



Co-Creating Circular  
Resource Flows in Cities

constRuctive mEtabolic processes For material fLOWs in  
urban and peri-urban environments across Europe

## Deliverable 1.2

# CITIES' CIRCULAR ACTION PLANS

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<b>Abstract (for public dissemination only)</b>	The Cities' Circular Action Plans (CCAP) are roadmaps for the transition toward circular and regenerative cities. The report containing the CCAP gathers the competences of the consortium to create viable ways for the pilot cities to implement CE practices and ensures replicability. In line with the overall structure of the project, The REFLOW Cities' Circular Action Plan operates on two levels: Project Level and Pilot Level. On a Project Level, the CCAP is described as the overall Roadmap that determines the general direction and modes of organising of the whole consortium. On a Pilot Level, the CCAP refers to the specific action plans created by the REFLOW cities, within the broader Roadmap of the project. The action plans are mainly concerned with the management and implementation of local activities aimed at achieving the pilot-specific objectives. The CCAP gathers the resources created and implemented by the project consortium



	to overcome the challenges encountered or expected by the pilot cities thus fostering replicability. The CCAP will turn into a living, online document that will provide resources for cities to become regenerative and implement circular economy practices. The CCAP as a digital resource will last beyond the life of the REFLOW project.
<b>Keywords</b>	Circular transition; circular design; circular economy challenges; circular economy case studies; regenerative cities.
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## Table of Contents

<b>Introduction.....</b>	<b>8</b>
<i>What is this deliverable about?.....</i>	<i>8</i>
<i>What is a Cities' Circular Action Plan? .....</i>	<i>8</i>
<i>What are the resources described in the CCAP? .....</i>	<i>9</i>
<i>What can you learn from the Cities' Circular Action Plan? .....</i>	<i>10</i>
<i>How is this deliverable organised? .....</i>	<i>10</i>
<b>1. Understand – REFLOW Journey .....</b>	<b>12</b>
1.1 <i>The REFLOW Project.....</i>	<i>12</i>
Pilot Cities .....	12
Work Packages and Building Blocks.....	13
1.2 <i>REFLOW Journey.....</i>	<i>15</i>
<b>2. Understand – Pilot Case Studies .....</b>	<b>16</b>
2.1 <i>Amsterdam .....</i>	<i>17</i>
Summary.....	17
The City of Amsterdam .....	17
Amsterdam – a REFLOW Pilot City .....	18
Challenges encountered by the Amsterdam pilot.....	20
Next steps envisioned by Amsterdam pilot .....	21
2.2 <i>Berlin.....</i>	<i>22</i>
Summary.....	22
The City of Berlin.....	22
Berlin – REFLOW Pilot City .....	23
Challenges encountered and expected by Berlin pilot.....	24
Next steps envisioned by Berlin pilot.....	27
2.3 <i>Cluj-Napoca.....</i>	<i>28</i>
Summary.....	28
The City of Cluj-Napoca .....	29
Cluj-Napoca – a REFLOW Pilot City .....	30
Challenges encountered and expected by Cluj-Napoca pilot .....	33
Next steps envisioned by Cluj-Napoca pilot .....	36
2.4 <i>Milan.....</i>	<i>37</i>
Summary.....	37
The city of Milan .....	37
Milan – REFLOW Pilot City.....	38
Challenges encountered by the Milan pilot.....	40
Next steps envisioned by Milan pilot.....	44





2.5 Paris.....	46
Summary.....	46
The City of Paris.....	46
Paris – a REFLOW Pilot City.....	48
Challenges encountered and expected by the Paris pilot.....	50
Next steps envisioned by Paris pilot.....	52
2.6 Vejle.....	53
Summary.....	53
The City of Vejle.....	53
Vejle – REFLOW Pilot City.....	54
Challenges encountered and expected by the Vejle pilot.....	56
Next steps envisioned by Vejle pilot.....	58
<b>3. Define – Project Challenges.....</b>	<b>59</b>
3.1 Adequately representing complexity.....	60
3.2 Achieve a common understanding of theoretical assumptions and terminology.....	61
3.3 Risk of working in silos.....	62
<b>4. Define – Pilot Challenges.....</b>	<b>63</b>
4.1 Awareness challenges.....	63
4.2 Business challenges.....	64
4.3 Governance challenges.....	64
4.4 Project management challenges.....	65
4.5 Technological challenges.....	65
4.6 COVID-19.....	66
<b>5. Make – REFLOW Resources for project-level challenges.....</b>	<b>67</b>
5.1. <i>The REFLOW Vision</i> .....	68
5.1.1 The REFLOW Theoretical Framework.....	70
5.1.2 Shared understanding of circular economy.....	89
5.1.3 The REFLOW Vision.....	90
5.2 <i>The REFLOW Process</i> .....	92
Theory of Change and design thinking.....	98
The REFLOW Theory of Change.....	99
Circular Design Thinking for Alignment and Coordination.....	103
<b>6. Make - REFLOW Resources for circular transitions.....</b>	<b>106</b>
6.1 <i>REFLOW Resources overview</i> .....	107
6.2 <i>Pilot Challenges and REFLOW Resources</i> .....	127
<b>7. REFLOW Resources for circular transitions: inspiration.....</b>	<b>134</b>
7.1 <i>The Best Practices Database</i> .....	134



<b>8. Release: Cities' Circular Action Plans.....</b>	<b>137</b>
<i>Next Steps.....</i>	<i>138</i>
<i>Digital Cities' Circular Action Plans.....</i>	<i>138</i>
<b>Bibliography .....</b>	<b>140</b>

## List of figures

Figure 1. Circular Design Framework. Source: Ellen MacArthur Foundation and IDEO (2020).....	10
Figure 2. Pilot cities, work packages and building blocks. Source: Copenhagen Business School. ....	15
Figure 3. Cluj-Napoca's urban area. Source: World Bank Group (2013). ....	30
Figure 4. Milan initiatives on circular economy. Source: Urban Economy and Employment Directorate, internal document. ....	38
Figure 5. Flows of material entering and leaving Paris. Source: Paris Circular Economy Plan 2017-2020. ....	47
Figure 6. Stakeholder map and role in Paris pilot. Source: REFLOW Deliverable 5.1.....	49
Figure 7. Resources developed in REFLOW to address project level challenges.....	67
Figure 8. Overview of disciplines, theories and methods in REFLOW. Source: Copenhagen Business School. ....	87
Figure 9. The REFLOW Vision Source: Copenhagen Business School.....	91
Figure 10. The REFLOW Process represented in a double diamond.....	95
Figure 11. Circular Design Framework. Source: Ellen MacArthur Foundation and IDEO (2020). ....	96
Figure 12. PDSA model. Source: Moen (2009). ....	97
Figure 13. Strategic Doing Cycle. Source: Morrison et al. (2019). ....	98
Figure 14. WP-Pilots interaction. Source: Copenhagen Business School .....	104
Figure 15. Knowledge transfer points. Source: Copenhagen Business School.....	105
Figure 16. Circular Design Thinking. Source: Copenhagen Business School .....	106
Figure 17. Overview of resources in REFLOW within each building block. Source: Copenhagen Business School .....	108
Figure 18. Potential REFLOW Resources to address Awareness Challenges. Source: Copenhagen Business School.....	128
Figure 19. Potential REFLOW Resources to address Business Challenges. Source: Copenhagen Business School .....	129
Figure 20. Potential REFLOW Resources to address Governance Challenges. Source: Copenhagen Business School.....	130
Figure 21. Potential REFLOW Resources to address Project Management Challenges. Source: Copenhagen Business School..	131
Figure 22. Potential REFLOW Resources to address Technological Challenges. Source: Copenhagen Business School.....	132
Figure 23. Potential REFLOW Resources to address Covid-19-related Challenges. Source: Copenhagen Business School.....	133
Figure 24. Example of a practice structure in Best Practice Database. Here: City Policy Best Practice.....	136

## List of tables

Table 1. Elements and format of the resource description.....	9
Table 2. REFLOW's work packages and REFLOW's building blocks. ....	14
Table 3. Activities planned for the short-term scenario in Amsterdam pilot. Source: REFLOW: Deliverable 5.1.....	19
Table 4. Activities planned for the long-term scenario in Amsterdam pilot. Source: REFLOW Deliverable 5.1.....	19
Table 5. Summary of the challenges and possible solutions in Amsterdam pilot.....	21
Table 6. Key stakeholder groups in Berlin pilot. ....	24
Table 7. Key performance indicators in Berlin pilot.....	24
Table 8. Summary of the challenges and possible solutions in Berlin pilot. ....	27
Table 9. Cluj-Napoca's strategy and activities in REFLOW. Source: REFLOW Deliverable 5.1.....	31
Table 10. Primary and secondary objectives of the Cluj-Napoca pilot city. Source: REFLOW Deliverable 5.1.....	31
Table 11. Cluj-Napoca pilot's stakeholders and their role in the project. ....	32
Table 12. Summary of the challenges and possible solutions in Cluj-Napoca pilot. ....	36
Table 13. List of Milan Pilot stakeholders. Source: REFLOW Grant Agreement Annex I.....	40
Table 14. Summary of the challenges and possible solutions in Milan pilot.....	44
Table 15. Areas of circular economy intervention in Paris. Source: Paris Circular Economy Plan 2017-2020. ....	46
Table 16. Stakeholders engaged in the Paris pilot. Source: REFLOW Deliverable 5.1.....	48
Table 17. Paris' strategy and activities in REFLOW. Source: Adapted from REFLOW Deliverable 5.1. ....	50
Table 18. Summary of the challenges and possible solutions in Paris pilot.....	52
Table 19. Summary of the envisioned scenarios and related activities in Paris pilot.....	53
Table 20. Vejle's strategy and activities in REFLOW. Source: REFLOW Deliverable 5.1. ....	55
Table 21. Summary of the challenges and possible solutions in Vejle pilot. ....	58
Table 22. Summary of the envisioned scenarios and focus areas in Vejle pilot. ....	59
Table 23. Categories of challenges encountered by REFLOW pilot cities. ....	63
Table 24. Overview of CE visions drawn from the survey conducted by WP6. ....	90
Table 25. Glossary of terms used in Theory of Change methodology.....	101
Table 26. Theory of Change of REFLOW. ....	103
Table 27. Challenges experienced by pilot cities and related REFLOW resources.....	127
Table 28. Description of fields in each of the three categories in Best Practice Database. Source: WP6. ....	135

## Abbreviations

BM	Business Model
BMI	Business Model Innovation
CA	Consortium Agreement
CCAP	Cities' Circular Action Plan
CE	Circular Economy
CoP	Community of Practice
EC	European Commission
EMF	Ellen MacArthur Foundation
EU	European Union
GA	Grant Agreement
IDR	Interdisciplinary Research
KPI	Key Performance Indicators
MFA	Material Flow Analysis
NGO	Non-Governmental Organisation
OS	Operating System
SDG	Sustainable Development Goals
SME	Small-Medium Enterprise
SROI	Social Return on Investment
ToC	Theory of Change
UN	United Nations
WP	Work Package
WPL	Work Package Leader

## Introduction

### What is this deliverable about?

The Cities' Circular Action Plans (CCAP) is a living document consisting of resources for individuals, citizens' associations, municipalities and other agencies within cities in their transition toward circular and regenerative practices through the adoption of circular economy (CE) strategies and activities. In doing so, the CCAP will support the cities in the strategic use of the resources developed and used in REFLOW, to overcome barriers and challenges towards the implementation of CE and to facilitate the operationalisation of circular transitions. Furthermore, the CCAP will evolve into an online platform and will be regularly updated in order to effectively support and sustain engagement and self-organised CE activities beyond the end of the project.

### What is a Cities' Circular Action Plan?

A Cities' Circular Action Plan is **the roadmap for the transition toward circular and regenerative cities**. Therefore, the Cities' Circular Action Plan is the result of the collective action undertaken by the different agents involved in the project. In particular, the REFLOW project involves a variety of teams across Europe. These can be grouped into two general categories: work packages and pilot cities (pilots). On the one hand, the pilot cities refer to the various teams operating in the cities where the Cities' Circular Action Plans are implemented. On the other hand, the **work packages (WP)** consist of teams of experts from multiple organisations managing and facilitating a broad set of activities to support the pilot cities. The relation between WPs and pilot cities is further described in section 1.1.

In line with the overall structure of the project, The REFLOW Cities' Circular Action Plan operates on two levels: Project level and Pilot level.

On a **Project Level**, the CCAP is described as the **Action Plan of the project**. In fact, it is the overall Roadmap that determines the general direction and modes of organising the stakeholders of the project, i.e. the work packages (WPs) and the pilot cities.

Therefore, at a project level, the Circular Action Plan is mainly concerned with the overall management, coordination and alignment of the activities and resources to achieve the overarching project objective to enable the transition towards circular and regenerative cities. This would for instance refer to the alignment of the different building blocks of the project, the identification of possible synergies and the management of possible overarching challenges that might affect the implementation of the circular transition both at the EU and local level.

On a **Pilot Level**, the CCAP refers to the **specific action plans created by the REFLOW cities**, within the broader Roadmap of the project. The action plans are mainly concerned with the management and implementation of local activities aimed at achieving the pilot-specific objectives. On a pilot level, resources refer to the tools devised and implemented by the project consortium to overcome the challenges encountered or expected by the pilot cities.

## What are the resources described in the CCAP?

The resources collected and described in this document are the main tools developed or implemented during the first year of the project to enable the transition towards circular and regenerative cities. The above-mentioned resources include all the solutions created by the consortium and adopted by the pilot cities involved. The resources are described in relation to the specific challenges encountered, currently faced or expected by the REFLOW's pilot cities in the transition towards circular and regenerative modes of dealing with urban material flows.

Firstly, on a project level, resources have been used to enable the development of all the pilots through a better coordination and alignment of the work packages and pilot cities. These resources are co-designed and developed by the different building blocks or work packages on the project based on the work with the pilot cities.

Secondly, on a pilot level, resources have been relevant to address pilot objectives common to more pilots. These resources were co-designed and developed by the pilot cities and the work packages, based on the work and information collected by the pilot cities themselves on a local level.

Finally, some resources have been relevant to address pilot-specific objectives on a local level. These resources are designed and developed by the pilot cities, based on the work they have done on a local level.

Each resource included in this deliverable is related to one or more challenges encountered by the consortium either at a project level or at a pilot level. The resources described in this deliverable supported the solution of the said challenges or were selected to address them in the future.

Each resource is described according to the purpose it contributes to address, the audience and the activities necessary to develop it.

When possible, a description of the method used to develop this resource is provided so that the reader can replicate it. The elements and format of the resource description are presented in Table 1 below.

Elements of the resource description	Main content
Resource Name	Name of the resource
Main Building Block	A building block describes the theoretical and thematic area within which WPs perform their tasks
Responsible WP	Team of experts in the REFLOW consortium responsible for the development of the resource
Other WPs involved	Other teams involved in the development of the resources
Resource Description	Overview of the main features and characteristics of the resources
Additional Information	Link to the document where the resource is described in detail
REFLOW Cities using this	Pilot Cities that will use the resource
Contribution to the REFLOW Objectives	How the resource contributes to address REFLOW Objectives

Table 1. Elements and format of the resource description.

## What can you learn from the Cities' Circular Action Plan?

The Cities' Circular Action Plan provides an overview of the first year of the project by describing the evolution of pilot cities' Action Plans and the challenges encountered both at project and a pilot city level. Moreover, this document presents the resources that have been developed to address them.

When it comes to the challenges that cities may encounter based on the risk assessment made at project level and the academic and practitioners' literature in the field, the CCAP provides a collection of possible best practices to support the project's pilot cities in the development of their action plans.

In this way, the reader willing to implement a circular transition at city level, will be able to relate to specific challenges encountered in REFLOW, learn about the resources selected to address them and will be given instructions on how to replicate them.

## How is this deliverable organised?

The structure of this deliverable is inspired by the Ellen MacArthur Foundation (EMF) "Circular Design Guide" (2017). In order to facilitate the replication of the project, each section of this deliverable is related to one of the phases of the EMF Circular Design Guide: Understand, Define, Make, Release.

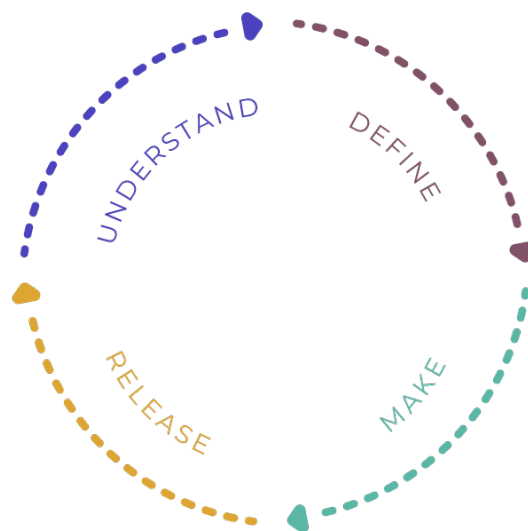


Figure 1. Circular Design Framework. Source: Ellen MacArthur Foundation and IDEO (2020).

**Understand Sections:** describe the Action Plans in the first 12 months of the project.

**Define Sections:** describe the challenges encountered and envisioned.

**Make Sections:** describe resources created or under development.

**Release Section:** describes next steps.



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## What are the different sections about?

