enable the faster uptake of the CE solutions. ▪ *CE use cases*
5 – Recommendations and guidelines for CE solutions	Formulation of the set of recommendations and guidelines for implementation of selected circular economy solutions and models for analogical actors. These outcomes will be discussed with Košice Self-governing region to enable smooth application of public sector organizations (e.g. other school canteens). ▪ *Set of recommendations and guidelines for implementation of feasible CE solutions*
6 – ICT tool for uptake of CE solutions	Creation of the interactive ICT tool supporting the uptake of recommended CE solutions and models, and enabling the creation of circular value chains. ▪ *ICT tool*

1.2 References and Knowledge Base

1.2.1 References

Further readings – Košice, Slovakia
Transition towards Circular Economy in Slovakia Circular Economy Policy framework https://www.minzp.sk/files/2-sekcia/circular-economy-a4.pdf
Transition towards Green Economy Circular economy is gradually winning political support in Slovakia and several framework conditions have been created to facilitate progress, e.g. in the area of waste management. During the EU Council presidency in 2016, the main goal within the Environment Council was to actively contribute to the current European discussion about the transition to the green economy and circular economy. The Slovak presidency triggered the development the „Bratislava Green Economy Process" the main goal of which is to enable regular and broad discussion about progress towards the green economy in the context of strategic EU documents such as the Europe 2020 strategy, 7th Environment Action Programme, etc. http://www.t2ge.eu/
Green Economy Information Platform To facilitate the implementation of the principles of circular economy in practice, the Green Economy information platform has been established. It offers the possibility to present green solutions and to share the experience with their implementation. http://green-economy.enviroportal.sk
Greener Slovakia - Strategy Environmental Policy of the Slovak Republic until 2030 The basic vision of Enviro's 2030 strategy is to achieve better environmental quality and a sustainable circulatory economy using as few non-renewable natural resources and hazardous substances as possible. Protecting the environment and sustainable consumption will be part of the general awareness of both citizens and policy makers. By preventing and adapting to climate change, its consequences in Slovakia will be as modest as possible. https://www.minzp.sk/files/iep/greener_slovakia-strategy_of_the_environmental_policy_of_the_slovak_republic_until_2030.pdf
Waste Prevention Program of the Slovak Republic for the years 2019 - 2025 The main objective of the program is to shift from material recovery as the only priority in waste management of the Slovak Republic to the prevention of waste in accordance with the waste hierarchy of the Slovak Republic. This trend is in line with the European Union Action Plan for Circular Economy Link to programmes factsheet: https://www.eea.europa.eu/ds_resolveuid/NY4PBIZOSC
Waste Management Program of the Slovak Republic for 2016 – 2020 The program of the region defines the targeting of the management of the designated types and quantities of waste (waste streams), at a given time, measures to achieve these objectives and the assessment of the need to build new waste treatment facilities and the need to expand existing waste treatment facilities, including plans to build facilities for waste management of regional importance. https://www.minzp.sk/files/sekcia-enviromentalneho-hodnotenia-riadenia/odpady-a-obaly/registre-a-zoznamy/poh-sr-2016-2020_vestnik_en-2.pdf

Further readings - Circular Economy in Agriculture and Food Sector
Food safety and waste policies in EU https://ec.europa.eu/food/overview_en https://ec.europa.eu/food/safety/food_waste_en
Reduce Food Waste Initiative by Interreg Central Europe project STREFOWA http://www.reducefoodwaste.eu/index.html https://www.interreg-central.eu/Content.Node/STREFOWA.html
AgroCycle project under H2020 programme http://www.agrocycle.eu/

1.2.2 Knowledge Base

Knowledge Base
FoodDrinkEurope - https://www.fooddrinkeurope.eu/ ▪ **Ingredients for a Circular Economy** - https://circulareconomy.fooddrinkeurope.eu/ ▪ **Preventing Food Waste** - https://foodwaste.fooddrinkeurope.eu/

2. Waste management and reuse (Varaždin, Croatia)

- **Varaždin, Croatia -** boosting local economy through innovative approach to waste management and reuse. Innovating new business opportunities originating from waste recycling through public-private co-creation.

2.1 Pilot project – city market Gradska Tržnica d.o.o. in the City of Varaždin

Reference :

Pilot implementation concept **City of Varaždin**. D.T3.1.2 – 03 2020.

2.1.1 Pilot project scope

The scope of the PP is limited to the city market Gradska Tržnica d.o.o. in the City of Varaždin. It has been decided that the PP will take place there since it is the best representative of the city and it gathers a lot of people throughout the day. The idea is to test the potential of CE on a smaller scale and then, if it possible, extend it on a larger scale. In a period of 24 months all sort of waste from city market will be sorted, collected and properly treated. The emphasize will be on biodegradable waste which will be treated in a biogas plant while produced digestate will be used on a hazelnut farm owned by the city market. That is just one of the ways for closing the loop. Defined PP will serve for utilization of innovation potential of circular economy and for testing tools and guidelines given by CITYCIRCLE project. Besides that, PP will serve for identification of possible problems and will enable necessary changes and adjustments. Nevertheless, it is necessary to emphasize that the project will not have economic performance during the implementation, but it is expected that it will serve as precondition and origin for future activities.

2.1.2 Main goal and specific objectives

Main goal	***Once successfully implemented, the PP will represent a valuable blueprint for policymakers who want to stimulate the progression from a linear towards CE.***
SO 1	▪ providing education and educational materials about proper sorting of waste
SO 2	▪ procurement of waste bins in different colours for easier and adequate separation of waste
SO 3	▪ proper and timely waste disposal according to needs
SO 4	▪ treatment of biodegradable waste in a biogas plant
SO 5	▪ closing the loop by using the obtained digestate as a fertilizer on the hazelnut farm owned by the *Gradska Tržnica d.o.o.*

2.1.3 Stakeholders and external initiatives

As part of the PP 'City market Varaždin' various stakeholders will take place. All of them together are part of quadruple helix model and represent a round picture of national circumstances and ambitions.

Development Agency North (DAN) has the partner role in the project. They oversee conducting management and coordination of the project on local/regional level and all activities which are needed to achieve specific goals of the project. They already have experience in preparing and implementing transnational projects focusing on themes related to environmental protection, urban planning and industrial cooperation. *City of Varaždin,* on the other hand, is the founder of business supporting agencies such as aforementioned DAN, Technological Park Varaždin, Čistoća d.d. for waste management and other supporting institutions. It is primarily a public institution and doesn't perform economic activities on the market. As a representative of Varaždin county and public authority it is giving all the support needed for easier implementation of PP and transition towards CE.

Based on several meetings and workshops it has been decided that the PP will take place on the city market named *Gradska Tržnica d.o.o.* since it is the main promotion of the city and it gathers a lot of people throughout the day. It is a public utility that serves as a location where people regularly gather for purchase and sale. Due to large amounts of biodegradable waste throughout the year (around 59 tons of waste), it is considered the best option for the implementation of PP. To meet the goals of circular economy the following public utility companies will take part in taking care of different sort of waste that is produced. As a company responsible for public services and waste management *Čistoća d.o.o.* will participate in waste transportation from one location to another while the dynamics of transportation will be determined over time. According to the morphology of city market waste, biodegradable waste accounts for the largest share. Since *OPG Vrček* owns a biogas plant that can treat biodegradable waste and it seems like a perfect cooperation between these two stakeholders. Besides biogas, anaerobic digestion produces a digested waste (digestate) that can be used as a fertilizer. During one of the meetings it has been found that *Gradska Tržnica d.o.o.* owns a couple of acres of hazelnuts and according to that, the produced digestate could be used for fertilization. The possibility of applying the digestate on hazelnut farm will be explored by scientific community. For successful implementation of the PP, valid education of all participants will be indispensable. The proposed idea is to include students from the *Faculty of organization and informatics, Varaždin* to participate in creating of all necessary leaflets, brochures, flyers, presentations and posters.

As an expert for CE, *CROTEH d.o.o.* is responsible for designing a clear and consistent PP concept agreed by all of the stakeholders.

Once again, we see the importance of having a wider group of stakeholders required for valid implementation of the CE.

2.1.4 Pilot activities, milestones/ outputs

Pilot activity	*Description and milestones/ outputs*
1 - Determination of quantity and composition of city market waste	Prior to PP implementation it was necessary to determine the quantity and composition of produced waste on the city market. It was done by Gradska Tržnica d.o.o. who collected and sorted waste for one week (January 8th – January 14th). Data collected in a period of one week have been used for a monthly estimate. However, bearing in mind the variability of waste during different periods of a year, continuous monitoring will be implemented. The monitoring will also be the measuring tool of successful waste separation. ▪ *Report on quantity and composition of city market waste*
2 – Strategical placements of waste bins	Once the sets of waste bins arrive, they will need to be strategically placed. In order to accomplish that, Croteh d.o.o. and workers from the city market will work together. Since they have already inspected the place and possible locations during the Activity 02, the placement is presenting a simple challenge. ▪ *Procurement and strategic placement of waste bins*
3 – Separation, collection and treatment of waste	Separation of waste by tenants and public during the duration of the PP. Frequency of waste disposal will be dynamic, meaning it will be based on the amount of produced waste. Čistoća d.o.o. will transport the collected biodegradable waste for treatment in the biogas plant OPG Vrček. The produced digestate, will then be transported to the hazelnut farm. ▪ *Successful separation of waste* ▪ *Production of high quality digestate*
4 – Soil and digestate sampling and analysis and application of digestate on farmland	Sampling of soil from hazelnut farm and digestate from the biogas plant and their analysis. In order to determine the real impact of the digestate on farmland, the digestate will be applied only on half of the farmland. It will be done by city market workers. After application of the digestate, the farmland will be normally cultivated, and the progress will be determined after approx. one year. The results and comparison of the fertilised and unfertilised farmland will be compared, and the benefits will be evaluated. This activity is a research part of the project about the possible use of digestate for hazelnut production. It will be performed by all responsible parties, aided by Croteh d.o.o. and scientific community. Besides the use on a hazelnut farm they will also find alternative solutions about the possible use of digestate on some other city areas such as parks and roadsides with poor soil quality. ▪ *Utilization of the digestate on the hazelnut farm*
5 – Hazelnut harvesting	The difference between the treated part of the farm and the untreated part of the farm will show the effectiveness of the use of the digestate. Depending on the amount of harvested hazelnuts, Gradska Tržnica d.o.o. will decide how to treat

	them. If there is an excess of hazelnuts left after a part has been used for personal needs, it can be sold on their city market. That way a value-added product will be obtained. ▪ *Successful harvest of hazelnuts*