### 1. Understand - REFLOW journey

This section briefly describes how the Action Plan of the project evolved in the first 12 months, by outlining the main milestones and events occurred, and the coordination mechanisms applied.

### 2. Understand – Pilot Action Plans

This section describes the Action Plans of the six REFLOW pilot cities. For each pilot city a case study is undertaken to describe the development of the Cities' Action Plans.

The case studies describe the development of the pilot scenarios from the outset of the project and describe the envisioned next steps of their Action Plans.

### 3. Define – Project-level challenges and possible solutions

This section highlights the main implementation challenges encountered and currently faced at a project level.

### 4. Define – Pilot-level challenges, implementation barriers and possible solutions

This section collects the key learnings from the case studies, discusses analogies and differences between the main challenges encountered by the pilots, and provides insight on one overarching solution identified.

### 5. Make – REFLOW Resources for Project-level challenges

This section describes the resources developed to address the project level challenges. In particular, these resources are: REFLOW Theoretical Framework; REFLOW Theory of Change.

### 6. Make - REFLOW Resources for circular transitions

This section describes the resources under development in the REFLOW Process to support the pilot cities in their transition to become circular and regenerative.

### 7. Make - REFLOW Resources for circular transitions - inspiration

This section introduces a collection of best practices that might help the pilot cities to address the challenges identified in the pilot case studies. The best practices are collected in the Best Practices Database, which provides inspiration from various sectors on how to address circular economy implementation challenges.

### 8. Release – Cities' Circular Action Plans

This section summarises the next steps for REFLOW in addressing the circular economy implementation challenges, and how the Cities' Circular Action Plans will evolve into an online platform. The latter will be designed as a set of resources to allow replication by any city embarking on a transition towards circular economy.



## 1. Understand – REFLOW Journey

This section provides an overview to *Understand* REFLOW in relation to the main stakeholders involved and activities undertaken in the first 12 months. Firstly, the pilot cities implementing the Cities' Circular Action Plans are described in brief. Secondly, an overview of the work packages, i.e. the team of experts supporting the pilot cities, is provided. Thirdly, an introduction of a general description of the first 12 months of the project is presented. This section is preparatory for the next chapters, where the case studies will provide a more in-depth understanding of the pilot cities' Action Plans. Finally, it will provide the context to understand the resources developed to support the development of the pilot cities.

### 1.1 The REFLOW Project

REFLOW is an EU Horizon 2020 research project running from 2019-2022, which aims to enable the transition of European cities towards circular and regenerative practices. More specifically, REFLOW uses Fab Labs and makerspaces as catalysers of a systemic change in urban and peri-urban environments, which enable, visualize and regulate “four freedoms”: free movement of materials, people, (technological) knowledge and commons, in order to reduce materials consumption, maximize multifunctional use of (public) spaces and envisage regenerative practices. The project will provide best practices aligning market and government needs in order to create favourable conditions for the public and private sector to adopt circular economy (CE) practices. REFLOW is creating new CE business models within six pilot cities: Amsterdam, Berlin, Cluj-Napoca, Milan, Paris and Vejle and assess their social, environmental and economic impact, by enabling active citizen involvement and systemic change to re-think the current approach to material flows in cities. Therefore, the REFLOW project is composed by different teams collaborating across Europe to develop the different Pilot Cities' Action Plans. Such teams can be grouped in two broad categories: work packages and pilot cities (pilots).

#### Pilot Cities

As mentioned above, the REFLOW pilots consist of the following six cities: Amsterdam, Berlin, Cluj-Napoca, Milan, Paris and Vejle. The selected group of cities includes both large capitals and average or smaller sized European cities. Moreover, it covers Scandinavian cities, southern European municipalities and a city representing one of the newer member states of the European Union. When we refer to the pilot cities, we refer to the local consortium responsible for the Cities' Circular Action Plan. Usually in REFLOW the local consortium is composed by representatives of the city's municipality, makerspaces, Fab Labs or SMEs.

Although all pilot cities seek to co-create and develop CE strategies, each city has chosen a different problem to address. This circumstance makes the different cities' Action Plans context-specific – not only in relation to the different problems addressed, but also in relation to the different modes of organising. The six pilot cities are presented below:

**The Amsterdam Pilot** focuses on how textiles in general, and home textiles in particular, are discarded and reused as well as how textile waste can be brought back into the material flow.

**The Berlin Pilot** aims to reduce CO<sub>2</sub> emissions and increase energy efficiency in the German capital. More



specifically, the project aims to implement a digital and organisational platform for the optimization of the use of wastewater heat.

**The Cluj-Napoca Pilot** focuses on reversing the city's increasing energy consumption and waste by introducing more efficient and circular solutions concentrating on district heating and electricity usage.

**The Milan Pilot** seeks to introduce circular economy and long-term sustainable tech solutions on logistics, transportation, transformation, distribution, and conservation of food in the local municipal markets.

**The Paris Pilot** focuses on managing the material waste produced from major events that take place regularly in the city and incorporating it in sustainable and circular supply chains.

**The Vejle Pilot** aims to develop circular solutions and raise awareness among citizens and organisations that will allow the reuse, reduction, and recycle of plastics and plastic-based waste in the West of Vejle.

## Work Packages and Building Blocks

REFLOW is organised in 9 work packages (WP) which support the pilot cities in the development of the Cities' Circular Action Plans. A **work package (WP)** consists of a team of experts from multiple organisations responsible for a particular work stream and aspect of the project, including a number of tasks and deliverables to be executed. Each WP supports the pilot cities with specific aspects of the cities' Action Plans, according to the focus of the work package.

In this deliverable seven WPs, WP1 to WP7, will be described. The reason being that they are those actively supporting the pilot cities in the development of the Cities' Circular Action Plans, whereas the last two work packages, WP8 and WP9, focus on the project management and ethical management activities. Each WP is related to one or more **building blocks**. Although WPs are sometimes used as synonyms of REFLOW's building blocks, the two terms differ. A building block describes the theoretical and thematic area within which WPs perform their tasks (see: Table 2). In other words, building blocks comprise the different theories, methods and approaches that the REFLOW WPs use to develop their activities. Given the twofold role of WP1 for instance, this is the only WP related to two building blocks, namely Process Coordination and Business and Society. The relation between WPs and building blocks is further elaborated in the REFLOW Theoretical Framework (Section 5).

REFLOW	
Work Packages	Building Blocks
WP1: Business and Design Co-Creation	Process Coordination
WP1: Business and Design Co-Creation	Business and Society
WP2: IT Infrastructure and tools	Technology
WP3: Circular Engineering	Circular Engineering
WP4: Governance and Urban Strategies of CE	Governance
WP5: Pilots	Pilot Coordination
WP6: Capacity Building and Knowledge Transfer	Capacity Building



WP7: Disseminations, Exploitation, and Sustainability	Communication
WP8: Project Management	
WP9: Ethics Requirements	

Table 2. REFLOW's work packages and REFLOW's building blocks.

The REFLOW WPs are presented in detail below.

**WP1 – Business Design and Co-Creation** has a double role. On the one hand, this WP is in charge of the overall process coordination with the objective of facilitating the people-centred approach. In fact, the main task of this WP is to align the WPs and the pilot cities in the development of the Cities' Circular Action Plans. In this sense, this WP is responsible for the development of the resources to facilitate and implement the co-design activities of the project. Here, the related building block is **Process Coordination**.

On the other hand, WP1 is supporting the pilot cities with the definition of the business case for circular and regenerative cities, and is responsible for the overall economic, social and environmental impact assessment of the pilot projects. In this sense, the resources developed by this WP are concerned with the definition business cases for CE practices at pilot city level as well as with the overall social, environmental (in collaboration with WP3) and economic impact evaluation. The related building block is **Business and Society**.

**WP2 – IT infrastructure and Tools** collaborate with the pilot cities by providing the technical knowledge necessary for the development of technological solutions to enable circular transitions. The resources developed in this WP consists of the digital tools around which the Cities' Circular Action Plans unfold. The related building block is **Technology**.

**WP3 – Circular Engineering** supports the cities by developing resources and collaborating with the cities in the analysis of the resource flows and the downstream and upstream consequences of resource consumption in the pilot cities. In so doing, it supports the development of interventions and strategies that enable systems change towards positive social and environmental impact. One of the first outcome of this WP is the development of Circular Principles and environmental KPIs to inspire and guide the development of the Cities' Action Plans. The related building block is **Circular Engineering**.

**WP4 – Governance and Urban Strategies on Circular Economy** provides support for the innovation of governance models in the pilot cities to enable the circular transition. In so doing, it supports the cities involved in the study with the analysis, definition and co-design of governance models. Moreover, it aims at providing a series of tools that can support urban systems to adopt and implement circular practices. The related building block is **Governance and Urban Strategy**.

**WP5 – Pilots** is concerned with Pilot Coordination and is responsible for the alignment, co-development and testing of the CE strategies in the pilot cities. The resources produced within this WP are concerned with the coordination of pilot cities, and the activities included here represent the central input of the cities' Action Plans. The related building block is **Pilot Coordination**.

**WP6 – Capacity Building and Knowledge Transfer** contributes to integrate the key learnings from the project's WPs and develop a set of resources for the pilot cities and for the other stakeholders of the project to gain deep understanding of circular practices. The targeted audience includes academic institutions, municipalities, citizens' grassroots organisations, and the general public. The related building block is **Capacity Building**.

**WP7 – Dissemination, Exploitation and Sustainability** supports the pilot cities by disseminating the project findings and practical results to facilitate the replication of the REFLOW experience. The related building block is **Communication**.

Figure 1. further illustrates in a matrix form the relationship between work packages, building blocks and the pilot cities in REFLOW.



Figure 2. Pilot cities, work packages and building blocks. Source: Copenhagen Business School.

## 1.2. REFLOW Journey

This section outlines the main elements that characterized the REFLOW Journey in the first year of the project. The aim is to briefly describe the context in which the development of the REFLOW Resource took place.

During the first 12 months, REFLOW made significant progress on several fronts. To start with, WP1 began the process of alignment of the project's consortium with the Grant Agreement and the overall strategy of the project. This exercise started in the first month of the project, June 2019, and resulted in a document co-created by the whole partnership "The



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Work Plan of the first six months". This internal document helped the partnership translate the requirements of the Grant Agreement into operational objectives in line with the overall vision of the project itself. This exercise was repeated in the seventh month of the project, December 2019, and resulted in another co-created document called "Operational Strategy". The latter document is guiding the partnership until the end of the first year of the project itself. The strategy documents will be reviewed and improved every six months until the end of the project.

Moreover, research and mapping of the needs and challenges that the six pilot cities of REFLOW met while designing and implementing circular economy practices started early on and was intensified as the cities further developed their scenarios. These refer to the descriptions of possible actions that a city could take on their path towards becoming a circular city. The identification and development of scenarios were facilitated by WP5 through guiding the pilot cities in the identification of the initial challenges or opportunities to address.

The completion of the whole process led to the development of the current report. In the same timeframe, REFLOW has been quite active in terms of organising events to support and facilitate its partners to fulfil their objectives. In particular, the first co-creation workshop was organised in Copenhagen in November 2019 to respond to the needs of the pilot cities to get a better understanding of the project and the different work packages and building blocks that can be helpful in fostering the pilot cities' transition towards CE. This workshop was held as part of the REFLOW methodology, which aims at developing and fine tuning the pilot cities' projects on the basis of three key plenary workshop. The first workshop was held in month 06 of the project, November 2019 and the next two co-design workshops will take place respectively in month 18 and 24 of the project. These dates correspond to November 2020 and June 2021.

Moreover, in March 2020, a project meeting was organised in Vejle, Denmark. The meeting was arranged in line with the Grant Agreement requirement (GA part B, p. 11). The meeting was to have been organised in June 2020 however, it was pushed forward to take place in March 2020 to support the development of the six reports that REFLOW was required to produce by the end of May 2020. Due to the COVID-19 pandemic and in order to avoid unnecessary risks, the meeting was transformed into an online meeting. This decision met the support of the partners who ultimately decided to have additional plenary meetings in the future. In fact, the strategic discussions and the alignment of the partners' operations resulted in concrete actions to support the pilot cities. For instance, during the online meeting, WP1, was able to gather information needed for the current document and the same applies for WP4 and the development of the REFLOW Collaborative Governance Toolkit.

The emergence of the COVID-19 pandemic and the subsequent lock-down of workplaces and countries did not leave REFLOW uninfluenced. Visits to the pilot cities and interactions requiring physical presence of the participants have been cancelled or postponed, while online meetings have been intensified. In addition, REFLOW followed a risk assessment process described a previous internal report produced by the project: "Quality Assurance and Risk Management" produced by the Coordinating Organization Copenhagen Business School in August 2019. The practice adopted is aimed at gathering the input and the risks perceived by all the partners in the project in order to find the more suitable solutions to face them. Moreover, an "IT workgroup" has been created at project level with the aim of gathering the needs of the partners and trying to provide the best technological answer to face them. This group gathers partners with strong technological competences and is led by the Project Coordinator. So far, the workgroup met and discussed tools to allow for online collaboration and gathered the consortium needs through a survey diffused to all the project partners (for more information, please see the "REFLOW: Resources for circular transition" section below).



## 2. Understand – Pilot Case Studies

This chapter presents the Case Studies for the six pilot cities in REFLOW – Amsterdam, Berlin, Cluj-Napoca, Milan, Paris, and Vejle. The Case Studies describe the pilot project details and highlight the challenges that the pilot cities have encountered in their project journey. These challenges are described here from each pilot's perspective, and account for the contextual and operational differences between the pilot cities. The aim is to understand the individual situation in each REFLOW pilot city, while the next chapters will provide a more overarching view and definition on the cross-cutting challenges that cities are likely to face in the transition to circular economy.

The six Case Studies are organised as follows: each Case Study begins with a (1) brief summary of the pilot Case Study, followed by a (2) description of the city context. Next, a (3) description of the pilot city in REFLOW is outlined; followed by a (4) description of the challenges that the pilots have experienced in the transition to circular material flows. The latter information has been collected through a series of individual interviews with pilot cities. The next section (5) outlines the action plan of each pilot – i.e. the next steps envisioned by the pilot.

### 2.1 Amsterdam

#### Summary

The city of Amsterdam formulated a circular strategy in year 2019, and started its implementation in 2020, with the vision to be a thriving, regenerative, and inclusive city for all citizens while respecting planetary boundaries. As a pilot city in REFLOW, it focuses on the ways in which textiles are discarded and reused; and on how textile waste can be brought back into the material flow. Special attention is given to home textiles. Supporting diverse collection methods with citizens will provide feedstock for the recycling industries, and in turn increase the demand for the supply of newly produced products out of recycled resources.

#### The City of Amsterdam

Located in the province of North Holland, Amsterdam is the capital and largest city of the Netherlands with a population of 872,680 within the city and 2,410,960 in the metropolitan area. The city is well known for its countless canals and is also the Netherlands' cultural and commercial capital. Ranked as one of the world's most liveable and most innovative cities (Innovation Cities Program, 2019), it attracts people and businesses alike. With a motto "learning by doing", Amsterdam encapsulates its innovative spirit while its ambition is to keep developing in a way that ensures a thriving and equitable environment for its citizens and visitors. The city has set a specific focus on wellbeing next to welfare.

The city of Amsterdam describes sustainability as one of its top priorities and has set a clear goal of reducing waste and transitioning fully to a circular economy. By 2025, Amsterdam aims to enable recycling or reuse of 65 percent of all household waste, by 2030, the use of primary raw materials should be reduced by 50 percent, and by 2050 the entire city economy should become circular (Amsterdam City Policy, 2020). To achieve these goals, the city actively promotes new ways of thinking and close cooperation between knowledge institutes, businesses and citizens – not least through a number of initiatives like Amsterdam Circular: Learning by Doing, or the Circular Innovation Programme (City of



Amsterdam, Circle Economy, Raworth K., 2019). The overall circular economy strategy for the years 2020-2025 has been developed based on the Doughnut Economics model by Kate Raworth, aiming to create a holistic umbrella for environmental, social, and economic priorities. The support from the city and a conducive climate for circular innovation and implementation of circular principles have already reaped benefits – over the last few years, there has been more than 70 projects completed that contributed to circular economy implementation in Amsterdam (City of Amsterdam, Circle Economy, Raworth K., 2019).

Circularizing cities, its municipalities, businesses and material flows related specifically to the textile industry can play an important role in reaching the overall sustainability and circularity goals. While annual purchases of clothing in the EU have increased by over 40 percent since 1996, more than 30 percent of these items are not actually in use (Šajn, 2019). In Amsterdam alone, households, the main consumers of textiles, are estimated to have built up 1400 tons of textile stock. Textiles are therefore one of the main points of focus for the Dutch government and Amsterdam city – e.g. through the government-supported initiative Dutch Circular Textile Valley, which supports initiatives around circular textiles in four regions in the Netherlands, including Amsterdam region. Under the national Circular Economy Pact, signed by Amsterdam in 2019, the city is also renewing its textile collection procedures, focusing on better strategies for executing the collection.

### Amsterdam – a REFLOW Pilot City

The current status quo in the textile industry is far from circular. Even though the demand for recycled materials is very slowly growing, general commercial uptake is still missing and very far away. In addition, cities, who hold the responsibility for the collection, sorting, and treatment of textiles, cannot improve material flows by themselves. While municipal waste collectors collect 71 percent of the household stock, 67 percent of it are incinerated rather than being reused as clothing or material. Incorrect sorting and disposal of textiles among households – due to lack of awareness and sub-optimal ways of collecting textiles – also contributes largely to the problem. Within the REFLOW project, the Amsterdam pilot, therefore, focuses on textiles used by citizens, how these textiles are discarded and reused, and how textiles as resources can be brought back into the material flow. By supporting more diverse strategies for the collection of textiles, the project can aid the provision of feedstock for recycling industries, increase the demand for recycled textile and support the supply of newly produced products out of recycled resources for other stakeholders. The goal is to increase the number of textiles collected through empowering citizens to become the change makers – by taking active part in the behavioural change unfolding in Amsterdam, they can further educate and empower others.

To facilitate the shift towards more circular textile material streams in the region, the Amsterdam pilot is implementing a strategy consisting of two complementary scenarios. The short-term scenario aims to achieve impact by saving textiles from being discarded. By raising awareness and inducing behavioural change among citizens, home textiles and clothing can be collected in a more efficient way for recycling. Specific activities in the citizen scenario are laid out in Table 3.

Short Term Scenario	
Addressing citizen/stakeholder engagement and education	Addressing governance, network and policy
Design and execute public events, talks and workshops for learning and behaviour change	Promote and organise collections through retailers, libraries and other public indoor spaces





Intensify collaborative actions with local networks to raise awareness	
Brainstorm sessions with citizens/ students on how to collect more effectively	
Promote circular textile in educational programs on sustainability for fashion schools and universities	

Table 3. Activities planned for the short-term scenario in Amsterdam pilot. Source: REFLOW: Deliverable 5.1.

The long-term scenario (illustrated in Table 4) aims to increase the provision of feedstock for the recycling industry – and in turn to increase the supply of products made from recycled resources for other stakeholders, thus creating new business opportunities and models. This is done by involving different stakeholders to generate demand for recycled textiles/ 'circular' fabrics - in particular designers. Moreover, a digital platform will be developed as a tool to engage with the industry and help prove the circularity of the sourced materials.

Long Term impact / Industrial Scenario		
Addressing citizen/stakeholder engagement and education	Addressing governance, network and policy	Addressing technological development
Promote the use of recycled resources, decrease the use of only virgin fibres	Workshop focused on collecting information for an online platform for exchange	Workshop focused on the identification of the market needs
	Creation of advice documents for policies to push the implementation of recycled textiles	Development of the platform for track and trace, validation of circular flows, and investigation of business opportunities
	Rethinking the common governance model for the textiles chain by strengthening public awareness through thought-provoking articles	Create live tracking garments/home textiles in the city – tags/bins
	Work towards the creation of policies that push for the implementation of tracking labels/ smart bins	Testing of the platform
	Work towards the creation of policies that push for the implementation of recycled materials in textiles, use tracking labels and network analysis	
	Facilitate the connection and the exchange in the marketplace between entrepreneurs and the sorting companies	

Table 4. Activities planned for the long-term scenario in Amsterdam pilot. Source: REFLOW Deliverable 5.1.

To monitor and assess the success of the project, targets for key performance indicators (KPIs) have been formulated. These indicators are directed at anticipated outcomes of the two scenarios as well as at the uptake and satisfaction of related measures. KPI targets for activities related to the citizen scenario are concerned with textile collection and citizen engagement. Accordingly, the Amsterdam pilot aims to regenerate 40 percent of the textile stream and engage 500 citizens through diverse activities by the end of the project. KPI targets related to the industrial scenario set goals like the





identification of 100 textile specific city resources and 10 specific textile streams, and the development of 5 governance/business models. Additional targets address stakeholder satisfaction, applications for textile waste development, willingness to pay for regenerated products and materials, as well as the number of local businesses reached through showcases.

### Challenges encountered by the Amsterdam pilot

In the first year of the pilot project, the team has experienced and reflected on at least four key challenges:

#### **1. Alignment of different local and national initiatives and activities to create purposive directional movement, not isolated actions.**

The city of Amsterdam, and the Amsterdam metropolitan region, are beginning the implementation of a new circular strategy in 2020, where different initiatives (both bottom-up and top-down) are being developed and introduced, and different organisations and municipal bodies have circular textiles on the agenda. This is a great opportunity for the Amsterdam pilot to uncover the inevitable synergies with other local initiatives and work in alignment to amplify the results of each individual action. At the same time, this situation also carries the risk of many activities happening in silos, losing the chance to optimise the impact of the local pilot together.

**Possible solution:** To secure alignment and awareness about each other's actions among different initiatives. It should be ensured that key actors work together as (local) project partners. These should be the stakeholders involved in different activities, with good connections to the vast range of already existing and unfolding projects, initiatives, and activities in the Amsterdam region. In this way the Amsterdam pilot's stakeholders would be able to identify potentials for collaboration and make connections to join forces and build upon already existing projects and infrastructures.

#### **2. Complexity in stakeholder alignment and engagement**

Throughout the two scenarios (short-term and long-term), the Amsterdam pilot aims to closely engage and collaborate with a large range of stakeholders, ranging from citizens to industry. However, developing mutually beneficial partnerships is a complex task that requires the understanding of the needs, requests and benefits for each of the stakeholders involved.

**Possible solution:** Having a clear communication strategy with the different stakeholders is crucial; as well as crafting a transparent system (analog and digital) that moves from linear to circular, in which all the actors are represented, and the value and co-benefits, in other words the business case, can become clear.

#### **3. Unexpected pandemic and social isolation – teamwork**

The main challenge the Amsterdam pilot is facing right now is in finding alternative strategies to the ones previously expected and planned activities aimed at reaching a broader public, especially in specific neighbourhoods. Reaching citizens that are not yet fully aware of the problems in recycling textiles became significantly more difficult in a social isolation context such as COVID-19.

This challenge requires the Amsterdam pilot to restructure and adapt their team formation and tasks in order to be able to cover newly emerged activities, which are outside their usual expertise. The pilot project and the team need to undergo internal changes and adapt operations and focus.



**Possible solution:** For a short period of time, the Amsterdam pilot team need to prioritise the communication activities in the short term and tap into the changed flows of the city. Demonstrating flexibility, the entire system of roles and responsibilities that were framed and functions had to be reshaped in order to adapt to the current situation. The immediate steps include a partial shift from analog to digital – hopefully for a temporary phase. The pilot team is now focused on learning and exploring options for how to engage citizens online, e.g. through social media campaigns.

#### 4. Unexpected pandemic and social isolation - recycling

With the same underlying reason – the COVID-19 pandemic – another key challenge the pilot is facing right now is in finding alternatives to the initially planned strategies and activities in relation to working with circular textile streams. Currently, the recycling system of the Netherlands is facing serious issues given that the resource streams cannot be collected, sorted and processed, due to the social distancing and closed borders measures adopted in Europe.

**Possible solution:** Given the novelty of the situation, the solutions are currently under development.

	Challenge	Solution
1	Alignment of local and national initiatives and activities	Ensured key actors work together as project partners
2	Complexity in stakeholder alignment and engagement	Clear communication strategy with stakeholders
3	Pandemic and social isolation - teamwork	Restructure into communications strategy team, tap into changed flows of the city
4	Pandemic and social isolation - recycling	Under development

*Table 5. Summary of the challenges and possible solutions in Amsterdam pilot.*

#### Next steps envisioned by Amsterdam pilot

As mentioned before, the Amsterdam pilot organises its activities based on two interconnected scenarios – one in the short term and one in the long term – which collectively aim to spearhead the transition of textile material flows from linear to circular in the Amsterdam region.

The key outcome of the short-term scenario is the behavioural change among citizens, which will result in the increase of home textiles collection at a city level. This will be achieved by engaging citizens through a series of activities structured in iterative learning entry points, where passing through all stages of behavioural change will be crucial to achieve a long-lasting impact. The bottom-line of this scenario entails (1) raising awareness among citizens, to (2) enable citizens' action and (3) ultimately inspire a behavioural change. This will be done by an online campaign, hyper local activities, organising events, workshops or expositions as “learning entry points”, where each learning entry point represents a step to generate behavioural change.

The long-term scenario focuses on complementary continuation of the solutions found in the short-term scenario, where through increased number of textiles collected for recycling, the manufacturers will be able to decrease the amount of virgin fibres used in the production of yarns and textiles. Additional support in this process will come from an online exchange platform and database, co-developed with different stakeholders, which will allow to gain better insight into the available feedstock materials ready for re-manufacturing.



Initially, the Amsterdam pilot has been focusing on the short-term scenario. So far, the pilot has developed a campaign consisting of different activities mapped on the behavioural change wheel – with five key steps: (1) learn, (2) engage, (3) situate, (4) change, (5) continue, that are critical to achieve lasting behavioural change. Possible locations and stakeholders to involve have already been identified both through the Material Flow Analysis (MFA) carried out in collaboration with work package 3 of REFLOW, and directly through the research and mapping completed by the Amsterdam pilot.

Due to the current situation caused by the COVID-19 pandemic, the Amsterdam pilot team has shifted some of the focus into developing solutions to this new challenge and finding alternatives to the planned strategies and activities that are currently on hold. The response plan includes:

- Restructuring of the local team – in line with the solution proposed to Challenge #3.
- Kicking-off a communication campaign.
- Identifying and tapping into some other similar initiatives, where project activities have moved online.
- Finding solutions for textile streams that cannot be collected now – to address Challenge #4.

Further implementation of activities in the Amsterdam pilot, and likewise in other REFLOW pilot cities, will be highly dependent on the development of the COVID-19 situation and the restrictions imposed on countries affected by the health situation.

## 2.2 Berlin

### Summary

In line with the Berlin Energy and Climate Protection Programme 2030, the REFLOW project pilot Berlin aims to reduce CO<sub>2</sub> emissions and increase energy efficiency in the German capital. Specifically, the project aims to implement a digital and organisational platform to optimise the use of waste heat via water as a medium. Wastewater-heat is a particularly relevant category of waste heat in the urban context, as the underground water pipes cover large parts of the city and, therefore, allow for an extensive distribution of the energy used. This state of the art in the city was a decisive factor in the selection of the Berlin pilot's focus. By implementing different measures, wastewater-heat potentials will be identified, and the visibility of the technology will be increased.

### The City of Berlin

Berlin is the capital and largest city of Germany. The city has roughly 3.7 million inhabitants and is well known for its festivals, diverse architecture, contemporary arts and a very high living standard. Besides its importance for politics, Berlin is a centre for tech and the service sector companies in Germany. In line with European efforts towards more sustainability and environmental protection such as the Europe 2020 Strategy and the European Green Deal, Berlin has committed itself to the Berlin Energy and Climate Protection Programme (BEK) 2030. In it, the Federal State of Berlin has set concrete targets for the reduction of CO<sub>2</sub> emissions and the adaptation of the city to the effects of climate change.

In recent years, the city of Berlin is at the forefront of working with circular economy, the zero-waste movement, and other associated initiatives. In fact, a recent report published by the organisation Circular Berlin (Padalkina, D. 2018)



describes Berlin as a city with *“the potential to become the first Circular City in Germany, due to its growing variety of initiatives, grass-roots and research work in the area of circular economy”* (ibid.). Already in 2016, the Innovation Hub CRCLR opened its doors in the Neukölln neighbourhood in Berlin, aiming to facilitate knowledge sharing and to equip change-makers with the knowhow needed to develop circular solutions (CRCLR, 2020). In 2018, the city hosted a Circular Economy Mapping event in order to identify local Berlin initiatives operating with the topic of circular economy. In the same year, the Senate Department for the Environment, Transport, and Climate Protection launched the “Re-Use Berlin” initiative as a movement against the throw-away culture. Many more initiatives followed – from large projects rooted within the four sectors with most ‘circular’ potential in Berlin (built environment, textile and fashion, food and agriculture, materials and products [Padalkina, D. 2018]), to small local initiatives like repair cafes, neighbourhood exchange platforms, etc. The vibrant, innovative environment in Berlin therefore creates a perfect playground for the REFLOW Pilot.

### Berlin – REFLOW Pilot City

As part of the REFLOW Project, the Berlin pilot focuses on the recovery of wastewater heat as an important lever in the reduction of CO<sub>2</sub> emissions and increasing energy efficiency. Waste heat is a by-product of processes and machinery that use energy. The part of consumed energy transformed to heat, however, is often wasted. Efforts to re-channel this heat energy and reintroduce it into the urban metabolic system could increase efficiency and lower carbon emissions. Based on the analysis provided by one of Berlin pilot’s partner, the public utility Berliner Wasserbetriebe, the pilot estimates a theoretical waste-heat potential of up to 360 megawatts city-wide.

To enable wastewater heat to be used more effectively, the project aims to increase the visibility of this issue, which can be achieved, among the others, by installing waste heat solutions into properties as a showcase to the public. Initiatives like urban farming installations can further illustrate how productive activities in these objects can be promoted by waste heat recycling. Raising citizen awareness on the productive potential of waste heat can be pivotal in facilitating the implementation of technologies to capture it.

To achieve these long-term goals, the project must first focus on identifying where wastewater heat potential lies in the metropolitan area. By establishing a database for identifying matches between waste heat generating and consuming properties, the pilot aims to reduce the time needed for stakeholders to request and receive advice about the implementation of waste heat technology.

To achieve the project objectives and overcome challenges posed by complexity, the pilot aims to implement several measures. This include mapping of existing networks of stakeholders, capturing data related to waste heat and complementary energy sources, gaining knowledge about waste heat at the business level and establishing a supportive type of governance around the new resource flow which includes the general public.

Different stakeholders are targeted and involved in the project by the Berlin pilot team. The key interest groups related to the Berlin solution refer to different *“organisations, which will require different types of approaches. In particular, the Berlin pilots targets public and private “property developers”* (Interview, Berlin pilot team). The property owners and the developers have the authority to decide on the energetic set-up of a property – hence, they are the key stakeholders to be targeted in Berlin. Furthermore, the municipal decisions makers, i.e. the local senate agencies, are also identified as a key stakeholder group. Finally, Berlin citizens at large constitute a third interest group for the Berlin pilot team. Table 6 below summarises the different stakeholder groups for the Berlin pilot.



Stakeholder group	Description
Property decision makers	Property decision makers – like property owners or developers – are responsible for decisions regarding the energy set up in the building. For example, the soon-to-be-outdated Berlin airport is expected to become a “dynamic neighbourhood” and will be entirely managed by a public property development agency – presenting a large potential for implementing waste heat solutions.
Municipal decision makers	The municipal decision makers, such as “senate agencies” and “senate departments”, are directly involved in the energy set-up of properties. For example, the senate is authorized to give inputs to the municipal property developers, e.g. in regard to certain type of technologies or waste management measures to be applied in a given area.
Berlin citizens	Here the focus is specifically on the general public that wants to know where the waste-heat potential lies. The stakeholder group could be further narrowed down to interested decision makers, such as media, that can have a direct interest in this issue.

Table 6. Key stakeholder groups in Berlin pilot.

In monitoring the project's progress and success, several key performance indicators and respective targets have been formulated. These KPIs are directed at measuring the increase in citizens' awareness and engagement, as well as at the success of the technical implementation. Table 7 provides an overview of KPIs and targets.

KPIs	Target value
Total volume of waste heat harvested (comparative assessment for previous and future years) measured in megawatt	2,2 (2019) 4,4 (2020) 8,8 (2021) 22,2 (2022)
Number of properties with waste heat potentials identified	50
Number of businesses interacted with through waste heat adoption measures	12
percent waste heat of overall heating	10
Number of productive activities facilitated through waste heat supply	10
Number of citizens and production-oriented business reached through showcases	320
Number of citizens engaged through educational programmes	220

Table 7. Key performance indicators in Berlin pilot.

### Challenges encountered and expected by Berlin pilot

Throughout the early stages of the REFLOW project, Berlin pilot has encountered a number of challenges in its development and implementation – both on a practical and operational level. These challenges (1.1 - 1.3), along with future expected challenges (2.1 - 2.3) and the implemented solutions, are described in the following section.



### 1.1 Navigating an abstract topic and technical complexity

Waste heat and its connection with complementary energy and water sources like photovoltaics or filtered rainwater is a complex and often intangible field. This element can present a challenge to achieving social change in relation to these issues since people cannot easily relate to them. Moreover, the technical complexity of the solution presents a challenge to its management since hardly any versions of potential interventions are readily available. In addition, technical complexity raises the required investment needed to trigger effective change.

**Solution:** To reduce this risk, the Berlin pilot has decided on two activities: Firstly, clear infographics and short explanatory videos are to be used to make the abstract topic tangible. Secondly, demonstrators are to be created on a smaller scale, so that the basic principle of wastewater-heat becomes understandable even for those not familiar with the subject.

### 1.2 Infrastructure limitations

The infrastructural requirements for wastewater-heat implementations for buildings or building clusters are high. The emitters are usually industrial companies with a high heat and/or water output. The consumers must not only be located close enough to the emitters, but also close enough to the central water supply of the city. Only when this is the case are the basic technical conditions fulfilled.