2.2 References and Knowledge Base

2.2.1 References

Further readings – Varaždin and Croatia *(mentioned in the presentation)*
City council of Municipaliy City of Varaždin (2018) Waste management plan for Varaždin for the period 2018 – 2023., February, 2018. https://glasila.hr/upload_data/site_files/svgv318.pdf
Development Agency Sjever DAN Ltd. (2016) Development strategy of the City of Varaždin by 2020, May, 2016. https://varazdin.hr/upload/2016/12/strategija_razvoja_grada_varazdina_do_2020_godine_584e471f6dd4f.pdf
Government of the Republic of Croatia (2017) Waste management plan of the Republic of Croatia for the period 2017 – 2022. Zagreb: January 2017. https://mzoe.gov.hr/UserDocsImages/UPRAVA-ZA-PROCJENU-UTJECAJA-NA-OKOLIS-ODRZIVO-GOSPODARENJE-OTPADOM/Sektor%20za%20odr%C5%BEivo%20gospodarenje%20otpadom/Ostalo/management_plan_of_the_-republic_of_croatia_for_the_period_2017-2022.pdf "On January 5th 2017 Croatian Government adopted the Waste Management Plan in the Republic of Croatia for the period 2017 -2022. Adoption of the Plan is an important precondition for the use of funds in the waste sector, from the Operational Programme Competitiveness and Cohesion 2014-2020. The Plan should enable the development of the recycling industry, the creation of new green jobs and fulfilment of the EU's commitments. An integral part of the Plan is the Waste Prevention Plan, which introduces measures for separate collection at the source, selection of waste and household composting." Source: http://polocro28.irmo.hr/waste-management-plan-in-the-republic-of-croatia-for-the-period-2017-2022-adopted/
The Ministry of Environment and Energy (2017) National waste management for the period 2017-2022. Zagreb: April 2017. https://www.hgk.hr/documents/prezentacijaradovicjosic458ecda6314806.pdf
Croatian Parliament (2009)

Pursuant to Article 44, paragraph 4 of the Environmental Protection Act (Official Gazette No. 110/07), the Croatian Parliament passed, during its session held on February 20, 2009, the following SUSTAINABLE DEVELOPMENT STRATEGY OF THE REPUBLIC OF CROATIA.
https://narodne-novine.nn.hr/clanci/sluzbeni/2009_03_30_658.html

Croatian Parliament (2005)

Pursuant to Article 8 of the Law on Waste (Official Gazette No. 178/04), the Croatian Parliament passed, during its session held on October 14, 2005, the following S T R A T E G Y OF WASTE MANAGEMENT IN THE REPUBLIC OF CROATIA
https://vlada.gov.hr/UserDocsImages//ZPPI/Strategije%2020OGP/za%C5%A1tita%20okoli%C5%A1a//-130%202.11.2005%20Strategija%20gospodarenja%20otpadom%20Republike%20Hrvatske.htm

Further readings _ Waste Croatia *(website search)*

Netherlands Enterprise Agency (2018)

Waste management and circular economy efforts in Croatia. The Hague: July 2018.
https://www.rvo.nl/sites/default/files/2018/07/circular-economy-and-waste-management-in-croatia.pdf

Flanders Investment & Trade Market Survey (2018)

Waste and Water Management in Croatia. Paper. Zagreb: November 2018.
https://www.flandersinvestmentandtrade.com/export/sites/trade/files/market_studies/2018-Waste%20and%20Water%20Management%20in%20Croatia.pdf

2.2.2 Knowledge Base - International Solid Waste Association (ISWA)

Knowledge Base

International Solid Waste Association (ISWA), Rotterdam, Netherlands
https://www.iswa.org/

The ISWA Knowledge Base aims to provide up to date information on all aspects of waste management in order to promote and develop best practices worldwide.

ISWA's mission is to Promote and Develop Sustainable and Professional Waste Management Worldwide
ISWA achieves its mission through:

- Promoting resource efficiency through sustainable production and consumption
- Support to developing and emerging economies
- Advancement of waste management through education and training
- Promoting appropriate and best available technologies and practices
- Professionalism through its programme on professional qualifications.

ISWA provides a Knowledge Base

https://www.iswa.org/media/publications/knowledge-base/

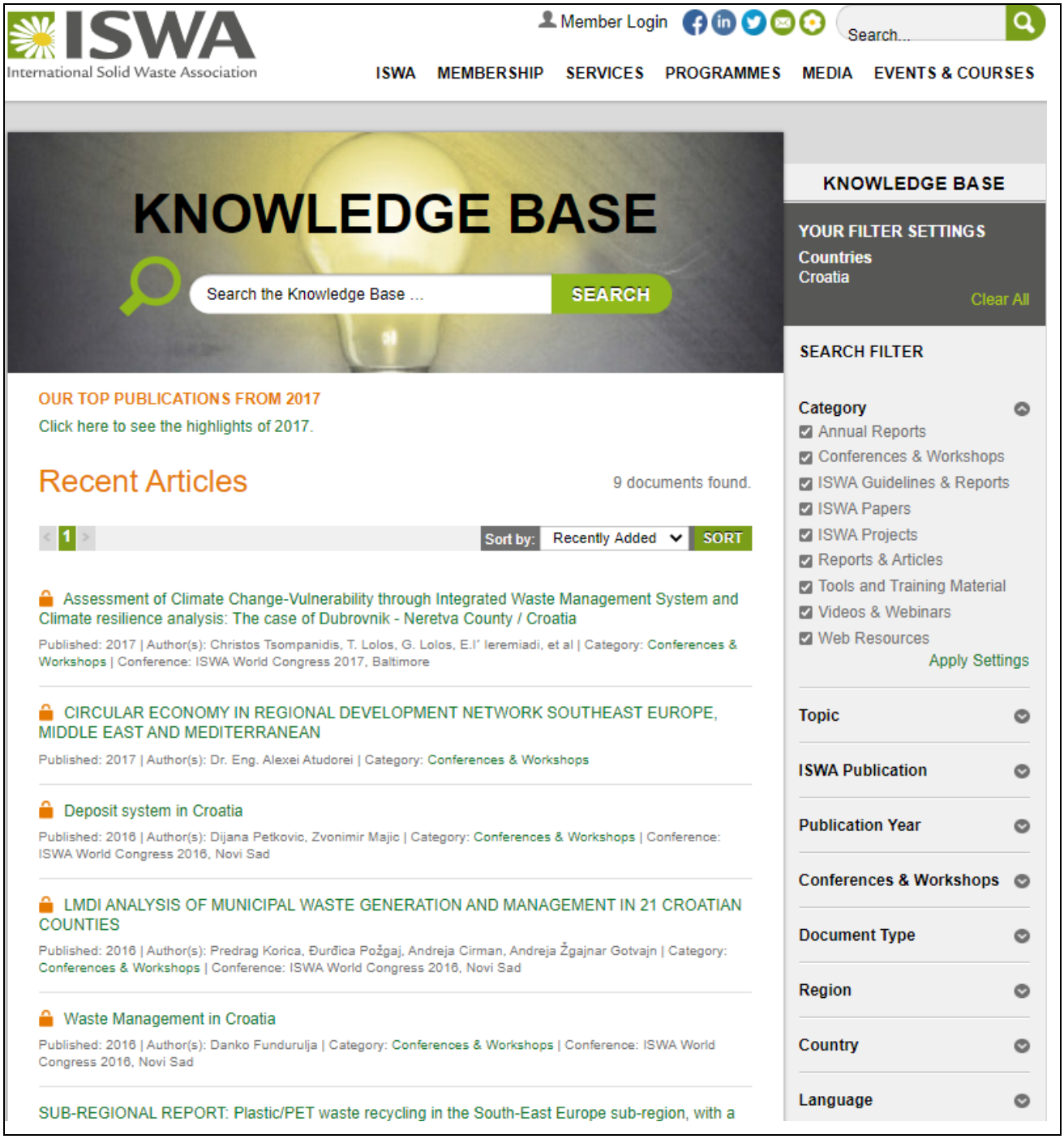
The ISWA Knowledge Base aims to provide up to date information on all aspects of waste management in order to promote and develop best practices worldwide.

The following **SEARCH FILTERS** are provided:

- **Category**
- **Topic**
- **ISWA Publication**
- **Conferences & Workshops**
- **Document Type**
- **Region**
- **Country**
- **Language**

Until now roundabout 4.000 documents are stored in the Knowledge Base.

For CROATIA the search shows 9 documents if no further filter is set.


ISWA
International Solid Waste Association
Member Login
Search...
ISWA MEMBERSHIP SERVICES PROGRAMMES MEDIA EVENTS & COURSES
KNOWLEDGE BASE
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SEARCH
OUR TOP PUBLICATIONS FROM 2017
Click here to see the highlights of 2017.
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9 documents found.
1
Sort by: Recently Added SORT
Assessment of Climate Change-Vulnerability through Integrated Waste Management System and Climate resilience analysis: The case of Dubrovnik - Neretva County / Croatia
Published: 2017 | Author(s): Christos Tsompanidis, T. Lolos, G. Lolos, E.I' Ieremiadi, et al | Category: Conferences & Workshops | Conference: ISWA World Congress 2017, Baltimore
CIRCULAR ECONOMY IN REGIONAL DEVELOPMENT NETWORK SOUTHEAST EUROPE, MIDDLE EAST AND MEDITERRANEAN
Published: 2017 | Author(s): Dr. Eng. Alexei Atudorei | Category: Conferences & Workshops
Deposit system in Croatia
Published: 2016 | Author(s): Dijana Petkovic, Zvonimir Majic | Category: Conferences & Workshops | Conference: ISWA World Congress 2016, Novi Sad
LMDI ANALYSIS OF MUNICIPAL WASTE GENERATION AND MANAGEMENT IN 21 CROATIAN COUNTIES
Published: 2016 | Author(s): Predrag Korica, Đurđica Požgaj, Andreja Cirman, Andreja Žgajnar Gotvajn | Category: Conferences & Workshops | Conference: ISWA World Congress 2016, Novi Sad
Waste Management in Croatia
Published: 2016 | Author(s): Danko Fundurulja | Category: Conferences & Workshops | Conference: ISWA World Congress 2016, Novi Sad
SUB-REGIONAL REPORT: Plastic/PET waste recycling in the South-East Europe sub-region, with a
KNOWLEDGE BASE
YOUR FILTER SETTINGS
Countries
Croatia
Clear All
SEARCH FILTER
Category
Annual Reports
Conferences & Workshops
ISWA Guidelines & Reports
ISWA Papers
ISWA Projects
Reports & Articles
Tools and Training Material
Videos & Webinars
Web Resources
Apply Settings
Topic
ISWA Publication
Publication Year
Conferences & Workshops
Document Type
Region
Country
Language

3. Value chain in waste-waste water-waste energy (Udine, Italy)

Due to COVID-19 and the associated lockdown, Udine is behind schedule. This section will be completed as soon as the implementation concept for the pilot is available.

- **Udine, Italy –** setting-up value chain in waste-waste water-waste energy field on the principles of CE. Integrating different flows and companies into single solution supported by business model and business plan.

3.1 Pilot project – Udine

Reference :

Pilot implementation concept **Udine**. D.T3.1.3 – 0x 2020.

4. Management of land - industrial sites, public spaces (Kranj, Slovenia)

- **Kranj, Slovenia –** management of land (industrial sites, public spaces) on the principles of CE. Setting-up the network of land-owners and users to develop joint urban regeneration process.

4.1 Pilot project – Management of land in Primskovo area

Reference :

Pilot implementation concept **Kranj**. D.T3.1.4 – 05 2020.

4.1.1 Pilot Project scope

Through the CITYCIRCLE pilot project the Municipality of Kranj intends to explore, test and refine its approach on management of land on the principles of CE. The city aims to create an approach that will enable urban regeneration in collaboration with land-owners and users.

The municipality recognises urban space as a key resource for enabling a sustainable, circular and prosperous development of the city. It also recognises that degraded, non-vital areas of the city are a high priority challenge that can be tackled with circular economy approach. Herein the city recognises vital opportunities to regenerate and enhance the value of this crucial resource.

Municipality of Kranj has for this purpose chosen a pilot area, called zone Primskovo. The reason for choosing this area is its current status as low-performing asset at risk of degradation.