**Solution:** In response to this risk, the Berlin pilot envisages careful expectation management using the web application created with the support of the REFLOW partners. From the outset, the web application will show where there is potential for wastewater heat implementation.

### 1.3 Limited availability of data

Since the data needed for the project partly concerns supply-critical infrastructure, access is often limited. Coming up with an appropriate tool to determine where waste heat can be used is a challenge.

**Solution:** This risk has already been largely eliminated. The Berlin pilot receives relevant data sets from project partner BWB and triangulates them with freely available geodata. Nevertheless, additional local data is to be collected at the potential areas.

In addition to the challenges encountered so far, the Berlin pilot has identified several potential challenges expected for the future, as well as possible solutions. They are summarized in the following paragraphs.

### 2.1 Effective reach out to user groups

Figuring out what users want is a key challenge to address in the design of the application. In fact, getting relevant input, and facilitating the co-creation of solutions and the knowledge exchange with external, business stakeholders could be met with some resistance.

**Possible solution:** Given that the Berlin scenario is still rather “abstract”, reaching out to stakeholders might be particularly difficult. In particular, municipal property managers, will be hard to reach, as they often try to avoid additional work. They might not understand why the Berlin pilot is seeking for their inputs; therefore, they might not be adequately motivated to engage in the project. This would open to the risk a *“very annoying and time-consuming task to work with property developers and decision makers”* (Interview, Berlin pilot team).

## 2.2 Data management

The overarching category of challenges related to data management – data acquisition, handling, sharing, etc. - can be broken down into many challenges that the Berlin pilot will face in the implementation of their planned activities:

- a. **Clarifying incentives to share relevant data.** This challenge is related to the data types that the Berlin pilot is expecting to use in their scenario, namely geo-spatial data (publicly available) and data coming from property owners and energy supply companies (proprietary data). The latter are data owned by the energy supply companies and the municipality.

These stakeholders would have to share data from their own infrastructure into the joint platform that the Berlin pilot is planning to build. Coupling these different data sources will be a challenge. In particular, the challenge will relate to the information that can or cannot be shared publicly. One key question is what the incentives for the private owners are to share these data.

- b. **Shareability of data and risk of potential misuse of data.** This challenge is directly related to the previous one. In fact, according to the Berlin pilot team, sharing relevant data could give a competitive advantage to the energy supplier's competitors.

Given the open source nature of the REFLOW project, a key challenge will be to balance ownership and shareability of data. In particular, sensitive data refers to customer IDs and the prices charged for the energy. The outcome of the Berlin pilot could provide competitors with sensitive information.

- c. **Balance between professional and general data.** The Berlin pilot city aims at creating a digital platform targeting business users such as city planners or property developers, however, given REFLOW's overarching goal of inclusivity, the digital platform will have to provide information to the general public.

For this reason, the online platform will need to have different user focuses, while targeting mainly technology and urban planning professionals. Creating a service that can balance the interests of different users characterised by a very diverse profile will constitute a key challenge to consider early in the development process.

- d. **Security of the system.** This challenge refers to the risk of misuse and intrusion into the system, and that it is safe and does not cause conflicts with the existing security system of the organisations. Understanding the security requirements of the user groups is central in the development of the interface.

**Possible solution(s):** In the opinion of the Berlin pilot, there is no across-the-board solution here, since it is all about non-trivial challenges in the data area. This will facilitate the process of data feed-in by private and public actors. (a) Members of the Berlin pilot will ensure, through an adequate support of their personnel, that the stakeholders on the side of the private or public feeders will be supported to the extent possible. (b) In order to prevent the misuse of the data by private energy service providers, the Berlin pilot will take certain legal and technical precautions, the details of which will be clarified in WP5. (c) By differentiating between interfaces for the citizens and for city planners with more specific knowledge, it is ensured that no target group receives too much or too little information. (d) The exact security measures to protect the critical infrastructure information will be defined during WP5.

## 2.3 Time dimension, complexity and implementation.

One main challenge that the Berlin pilot is facing is related to the execution of the project itself. In fact, in order to develop an economically viable wastewater-heat set-up, an investigation exercise and a due diligence procedure must be put in place to map all the available resources (e.g. water) and infrastructure available to support the system: "what we are



*trying to do needs to be feasible and economically viable. This is probably the biggest challenge.” (Interview, Berlin pilot team).*

The Berlin pilot relies on complex decisions such as the one related to the choice of the infrastructure, which require a lot of time to be thoroughly grounded in research. The time required to get to actual implementation will be a challenge.

*“What we need for an economically viable waste-heat set-up in a particular area is to check a variety of things. For instance, is there sufficient water tube infrastructure in the neighbourhood? This is already a narrow filter. This is difficult to catalyse in an H2020 project which is not too long. This is the most relevant challenge.” (Interview, Berlin pilot team)*

**Possible solution:** The Berlin pilot cannot avoid this type of risk to a full extent. A certain contingency regarding the implementation roadmap remains, especially with regard to the medium-term braking effects of the COVID-19 pandemic. However, the Berlin pilot partners will examine whether an even closer cooperation with the Senate Department for Economics, Energy and Public Enterprises can accelerate the process of implementation.

	Challenge	Solution
1	Abstract topic and technical complexity	Clear infographics, short explanatory videos, demonstrators
2	Infrastructure limitations	Web application
3	Limited availability of data	Data from new partners, geodata
4	Effective reach out to user groups	Work with propriety developers and decision makers
5	Data management	Data feed-in by private and public actors
6	Time dimension, complexity and implementation	Closer cooperation with policy makers and stakeholders in the city administration.

Table 8. Summary of the challenges and possible solutions in Berlin pilot.

### Next steps envisioned by Berlin pilot

The Berlin pilot expects the project to follow two key steps, which reflect the entry points to reaching key external stakeholders:

1. Dynamic web application. This digital entry point, aimed at professional decision makers (property owners, developers), will show waste heat potentials in Berlin and create matches between waste heat producers and consumers. Data will be obtained via geolocation as well as interviews with property operators.
2. Waste heat prototypes. This physical entry point, targeting the Berlin citizens, will demonstrate waste heat potentials through the installation of prototypes for waste heat and supplementary energy sources. The prototypes will be installed in public spaces such as makerspaces and co-working spaces, to support the diffusion and increased visibility of the technology.

These two overarching targets will unfold in a number of activities, which can be grouped under three main categories:

1. Mapping and research grounding.
2. Multi-stakeholder workshops.
3. Dissemination and outreach.



The **mapping and research** will focus primarily on addressing the key stakeholders, and collecting additional data, in order to map the energy and financial potentials of waste heat in Berlin. This activity will also ensure grounding of the project strategies through thorough research.

In order to reach and maintain the relationships with the key stakeholders, **multi-stakeholder workshops** will be carried out. These workshops will have a twofold focus, and will be created around two main topics: (1) workshops on waste heat related data, which will feed into the online platform development, and (2) workshops on the different aspects of the technical implementation, e.g. sourcing, construction, financing, etc.

The **dissemination of knowledge and outreach** activities will target clusters of relevant stakeholders in the built environment in order to achieve a critical mass of adopters – leading to actual interventions.

The two scenarios and activities that follow are directly contributing to achieving the goal of making the utilization of waste heat the 'new normal', not the exception in Berlin City.

In order to sustain the impacts of this REFLOW pilot, and to ensure future focus on waste heat utilisation in Berlin, the Berlin pilot team is planning solutions to last beyond REFLOW:

*"I could imagine that we could fund an entity, possibly a non-profit, that brings waste heat to the neighbourhood. "Bringing waste heat to" means developing a financing model and a logistical, technical project expertise. If we could provide both, we could become the catalyst [for implementation of waste heat] ourselves."* (Interview, Berlin pilot)

Such non-profit would use the web interface to spot opportunities for waste heat interventions. It would also ensure that the instalment of the waste-heat technology is economically feasible, meaning that it would not entail excessively high costs for the property owner. The imagined non-profit would be therefore based on three different services:

1. Data Analysis. Data retrieved from the platform, identifying and demonstrating the business case for the waste-heat intervention.
2. Logistics Model. Focused on the identification of the right technology to implement, as well as on the definition of the other elements of the supply chain such as the organisation of the actors along the value chain.
3. Financing Model. In this case, the non-profit would act as intermediary between "investors" and the "property owners".

These initiatives ensure that the REFLOW project can achieve its overarching goal of replicability. In fact, the Berlin city's Action Plan will provide detailed information to this end including the definition of the legal and economic set-up, the definition and involvement of external stakeholders, the detailed description of the processes, and the details to define the business case for the implementation of these CE solution.

## 2.3 Cluj-Napoca

### Summary

Cluj-Napoca is an emerging and ambitious Romanian city participating in REFLOW. The Municipality's Action Plan focuses on reversing the city's increasing energy consumption and waste by introducing more efficient and circular solutions in district heating and electricity usage. With the help and support of a wide range of public, private, and societal



stakeholders, the Cluj-Napoca pilot city aims at raising awareness among citizens as well as offering a replicable sustainable model to be followed locally but also nationally and beyond.

### **The City of Cluj-Napoca**

Cluj-Napoca is a city located in the north-western part of Romania, 450 kilometres from Bucharest. It is the capital of Cluj County and the unofficial capital of the historical province of Transylvania. The city has more than 300,000 inhabitants, while the broader metropolitan area of Cluj-Napoca accounts for 392,000 people thus making Cluj-Napoca one of the biggest cities in Romania.

Cluj-Napoca's background on sustainability and energy efficiency has not fallen short compared to the rest of the REFLOW pilot cities. Although most of the initiatives related to energy efficiency and consumption took place at the national level, Cluj-Napoca not only sought to tie-in with these national programs but also took additional initiatives at the municipal and metropolitan level. In 2011, for example, Cluj-Napoca became a member of the Covenant of Mayors (CoM), the world's largest movement for local climate and energy actions. The CoM is concerned with action at the local level within the competence of the local authority. Within this framework, Cluj-Napoca committed to reduce energy consumption and emissions. The plan and actions to achieve this objective were described in the Sustainable Energy Action Plan (SEAP) whereby the city of Cluj-Napoca agreed to cut off energy consumption and greenhouse emissions by 20 percent by 2020 as compared to 2011 levels. Similarly, under the SEAP, Cluj-Napoca agreed to increase the share of renewable energy by 8 percent. The SEAP includes interventions in the energy consumption and sustainability of buildings and infrastructure, e-administration, transportation, local electricity and heating production, internal organisation, communication and cooperation of citizens and stakeholders, and public procurement. Being a pilot city of REFLOW and developing circular business models thus has been a 'natural' continuation of Cluj-Napoca's efforts to reduce energy consumption and achieve energy efficiency.

Unsustainable modes of energy production and distribution have been contributing to a deterioration of human health and quality of life as well as negatively affecting ecosystems and climate change. Energy sustainability and efficiency has been the main target of international organisations such as the United Nations and the European Union. As an example, the United Nation's Sustainable Development Goal (SDG) 7 focuses, among its other goals, on renewable energy production as well as on improving energy sharing, efficiency, and affordability by 2030. Likewise, the EU has employed several strategies to cover both short and long-term objectives with regard to energy efficiency, renewables, greenhouse gas, emissions reductions, interconnections, research and innovation. According to the European Environment Agency for example, two thirds of global greenhouse gas emissions are produced by burned fossil fuels for heating, electricity, transport and industry. According to the same source, 78 percent of total EU emissions in 2015 were energy related emissions. At the city-level, it is known from research that energy efficiency follows the density of a city. This is to say that the more scattered a city is the less efficient its energy consumption will be. Less efficiency means in effect that heating, electricity, public transportation and services need to cover larger areas and thus they require more energy.

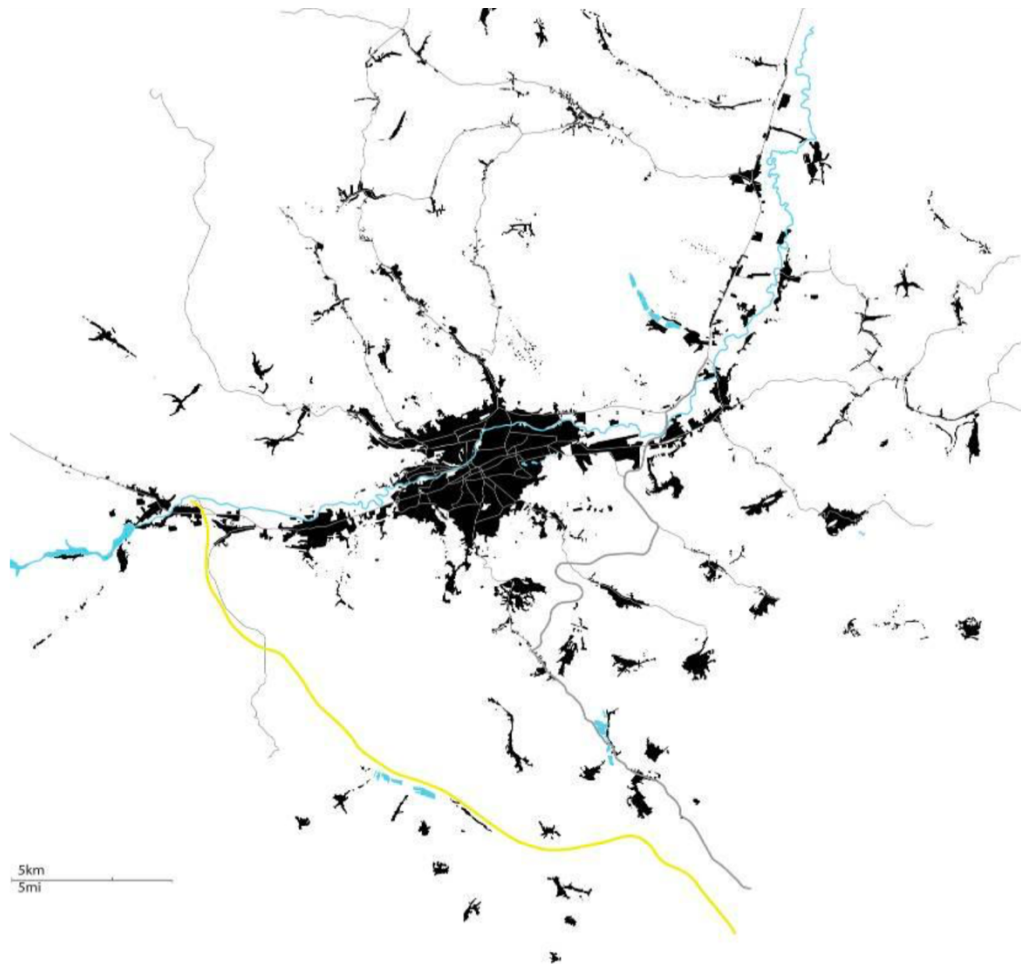


Figure 3. Cluj-Napoca's urban area. Source: World Bank Group (2013).

In Figure 2.1, Cluj-Napoca's urban expansion explains why local authorities have been focusing on energy efficiency in recent years. As the city grows outwards, it requires larger amounts of energy to continue offering its services. As a result, its energy efficiency (and waste management) is affected since it needs to be carried out in a wider network to cover both the city downtown and its peripheral communities. According to one of the key partners in the Cluj-Napoca pilot, what makes things worse is that the centrally organised initiatives, more often than not, fail to meet local needs:

*'One problem is that energy policy making is on a central level. This is another key factor that we cannot control. There are programs to incentivise better use of energy, but they are concentrated at a central level, meaning that they don't really understand needs at a local level. Sometimes there is a lack of correlation between the national level and local needs.'* (Interview, Cluj-Napoca pilot team)

### Cluj-Napoca – a REFLOW Pilot City

The main objective of Cluj-Napoca's Action Plan is to make energy efficiency a 'business case' in that it reduces the carbon footprint and allows for the reduction of energy expenditure. For the above objective to be achieved, Cluj-Napoca plans a strategy and several initiatives (Table 9) that will lead to the pilot's primary and secondary objectives (Table 10).



*This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement number 820937.*

Cluj-Napoca pilot strategy and activities
<b>Addressing governance, network and policy</b>
1) Opportunities arising from the EU funds
2) Attract new ideas and technologies through the establishment of a network with other European cities and institutions.
3) Make energy efficiency a strategic goal of Cluj-Napoca for the period 2021-2030
<b>Addressing technological development</b>
1) Strong cooperation with universities and businesses with specific technological expertise
2) Apply technological solutions such as blockchain to deal with energy related challenges.
<b>Addressing capacity building/citizen/stakeholder engagement and education</b>
1) Bi-annual meetings with stakeholders.
2) Raise awareness on energy efficiency and promote consumer education at the citizen-level through the Center of Civic Imagination and Innovation.

Table 9. Cluj-Napoca's strategy and activities in REFLOW. Source: REFLOW Deliverable 5.1.

Primary objectives	Secondary objectives
<ul style="list-style-type: none"> <li>To test the effectiveness of the measures taken so far by the Municipality of Cluj-Napoca in improving the energy efficiency of buildings</li> <li>To involve more external stakeholders in implementing similar measures</li> <li>To disseminate relevant information to citizens and businesses</li> <li>To promote innovative practices in the area of renewable energy at city level</li> <li>To educate citizens and raise awareness on circular economy</li> </ul>	<ul style="list-style-type: none"> <li>Improving quality of life</li> <li>Saving economic and ecological resources</li> <li>Improving cooperation with external stakeholders</li> <li>Establish Cluj-Napoca as a 'lighthouse city' in Romania</li> </ul>

Table 10. Primary and secondary objectives of the Cluj-Napoca pilot city. Source: REFLOW Deliverable 5.1.

Cluj-Napoca, as a pilot city in REFLOW, has set a strategy to address the problem of energy efficiency on three levels (see Table 9); 1) governance, network and policy, 2) technological development, and 3) capacity building, citizen and stakeholder engagement and education. Cluj-Napoca's Action Plan starts from the exploration and mapping of the energy production and consumption in the city itself. In particular, the Cluj-Napoca pilot project is interested in gathering data about gas and electricity consumption. In order to do so, energy producers and providers have been approached and asked to provide the necessary data regarding energy consumption in the city of Cluj-Napoca. These data will be further analysed to either confirm the effectiveness and efficiency of current energy related measures in municipal buildings and public lighting system or to set up new ones. As one of the team members from the Cluj-Napoca Municipality puts it:

*'One of the scenarios is to test some products that these companies are developing now regarding energy efficiency, smart home, smart cities, to monitor energy consumption and increase energy efficiency.'* (Interview, Cluj-Napoca pilot team)

The results of the test performed will be made publicly available and used to raise awareness on this issue. Citizens and other local stakeholders are involved in the co-creation of further and future measures and energy governance tools (Table 11).

Stakeholder	Role in pilot
Municipality of Cluj-Napoca <a href="https://primariaclujnapoca.ro/en/">https://primariaclujnapoca.ro/en/</a>	Policy making-project administration
Aries Transilvania <a href="https://aries-transilvania.ro/en/">https://aries-transilvania.ro/en/</a>	Mapping of existing energy suppliers
Transilvania IT Cluster <a href="https://transilvaniait.ro/">https://transilvaniait.ro/</a>	Supports monitoring and reduction of energy consumption.
National Institute for Research and Development of Isotopic and Molecular Technologies (ITIM) <a href="http://en.itim-cj.ro/">http://en.itim-cj.ro/</a>	Proposes solutions on regenerative energy sources.
The Energy Cluster <a href="http://www.transylvaniaenergycluster-trec.ro/">http://www.transylvaniaenergycluster-trec.ro/</a>	Supports companies developing new energy flows for the heating and lighting systems in the metropolitan area.
Center for Citizen's Innovation and Creativity (CIIC) <a href="https://primariaclujnapoca.ro/cetateni/centrul-de-inovare-si-imaginatie-civica/">https://primariaclujnapoca.ro/cetateni/centrul-de-inovare-si-imaginatie-civica/</a>	Support citizens to propose ideas and educate them on the use of new tools on energy consumption and efficiency.
Local companies	Allow for the new solutions to be tested and utilized in their business
Technical University of Cluj-Napoca	Making sense of data, contributing know-how on technical matters.

Table 11. Cluj-Napoca pilot's stakeholders and their role in the project.

Cluj-Napoca has an ambitious plan when it comes to its energy consumption and efficiency. First, it seeks to introduce measures and circular models to further improve its energy efficiency. Second, it also seeks to disseminate, educate, and in so doing raise awareness of the general public and societal stakeholders. Third, Cluj-Napoca aims at involving both citizens and stakeholders including local businesses and institutions in achieving its objectives. With regard to the latter, the application of circular economy models in the city is not only a mean to improve energy efficiency and reduce energy consumption, but also a way to allow for a broader coalition of societal stakeholders. Indeed, for Cluj-Napoca's objectives to be achieved, local, national, academic, and business stakeholders all need to work together and contribute to the city's sustainable future.



## Challenges encountered and expected by Cluj-Napoca pilot

This section will present the challenges that the pilot has experienced (1.1 - 1.4) and the ones it expects to face in the future (2.1 - 2.4).

### 1.1 Raising awareness with broader audiences

Raising awareness on broader societal audiences on circular economy is a common challenge all pilots must deal with. As the partners from the Cluj-Napoca suggest:

*'(a challenge) is to support and stimulate small businesses that operate inside the city to be aware of circular economy and the principles that increase efficiency in production, consumption and reduce energy consumption and waste.'* (Interview, Cluj-Napoca pilot team).

**Solution:** To raise awareness, the Pilot of Cluj-Napoca plans to set up and organize events in annual and bi-annual basis so people stay updated with regards to the project's progress. In addition, further public meetings will take place within the capacity of the Center for Civic Imagination and Innovation (CIIC) whereby specialists in among other, urban development, infrastructure, and green spaces will initiate and moderate public discussions and debates.

### 1.2 Presenting the business case

As the same source states and similarly with the experience of other pilots, Cluj-Napoca has also found it difficult to explain in a convincing way what the benefits of circular economy are and what the business case is for businesses.

*'When we speak with the business sector, we have to be really good in persuading them. They are interested in ROI (Return on Investment).'*' (Interview, Cluj-Napoca pilot team).

**Solution:** It is understandable that business may be reserved with regards to the benefits they can reap from the application of CE practices and models. Although not a solution per se, Pilots, including Cluj-Napoca, expect this cautiousness to be reduced as REFLOW and its objectives mature and move from theory to practice.

### 1.3 Centrality of governance

The Cluj-Napoca pilot also faces some challenges related to the characteristics of the city itself. For instance, according to Cluj-Napoca's Municipality, a major problem is the governance of these and other similar initiatives. In Romania many of energy efficiency related initiatives are taken in the central governmental level, thus leaving little space for local intervention. Additionally, cases of mismanagement and bad cooperation have also been observed that eventually could slow down the implementation of projects.

*'The Municipality is not in charge of that (energy efficiency policies) but another institution at a central level. Unfortunately, they are not well connected to the local level.'* (Interview, Cluj-Napoca pilot team).

### 1.4 Data collection

When it comes to the implementation of Cluj-Napoca's project in REFLOW, a major challenge is data collection. More precisely, the energy market in Cluj-Napoca includes many distributors and suppliers. Distributors handle and manage the infrastructure and suppliers manage the supply of energy in Cluj-Napoca. So far, these two main stakeholders were not able to supply the Municipality team working on REFLOW with the necessary data on a city level for the project to move on.



**Solution:** To address this issue, Cluj-Napoca partners have devised a plan B to gather data on consumption only for the municipality-owned buildings and other consumption points like the public lighting system. This data can be communicated by energy distributors and suppliers without problems regarding General Data Protection Regulation (GDPR).

In addition to the challenges experienced so far, the pilot anticipates further challenges to be encountered with the progression of the project. These challenges and possible solutions are described below.

### 2.1 Slow communication with energy providers to get data

For the Cluj-Napoca pilot, communication with the energy providers (i.e. data providers) has proven to be extremely slow and does not help the municipality to concretely address the problem of energy consumption of public buildings. Indeed, the process to have energy consumption data regarding municipality-owned buildings requires the municipality to provide a formal request and wait for up to one month to get the data themselves.

**Possible solution:** Therefore, the Cluj-Napoca pilot is working internally and with another REFLOW partner, Fraunhofer/Fokus, to automate the process of data delivery from energy providers to the municipality. Even though the data will be provided to the REFLOW database, the solution will be produced within the municipality, which will develop API (Application Programming Interface) to retrieve the data from the servers of the energy providers to the ones of the municipality.

### 2.2 Engage energy providers to participate in the workshops

Convincing the energy providers to participate in workshops might not be an easy task, as *“time is a valuable resource for them”* and *“they’ll have to justify the work they are conducting”*. (Interview, Cluj-Napoca pilot team)

**Possible solution:** This will require the pilot to justify and clearly explain how the energy providers might benefit from their involvement in this project. This is in line with the objectives of the REFLOW project, which will work towards the definition and quantification of the business case for circular economy practices. One clear benefit already identifies by the Cluj-Napoca pilot refers to the opportunities provided by an automated system to track the energy consumption data. This would make it easier for the energy provider to craft the offers for the annual tenders opened by the municipality. In turn, this solution would reduce the costs and the time the Municipality would need to use in order to prepare for these tenders. Moreover, the Municipality will be in a position to calculate more accurate projections of energy consumption patterns. The next step would be to engage in communication on top levels between the municipality (the mayor) and the management teams from the respective companies.

### 2.3 Select the right technology to increase energy efficiency in municipality-owned buildings

This challenge relates to the lack of technical expertise inside the municipality to intervene on the identification of tech solution to improve energy efficiency in the municipality-owned buildings.

**Possible solution:** To address this challenge the municipality is partnering with the Cluj-Napoca Technical University, which is providing counselling to select the tech solutions to install. At this stage, the pilot has a preliminary collaboration agreement in place. At the same time the Centre for Advanced Energy Technology and the Transylvanian Energy Cluster can support the municipality in this process.





## 2.4 Convince the IT companies to engage with REFLOW

Similarly, to the energy providers, engaging the IT local stakeholders will require the development of a clear business case to raise their interest. Most of these stakeholders focus their attention to larger projects with a broader scope.

**Possible solution:** Allowing IT stakeholders to develop supporting technologies such as an app for smartphones, could support the pilot in the definition of a sound business case for their participation in REFLOW. Alternatively, outlining the benefits provided by a higher visibility or implementation of successful circular economy strategies has been considered. However, being business to business companies, usually IT companies are not attracted by the returns guaranteed by the reputational effects of investments in CE. The pilot project is also considering the involvement of students of technical Universities in the development of such technologies. Examples of relevant ways to involve them could be through hackathons and special events in their Universities.

## 2.5 Communication with and engagement of different age groups

One of the activities planned by the pilot City is the organisation of events and workshops inside the Civic Imagination and Innovation Center (CIIC). This would be the space to test the technology/app and disseminate the progress of REFLOW to the general public. These initiatives would provide the opportunity for citizens to participate in the development of CE prototypes, while also providing the municipality with an opportunity to learn how the community foresees the transition towards circular economy. However, thus far participants to events at CIIC do not fully represent the different group ages of the city of Cluj-Napoca. A key challenge is how to expand the audience, and how to attract younger citizens in line with the inclusivity approach that characterises REFLOW.

**Possible solution:** Currently the Cluj-Napoca pilot team is considering targeting online ads to younger audiences and involve the companies in the IT Cluster and the Technical University to mobilize employees and students to disseminate the events in their communities.

## 2.6 Cluj-Napoca is perceived as a thriving city

This counterintuitive challenge may affect the relation between the pilot city and its key stakeholder groups. In fact, being perceived as thriving city, Cluj-Napoca is also perceived as a wealthy environment where no improvement is really needed. More specifically, both the IT companies and the energy providers may not see the need to invest in innovation by joining a large multi-stakeholder project such as REFLOW. As noted by the pilot team: *“because they are doing fine. I mean, the energy providers are doing fine, the IT companies are doing excellent. So that would be a challenge. It’s important to point this out”* (Interview, Cluj-Napoca pilot team). Understanding how to emerge and gain visibility vis-à-vis other existing initiatives sees crucial for the REFLOW project to engage with all the key stakeholder groups.

**Possible solution:** According to the Cluj-Napoca pilot team, one option to increase the attractiveness of the project would be to develop a business rationale related to the development of such services not only for the city of Cluj-Napoca, but also for other Romanian cities. This *“would be a strong incentive for them to really do something”* (Interview, Cluj-Napoca pilot team).



	Challenge	Solution
1.1	Raising awareness with a broader audience	Organization of public events, meetings, debates etc.
1.2	Presenting the business case for CE practices	Allow time for the project to mature and become more practical
1.3	Centrality of governance structures in Romania <sup>1</sup>	
1.4	Data collection	Focus on data about the energy consumption of municipality-owned buildings
2.1	Inefficient communication with energy providers	Automate the process of data delivery from energy providers
2.2	Motivate the energy providers to participate in specific workshops	Justify and explain benefit
2.3	Selecting the right technology	Counselling from Cluj-Napoca Technical University and other IT stakeholders in addition to the REFLOW IT partners.
2.4	Convincing technology developers to engage with REFLOW	Financial and EC incentives. Organisation of events such as hackathons.
2.5	Communication to reach and engage diverse citizens	Online advertisements targeted to younger citizens and utilizing IT companies' and university networks
2.6	Attracting partners in a city that is perceived as thriving	Engage with other Romanian cities.

Table 12. Summary of the challenges and possible solutions in Cluj-Napoca pilot.

### Next steps envisioned by Cluj-Napoca pilot

In order to achieve its overarching goal of increasing efficiency in energy consumption and decreasing the energy waste in Cluj-Napoca, the pilot city's Action Plan decided to work on three levels:

1. Mapping, research grounding, and stakeholder engagement.
  - a. Focus on energy consumption in municipality-owned buildings (before/after the REFLOW CE activities to increase the energy efficiency have been undertaken);
  - b. Organise workshops about the development of technological solutions and activities to increase energy efficiency.
2. Promote knowledge sharing and raise awareness on CE practices.
  - a. Development of a mobile application for efficient use of energy in households
3. Support research endeavours on potential new energy sources to be used at city level
  - a. Solutions to be proposed to the municipality in the field of regenerative energy sources

The **mapping and research activities** will play an important role in the scalability of the project, assuming that the results and consequent recommendations will be implemented as part of the city strategy regarding energy efficiency. Such strategy will ensure any future municipal projects to include the recommended energy efficiency measures.

<sup>1</sup> A solution for such a challenge would require a systemic change in Romanian National politics an area of activity well beyond REFLOW's objectives and ambition.



Local IT community will be engaged in the **development of technological solutions such as a mobile application**, which will be a crucial tool to monitor energy consumption by citizens on a household level. Cluj-Napoca pilot assumes that by the end of the project 500 citizens and 1000 local makers and businesses will be educated about the benefits of energy efficiency, informed about the application, and will be using it on a daily basis. For example, the mobile application is considered a cost-efficient solution to raise awareness among citizens and help reduce energy consumption on a household level.

The **research on potential new energy sources** will result in at least one solution in the field of regenerative energy being proposed to the authorities. Based on the impact assessments performed within REFLOW and the best solution will be implemented by the municipality.

## 2.4 Milan

### Summary

The Municipality of Milan participates as a pilot city in REFLOW with the project 'Circular Markets' and within the broader goal of facilitating the transition towards circular economy. Its objective is to provide circular economy and long-term sustainable tech solutions on the logistics, transportation, transformation, distribution, and conservation of food that will enable the connection of local peri-urban agricultural areas with municipal covered markets.

### The city of Milan

The city of Milan is located in northern Italy almost 600 kilometres north of Rome, in the north-western part of Po Valley and in between the river Po in the south and the Alps to the north. West and east of Milan are also the rivers Ticino and Adda respectively. Milan is the capital city of its region, Lombardy, and as such it is a municipal, administrative, and regional centre. The Municipality of Milan is a Metropolitan city (Greater Milan) subdivided in nine boroughs with an estimated total population of more than 8 million people rendering it thus the largest in Italy and fourth largest of the EU. Milan has been quite active and dynamic in recent years in exploring a transition towards a circular economy in several areas including its food system. To this end, Milan, has advanced a set of policies and initiatives to support innovation in food related matters by seeking and bringing together a variety of institutions and expertise from the public-private-society spheres. The well received and promoted World Expo 2015 'Feeding the planet. Energy for Life' hosted by Milan as well as other various events and exhibitions paved the way for the next generation of initiatives. 'Milan Food Policy' for example is a policy which aims at forcing the nine municipalities of Milan Metropolitan city to rethink and reconsider the system by which their citizens are fed and how this system could be restructured to become more sustainable in the light of climate change. Similarly, 'Manifattura Milano' sought to support Milan's vibrant and growing community of Fab Labs, makerspaces, and other civilian initiatives willing to merge social innovation with university structures and business expertise, to experiment and produce solutions to a variety of problematic areas including, but not limited to, agri-food, manufacturing, and digital technologies.

# Circular Milan: the approach



Topics Instruments	Waste	Energy	Food	Creativity	Manufacturing	Mobility
<b>Awareness raising &amp; Networking</b>	«Towards zero waste» Declaration	C40 Network	Milano Food City Food Policy	100 Italian Circular Economy Stories	Manifattura Milano	EU Week of Sustainable Mobility
<b>Regulation</b>	PAES Food Policy	PGT PAES	Food Policy	National Chamber for Italian Fashion Agreement	PGT	PGT PUMS PAES
<b>Procurement/ PPP</b>	Smart Bin (AMSA)	LED Lighting (A2A)	Food Hot Pot (in coll. with Cariplo Factory)	BASE Milano	Makerspaces & Fablabs	ATM Fleet replacement (electrical bus)
<b>Fiscal Policies &amp; Business support</b>	TARI Tax relief	Call for Boilers Call for Energy Efficiency	TARI Tax relief Street Food Call Ellen MacArthur Found Partnership	Incubators for Circular Startups (Orange Fiber)	Call FabriQ III Call FabriQ IV «Innovazione di Quartiere»	Call for Business Vehicles substitution Carpooling Call Call for Electric Vehicles
<b>Pilot projects</b>	Environmental Meter Milano Plastic Free	EU Project: Sharing Cities (Smart Cities Lighthouse)	<b>EU Project: OpenAgri REFLOW</b>	Green Carpet Fashion Awards Call for Reuse of Fuorisalone Furniture	<b>EU Project: REFLOW</b>	EU Project: Sharing Cities (Smart Cities Lighthouse)

Figure 4. Milan initiatives on circular economy. Source: Urban Economy and Employment Directorate, internal document.