Testing the CE based on land management approach in Primskovo area will help the municipality to explore the strengths and weaknesses of this approach with the aim to refine experiential input of involved stakeholders, so that it becomes a blueprint model for regeneration and activation of under-utilised spaces across municipality.

4.1.2 Main goal and specific objectives

The overarching objective of the CITYCIRCLE pilot is to develop an approach on management of land based on the principles of circular economy.

The pilot development process will include the following key phases:

- In-depth analysis of the Primskovo area to understand the context, define key challenges and opportunities for revitalisation and land management improvement as seen by users, potential users, landowners and the municipality.
- Setting-up the network of land owners & users to develop joint established business location.
- Upgrade of municipalities Information system with new relevant data and new potential solutions to support competitiveness of business location.

For all set goals, feedback on the achievement of the goal is available within the project time frame. The goals can be achieved with a positive response from the stakeholders of the Primskovo zone and their participation in the transition to a CE, by finding opportunities for the CE (principles of optimization, circularity, replacement) and with facing the challenges of the transition to it.

The conclusions and results, that will be monitored during and after implementation, will be recognized as long-term goals of the project. The new innovative approach on land management based on the principles of CE tested in Primskovo area will be used in other degraded areas in the Municipality of Kranj.

Main goal	*To develop an approach on management of land in Primskovo area based on the principles of CE.*
SO 1	▪ In-depth analysis of the Primskovo area.
SO 2	▪ Setting-up the network of land owners & users to develop joint established business location and of coordination support between stakeholders in the area, focused on the CE. ▪ Activation and support for implementation of CE activities in the area.
SO 3	▪ Upgrade of municipality Information system with new relevant data and new potential solutions to support competitiveness of business location for improved spatial planning and space utilization.
SO 4	▪ Monitoring, approach testing and upgrades.

4.1.3 Stakeholders and external initiatives

Stakeholder group of Primskovo area will be established after phase 1 of pilot concept - in-depth analysis. The potential stakeholders for CE transition regarding land management will be selected and grouped for further consideration.

Stakeholder	
Owners and business tenants in Primskovo area (by landuse or activity)	▪ RESIDENTAL BUILDINGS, ▪ BUSINESS-SERVICE ACTIVITIES (business premises, trade, shopping center, gas station, mechanical workshop, car salon, hairdresser, restaurant, warehouse), ▪ PRODUCTION, ▪ INDUSTRY;
Municipality of Kranj	▪ As a representative of the local authority.
Komunala Kranj	▪ As a public institution responsible for public services and waste management.
CITYCIRCLE team	▪ As coordinator and incubator of ideas and others.

External initiatives
The pilot activities will also include possible initiatives for CE from other stakeholders operating in other business areas in municipality and would show interest in (business) cooperation in the Primskovo area.

4.1.4 Pilot activities, milestones/ outputs

Pilot activity	*Description and milestones/ outputs*
1 – Pilot concept definition	Management of land (industrial sites, public spaces) on the principles of CE in Primskovo area.
2 – In-depth analysis of pilot area	Preparation of database: ▪ a list of plots, land registry status and the design of sets of units (land + building) in graphics ▪ Simulation of variants for development of pilot area.
3 – Networking	Preparation of communication activities such as online survey, interviews, workshops, report of results, coordination and awareness raising among stakeholders and others. Setting up the network will help collect data of the users of space in the Primskovo area, what activity they are engaged with and what are their plans for the future. Based on the obtained data it will be possible to place activities in the space that will correspond to the existing ones and create industrial symbiosis between them. It is possible, that new economic activity will appear in the area, with which it will be possible to establish new business model based on circular economy principles.
4 – Upgrade of information system	Upgrade with new relevant data and new potential solutions to support competitiveness of business location for improved spatial planning and space utilization.
5 – Monitoring, evaluation	During all three phases the CE approach will be tested, results monitored, and upgrades made based on results and user feedback. This overall phase will be key to ensure the usability and functionality of support tools and the overall approach with a view for further scaling in to other areas of the city.
6 – Agreement on further work	The conclusions and results, that will be monitored during and after implementation, will be recognized as long-term goals of the project. The new innovative approach on land management based on the principles of circular economy tested in Primskovo area will be used in other degraded areas in the Municipality of Kranj.

4.2 References and Knowledge Base

4.2.1 References

Further readings – Circular economy in Kranj, Slovenia, EU (mentioned in the presentation)
Kažipot prehoda v KG The process of creating the Kažipot is based on regional consultations held in Slovenia in co-organization of the Partnership for the Green Economy of Slovenia and the Ministry of the Environment and Spatial Planning, as the bearers of the preparation of the document. The consultations were carried out in cooperation with the contractors and the authors of the Signpost. A consortium of authors, including dr. Janez Potočnik, representatives of the Jožef Stefan Institute and others, led the Circular Change platform.
Circularity gap report - https://www.circularity-gap.world/ The first Circularity Gap Report presented the alarming statistic that our world economy was only 9.1% circular, leaving a massive circularity gap. The Report, launched in January 2018 during the World Economic Forum Annual Meeting in Davos, has since been updated and published every year, with this being the third edition. It aims to contribute to the emerging evidence base that supports decision-makers in business, politics and civil society with key insights and metrics to guide their action in the most impactful way.
EOL_144-145_EIT Climate-kic v Sloveniji Specialized magazine for sustainable development.
Letno-porocilo-2018-_Komunala_Kranj
RIS3_smart_specialisation_sl
Slovenska podjetja in krožno gospodarstvo The first part of the monograph analyzes all companies and sole proprietors in Slovenia for 2016 and compares key data for 2015 and 2014 between Slovenia and the EU-28 or individual members in the non-financial sector of the economy (industry, trade and services). The second part examines the context of the circular economy in terms of challenges and opportunities for Slovenian SMEs. The concept of the circular economy, strategic starting points for the transition to the circular economy at the national level, the issue of measuring the circular economy and the state and possibilities of using ecodesign in Slovenian SMEs in the field of construction and related activities are defined.
Strategija prehoda mesta Maribor v KG_Wcycle
Strategija trajnostnega razvoja MOK 2009-2023
Sustainable_circular_reuse_of_spaces_and_buildings_handbook The book intends to serve as a stimulus and an incentive for strategic planning at the urban level, especially carried out by public authorities, but also supported by the regional and the national level. With a wide review and analysis of good practices of urban re-use offered by the handbook, cities may learn about the different solutions that can be adopted, taking into account their specific urban features.

Further readings – circular economy in management of land, circular economy (website search)
Spatial Development Strategy of Slovenia https://www.gov.si/zbirke/projekti-in-programi/strategija-prostorskega-razvoja-slovenije/
Strategy for the transition to circular economy in the municipality of Maribor https://www.greencycle.si/static/strategy.pdf
Networks for the transition into circular economy https://srip-krozno-gospodarstvo.si/
Industrial sustainability https://ec.europa.eu/growth/industry/sustainability/circular-economy_sl
Sustainable urban world https://www.citieswithnature.org/

4.2.2 Knowledge Base - Will be further elaborated

Knowledge Base
xxxxx

5. Advanced manufacturing and ICT (Dornbirn, Austria)

- **Dornbirn, Austria –** advanced manufacturing and ICT on the principles of CE. Developed holistic concept for covering the whole chain from manufacturing over compiling the right product data to recycling.

5.1 Pilot project – Dornbirn

Reference :

Pilot implementation concept **Dornbirn**. D.T3.1.5 – 03 2020.

5.1.1 Pilot Action field

The scope of FHV's pilot is in the field of advanced manufacturing and green innovation. Focusing on Industry 4.0 Smart City setting, FHV will test new methods and business models in managing advanced manufacturing innovation systems that stimulate CE expansion in the region.

The pilot will promote defined CE strategy that both triggers the further growth of regional intelligent production systems in Vorarlberg, while simultaneously stimulating regional transition towards CE. The Intelligent production system, in the context of defined smart specialization strategy in Vorarlberg, promotes the economic growth through manufacturing, ICT, Information system activities, professional, scientific and technical activities. In this regard, the pilot will adapt solutions in the field of industrial production and technology that stir economic efficiency and competitiveness, improves industrial production and technology, as well as general advancement of knowledge. More specifically, the pilot will test the application of key enabling technologies – advanced manufacturing systems in the context of the CE strategy execution.

FHV has already conducted successful projects that contribute to Industry 4.0/Smart Manufacturing Systems, collaborating with local industry and international research institutions. These projects, both directly and indirectly, supported discoveries of solutions that utilize green innovation capacities and supports further local openness to CE potentials. FHV pilot will focus on the use of advanced manufacturing technologies (AMT) for stimulating CE growth, by application of green innovation technologies and technologies. The pilot foresees experimentation in a quadruple helix environment aimed at stimulating innovation both through process and business model innovation for green advanced manufacturing innovation. In order to achieve the goal, FHV will test and evaluate the use/adoption of specific AMT techniques aligned with different dimensions of CE strategy. In addition, FHV will test AMT solutions focusing on quadruple helix approaches to innovation, as well as promote community growth and knowledge exchange among actors involved.

In summary, FHV pilot will provide new insights into how manufacturing firms can adapt their organizational systems to support a process and open business model innovation approaches, and

experiment with diverse AMT techniques to promote green innovation. This will be done in cooperation with diverse regional actors encompassing quadruple helix ecosystem. Therefore, the main focus of the pilot will be development of a holistic concept for covering the whole chain from manufacturing over compiling the right product data to recycling - encompassing organizational design, business processes and product development. In this regard, FHV will provide a framework for CE Open Business Model Innovation for Advanced Manufacturing.

5.1.2 Main goal and specific objectives

Main goal	*To introduce the CE strategy in Vorarlberg, as a driver for regional innovation growth implemented in smart manufacturing system. To achieve the goal, FHV will test application of new technologies services, solutions and business models with a diverse group of stakeholders, covering the broad range of quadruple helix actors.*
SO 1	▪ Analyze open business models and services in advanced manufacturing and green innovation field, its acceptance and potentials of quadruple helix collaboration for further stimulation of CE innovation potentials.
SO 2	▪ Best practices: Research study and analysis on global CE strategies and its possible translation to innovative manufacturing in local context.
SO 3	▪ CE Advanced Manufacturing Open Business Model Platform: Measurement of new solutions for the CE in urban contexts, combined with new stakeholder networks for innovative, green manufacturing settings.
SO 4	▪ Lessons learned, recommendations and guidelines for implementing CE principles in advanced manufacturing field, studied in context of national & public, industrial, entrepreneurial & startup, as well as academic relevance.
SO 5	▪ Promoting initiatives at policy and entrepreneurial level against the state-of-art, allowing them to be at the forefront of new findings and green solutions.
SO 6	▪ Generating knowledge regarding current challenges and problems in connected green advanced manufacturing – ICT solutions.
SO 7	▪ Setting up the foundation for territorial knowledge and its transferability to other European regions.

5.1.3 Stakeholders and external initiatives

FHV pilot will be implemented within the established cluster around Smart City Rheintal in Vorarlberg, focusing the adoption of CE business models in the field of advanced manufacturing, with quadruple helix innovation sector.