## Milan – REFLOW Pilot City

Milan's participation in REFLOW as a pilot city on 'Circular Markets' is part of a clear long-term strategy of the city itself. The project created for REFLOW has been inspired by Milan's experience in promoting sustainable food system and motivated by the global challenge of climate change. Indeed, not only 55 percent of the world's population lives in urban areas but also, according to a recent report from C40 City Group in which Milan is a member, it is argued that 100 major cities are responsible for 10 percent of total global emissions. Moreover, in the same report, food consumption was identified as one of the drivers with high potential to reduce emissions caused by urban consumption. In a similar vein, UN's Sustainable Development Goals (SDGs 2, 3, 12, 13) acknowledge the need for investments in agriculture to avoid food security risks caused by climate change and address global issues such as sustainable production and consumption negatively affecting climate change. Likewise, the EU has witnessed recently how extreme climate conditions like the summer of 2018 can have serious impact on food producers and consumers alike. More concretely, total EU cereal production was reduced by 8 percent below the last five years average because of the extended drought in the summer of 2018, which in turn caused a lack in fodder and as a result, 1.6 percent more cattle had to be slaughtered. In response, to these challenges, the EU and its Horizon 2020 programme invest heavily on innovation and research to find sustainable solutions that will mitigate the abovementioned risks on food security and climate change in cities.

Milan's pilot 'Circular Markets' shares the high ambition of the other 5 pilots of REFLOW to address problems caused by and in relation to climate change. It aims to address risks in food security and climate change that a metropolitan and



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement number 820937.

global city like Milan needs to face. Milan's starting point is the municipal commercial markets of the town; these municipal markets that served for the second half of the 20<sup>th</sup> century as connection points between rural and urban communities have recently suffered from low demand. For this reason, their physical facilities face degradation and decay. Milan seeks to reinvigorate its municipal markets by shifting its existing food-model from a linear model to a circular one. In other words, these markets will not serve anymore as the final destination of products to be sold, but rather, as hubs of social innovation and inventiveness whereby local and peri-urban experience and skills on agriculture will be merged with the innovative work of Fab-Labs. The result will be an increase in inside-the-city production since recyclable materials and food will be reused to serve local needs. This circular way of organising material flows in the municipal markets will be enabled by the utilization of data that will provide knowledge, design, and code of the material flows.

In so doing, the Milan pilot seeks to contribute to the four areas of interest below:

- At the local level, the pilot will seek to promote circular practices in the agro-food field. This will become possible through the transformation of the municipal markets into 'laboratories' whereby Fab Labs will co-create and develop circular models for the management of food.
- At the policy level, the Milan pilot aims at enhancing and transforming the municipal markets from local exchange points to communal and neighbourhood hubs whereby local needs will be met.
- At the citizen level, 'Circular Markets' seek to raise the awareness of citizens with regards to circular agri-food chains and in doing so empower the fight against food waste.
- At the business level, the Milan pilot will enable the collaboration of public and private sectors to contribute in the transformation of municipal markets to drivers of the local economic life, and to provide solutions for socio-technical transition to a circular economy in food systems.

To accomplish these objectives, a cooperation between key stakeholders such as citizens, SMEs, policy makers, and corporations is required. Indeed, the Milan pilot builds on a rather diverse and broad coalition of actors. Actors from the agricultural and local market field for instance are necessary as they provide the content and background upon which circular solutions are to be developed and tested. Likewise, Fab Labs and makerspaces are the stakeholders providing the vision and technical skills and equipment for solutions to be designed, developed, and tested while corporations and other organisations may also offer resources and expertise (Table 13). To this end, the Milan Municipality has already taken steps in reorganising the administration and management of municipal markets to facilitate change:

*'The policy of Milan changed in the last year. Before there was a contract between the municipality and singular people, which rented the single space of the municipal markets. Now we have a general manager (it can be a person, SMEs, association, etc.) that stipulates a contract with Milan Municipality. This entails and supports a mid-long-term investment project. In this way we can project with them a new strategy which considers circular economy a central aspect for these physical spaces.'* (Interview, Milan pilot team)

Stakeholder	Description
<b>Sogemi</b>	Joint-stock company which, on behalf of the Municipality of Milan, manages all the city's wholesale agri-food markets <a href="https://www.sogemispa.it/">https://www.sogemispa.it/</a>

<b>Parco Agricolo Sud Milano</b>	The South Milan Agricultural Park includes the agricultural and forest areas of 60 municipalities, for a total of 47,000 hectares. <a href="http://www.cittametropolitana.mi.it/">http://www.cittametropolitana.mi.it/</a>
<b>Slow Food</b>	NGO dedicated to prevent the disappearance of local food cultures and traditions, counteract the rise of fast life and combat people's dwindling interest in the food they eat, where it comes from and how our food choices affect the world around us. <a href="https://www.slowfood.it">https://www.slowfood.it</a>
<b>Milano Ristorazione</b>	Manages the public canteens. It is a public entity, managed by the municipality, serving schools and hospitals in Milan. <a href="https://www.milanoristorazione.it">https://www.milanoristorazione.it</a>
<b>Coldiretti</b>	Organisation of agricultural entrepreneurs with 1.5 million members. <a href="https://www.coldiretti.it/">https://www.coldiretti.it/</a>
<b>Consorzio Dam</b>	The Consortium was established on January 28, 2011 in order to enhance agricultural activities and support companies in the sector operating in the municipality of Milan. <a href="http://consorziodam.com/">http://consorziodam.com/</a>
<b>Lombardy Region</b>	Italian Government authority to guide, plan, coordinate and control the management of the territory. <a href="https://www.en.regione.lombardia.it">https://www.en.regione.lombardia.it</a>

Table 13. List of Milan Pilot stakeholders. Source: REFLOW Grant Agreement Annex I.

For the Milan pilot it is important to focus on where the actual change is needed the most. As one of the key partners from Milan pilot reminds us:

*'In our project the change we want to bring is not for the managers, but rather for the neighbourhood.'* (Interview, Milan pilot team).

Likewise, the focus is not on just recovering and rebranding of the municipal markets but also in turning them into hubs of local innovation and inventiveness in the service of the local people. Material flows, either in the form of data or food, from all around Milan's peripheral municipal markets will not only give voice to local communities but also connect them with each other.

Moreover, the project aims at connecting municipal markets' traders with agri-food-tech start-ups involved in reuse-recycle of food materials by using innovative technologies and processes.

### Challenges encountered by the Milan pilot

The Milan pilot has experienced and overcome challenges throughout the project, and it expects to encounter more as the project progresses. This section first outlines challenges experienced in the development and implementation of their scenarios (1.1 - 1.4) – both on a practical and operational level, before describing expected future challenges (2.1 - 2.3). For each challenge respectively, planned solutions (which may be revised due to recent COVID-19 restrictions) are outlined.

## 1.1 Choosing the “right” solution

First, the needs and the opportunities for traders (as a main target of the project) had to be understood by the pilot team and Fab-Labs so that the co-created solutions offer a viable and sustainable impact.

*‘So the barrier here is the difficulty to identify the right needs and truly understand how to contribute to the real needs of the people. Because the risk is that the solution is not really relevant for them.’* (Interview, Milan pilot team)

For this challenge to be addressed, according to Milan pilot, a new definition of circular economy was required. This new definition is able to capture the needs of the local people and markets. In this sense, Milan pilot faces another, “secondary” challenge – namely to translate the concept of CE in a way that allows theory to become practice, or, in other words, theory to become practical initiatives in the local markets.

*‘This is an interesting experiment, because we try to translate a general concept of CE to specific needs and activities that we can create in the local marketplace.’* (Interview, Milan pilot team)

**Solution:** The challenge has been addressed by developing a participatory audience engagement. Traders have been introduced to the topic of CE using several examples and case studies to suggest speculations on their own practices and habits. Most of them are aware about the concept of CE in a practical sense, and capable of applying it to daily problems and challenges. This process has allowed Milan Pilot team to collect first insights on topics that seems to be relevant and potentially impactful.

The process was interrupted because of the COVID-19 restrictions, which have slowed down the co-creation phase with markets’ managers.

Nevertheless, from the first interviews with markets’ managers (Morsenchio, Ponte Lambro and partly Ferrara) the interviewees maintained that that some traders (e.g. Morsenchio Market) are implementing with sustainable practices, although in an informal and non-structured way. This evidence represented a good starting point for co-creation and co-design workshops. On the other hand, other traders are not used to think in terms of circular principles and practices (e.g. Ferrara Market) and the strategy to engage them will be helped through external local stakeholders as NGOs that are more sensitive to CE.

## 1.2 Physical degradation and decay of the municipal markets

The managers of the municipal markets have been more concerned and interested in the physical restoration of the buildings than the introduction of more sustainable and circular business models. In this sense, the Milan Pilot needs to translate once again the concept of CE so municipal market managers can see and better appreciate the contribution of switching towards more sustainable ways on food management.

**Solution:** This is a long-standing situation that cannot be completely reversed in the short term. However, the REFLOW project will improve the situation and provide the initial steps to improve the situation. Unfortunately, physical degradation and decay of the municipal markets is the result of missed public and private investments for several decades and short-term solutions cannot resolve the issue. However, the project can attract the citizens’ attention towards needs and problems that can be solved through new CE product or process solutions.

In other words, the challenge is not in fact considered as a challenge for REFLOW to address, but rather a constraint to the project, as it represents one of the constraints of the Municipality. In fact, it works as a sort of “entry barrier” to the engagement of traders in new initiatives, being this controversial or individualistic attitude a relevant aspect of the



municipal market traders' "culture" and practices. It is important to mention that the municipality is not relying on the project REFLOW to face such an ingrained and serious situation of the city's infrastructures.

### 1.3 Aligning different ways of working

There have been reported difficulties in aligning the innovation and the fast pace of Fab-Labs and Makerspaces – but also start-ups and innovators potentially interested in participating – with the interests of the stakeholders, who are used to a traditional way of working with food and waste management.

*'Our role as pilot coordinator is to translate the language of Fab-Labs, who are going very fast, and going at a different pace compared to other players.'* (Interview, Milan pilot team).

Indeed, this challenge seems to be common among the REFLOW pilot cities. However, each city has chosen different ways of dealing with it. In the case of Milan, a possible solution proposed for to this challenge is to start with an in-depth understanding of the local and business needs that the new circular practices will address. In this way, new and old stakeholders will have the opportunity to synchronize around the circular model making the most of it and most importantly serving and revitalizing local communities and markets.

Nevertheless, misalignment is part of the challenge the project addresses as a whole, being Municipal Market perceived, generally speaking, as "old style" or too expensive compared to the quality of the products and services they offer. In this sense, a radical change is not an expected result of the REFLOW project, but rather a result of a more complex and incremental policy to whom REFLOW can contribute.

**Solution:** Due to COVID-19 some activities planned to address this challenge had to be rescheduled. Initially, the plan assumed concluding an in-depth survey by March and organising a first co-design workshop with markets in April.

The goal of the co-design workshop is to share knowledge and build a common ground across diverse participants – makerspaces, Fab-Labs, markets managers, and external stakeholders such as start-ups and corporate partners – as a propaedeutic activity for starting the next circular laboratories and experimental workshops.

The idea is to co-design the engagement of the markets' traders involving at first their representatives (i.e. market's managers/trustees), identifying the first strategic areas of intervention in which to apply circular economy practices on the basis of the needs collected from the previous phase of market analysis and listening.

This strategy recognizes time as a key-resource from the point of view of the market's traders. The time they do not spend in sales activity usually consists in a few hours during the week. Therefore, the workshops and the Labs to be organised with a wider group of traders during the next phase of the project will follow a pragmatic-driven approach for circular products or service-solutions with positive impact also on their economic activities based on their time availability.

### 1.4 Scalability and replicability of the project

Scalability for the Milan pilot refers to the ways the project uses and the solutions it may bring that will be diffused beyond the few local markets participating in the project. Moreover, the Milan team imagines that the solutions the project will propose could be exploited by other stakeholders, such as the company that manages the integrated waste cycle (AMSA), or the corporation that runs the city's four wholesale agricultural and food markets (Sogemi). According to the Milan pilot, competition between municipal markets may play a role in this regard by forcing more markets to introduce similar approaches and business models. Likewise, the challenge of replicability of the project has a similar notion but the proposed solution from the Milan pilot is a more institutional one. The pilot partners argue that replicability may be



achieved through the change of the regulatory framework towards opening and offering more motivation to municipal markets and managers to adapt to more sustainable and circular models.

**Solution:** Scalability at Milan markets system level will be possible after the experimental phase of REFLOW. In relation to the solutions identified, it will be possible to consider if there will be policy and governance conditions to extend the solution proposed to traders of other markets not involved in the project.

Apart from the abovementioned challenges that the pilot team has encountered in the early stages of the REFLOW project, and which already have been addressed to a large extent, a number of further challenges and risks has been identified for the next phase of the project implementation. In particular, the Milan project team expects to face four key challenges:

## 2.1 Attractiveness for the locals

The main challenge for any municipal market is to be more attractive for various neighbourhoods within the city. To date, the municipal market is a hub for social and commercial activities. Therefore, it cannot be simply compared to a traditional supermarket or a commercial centre. Municipal markets have existed and played a key role in local communities for years – and can maintain that role in the years to come, once they overcome some innovation challenges and rethink their role in the local communities. Different root causes have been identified related to a lack of attractiveness, together with potential solutions:

- a. Lack of information. This is strongly connected to communication, i.e. although there are already strong circular and sustainable practices in the municipal markets, however they are not valorised and communicated to a larger audience.

**Possible solution:** Communication and storytelling are key aspects to consider in order to attract and retain frequent customers, and to trigger interest among local communities. Each market has a different story to tell. With this in view, every solution the project may bring will take account of specific local conditions. Neighbourhoods' identity and Markets' specific features may be view as a valuable resource in communicating towards the various types of target audience.

- b. High prices. Lack of attractiveness can be since prices are higher than in supermarkets in some cases.

**Possible solution:** On the one hand, the value proposition is based on the key role that Markets' traders play in the local context. On the other hand, for the same price the competitors offer greater quality products. Therefore, the aim of the project is to maintain the social role of the market but also to improve the quality of the products sold through the creation of short supply chains that ensure safe high-quality products. With this in view, Milan pilot team is considering addressing the challenge by providing technological tools aimed at simulating and reporting revenues and costs for specific products.

- c. Limited offer of goods. The limited offer of goods is also a drawback of the local market compared to a supermarket.

**Possible solution:** Creating new networks and connections with local producers will help the markets to change customers' habits.



d. Lack of appeal of the market facilities.

**Possible solution:** The appeal of the physical facilities will not be directly impacted or improved by REFLOW activities. However, some of the engaged markets are identifying simple but efficient solutions to improve the quality of the space (e.g. use of the outdoor spaces). REFLOW and Milan pilot can leverage this simple solution with adding new human- and tech resources offered by Fab Labs.

## 2.2 Cultural Barriers

Some stakeholders are more interested in sustainability issues than others. Therefore, the Milan pilot needs to act as a facilitator between the different stakeholders involved, in particular, Fab Labs and the traders (similarly to the operational challenge already experienced in the initial phases of the project, where the pace of working was different for e.g. Fab Labs and other stakeholders). Later, the facilitator role should be extended to the urban and metropolitan farmers; Sogemi; and relevant institutional players.

**Possible solution:** The cultural barriers are difficult to address with the REFLOW resources. The project can contribute to facing these challenges by experimenting with participation and co-design processes and if the results are positive and relevant, the experience in other market management activities can be replicated.

## 2.3 Cost vs. value created by the pilot project

The costs benefit analysis associated with the planned CE activities defined and implemented within REFLOW is central for the traders in the market.

**Possible solution:** Specific activities will be experimented with a limited number of stakeholders (i.e. market's traders involved in the project). This approach will facilitate the identification of the key factors influencing the outcomes of the pilot. For example, urban planning activities, such as future modifications to PGT – services plan could be an important effect of the experimentation. REFLOW aims at calculating and proposing metrics for the assessment of the social, environmental and economic impact of the CE activities undertaken.

	Challenge	Solution
1.1	Choosing the “right” solution	Participatory audience engagement
1.2	Physical degradation and decay of municipal markets	Challenge to which REFLOW will contribute in parallel with other existing initiatives
1.3	Aligning different ways of working	Co-design workshops
1.4	Scalability and replicability of the project	Will be explored after experimental phase
2.1	Attractiveness for the locals	Communication, cost tracking, producer networks, added resources
2.2	Cultural Barriers	Participation and co-design processes
2.3	Cost vs. value created by the city's Action Plan	REFLOW's impact assessment and implementation in pilot markets to fine-tune the solutions.

Table 14. Summary of the challenges and possible solutions in Milan pilot.