Stakeholder	
Citizens and association of citizens	▪ … interested in the green innovation and CE environments, as well as in digitzation and their further inclusion in public life. Also, NGOs interested to support further integration of citizens in co-creating regional innovation ecosystem.
Local public authority – **The City of Dornbirn, Smart City Dornbirn**	▪ … offers attractive framework conditions to promote digital innovations in start-ups, companies and administration. By digitizing its services, Smart City Dornbirn enables direct contact with its citizens, going far beyond purely technical digitization with the main goal to improve the quality of life and societal welfare in the long term.
Regional public authority – **State Government of Vorarlberg**	▪ State government of Vorarlberg supports the transition towards CE system through the implementation of the four main policy instruments: Energy Autonomy Vorarlberg, Waste management Vorarlberg, Building Codes Vorarlberg and Spatial Planning Vorarlberg.
Infrastructure and (public) service provider – **illwerke vkw**	▪ Illwerke vkw is the largest energy service provider in the region, with four business areas - hydropower, supply and services, energy networks and tourism.
Higher education and research – **V-Research**	▪ V-Research is a non-university center of excellence for applied research, development and innovation in the technological-industrial sector. The activities performed by the institute aim at meeting the complex challenges of the economy as well as at ensuring the contribution to the further development of society on a non-profit basis.
Business support organisations	▪ **Haimaten** - The company is responsible for carrying out innovation research and provides services both in local and international context, with the main expertise in spatial planning systems. ▪ **Postgarage** - Provides services and environment that supports start-ups, initiatives, corporate partners and institutions focusing on digital innovations in mutual development of products and services. ▪ **Wirtschaftskammer Vorarlberg** - The Economic Chamber of Vorarlberg (WKV) is a self-governing body in the form of a professional body ("Chamber") in the province of Vorarlberg in Austria and, as a provincial chamber, is part of the Austrian Federal Economic Chamber. ▪ **Startupland Vorarlberg** - The platform for all startups in Vorarlberg, and the contact point for all startup topics and drivers of the Vorarlberg startup ecosystem.
SME	▪ **Carcoustics Austria GmbH** - With a worldwide network of production facilities and wide-range of production technologies and raw materials, Carcoustics manages provision of any kind of acoustic and thermodynamic solution. ▪ **Senseforce GmbH -** The company employs its digital solutions to diverse industrial sectors, by supporting deployment of Industry 4.0 solutions in manufacturing processes of firms.

	▪ **Kaufmann Bausysteme GmbH** - The company provides solutions that allow more productive manufacturing and implementation in built construction. ▪ **Wirtschafts-Standort Vorarlberg (WISTO)** - The Economic Chamber of Vorarlberg (WKV) is a self-governing body in the form of a professional body ("Chamber") in the province of Vorarlberg in Austria and, as a provincial chamber, is part of the Austrian Federal Economic Chamber. ▪ **CARUSO Carsharing eGen** - offers an alternative to the own car in Vorarlberg. With almost 50 locations in Vorarlberg CARUSO Carsharing offers solutions that can be perfectly combined with public transport, thus supporting transition to Mobility on Demand and introduction of more environmentally friendly solutions in everyday mobility.

5.1.4 Pilot activities, milestones/ outputs

Pilot activity	*Description and milestones/ outputs*
1 - CE, Open Business Models and Advanced Manufacturing: State-of-the-Art	Analysis of CE strategies applied in open business processes, with particular attention to advanced manufacturing. The study will consider impact of CE in financial, social and environmental context. In addition, the main focus will be on solutions that have potential in application to local context, and will be further examined as part of subsequent pilot activities. ▪ *Best practices overview*
2 – Best Practice Analysis and Feasibility Study	Analysis of collected practices and the feasibility study with particular attention to technical component and value creation opportunities that support open communities and collaborative business models. ▪ *List of feasible solutions – feasibility study*
3 – CE Advanced Manufacturing Framework	Framework for CE Advance Manufacturing will provide methods for adopting CE solutions in for delivering innovative manufacturing solutions. Both open business model processes and advance manufacturing techniques applied in line with CE principles will be contextualized in a framework. This framework will serve as a foundation further testing and evaluation of the model. ▪ *Methodology for implementing CE design in advanced manufacturing environment.*
4 – CE Open Business Model for Advanced Manufacturing: Test Scenarios	Activity will consist of a set of practices that will serve to test possible scenarios for extending the knowledge on optimizing opportunities in organizing business and process environment for promoting CE in particular smart specialization field. Test scenarios will encompass theoretical as well as practical applicability of particular scenarios, and further discussed with field experts in quadruple helix context.

	▪ *Study on the practical application of CE principles in different test scenarios, in innovative manufacturing and open business modelling.*
5 – CE Open Business Model for Advanced Manufacturing: Evaluation	Earlier tested model will be further evaluated based on a set of standardized methodologies and will provide a basis for the advancement of CE measures already existing in national context. ▪ *Evaluation report*
6 – CE Open Business Model for Advanced Manufacturing: Recommendations and Guidelines	Recommendation and guidelines will build on previous results, and will be provided to support implementation of CE strategies in quadruple helix context. Discussion with representatives of all groups involved will uncover areas of its application suitable to all the actors. ▪ *Set of recommendation and practices for implementing CE practices and open business models for advancing innovative manufacturing practices.*

5.2 References and Knowledge Base

5.2.1 References

Further readings – Dornbirn, Austria
Circle Economy and ARA (2019) The Circularity Gap Report: Closing the Circularity Gap in Austria. https://publish.circle-economy.com/circularity-gap-report-austria
European Sustainable Business Federation (2019) Circular Economy Update: Overview of Circular Economy in Europe. https://circulareconomy.europa.eu/platform/sites/default/files/ecopreneur-circular-economy-update-report-2019.pdf
Schmidt, S., Pamminger, R., & Wimmer, W. (2019, March) Der Circular Economy Analyst. Ein Tool zur Quantifizierung des Umweltnutzens von Kreislaufstrategien. In: *Industrial Life Cycle Management* (pp. 145-153). Rainer Hampp Verlag.
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Su, D., Wu, Y., & Chai, Z. (2019, October) Advanced Integrated Manufacture by Application of Sustainable Technology through Product Lifecycle: a Circular Economy Approach.

In: *Proceedings of the 2019 International Conference on Artificial Intelligence and Advanced Manufacturing* (pp. 1-4).
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Rahman, S. M., Perry, N., Müller, J. M., Kim, J., & Laratte, B. (2020)
End-of-Life in industry 4.0: Ignored as before?
In: *Resources, Conservation and Recycling*, *154*, 104539.
https://www.researchgate.net/profile/S_M_Rahman/publication/336318913_End-of-Life_in_Industry_40_Ignored_as_before/links/5de5533aa6fdcc2837005842/End-of-Life-in-Industry-40-Ignored-as-before.pdf

Maurer, F., & Schumacher, J. (2019)
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5.2.2 Knowledge Base – Advanced Manufacturing for Circular Economy

Knowledge Base

Advanced Manufacturing for Circular Economy

Sustainability of the manufacturing industry is at the centre of attention in recent debates as it is one of the major consumers of energy and raw materials, and therefore, a major producer of greenhouse gas emissions and waste. Less waste is inherently generated by a manufacturing, than is the case with the conventional manufacturing. Advanced manufacturing (AM) is a fast-developing collection of production techniques which aids in designing new manufacturing paradigms. In contrast to conventional production methods, based on the application of AM techniques products are manufactured through a digital and additive process. It is considered to be a tool for stimulating sustainable production because the additive and digital nature provides opportunities for resources' savings. Such advanced and digital nature enables, for instance, on demand production of spare parts or avoids losses of materials when compared to technologies subtractive in nature. When designing products for the CE, these advanced manufacturing aspects may uncover new opportunities for all actors of the regional ecosystem. The CE hub in Vorarlberg will aid theoretical and practical background for integrating the concept of CE into AM, and further support the international hub CE network by offering solutions resulting from experimental activities performed in a quadruple helix perspective.

VI. Circular Economy Maturity Index for cities

1. Introduction

1.1 Description of *Circular Economy Maturity Index for cities* according to application

Circular Economy Maturity Index for cities enabling a self-assessment and the identification of improvement potential. The maturity index shall be multi-dimensional and address economic, societal and environmental aspects.

1.2 Preparatory work in the Starter Kit – introduction to chapter on "Towards a Comprehensive CE strategy in your territory. Planning for circular economy."

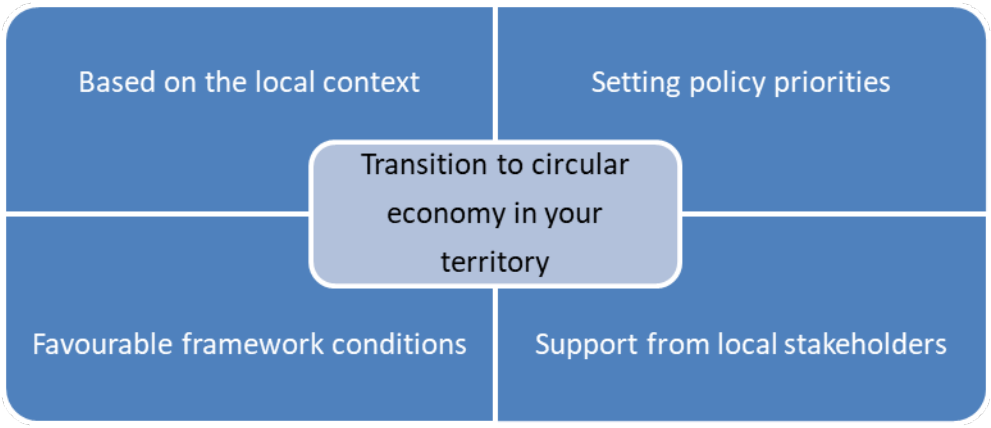
- **Starter kit _ reader's guidance**

In Chapter IV of the Starter kit (pages 55 - 69) a methodology for developing a CE strategy in a territory has been introduced. It includes instructions on how to assess local context and potential and provides tips on analysing enabling conditions and hindering factors. The chapter finishes with defining a vision and priorities for the city in its transition to the CE.

- **Introduction to chapter**

The transition to a CE is place-specific. It depends on the structure of the regional and local economy, on the existing policy mix (national legislation and local incentives) as well as on cultural and behavioural factors. The transition to the CE is a complex process requiring multi-sector and multi-governance effort requiring the buy-in, the efforts and the backing of numerous stakeholders. The CE also requires changes in the current production and consumption system and as such it is conditioned by a number of policy interventions. This transition often has both winners and losers therefore when addressing the change on a local level different trade-offs are to be carefully explored and properly communicated.

Figure 7: Building blocks of the transition to a CE



The transition to the CE is often hampered by a number of lock-ins which should be addressed individually:

- Lack of systemic vision;
- Unfavourable policy framework;
- Vested interests;
- Risk-averse organisational models;
- Practices of producers and consumers

In the following sections we will present approaches and techniques for addressing the above lock-ins and obstacles.

The chapter follows this structure:

1.3 Procedure chosen for this chapter

After an intensive literature research and evaluation, we have decided not to reinvent the wheel, but will refer to a paper published under the framework of the *Urban Agenda for the EU* and the *Partnership on Circular Economy* beginning of May 2019:

Urban Agenda 2019

Urban Agenda Partnership on Circular Economy (2019): Indicators for circular economy (CE) transition in cities - Issues and mapping paper. Brussels: 03/05/2019; Version 4. https://ec.europa.eu/futurium/en/circular-economy/issues-and-mapping-paper-indicators-circular-economy-transitions-cities

The authors have developed a long list of indicators from "several existing frameworks of indicators, which are related to the Circular Economy." (p 9) As it is an integration of existing frameworks of indicators with a special focus on cities is it exactly matching with the purpose of the CITYCIRCLE project. Finally, the "paper presents the final results of the mapping exercise and consolidates all input on CE indicators and issues highlighted by stakeholders (cities, academics, and networks) in the period September 2018 – April 2019." (p 4)

This work will be presented in chapter 2:

> *Urban Agenda Partnership on Circular Economy - Indicators for a circular economy transition in cities*

and serve as a basis for the next step. But - „Last, but not least, it should be noted that considering the limitations of the mapping process, the suggested indicators are only meant to support discussions and further work on CE indicators at city level." (p 24)

In their chapter on next steps and collaboration opportunities the OECD and their activities in the field on indicators in cities is mentioned. As the results of the activities are going to be published in September 2020 we are introducing the programme and the status in the 3rd chapter:

> *OECD – Programme on CE in Cities and Regions – working on CE indicators*

based on the following publications:

> ***OECD 2020***
>
> > ***OECD (2020):*** The Circular Economy in Cities and Regions. Presentation. http://www.oecd.org/cfe/regional-policy/circular-economy-cities.htm; https://www.slideshare.net/OECD-regions/the-circular-economy-in-cities-and-regions-oecd.
>
> ***OECD 2019***
>
> > ***OECD (2019):*** The Circular Economy in Cities and Regions. Brochure: http://www.oecd.org/cfe/regional-policy/Circular-economy-brochure.pdf

and Website:

> http://www.oecd.org/cfe/regional-policy/circular-economy-cities.htm

Special remark:

> In many places we will refrain from reformulations and choose the citation form and mark it accordingly.
> We will always abbreviate Circular Economy as CE, even in quotations.

In chapter 4 we will suggest the next steps before and for developing the CITYCIRCLE maturity index.

2. Urban Agenda Partnership on Circular Economy - Indicators for a circular economy transition in cities

2.1 Basics – definitions, indicator needs, challenges and objectives

Definitions

In the paper the following definition for CE – based on an analysis of 114 definitions done by other authors – has been chosen:

> „Circular economy is an economic system that replaces the 'end-of-life' concept withreducing, alternatively reusing, recycling and recovering materials in production/distributionand 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 to accomplish 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." (p 7)

„The definition introduces the level of cities (macro level) as key players for the development of a CE framework. The role of cities is defined [by another author] (based on 6 case studies) as:"

> „A circular city is a city that practices CE principles to close resource loops, in partnership with the city's stakeholders (citizens, community, business and knowledge stakeholders), to realize its vision of a future-proof city." (p 7)

These definitions – so the proposal in the paper - could serve as basis for discussions within the *Urban Agenda Partnership on CE*.

Indicator needs

„Through the implementation of a CE approach, cities have experienced the need of indicators for monitoring and to report on their efforts and achievements. The Partnership on CE has identified the lack of such indicators as a bottleneck for cities in implementing a CE strategy.

Measuring the performance of cities in their shift towards a CE provides an opportunity for cities to self-assess their achievements, to identify barriers as well as opportunities and to adapt accordingly their development trajectory towards circularity. From these considerations emerges the need for a sound and realistic framework of indicators for a CE transition in cities." (p 5f)

A lot of needs (p 5) as well as challenges (p 6) concerning the CE indicators have been identified together with partners and stakeholders :

Needs – a selection

- Need for a shared view on CE indicators among authorities and policy-makers.
- Conceptual underpinning of an indicator framework, which addresses appropriateness and availability of data.
- Indicators on CE may be part of a self-assessment tool but also allow for a comparison across cities in Europe.
- Clarity about definitions – on CE at the city level cities, but also on more technical issues, e.g. municipal waste (including industry waste), packaging waste, jobs in the CE sector.
- Indicators should make the best possible use of existing data (even though some cities have resources for data gathering, e.g. surveys amongst companies).
- The cost to introduce indicators should be considered – indicators should be as simple, as possible.
- Awareness-raising and the importance of mainstreaming (bringing a large group of companies and citizens into the understanding of CE) is an important aspect that may be captured by indicators.
- Inventory of cities with roadmaps and indicators would be useful and there could be follow-up meetings between them and/or a pilot project on exchange of information on setting up CE indicator systems.

Challenges – a selection

- How to monitor progress on the CE and macro-level when the baseline is so limited.
- There is a substantial time lag – when to expect effects and communicate them.
- Measuring circularity at a city level requires both a city wide CE metrics and a municipality narrative (e.g. case studies on micro-initiatives).
- If data sources like surveys are identified for indicators, it should be considered that operationalising the concept of CE in surveys is very difficult.
- The value of comparisons between cities may be questionable due to their specificities and different available statistics. Since objectives and indicators should be linked, different objectives would make difficult comparisons between cities.
- It is challenging to have indicators that can be measured on an annual/regular basis at a city level.

Objectives of CE indicators

„In order to develop and implement a CE strategy in urban environments it is crucial to find a framework of indicators to monitor the progress and performance and, when necessary, adapt the ongoing processes. Based on the literature review, the following objectives of CE indicators can be identified:

- **Support performance assessment** – Indicators are the cornerstone of monitoring as they quantify and aggregate data that helps track various elements of the CE;
- **Support policy-making** – ensure evidence-based urban planning and management of the CE;
- **Support accountability and CE promotion** – provide information on the progress of cities towards the CE and its benefits, which can be communicated to citizens (accountability);
- **Support improvement** – indicators can help identify key success factors and good practices on the transition to CE.“ (p 7)

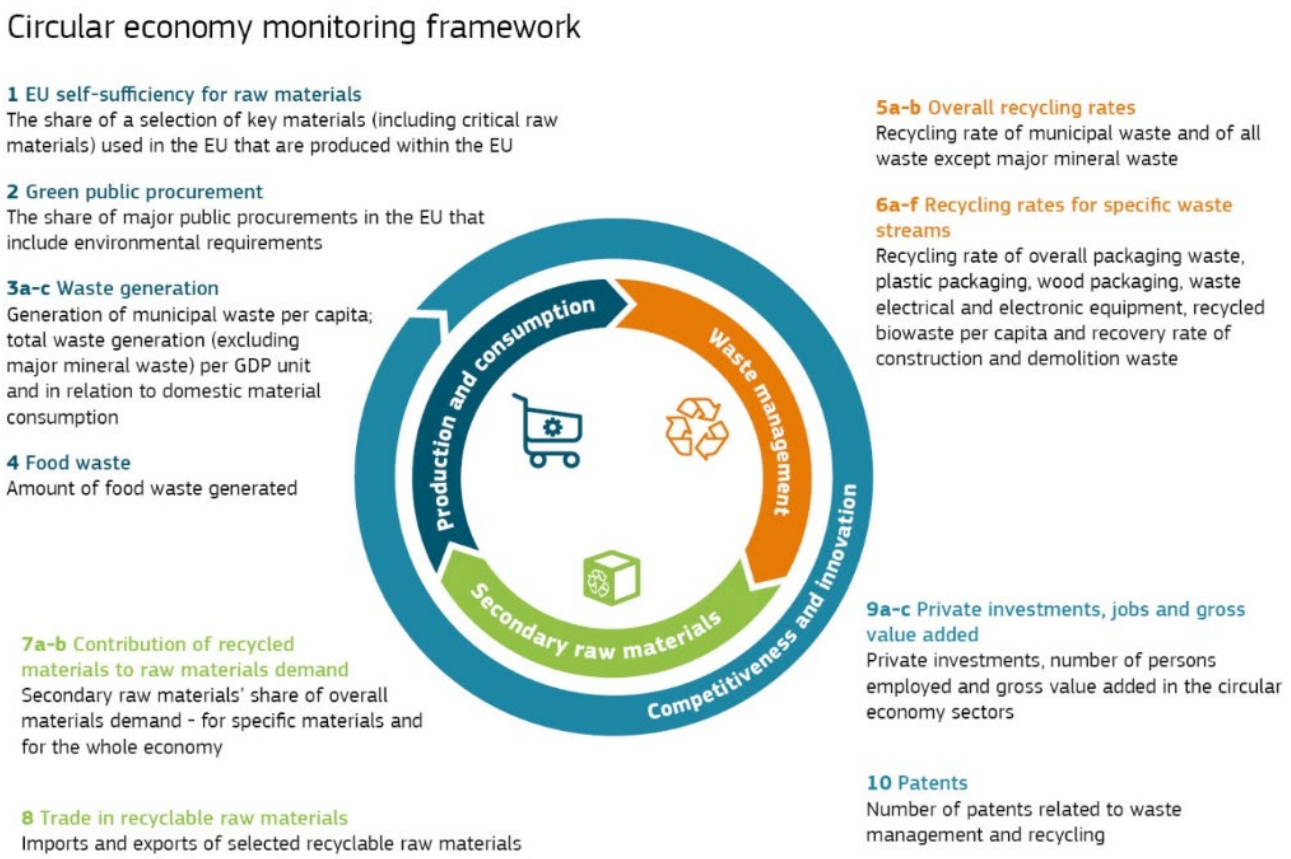
2.2 “Mapping and suggested indicators”

Chapter 2 of the *Urban Agenda Partnership* paper deals with an inventory of existing indicator frameworks related to CE. In the course of the explanations in this knowledge-base only the basic facts and procedures are given.

The starting point for the mapping is the „general monitoring framework for the CE .. provided by the European Commission (EC 2018) and identifies the following objectives: (1) to help understand how the various elements of the CE are developing over time; (2) help identify success factors in Member States; and (3) to assess whether sufficient action has been taken.

The general monitoring framework is composed of a set of key indicators, which capture the main elements of the CE. More specifically, it consists of 10 indicators (including subindicators).“ (p9)

Figure 8: CE monitoring framework



Source: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A29%3AFIN

„The framework and the above indicators offer a useful reference for cities to develop Circular Economy indicators." (p 10) After further consideration, additional indicators were introduced to fill the gaps.

In the paper the following general frameworks relevant to the work have been analyzed (p 12 – 19):

Publisher	*Report / project*	*Focus / special feature*
EC	In-depth report on Indicators for Sustainable Cities (2015/ revised 2018) Including the following case studies: Barcelona, Dublin	▪ focus on cities ▪ focus on the environmental dimension of sustainability, not on CE

Ellen McArthur Foundation	Circularity Indicators Project	▪ focus on companies ▪ provides a methodology and tools to assess how well a product or company performs in the context of a CE ▪ indicators are relevant to the CE, but might be difficult to apply at city level
OECD	Green Growth indicators framework (updated 2017)	▪ 30 indicators which are meant to help countries assess and compare their progress towards 4 main objectives: ▪ establishing a low-carbon economy, ▪ resource-efficient economy, ▪ maintaining the natural asset base, ▪ improving people's quality of life; and implementing appropriate policy to realise the economic opportunities of green growth ▪ indicators are not dedicated to the CE
ESPON	CIRCTER project	▪ aims to provide information on the territorial dimension of the CE transition and ▪ to provide evidence on local and regional patterns and flows of materials, including resources and waste. ▪ 13 indicators
HORIZON 2020	CITYkeys	▪ developed and validated, with the aid of cities, key performance indicators and data collection procedures for the common and transparent monitoring ▪ as well as the comparability of smart city solutions across European cities ▪ 73 key performance indicators
HORIZON 2020	Synergic Circular Economy across European Regions (SCREEN) project	▪ aims to develop a replicable systemic approach towards the transition to CE in EU regions within the context of their Smart Specialization Strategies ▪ 9 assessment criteria ▪ focus is on CE projects, but possibly some of the indicators can be adapted to cities
HORIZON 2020	CIRCULAR IMPACTS project	▪ aims to develop an assessment based on data and indicators of the macro-economic, societal and environmental impacts of a successful transition to a CE
Flanders - Policy Research Centre CE	Project dedicated to develop a CE monitor for Flanders	▪ inventory of CE indicators that are relevant to monitor the transition to a CE and to measure effects of new policy and trends ▪ set of indicators aims to describe the regional level, some of them could be adapted to the city level

Also existing CE frameworks on city level have been examined (p 20 – 22):

City	*Report / project*	*Focus / special feature*
London	London Waste and Recycling Board (LWARB)	▪ study - development of metrics that could be used to measure London's future progress towards becoming a more circular city ▪ includes the following key thematic areas: ▪ resource productivity and consumption; ▪ waste generation and recycling; ▪ business and employment opportunities in the CE
Brussels	Government of the Brussels-Capital Region	▪ developed a strategy toward CE transition ▪ a set of indicators ▪ process indicators ▪ competitiveness / investment ▪ jobs and GVA
Amsterdam	City Circle Scan	▪ assessment based on three core indicators ▪ value preservation ▪ economic and ▪ ecological impact
Melbourne	Assessment of the city services and quality of life	▪ some of the indicators can be used to address the CE

2.3 Long list of CE indicators

The following long list of indicators was derived from the previous sections in the paper of the *Urban Agenda Partnership*, see table 13 Original list of CE indicators and link to the thematic areas of the CE monitoring framework (Annex 1, p 32 – 37).