### Next steps envisioned by Milan pilot

The long-term change that Milan pilot wants to achieve through REFLOW project is threefold:

1. The municipal markets will become true hubs for the community and the neighbourhood
2. The community at large (including suppliers, traders, and customers) will be more aware of circular economy and sustainable food waste management practices
3. New initiatives will be launched at city level regarding food management in a circular economy perspective

All these impacts are in line with the project overarching goal of ensuring replicability and scalability of the sustainable food and waste management solutions to other markets, cities, and elsewhere.

To this end, the Milan pilot is working towards developing circular solutions for a sustainable food supply chain – i.e. redesigning food flows in logistics and transportation activities, smart food transformation, as well as distributions and conservation processes. Solutions for food waste and surplus food to be reintroduced into the value chain are also emphasized. Robust data collection and analysis play a crucial role in understanding food-waste flows into- and from the markets, and well as identifying the needs to be addressed with tailored solutions.

Three categories of activities will be undertaken by the Milan pilot:

1. Mapping, research grounding, and stakeholder engagements
  - a. On-field research on agri-food flows in markets.
  - b. Explore and classify circular solutions for the local markets.
  - c. Dialogue and with municipal markets' managers and traders.
  - d. Co-creation workshops with municipal markets' managers and other stakeholders.
2. Co-design labs
  - a. Two cycles of co-design labs, consisting of 6 co-design workshops.
3. Prototyping experiments
  - a. Two cycles of prototyping experiments, consisting of 6 prototyping workshops.

The **mapping and research activities**, supported with tech solutions (provided, where possible, by REFLOW), will allow for precise calculations of markets food and waste flows. The catalogue of best practice will demonstrate how markets can be paving the way for circular economy principles in relation to food and waste management. Such catalogue will work as a blueprint also for other cities to engage with municipal markets and replicate the circular principles based on Milan's experience.

The **co-design labs** and the **prototyping experiments** will develop and/or activate local agri-food chains in the municipal markets, with focus on introducing circularity to the flows of e.g. vegetables, dairy, legumes, etc. Food materials will be reused in innovative ways to reduce waste. The choice of co-design labs and prototyping experiments has been guided by the need to actively engage various stakeholders, making them participants in the process of developing the final solution in line with the REFLOW premises. Co-design not only helps to generate better ideas by bringing different people together; it also creates ownership of the solution. As a next step, prototyping is introduced to validate and iterate the solution, resulting in a tangible scenario being implemented and tested. In both activities, the engagement of participants is critical for success.

## 2.5 Paris

### Summary

The Paris city-pilot within REFLOW focuses on the material waste produced from major events that take place regularly in the city. Such material flows from around the city will be tracked down and analysed by social innovators who will test the incorporation of that waste into sustainable and circular supply chains. The Paris pilot aims in the short-term to develop innovative solutions and circular business models, and in the long-term to pave the way for the upgrade of the regulatory framework concerning waste management.

### The City of Paris

Paris is the capital city of France located in the north-central part of the country and along the Seine River. The City of Paris is the seat of the French Government and the administrative centre of the Paris Region with a population of 2.148.271 and 12.278.210 residents respectively. Paris is a global tourist destination for tens of millions of tourists and professionals attending the city's touristic attractions, numerous exhibitions and trade shows. According to Forbes (Talty, 2019) and the International Congress and Convention Association (ICCA) (ICCA, 2019), Paris is the second most attractive destination in the world both for tourists and international professional meetings.

Paris has been steadily building up and developing its strategy towards circular economy in recent years, aiming to make Paris a *"sustainable, cohesive, responsible and resilient"* city (Paris City Council, 2017, p. 7).

Areas of intervention	
Climate and Energy Plan	Sustainable food plan
Charter for sustainable urban logistics	Plan for urban agriculture and sustainable food
Blueprint for the recovery and development of non-potable water	Local waste prevention programme / zero-waste strategy
Urban agriculture development strategy	Compost plan
Sustainable Paris Actors Network	Plan to combat food wastage
Scheme to promote socially and environmentally responsible purchases	

Table 15. Areas of circular economy intervention in Paris. Source: Paris Circular Economy Plan 2017-2020.

The initiatives already undertaken by the Paris city include plans for climate and energy, local urban planning, urban agriculture development, local waste prevention, sustainable food, and various circular economy practices (Paris City Council, 2017) (Table 15). Circular economy became a topic of importance for Paris after a major study on the city's urban metabolism where material flows such as construction material and demolition waste were identified as crucial elements of a circular economic model (Athanasiadis et al., 2019) (Figure 4). The initiatives and actions needed to allow for such a transition were presented and described in a White Paper produced by the City of Paris and local authorities of the Paris



Region in the 'Circular Economy Plan'. The plan, which runs from 2017 to 2020, follows the recommendations of the White Paper and focuses on cultivating a logic of reuse over replacement in five areas of activity: (1) planning and construction, (2) reduction, reuse and repair, (3) support for actors, (4) public procurement, and (5) responsible consumption.



Figure 5. Flows of material entering and leaving Paris. Source: Paris Circular Economy Plan 2017-2020.

Waste management in cities has increasingly become a major area of concern and action during the last years. As it is expected that 70 percent of the human population will be living in cities by 2050, the use of resources and materials to sustain such numbers of inhabitants also skyrockets. Solid waste produced by cities has already negative impact on ground, water and air pollution and consequently public health. As a result, international and intergovernmental organisations have sought to tackle this issue with a number of initiatives. The UN SDG 11 and SDG 12, for example, set as their target to reduce waste production and to increase waste collection and management in cities. Similarly, the EU with the Circular Economy Action Plan has set ambitious targets such as, and among other, to halve the residual (non-recycled) municipal waste by 2030, and to harmonize separate waste collection systems.

Paris is a global city and a global destination for international meetings and events. The city therefore faces a double problem with regards to waste generation and management. Not only Paris is a metropolis where huge amounts of waste are produced by its citizens on a daily basis, but large quantities of event waste such as wood, plastic, packaging, construction material, and demolition waste pose not just a hazard for human health and natural environment but also a logistical challenge as well.

Furthermore, the city of Paris will organise the Olympic Games of 2024. It is reasonably expected that the amount of event and trade fair waste will be multiplied due to the significance and attractiveness of such an event for both tourists and professionals. This in turn makes REFLOW and the solutions the Paris pilot will produce particularly important for the City of Paris and beyond. This is because the circular economy solutions and business models the Paris pilot will design and develop will be put to the test ahead of the Olympic Games. Eventually, and upon success, these solutions will be ready for scaling up and replication and therefore for much broader environmental and social impact.

## Paris – a REFLOW Pilot City

In response to this situation, and among many other initiatives – some of which are mentioned above – Paris seeks to build a circular economy approach to event waste management by creating a tracking system to coordinate the use and reuse of materials involved in the trade fair sector.

Stakeholder	Role in project
<b>Makers</b> <ul style="list-style-type: none"> <li>• Re-Store</li> <li>• WoMa</li> <li>• WAO</li> <li>• <i>Initiatives solidaires</i></li> </ul>	Developing solutions and experimentation. Storage and open hardware project.
<b>Events and event managers</b> <ul style="list-style-type: none"> <li>• We Love Green</li> <li>• FIAC &amp; Reed Expo</li> <li>• Maker Fair</li> </ul>	Giving access to data and potentially applying conceptual approaches for modular design.
<b>Event organisation</b> <ul style="list-style-type: none"> <li>• Unimev</li> <li>• VIPARIS</li> </ul>	Giving access to data and network potentially applying recommendation.
<b>Waste Collectors</b> <ul style="list-style-type: none"> <li>• <i>La reserve des arts</i></li> <li>• <i>Co-recyclage</i></li> </ul>	Testing solution developed for REFLOW and feedback.
<b>Temporary space manager</b> <ul style="list-style-type: none"> <li>• Morning coworking</li> </ul>	Testing solution developed for REFLOW and feedback.
<b>Space for event</b> <ul style="list-style-type: none"> <li>• <i>Petit palais</i></li> <li>• <i>Cite des sciences/</i> <i>Universcience</i></li> </ul>	Giving access to data and materials for experimentation. Application of recommendation and solutions
<b>Association</b> <ul style="list-style-type: none"> <li>• <i>Les Canaux</i></li> </ul>	Help to disseminate REFLOW solutions

Table 16. Stakeholders engaged in the Paris pilot. Source: REFLOW Deliverable 5.1.

The city's Action Plan is to be implemented through the collaboration with the city's ecosystem and the key stakeholders (Table 16) such as makers, designers, architects, urban farmers, and innovators, who offer their expertise and inspiration on the development of circular economy in Paris. In short, the Paris pilot will initially observe and map the lifecycle of waste in events so to produce ideas and solutions on how to best manage the waste within a circular economy. The solutions and business models developed by the Paris pilot will allow for the collection of waste which will be either directly reused in similar events or upcycled for utilization in other manufacturing plants and processes (Figure 5). The objective for the Paris pilot is twofold: in the short term, the goal is to develop technological solutions and new business

models to meet the demands and needs of the event industry sector. In the long-term, the Paris pilot seeks to scale up its work by influencing policy making at the EU level, and ultimately upgrading and improving a new regulatory framework focused on waste.

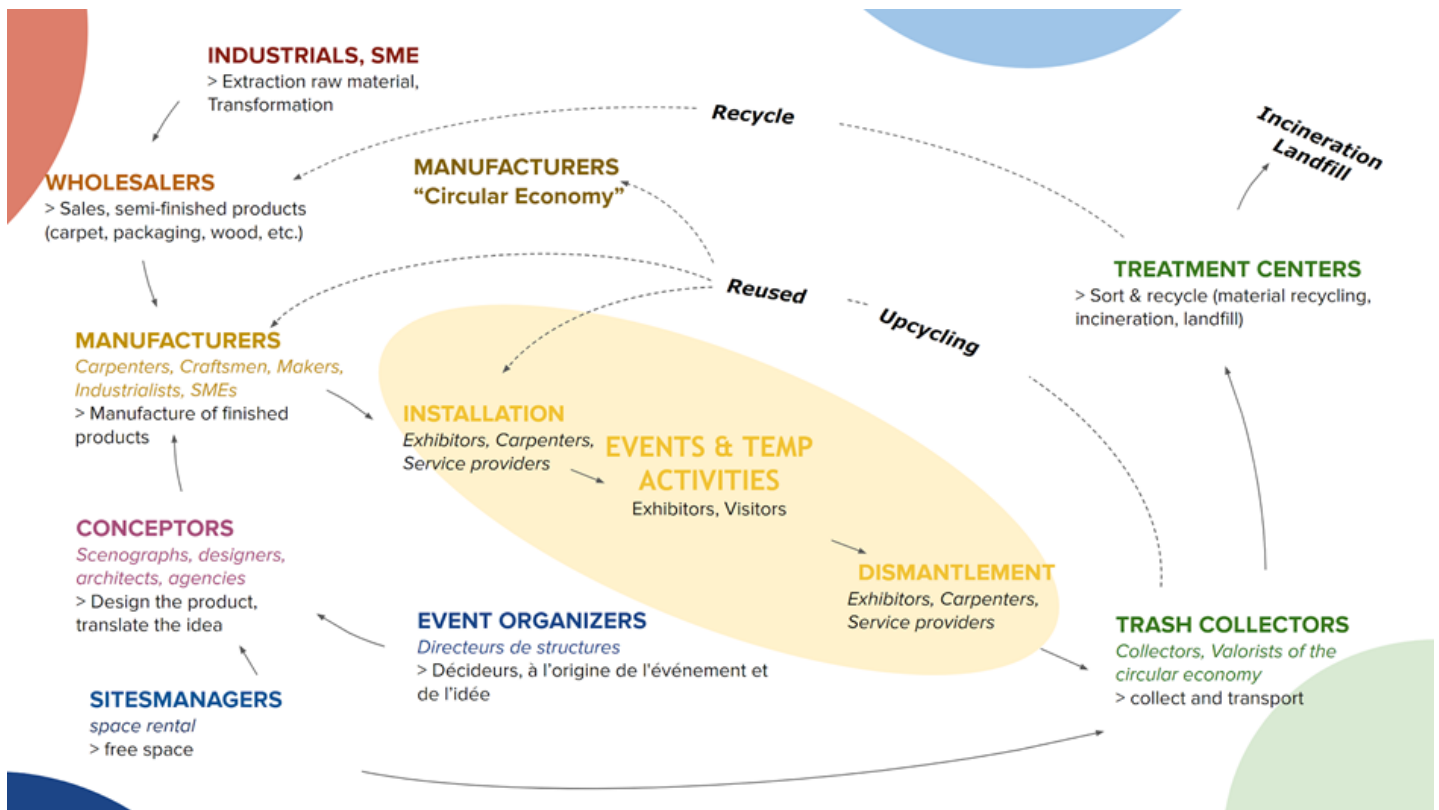


Figure 6. Stakeholder map and role in Paris pilot. Source: REFLOW Deliverable 5.1.

The activities and strategy devised by the Paris pilot cover three areas: a) governance, network and policy, b) technological development, and c) capacity building (Table 17). Governance, network and policy refers to preparatory actions upon which the pilot will implement its strategy such as mapping the stakeholders involved, their capacity, policies, and recommendations on how a circular economy can be implemented in practice. Technological development concerns the technological means by which the above policies and plans will be implemented. These may include expertise from companies interested in REFLOW but also the identification of local makers and designers along with the necessary IT skills and tools. Finally, capacity building includes actions with regards to engagement, communication, and dissemination of pilot's achievements to broader audiences including citizens and other societal stakeholders.

Paris pilot strategy and activities	
Addressing governance, network and policy	
4)	Conduct a review of existing public policies and actions undertaken by the city
5)	Analysis of issues and challenges

6) Mapping the network
7) Recommendations for best practices
8) Suggest identified solutions to involved stakeholders
9) Creation of new governance structures for new business models (Incubation)
<b>Addressing technological development</b>
3) Open source technological development
4) Develop open source tools. Define a traceability protocol such as a label tracker
<b>Addressing capacity building/citizen/stakeholder engagement and education</b>
1) Analysis of business models of existing actors and their difficulties in their practice
2) Incubate and develop innovative businesses
3) Design and test of new business models linked to the reuse of event materials
4) Developing services associated tools
5) Disseminate CE solutions and tools developed by REFLOW
6) Disseminate and communicate initiatives undertaken by REFLOW in the Paris pilot and at European level

Table 17. Paris' strategy and activities in REFLOW. Source: Adapted from REFLOW Deliverable 5.1.

### Challenges encountered and expected by the Paris pilot

In the early stages of the Paris city Action Plan, the team identified several challenges that they faced – and might be facing in the next stages of project implementation. Some of the challenges might have been easily resolved, others will be addressed throughout the project. The paragraphs below summarize these challenges and the different ways implemented by the Paris pilot to address them (1.1 - 1.3). Moreover, the challenges that the pilot expects to encounter are presented (2.1 - 2.3).

#### 1.1 Cooperation between public and private actors

Although much is said regarding public-private partnerships, in practice such endeavours are always challenging and require special attention. This statement proved true also for the Paris pilot city as it attempted to align various stakeholders on the best methodologies to manage event and trade fair waste. As one of the key partners from the Paris pilot states:

*'It is very different to understand decision making processes according to the type of actor (e.g. private and public). It takes time. This mapping needs to be adapted with every actor.'* (Interview, Paris pilot team)

Moreover, as the quote shows, it has also been challenging to understand the decision-making process for different kinds of organisations. Private for-profit organisations may need a 'business case' to be convinced, whereas governmental and public organisation may be more interested in the social impact of circular economy.

**Solution:** REFLOW aims at providing support and clear answers to address the interests of both categories of stakeholders. In this case, the first step to address this challenge is to 'translate' REFLOW and more precisely the plan and work being done by the Paris pilot in a way that matches a variety of interests and understandings. Creating an easy-to-grasp narrative is key to ensure understanding of the project and its interventions among different stakeholders.



## 1.2 Influencing regulation and policy

As mentioned above, the Paris pilot aims in the long-term to inspire, lobby and argue at the local, national, and EU level for an upgrade and revision of the relative regulatory framework on waste management. However, this creates a problem in itself as we learn from the Paris pilot:

*'Another problem is related to regulation. How do you start building a case for regulation?'* (Interview, Paris pilot team)

This would require, as explained by the Paris partners, a thorough understanding of the decision-making process of not only public and private organisations, but also how policy makers decide on policy changes.

**Solution:** It is towards this direction the Paris pilot geared its strategy and actions. In particular the Paris pilot decided to focus on mapping the sector and the actors involved in it, as well as who are the key stakeholders, and who and how is the decision-making process shaped. Moreover, it plans to systematically map individual stakeholders' regulatory barriers and explore ways to overcome them and create positive incentives towards CE.

## 1.3 Scalability

Another challenge faced by the Paris pilot, and more specifically by its maker and designer community, is how to scale up the project – even from a very practical point of view:

*'From Fab-Lab perspective the problem is to scale the project. Because the bigger the scale the more materials you need. This is one of the difficulties we have to face as makers.'* (Interview, Paris pilot team)

From a practical perspective, scaling up of the whole project would require more material. Fab Labs and makers use material to design, develop and experiment on solutions and new ideas that might work in a circular economy. However, increased volumes of production could cause management issues and will instigate a negative competition between different makers and Fab Labs.