Table 1: Long list of CE indicators (without indication of the reference framework)

Thematic area	**Theme 1: Production and consumption**
Category	**Indicators**
Self-sufficiency for raw materials	▪ Input of virgin materials per capita ▪ Water used for production processes ▪ Domestic Material Consumption (DMC) ▪ Material consumption per capita ▪ Use of the local natural endowment

	▪ Development of resource consumption over time ▪ Use of renewable resources (percentage of imports - net and domestic - consisting of biomass compared to total imports ▪ Share of green public procurement ▪ Green public procurement procedures and purchasing (strategies in place and awareness campaigns ▪ CE procurement
Waste generation	▪ Total waste generated per capita ▪ Different waste categories per capita ▪ Waste intensity per NACE activity ▪ Plastic uses prevention (including single-use) ▪ Number of water fountains (as a proxy for plastic waste prevention) ▪ Waste reduction policies ▪ Volume of solid waste generated ▪ Tonnes of (methane producing) organic waste diverted from landfill ▪ Diversion of landfill of biodegradable waste ▪ Annual amount of solid waste (domestic and commercial) ▪ Annual amount of solid waste (domestic and commercial) processed by landfill sites ▪ Annual amount of solid waste (domestic and commercial) processed by incinerators ▪ Annual amount of solid waste (domestic and commercial) given to other disposal units ▪ Municipal waste generated (domestic and commercial), total - 1000 t [urb_cenv] ▪ Tonnes of waste disposed of per inhabitant and per year (building and demolition waste, industrial waste, domestic waste, retail and service waste) ▪ Municipal waste, defined as household and similar waste collected by or on behalf of municipalities, and originated from household, offices and small businesses ▪ Municipal solid waste (t/cap/year) ▪ Landfill rates of municipal waste, defined as the amounts of municipal waste disposed at landfills as a percentage of amounts treated ▪ Landfill tax rates, the tax levied per tonne of municipal waste disposed in landfills ▪ Percentage of city population with regular solid waste collection (residential) ▪ Total collected municipal solid waste per capita ▪ Percentage of the city's solid waste that is disposed of in a sanitary landfill ▪ Percentage of the city's solid waste that is disposed of in an incinerator ▪ Percentage of the city's solid waste that is burned openly ▪ Percentage of the city's solid waste that is disposed of in an open dump ▪ Percentage of the city's solid waste that is disposed of by other means ▪ Hazardous Waste Generation per capita (tonnes) ▪ Percentage of the city's wastewater that has received no treatment ▪ Waste Electrical & Electronic Equipment (WEEE) management ▪ All waste for all industry sectors (tonnes of waste) ? London – CE indicator ▪ Management of local authority waste, share of waste to the following categories: landfill, incinerated, recycled, other

	▪ Waste intensity per household (tonnes of waste per household)
Food waste	▪ Initiatives/awareness campaigns at city level for food waste reduction ▪ Edible (avoidable) food waste per year (tons/year) ▪ Energy recovery from residue stream
Others	▪ Consumption-based GHG emissions (consumption of goods and services produced in the cities) ▪ Resource footprint indicator based on Cumulative Energy Extracted from the Natural Environment (CEENE) ▪ (Energy) Recoverability Benefit rate ▪ Share of environmentally related tax revenue, expressed as a percentage of total tax revenue and compared to GDP and to labour tax revenue ▪ CO2 emissions ▪ Energy consumption of public buildings per year (kWh/m²) ▪ Circularity of household consumption (ratio of spending on services to spending on goods) ▪ Material intensity per unit of GVA (tonnes/per £million), sum of all materials ▪ The percentage of total energy derived from renewable sources, as a share of the city's total energy consumption ▪ Scope 3 emissions (consumption-based methodology), MtCO2e
Thematic area	**Theme 2: Waste management**
Overall recycling rates	▪ Recycling rate (Percentage diverted from waste stream) ▪ % of waste recycled ▪ Municipal waste processed according to differentiated refuse collection schemes (pay as you throw) ▪ Recycling rate (% per tonnes, percentage of the city's solid waste that is recycled) ▪ EOL-RIR (End of Life Recycling Input Rate) ▪ Recyclability benefit rate ▪ Indicators on separate collection ▪ Recycling or recovery rate of different waste streams ▪ Breakdown of waste streams by different treatment options ▪ Material recovery (includes recovery for recycling and composting)
Recycling rates for specific waste streams	▪ Waste taken back by the industry for reuse/recycling ▪ Annual amount of solid waste (domestic and commercial) that is recycled ▪ Percentage of the city's solid waste that is recycled ▪ Percentage of the city's hazardous waste that is recycled
Water management	▪ Percentage of city population served by wastewater collection ▪ Percentage of the city's wastewater receiving primary treatment ▪ Percentage of the city's wastewater receiving secondary treatment ▪ Percentage of the city's wastewater receiving tertiary treatment ▪ Grey and rain water use (% of houses, houses equipped to reuse grey and rain water)

	▪ Share of the urban waste water load (in population equivalents) treated according to the applicable standard -% [urb_cenv]
Thematic area	**Theme 3: Secondary raw materials**
Contribution of recycled materials to raw materials demand	▪ Reduction in imported secondary raw materials ▪ Share of secondary or recycled materials in the raw materials ▪ "Reused" public buildings and spaces (sq.m) ▪ Mass of waste resources recovered and re-introduced in a production cycle as secondary raw material (kg/year) ▪ Cyclical material use rate ▪ MSA – Material System Analysis
Trade in recyclable raw materials	▪ Trade in recyclable raw materials within cities ▪ Trade in secondary raw materials
Thematic area	**Theme 4: Competitiveness and innovation**
Private investments, jobs and gross value added	▪ Number of organisations with environmental certification ▪ Number of organisations with registered environmental management systems according to EMAS and/or ISO 14001 or other recognised enviornmental certification schemes ▪ EMAS and ISO 14001 certification of public authorities ▪ Number of environmental [CE] professionals ▪ Share of certified companies (% of companies) ▪ Share of companies based in the city holding an ISO 14001 certificate ▪ Public energy technology RD&D expenditures directed at “renewable energy” and “fossil fuel energy”, expressed as percentages of total public energy RD&D ▪ Private investment, jobs and GVA: recycling sector, repair and reuse sector ▪ Number of enterprises receiving financial support in connection with the CE ▪ Amount of financial aid granted to companies in connection with the CE ▪ Number of economic operators supported/trained in CE ▪ Number of Circular services ▪ Direct jobs in CE (identify by 5-digit SIC-code) ▪ Indirect jobs in the CE (jobs dependent on CE, I/O method) ▪ Share of city’s GVA from CE activity ▪ Number of business supported ▪ Employment and value added in selected environmental protection activities expressed as a percentage of total; sewerage, waste management and remediation
Patent	▪ Actually applied patents fro CE at the city level ▪ Technology development: the number of inventions (simple patent families) developed by a country’s inventors, independent of the jurisdictions where a patent application has been registered (i.e. all known patent families worldwide are considered) ▪ Number of new patents per 100 000 population per year

Thematic area	not included in the EC monitoring framework for the CE
Process indicators	▪ Awareness raising campaigns for motivating stakeholders to take up CE measures ▪ Number of seminars organized on the CE under the PREC ▪ Number of pilot projects on the CE (e.g. on involving retailers) ▪ Citizens involvement ▪ Number of demonstration projects ▪ Number of CE courses PhDs/university courses, patent ▪ Number of schools that participate in environmental education projects ▪ Level of implementation of Agenda 21 processes ▪ Environmental education (% per school) ▪ Number of legislative and normative barriers identified and resolved ▪ Number of legislative and normative incentives created ▪ Number of people trained in CE trades ▪ Number of students trained in CE occupations ▪ Number of pilot cases set up via calls for projects / living lab ▪ Number of economic operators sensitized on CE ▪ Budget amount allocated to calls for projects / living lab made / implemented and number companies having benefited ▪ Budget amount and number of pilot public markets in CE developed in the city/province ▪ Number of new neighbourhoods incorporating the principles of the CE
Industrial symbiosis	▪ Number of companies involved in industrial symbiosis ▪ Investment in symbiosis ▪ Number of Eco-industrial parks ▪ Cubic metres of water saved ▪ Collective annual savings across firms ▪ Tons per year in CO2 savings ▪ Million tonnes of landfill diversion ▪ Million tonnes of materials recovered and reused ▪ Billion in cost-savings ▪ Tonnes of virgin resources saved ▪ Tonnes of waste turned resources
Eco-design	▪ Activities performed by cities that encourage the implementation of eco-design measures (e.g. promoting extended product lifetime, ability to re-use components or recycle materials from products at end-of-life, use of re-used components and/or recycled materials in products)
Collaborative economy	▪ Use of Composite indicator representing the combined scores of the business and regulatory environment surrounding the collaborative economy ▪ Use of individual thematic indicators (on regulatory environment): accommodation, transport, finance, public administration and business support ▪ Qualitative indicators on single use plastics

(Main source: Single market scoreboard)	▪ Actions by the city intended to encourage theprocurement of articles that use secondary raw materials ▪ Availability of a roadmap for resource management ▪ Availability of innovative schemes for businesses at the city level, which are related to CE ▪ Awards for circular businesses (e.g. stamps, stickers) ▪ Cross-learning and exchanges between cities
Additional indicators suggested by stakeholders as a part of the consultation process under the study	▪ Number of package free shops ▪ Number of supermarkets and restaurants partnering in a ´left-over give away-network´ ▪ Does the city have a Circularity Officer, with staff and budget? ▪ Recruitment and reward plan for acquisition of circular companies by the city ▪ City preference for eco/modulation in procurement and subsidies ▪ Litter in public space pers citizen in kilo ▪ Illegal dumping in public space per citizen per kilo ▪ M2 reserved for eco/activity/CE in spatial plans or in agreement with commercial estate developer (CE activity is considered collecting, managing and production of materials)

2.4 Suggested indicators

The long list of CE indicators has been discussed in a workshop in November 2018. Feedback and comments were also collected afterwards. Stakeholders assessed the indicators according to the following criteria:

- **„Core/additional indicator** (2 = core; 1 = additional, 0 = not relevant) Do you think the indicator is relevant for measuring CE in a city?
- **Data availability and quality at city level** (from 2 = high availability,to 0= no/scarse availability): Is information available (or could be available) at the city level?
- **Influence of local authority on the indicator** (from 2= high influence, to 0= no/very limited influence): To what extent can a local authority influence the activity measured by a specific indicator?“ (p 23)

„The results of the mapping and consultation exercises (See also the limitations in Text box 2) are presented in Table 12. It presents indicators in line with the EC monitoring framework for the CE (…). All of the indicators are linked to the extent possible to the simplified model of the circular economy for materials and energy (presented on the figure below), which was developed by the European Environment Agency.“ (p 24)

Figure 9: A simplified model of the CE for materials and energy

Source: EEA Report (2016), p 10

.

Table 2: List of suggested CE indicators (without indication of the reference framework)

Thematic area	**Theme 1: Production and consumption**			
Category	**Indicators**	**Indicator type**	**Links to conceptual elements**	**Comments**
Self-sufficiency for raw materials	Input of virgin materials per capita	Outcome	Production and distribution	Unit: Tons per capita Data: Very low / no data available
	Water used for production processes and domestic water consumption	Outcome	Production and distribution	Unit: Cubic meters Data: Low availability
	Organisations that have implemented an environmental management system (EMAS, Ökoprofit, QuB, ISO 14001 certification)	Outcome	Production and distribution / Eco-design	Unit: Number or share Data: Medium availability
Green Public procurement	Share of major procurement that includes environmental requirements	Process	Consumption and Stock	Unit: % Data: Medium availability
	CE/waste prevention criteria developed in guidelines for procurement	Process	Consumption and Stock	Unit: Qualitative (Yes/No) Data: High availability
Waste generation	Annual amount of solid waste (domestic and commercial)	Context	Waste	Unit: Tonnes of waste (per capita) Data: High availability
	All waste for all industry sectors	Outcome	Waste	Unit: Tonnes of waste Data: Medium availability

	Waste Electrical & Electronic Equipment (WEEE) Generation	Outcome	Waste	Unit: Tonnes of waste collected Data: Medium availability
	Hazardous Waste Generation per capita (tonnes)	Outcome	Waste	Unit: Tonnes of waste Data: Medium availability
	Level of public awareness for CE and waste prevention	Outcome	Waste / Consumption and Stock	Unit: % of people Data: Low availability (requires surveys)
	Communication measures (campaign, provision of information, events for the public/companies) on circular transformations and waste prevention	Process	Waste / Consumption and Stock	Unit: Number Data: Medium availability
Food waste generation	Generation of food waste	Outcome	Waste	Unit: total food waste generated (for households), or total food waste collected by separate collection, or share of food waste in residual waste Data: Very low / no data available
	Initiatives/awareness campaigns at city level for the areduction of food wste generation	Process	Waste	Unit: Number Data: Medium availability
Thematic area	**Theme 2: Waste management**			
Category	**Indicators**	**Indicator type**		**Comments**

Overall recycling rates	Recycling rate (% of the city's solid waste that is recycled)	Context	Recycling	Unit: % (of weight); If data allow it: % of waste upcycled and/or % of waste downcycled Data: High availability
Recycling rates for specific waste streams	Breakdown of waste streams by different treatment options	Outcome	Recycling	Unit: % (of weight) E.g.: % of construction and demolition mineral waste recycled; kg per capita recycled biowaste; tonnes of hazardous waste treated Data: Medium availability
	Waste electrical and electronic equipment (WEEE) by waste management operations	Outcome	Recycling (recovery, reuse)	Unit: Recovery (tonne/ percentage), Recycling and reuse (tonne/ percentage), Reuse (tonne/ percentage) Data: Medium availability – available from Eurostat, but not at city level
	Diversion of landfill of biodegradable waste	Outcome	Landfill minimisation	Unit: Tonnes of waste Data: Low availability
	Availability of a strategy for waste management	Process	Recycling	Unit: Qualitative (Y/N)

				Data: Medium availability
Thematic area	**Theme 3: Secondary raw materials**			
Category	**Indicators**	**Indicator type**		**Comments**
Contribution of recycled materials to raw materials demand	Contribution of recycled materials to raw materials demand - End-of-life recycling input rates	Context	Materials	Unit: % Data: Low availability
	Circular material use rate in local industrial/ economic processes	Outcome	Materials	Unit: % of total material use Data: Very low / no data
	Activities performed by cities that encourage the implementation of ecodesign measures	Process	Eco-design	Unit: Number of measures (e.g. promoting extended product lifetime, ability to re-use components or recycle materials from products at end-of-life, use of re-used components and/or recycled materials in products) Data: Medium availability
	Organisations that are implementing LCA schemes, EPR, Eco-label etc..	Outcome	Production and distribution / Eco-design	Unit: Number or share Data: Medium availability
Thematic area	**Theme 4: Competitiveness and innovation**			
Category	**Indicators**	**Indicator type**		**Comments**
Patents	Patents related to recycling and secondary raw materials	Context	Materials	Unit: Number Data: N/A

Private investments, jobs and gross value added in CE business	Direct jobs in CE (identify by 5-digit SIC-code)	Context	All sectors	Unit: Number / FTEs Data: Medium availability
	Number of CE businesses offered business support	Process	All sectors	Unit: Number Data: High availability
	Budget amount allocated to calls for projects on CE	Process	All sectors	Unit: Number Data: High availability
	Number of pilot projects on CE	Process	All sectors	Unit: Number Data: High availability
	Number of children and/or students trained in CE aspects and/or occupations	Process	All sectors	Unit: Number of children (school education) and/or students (higher education) Data: Medium availability
Thematic area	**Theme: Overarching indicators**			
Category	**Indicators**	**Indicator type**		**Comments**
	Greenhouse gases	Context	Emissions	Unit: thousand tonnes (E.g. in industrial processes and product use, waste management) Data: Low availability
	Availability of a CE strategy at city level	Process	All sectors	Unit: Qualitative (Yes/No)

				Data: High availability

2.5 Suggested next steps

Possible follow-up actions

The *Urban Agenda Partnership* sees – besides collaboration with other initiatives - the following follow-up actions :

- development of a toolkit,
- empirical work on indicators between cities.

„To implement the set of suggested indicators a toolkit could be created. The toolkit could consider the work performed under this study and build on it by:

- *Considering differences between cities* - It's interesting to think about how the data across cities would be interpreted. One would imagine big differences between cities that have a large manufacturing base as compared to a city with a large service sector, a city with a lot of construction work going on compared to one where few buildings are being constructed. It makes setting targets across cities difficult. Tourism flows also affect cities differently – significant increases in tourism, particularly in smaller cities, may have noticeable effects on the consumption and waste management of cities;
- *Further considering accessibility of data* - the source and accessibility of the data is key and should be clearly identified: some of the data is in the hand of various municipal departments, others are in the hands of local utilities, both being public authorities, but other indicators come from the private sector (patents, etc.);
- *Preparing a Manual on indicators* - the manual could include further operationalisation of the indicators suggested in this paper, by adding definitions of indicators, other CE objectives linked to them, more indicators, providing examples of the application of the indicators by cities.

To create this toolkit, funding could be sought, and collaborations pursued.

Another option is to focus on several core indicators applicable across cities (as suggested during the study, for example 10 indicators from the indicators in Table 12) and to compare their current implementation, relevance, data availability, drivers, and challenges across cities taking part in the Urban Agenda Partnership on CE. Such a collaboration between cities would allow going beyond the theoretical side of indicators and the provision of case studies and best practices in the actual use of indicators. When (and if) common understanding about the application of the indicators is ensured between the participating cities, comparisons can be provided in order to derive lessons learned on which indicators have the highest value of measuring success in CE actions in cities.

Thus, a next step for the partnership could be to invite participants to a new workshop to establish a project/initiative to test out several of the different indicators proposed in this note. The workshop and a project should be carried out in cooperation with other organisations.“ (p 29)

Future collaborations

The *Urban Agenda Partnership* also proposes collaboration with other initiatives – e.g. with ESPON, KIC or OECD.

Let's pick up OECD in the next chapter. Following the *Urban Agenda Partnership* paper „the OECD [is] working on Cities CE indicators." (p 30)

3. OECD – Programme on CE in Cities and Regions – working on CE indicators

„Transitioning to a circular economy is key for a prosperous, inclusive and sustainable future.“

3.1 Some words about the programme _ content and timeline

Concerning the role of cities

„Cities and regions have a critical role to play in the circular transition. First, they hold core responsibilities in key sectors for the CE such as transport and solid waste. Second, they are laboratories for innovation and experimentation. Third, being responsible for 60% of public investment in OECD countries, sub-national governments can lean on critical long-term investment choices related to energy, transport and water. Hence, they can avoid linear lock-in for infrastructures. Cities can be promoters, facilitators and enablers of the CE.“ (brochure p 3)

What can the OECD offer?

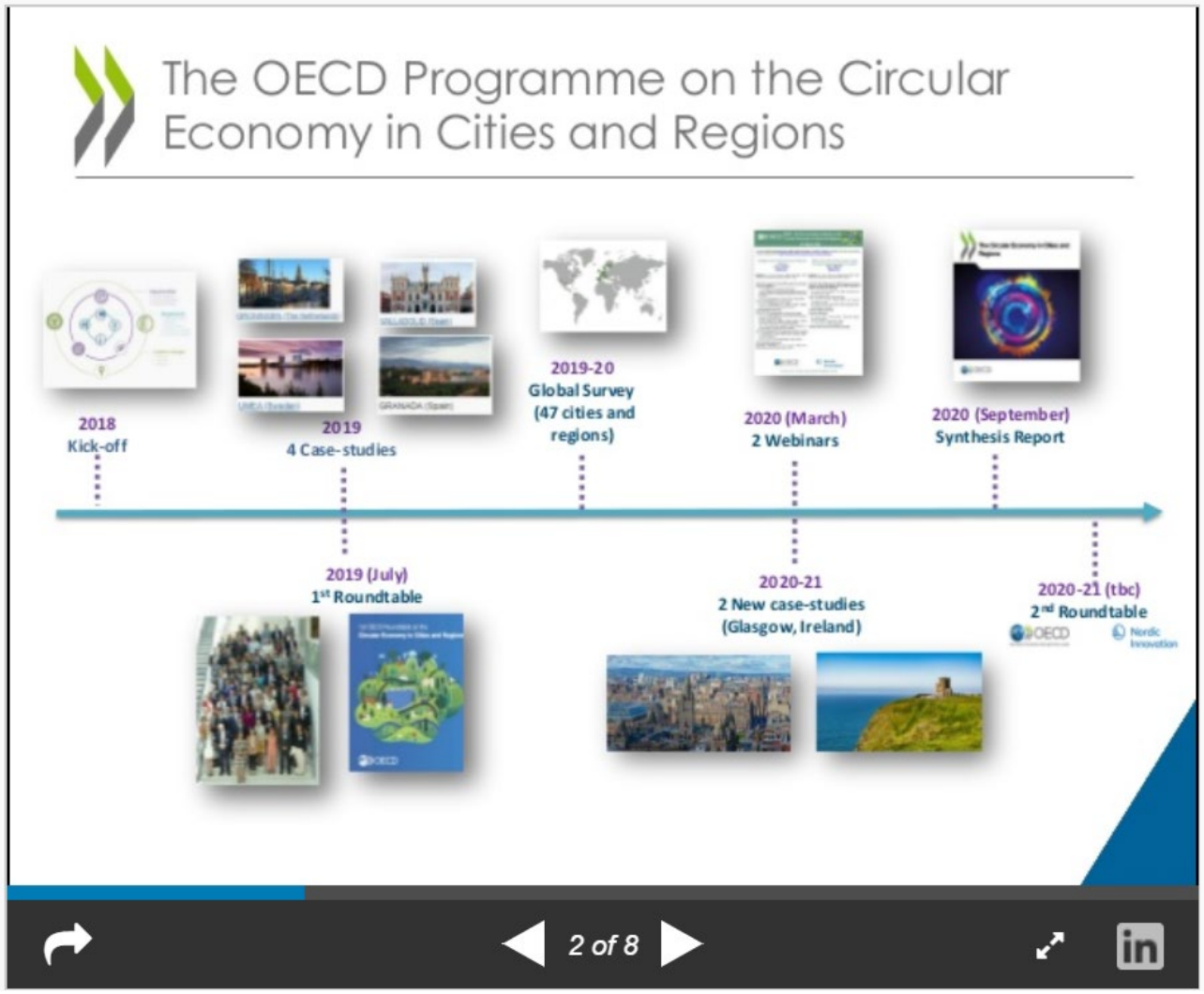
The OECD programme “supports cities and regions in their transition towards a circular economy, through:

- *Sharing*: favouring peer-to-peer learning, best practice and lessons from international experience
- *Learning:* engaging multi-level dialogues in cities and regions to identify challenges and opportunities
- *Measuring:* developing an indicator framework for decision making and evaluation of circular economy strategies”

(revers order; http://www.oecd.org/cfe/regional-policy/circular-economy-cities.htm)

The content and timeline of the programme is shown in the next figure and afterwards explained in more detail:

Figure 10: The OECD Programme on the CE in Cities and Regions



Source: Presentation - http://www.oecd.org/cfe/regional-policy/circular-economy-cities.htm

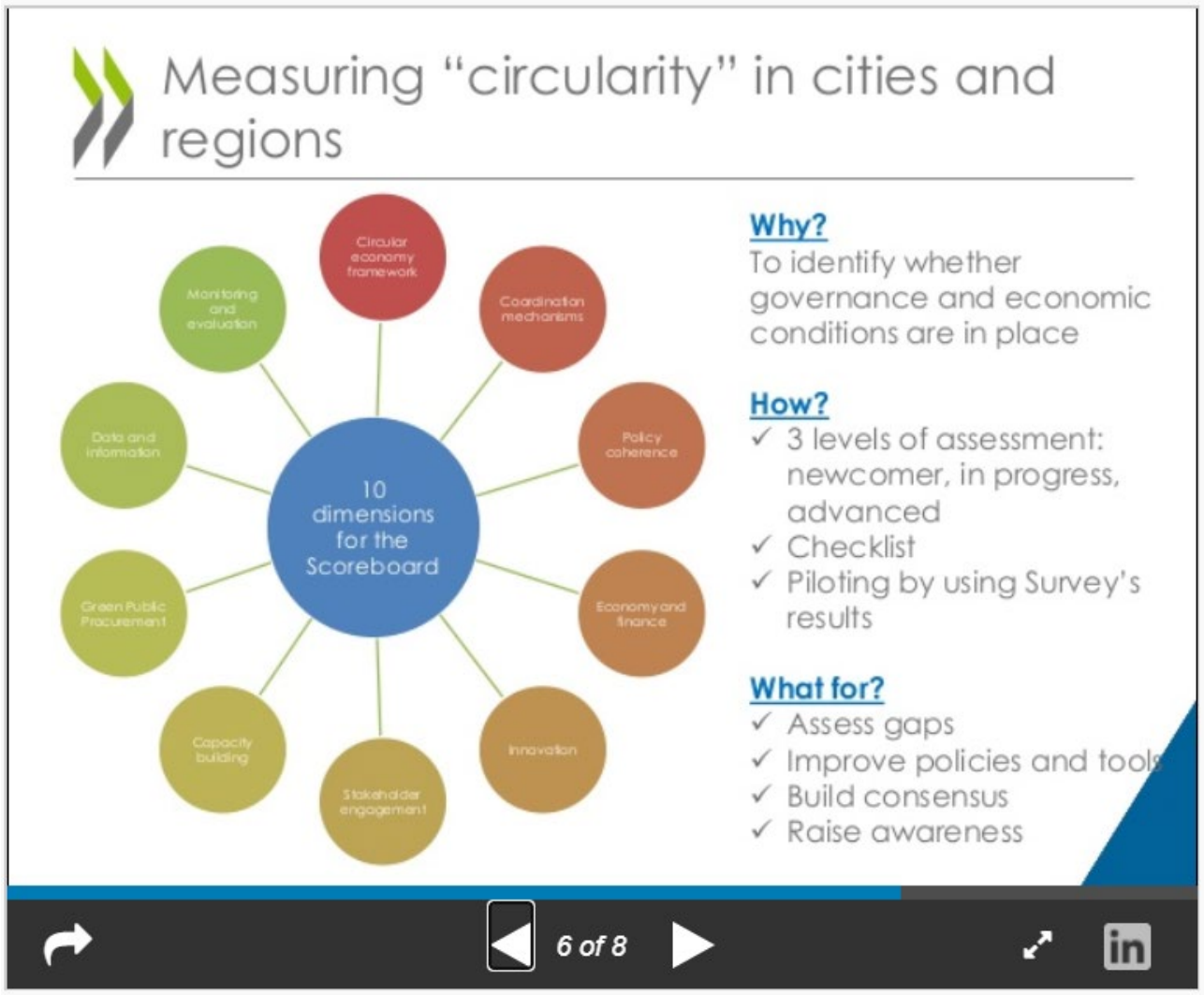
Thematic area	Theme 1: Production and consumption
6 case studies	▪ Groningen, The Netherlands ▪ Umea, Sweden ▪ Glasgow, United Kingdom (not published until now) ▪ Valladolid, Spain ▪ Granada, Spain (not published until now) ▪ Ireland (not published until now)
First Roundtable	… brought together key circular economy stakeholders from cities, regions, national government, business, academia and international organisations to share knowledge, experiences and best practices. http://www.oecd.org/cfe/regional-policy/roundtable-circular-economy.htm

Global survey	(not published until now)
2 Webinars on 31.03.2020	1. Spotlight on the CE in cities and regions 2. What's new on the CE in cities and regions and how to measure circularity ? Central topics ▪ Key Findings from the OECD Survey on the CE in Cities and Regions and the OECD framework to measure circularity at the local level (presentation : https://www.slideshare.net/OECDLEED/oriana-romano-oecd) ▪ Measuring the CE – 2 presentations ▪ EC/ Eurostat : Measuring the CE : European Union monitoring framework (https://www.slideshare.net/OECDLEED/arturo-de-la-fuente-european-commission) ▪ Ellen MacArthur Foundation : What is CIRCULYTICS ? (https://www.slideshare.net/OECDLEED/ashima-sukhdev-ellen-macarthur-foundation)
Synthesis report September 2020	

3.2 Towards an OECD CE indicator framework

The following figure gives a brief introduction to the topic measuring circularity in cities and regions:

Figure 11: Measuring "circularity" in Cities and Regions



Source: Presentation - http://www.oecd.org/cfe/regional-policy/circular-economy-cities.htm

„There is wide recognition amongst policy makers and scholars on the need for some metrics on the CE. According to the principle "One cannot improve what is not measured", policymakers need robust data and information on which to base decisions and improve implementation. … . According to the OECD Inventory on CE Indicators (forthcoming), the following preliminary observations can be drawn:

- Environmental measurement prevails (e.g. energy usage, emissions, hazardous waste).
- Several sectors are taken into account (water, energy, agriculture, transport, built environment, industry, textiles, raw material extraction), but solid waste is predominant.
- Governance indicators specifically tailored to the CE appear to be lacking or are under development.

- The greatest gap in literature and databases concerns lack of data and indicators at the city level. … .
- Resource consumption or waste recycling rates are typically used for measuring urban circularity.“ (brochure, p 10)

„OECD tools

The OECD is developing a set of tools towards a CE framework such as:

- **Key input, process and output indicators** regarding CE initiatives in place, with a focus on the economic and social aspects;
- **A scoreboard** for measuring how circular a city/ region is, based on key dimensions, such as innovation, system change, jobs and skills, economic and finance, a functional approach;
- **A self-assessment tool** to identify whether governance conditions are in place, work well or need to be improved. The potential of the CE can be exploited if the necessary governance and economic conditions are in place: legal and regulatory frameworks need to be updated; policies aligned, stakeholders informed and engaged; progress and results monitored and evaluated; clear and robust business cases created.“ (brochure, p 10)

The OECD's previous considerations can be supplemented as follows:

„They have collected more than 400 indicators used to measure CE. They have done a preliminary selection of quantitative indicators by sector (water, waste, energy, urban, material, air, demographics). Their aim is to create 2 tools to measure how circular cities are: a CE scoreboard and a self-assessment tool. The output of their project would be a synthesis report, … and consensus based indicator framework and self-assessment tool. A collaboration between the OECD and the Urban Partnership could maximise synergies, and complement existing findings. Indeed, cities of the Urban Partnership could be used for case studies and both sets of indicators could complement each other.“ (p 29)

4. CITYCIRCLE – suggested next steps before and for developing the CE maturity index

The next step foreseen in the CITYCIRCLE application form concerning the **CE maturity index** is the following :

- **A2.5 Circular economy maturity index**

  The knowledge collected will enable to develop a CE maturity index for urban ecosystems (comparable to smart cities index), which shall enable stakeholders to assess their innovation systems with respect to the CE.

  Start date : 04.2021 ; End date : 03.2022

- **D.T2.5.1 Circular economy maturity index**

  CE maturity index for cities enabling self-assessment and the identification of improvement potential. The maturity index shall be multi-dimensional and address economic, societal and environmental aspects. (online tool, files for printing)

  Delivery month : 03.2022

From the CITYCIRCLE timeline point of view, there is an excellent fit between the further work on the maturity index and the publications of OECD, EC, possibly the Urban Agenda Partnership because then the newest results can be taken into account:

- As indicated above, the ***OECD*** will publish its *Synthesis Report* September 2020, so that the work on the indicators, the scoreboard and the self-assessment tool can be taken into account.
- Furthermore the ***EC*** plans to update its *monitoring framework* in 2021. If available in time, the results will be reviewed and included in the CITYCIRCLE maturity index.

The following slide from the OECD webinar held on 31.03.2020 presents the central points :

Figure 12: New CE action plan – updating the monitoring framework

Source: *https://www.slideshare.net/OECDLEED/arturo-de-la-fuente-european-commission*

In more detail see *EC 2020* – especially chapter 8 on the monitoring progress.

We will also continue to monitor the activities of the ***Urban Agenda Partnership*** and contact them to see whether they are still addressing the issue of indicators.

5. References

Books, articles, papers

EC 2020

European Commission (2020): Circular Economy Action Plan – For a cleaner and more competitive Europe. Brussels. https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf

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Websites

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http://www.oecd.org/cfe/regional-policy/circular-economy-cities.htm (last accessed on 06/05/2020)

https://www.slideshare.net/OECDLEED/arturo-de-la-fuente-european-commission last accessed on 06/05/2020)