**Solution:** In order to address this challenge, the Paris pilot tried to find specific solution by focusing its activities on three different areas: internal storage management (capacity to find space for storage, allocation of stream/volume per makerspace), tools ease of use so that stakeholders can integrate these solutions into design and production easily, and the management of solutions and products to be easily applied or developed (supply and demand platform).

The challenges outlined below are the ones that the Paris pilot team believe might be encountered in the continuation of the project.

## 2.1 Technical skills

The Paris Pilot team does not have technical developers' skills in the team, which could be a challenge to develop some of the tools envisioned such the MFA map.

**Possible solution:** Focus on developing an MFA tool according to feasible technical level for the Paris Pilot team through design workshop to align MFA format and content and feasibility.



## 2.2 COVID-19

Due to the COVID-19 pandemic current impact on our key partners in the event industry, we expect some activities and testing to be delayed. In addition, we want to adapt our communication format and planning as the event industry partners are in crisis mode and we need to adapt our communication means to align with their current priority responses.

**Possible solution:** The Paris pilot team, in collaboration with the REFLOW project partners, is currently working on designing a new communication format and adapt our planning to be able to handle the crisis consequences without cancelling the planned public events.

## 2.3 Transition from demolition to dismantling

The Paris pilot is designed around the reuse of wood waste from Parisian events. In order to get access to this material, the pilot participants would not only require the different traceability and mapping tools described above, but also a transition from demolition to dismantling of resources at the end of the events.

**Possible solution:** Communication designed to raise awareness amongst key stakeholders.

	Challenge	Solution
1.1	Public private cooperation	Creating easy-to-grasp narrative
1.2	Influencing regulation and policy	Mapping, sectors, actors, and decision-making processes
1.3	Scalability	Storage management, easy to use tools, easy solution management
2.1	Technical skills	Develop MFA tool according to feasible technical level
2.2	COVID-19	New communication format
2.3	Transition from demolition to dismantling	Communication to raise awareness

Table 18. Summary of the challenges and possible solutions in Paris pilot.

## Next steps envisioned by Paris pilot

In achieving their vision of increasing circularity and reuse of wood resources in Paris, especially in the event industry, the Paris pilot team envisions four interrelated activities:

1. Uncovering opportunities for waste reduction within existing processes in the event industry.
2. Creating tools for digital certification and traceability.
3. Validating efficient business models through testing and incubation of innovative companies.
4. Raising awareness about circular potentials of waste management in the event industry.

The four scenarios further unfold in specific activities:

Scenario	Activities
Scenario 1: Uncovering opportunities for waste reduction in the event industry.	<ul style="list-style-type: none"> <li>• Data collection on timber waste management processes, as well as the associated public policies.</li> <li>• Mapping of the network around event management.</li> </ul>

	<ul style="list-style-type: none"> <li>• Creating a benchmark of best practices regarding waste management and circular economy.</li> </ul>
Scenario 2: Creating tools for digital certification and traceability.	<ul style="list-style-type: none"> <li>• Open source technological development of tools (regarding e.g. certification and traceability, design for reuse, obtaining supply, etc.)</li> </ul>
Scenario 3: Validating business models.	<ul style="list-style-type: none"> <li>• Analysis of the business models of existing actors and identifying their challenges to design new models through test-and-learn.</li> <li>• Incubation of innovative businesses.</li> <li>• Identifying new types of governance for new business models.</li> </ul>
Scenario 4: Raising awareness.	<ul style="list-style-type: none"> <li>• Communication activities.</li> <li>• Dissemination of tools developed by REFLOW through events.</li> </ul>

*Table 19. Summary of the envisioned scenarios and related activities in Paris pilot.*

Ultimately, the Paris pilot consortium wants to achieve continuous support for the event industry sector's economic development through sustainable and circular business models. The economic aspect of circular economy practices is crucial in waste management – if the projects are not economically viable, many stakeholders refrain from getting involved. However, with new, relevant business models being implemented, more actors can be engaged and the overall circularity and reuse of wood in Paris could be increased. Setting a good example, paired with uncovering the inefficiencies in existing regulation, could unleash national and global political reforms regarding waste management, especially in the event industry.

## 2.6 Vejle

### Summary

Vejle is a Danish Municipality actively involved in CE practices. Vejle's primary objectives are to raise awareness among citizens and organisations and to engage public, private, and civil society stakeholders in the design and development of new circular economy solutions and tools that will allow the reuse, reduction, and recycle of plastics. The Municipality's focus is plastic-based waste material streams, which have been mapped and analysed in seven micro test sites in the Western part of the City.

### The City of Vejle

Vejle is a dynamic and vibrant Danish city located in southeast Jutland, 241 kilometres east of Copenhagen, at the conjunction of Vejle Fjord, Vejle River, and Grejs River. Vejle neighbours the cities of Kolding and Fredericia in the south, in the so called "Triangle Region", Billund in the west, and Horsens in the north. The city of Vejle is inhabited by a population of 57,051 while the broader Vejle Municipality (Kommune), which the city of Vejle is part of, has a population of 111,743 citizens making it the 6<sup>th</sup> largest in Denmark.

Over the years, Vejle has developed a strong focus and tradition in pioneering when it comes to resilience and sustainability. Besides its strong welfare system and increased awareness among its citizens on environmental issues, Vejle was selected in 2013 to be one of the 100 Resilient Cities (100RC) of The Rockefeller Foundation's initiative to foster future



planning for cities to provide 'safer, healthier, and increased livelihood options' for their citizens. In this capacity, Vejle Municipality published its Resilience Strategy highlighting the city's dedication towards developing '*a cohesive, robust and sustainable city*' (Resilient Vejle, 2015: 3). Waste management and recycling have been among the strategic goals of Vejle's Resilience Strategy, offering not only experience in the implementation of sustainability projects, but also paving the way for Vejle's focus on plastic waste – and hence its participation in REFLOW.

Non-recyclable plastic and plastic-based waste is a common but increasingly worrying problem in modern societies and cities. Plastic waste, and most importantly its poor management and accumulation, has negative impact and can be harmful to human health and the surrounding environment. According the World Bank's report '*What a Waste 2.0*', just in 2016 more than 10 percent of all municipal solid waste globally was plastic-based, amounting to 242 million tons of plastic waste worldwide (Kaza et al. 2018). In Europe alone, more than 25 million tons of plastic waste are produced each year (European Commission 2018: 6), triggering the EU to device for the first time in 2018 a 'European Strategy for Plastics in a Circular Economy' that aims to transform the way plastics are designed, used, reused, and recycled. Vejle is not an exception in this regard, especially considering its growing population and consumption trends as well as diverse citizen groups. According to Vejle's innovation community Spinderihallerne:

*'We find plastic in many containers - our shampoo bottles, toothbrushes, and even our toilet lid is made out of plastic. By the time you are 15 minutes into your morning routine, you have already been in contact with several products containing plastic. (...) Most people agree that plastic has come to stay, but how do we clean up after ourselves in the nature, in the seas and in our own backyard? And how do we recycle the plastic that has already been produced? No one has the answers alone. But we believe that we can find new solutions together.'* (Spinderihallerne, 2020)

However, for Vejle the optimal is not just to recycle plastic but rather to include it in circular economy business models where the overall amount of plastic will be reduced through the use and reuse of plastic, through practices that are inclusive and determine a positive combination of social, environmental and economic impact.

### **Vejle – REFLOW Pilot City**

Vejle, as a pilot-city in REFLOW, has set a strategy to address the problem of plastic and plastic-waste on three levels (Table 20): 1) governance, network and policy, 2) technological development, and 3) capacity building, citizen and stakeholder engagement, and education.

Vejle pilot strategy and activities
<b>Addressing governance, network and policy</b>
1) Facilitate connections/ knowledge exchange between citizens, businesses and cities' political authorities.
2) Create arguments and show the business potential for a more circular procurement policy (both locally and nationally)
3) Identify potential barriers hindering a sustainable transformation (and present them to the political authorities at local level)
<b>Addressing technological development</b>
4) Identify the potentials for implementation of a blockchain technology in a local context to track the plastic streams and visualize the potential for a change of behaviour
5) Develop and launch a list of digital communications tools/channels that can help the Pilot spread the knowledge generated by REFLOW (social media, newsletter, homepage etc.)
<b>Addressing capacity building/citizen/stakeholder engagement and education</b>
6) Engage with citizens to induce positive behavioural changes
7) Information-meetings, events and workshops throughout the project period (at local and national level)
8) Events and workshops with designers/businesses/citizens/educational system

Table 20. Vejle's strategy and activities in REFLOW. Source: REFLOW Deliverable 5.1.

The city's Action Plan entails the exploration and mapping of plastic waste in seven different sites in the city of Vejle. These sites represent a broad collection of stakeholders from the public and private sector as well as public households such as apartments and residential neighbourhoods. The collected data from the material streams of plastic will offer a relevant basis upon which design-thinking methods, supported by the city's Fab Lab, will co-create circular strategies and solutions to enable the use of plastic as a resource. Three main sites have been selected as test-sites. As the REFLOW Vejle pilot leader mentions, the goal is about providing citizens with the tools and experience that will allow for a behavioural change:

*'We have experienced a lot of positive engagement from the local community. And we see great potential in regard to igniting a behavioural change in order to optimize sorting of plastic in households, institutions and companies.'*  
(Interview, Vejle pilot team)

Vejle's Action Plan will, therefore, not be complete without capacity building and a broad societal engagement. Indeed, among Vejle's objectives in setting out their strategy is also to mobilize and bring together expertise from the public, private and civil society organisations, including citizen engagement.

*'What Vejle is doing really well is making this social approach an identity for the city and making it an important cause for everyone. Seeing what incentives, we need in order to involve different stakeholders is one of the greatest potentials for this pilot.'* (Interview, Vejle pilot team)

The different initiatives in the Vejle pilot aim to facilitate the replication of their Action Plan through the REFLOW project in broader local, regional and national and, also international settings. As key partner in Vejle team argues:

*'The key for the Vejle pilot in circular economy is the social part. It is about bringing awareness in different stakeholders in thinking more circular. To stop, reflect, think - so that, if we are really successful, they will change behaviour.'* (Interview, Vejle pilot team)

Vejle set relevant targets to achieve its goals. Firstly, it seeks to raise awareness on the topic of plastic waste and its management; secondly, it aims to create knowledge on how a circular management of plastic can be achieved; and thirdly, it aspires to engage citizens and organisations in this effort and in particular in reusing, recycling, and reducing plastic waste. In regard to the latter, Vejle, aims to regenerate 25 percent of the plastic waste. This percentage refers to the plastic regenerated in the three sites where measurements of the material streams will take place, it indeed sets the bar high both in terms of problem solving and of replicability in other sites. To measure performance and ensure success, Vejle, has set several KPIs (Key Performance Indicators) to evaluate its progress. The KPIs represent e.g. number of registered partners, number of workshops, number of registered participants, just to name a few. The achievement of the KPI targets will be supported, finally, by the local steering committee consisting of a broad yet relevant variety of stakeholders of the pilot – including local politicians. The steering committee will conduct periodical meetings, whereby issues and decisions with regards to the pilot and its participation in REFLOW will be discussed and tackled, ensuring a smooth progress.

### **Challenges encountered and expected by the Vejle pilot**

In the following section, the challenges identified by the city of Vejle in the implementation of the REFLOW project so far (sections 1.1 - 1.3), as well as those they expect to encounter in the future (2.1 - 2.4) are presented. The encountered challenges have been identified in the early stages of the project implementation, and although some strategies have been developed to address them, some might remain unsolved until the end of the project.

#### **1.1 Lack of awareness about plastic recycling**

Lack of knowledge and awareness about plastic recycling is not only the overarching challenge that Vejle pilot is addressing with its activities. This lack of understanding among the population and stakeholders as to what can be done with plastic and plastic-waste is also a challenge in implementation of the project, as more focus needs to be placed on communication and outreach.

**Solution:** The issue is being addressed from two perspectives: first, the objective of the Vejle pilot is to raise the general awareness on the matter of how to use, reuse, and recycle plastic. Second, Vejle has made its intention clear to bring the expertise required from various stakeholders from the public, private, and civil society sectors into the project.

#### **1.2 Turning theory into practice**

Similarly, Vejle, has reported that it has been, and it will be, a challenge to turn theoretical suggestions on sustainability and circular economy to practical and experience-based habitual behaviour for citizens and organisations alike.

**Solution:** Towards this direction, Vejle seeks to take advantage of its ability to coordinate and incorporate to the effort a wide variety of specialists. Experts on plastics and their use have been consulted to gather ideas on how circular economy can be applied in practice in the use of plastic by citizens and commercial organisations. Furthermore, and in a similar vein, Vejle employs Fab Labs where digital fabrication allows for experimentation on how plastic can be used or even replaced by other materials.

### 1.3 Scaling up the impact

Another challenge Vejle has expressed refers to how to scale up the social impact of their work. More concretely, the question is how to move on from 'small social impact' as raising awareness on local level, to big environmental impact by reducing the overall use of plastic on a larger scale nationally and beyond.

**Solution:** The first aspect of the challenge will be dealt with through Vejle's strategy which not only requires the engagement of a variety of societal stakeholders, but also seeks to create experiences that will ultimately lead to behavioural change. Engaging schools, neighbourhoods, civil and commercial organisations, and public stakeholders in the initiative thus raises awareness and produces experience on the management of plastic waste. With regards to upscaling the pilot's social impact to national levels and beyond, Vejle is actively communicating with organisations in other regions in Denmark seeking cooperation, whereas the collaboration with Danish Design Centre also allows for broader national dissemination. Furthermore, the participation of Vejle in the REFLOW project offers in itself an excellent opportunity for dissemination at European level since it is among REFLOW's objectives to create a knowledge hub and base for the replication of the circular economy solutions its pilots will co-create with their partners.

Most recently, the Vejle pilot team has reflected on the challenges they see most pressing for their work in the coming months. Subsequently, they also provided ideas on how these challenges can be approached in their pilot. The expected challenges and possible solutions are summarized below.

### 2.1 Organisational mapping and organising activities internally

This challenge relates to the definition of roles and responsibilities at a pilot level and to the set-up of an organisational structure that can support the development of the different scenarios with the direct involvement of different stakeholders.

**Possible solution:** Organising in a way that each scenario will have the working group to tackle specific activities. This is crucial as the different scenarios will take place on different sites, and in each site different activities will be implemented, such as the development of prototypes.

### 2.2 Identifying the right actors

Given the broadness of the scope of the pilot, identifying the right actors has been one of the key challenges. First, at this early stage it requires to think broadly about what actors to involve: *"from the site actors, to people working on a local level, to citizens. (...) But this opens to the risk to involve actors that are not needed."* (Interview – Pilot team). In fact, at this stage it is still difficult to know who the "right" actors are. Another challenge related thereto is to understand the incentives that can allow to involve different people.

**Possible solution:** To work on this, the Vejle pilot has conducted a stakeholder mapping accordingly to each scenario furthermore, to be able to set up a national advisory board.

### 2.3 Involving the actors

One challenge beyond the identification of the different actors is the coordination and alignment of them. Having several test sites and a wide range of activities, it is crucial for the Vejle pilot project to ensure that all actors work towards the same goal. To ensure seamless communication the actors involved also need to 'speak the same language' – in a way that allows understanding and effectiveness.



**Possible solution:** To work on this, the Vejle pilot is using design methods: *“our focus to use design methods is to have everyone on board and have them working on the same goals. And we have a huge toolbox of different design tools to make sure that this can happen.”* A key part of the solution is to work together with the different actors to define and re-define the challenges they will be working with; in that way a common understanding is achieved from the beginning. Then that understanding can be opened up when new circumstances arise, and narrowed down again, so that at some point everyone is on the same page.

## 2.4 Prioritizing

In the Vejle pilot, different prototypes will be developed in different test sites. The prototype workshops will point to different potentials and solutions that could be implemented at each of the three test sites. Being able to identify prototypes that can be developed at a site level but have also potential for scaling up is one challenge to address. In this regard, different test sites hold different “potentials”, and different solutions will need to be prioritized depending on their relevance and potential.

**Possible solution:** In order to address this challenge, Vejle pilot will use specific design tools and possibly engage relevant experts to help key stakeholders to prioritize the most promising prototypes based on the concrete local needs.

	Challenge	Solution
1.1	Lack of awareness about plastic recycling	Raise awareness and combine involve stakeholder expertise
1.2	Turning theory into practice	Coordinate and incorporate experts
1.3	Scaling up the impact	Raising awareness among societal stakeholders and nation-wide dissemination
2.1	Mapping and organising activities	Organise working groups around specific activities
2.2	Identifying the right actors	Stakeholder mapping to set up national advisory board
2.3	Involving the actors	Use design tools
2.4	Prioritizing	Use design tools and expert advice

Table 21. Summary of the challenges and possible solutions in Vejle pilot.

## Next steps envisioned by Vejle pilot

The Vejle pilot team has further specified the scenarios to be pursued under the REFLOW project, focused on developing and providing realistic best practices through a people-centred approach. Each relating to one test site, the pilot has developed five scenarios:

Scenario	Test site	Focus area:
1. Changing the plastic streams in healthcare	Sofiegården (Elderly care centre)	Prototyping new solutions that will decrease the use of plastic in health care sector - scaling the solutions to a regional/national level.
2. Creating circular streams of specific plastic types	REMA 1000 (Local supermarket)	Prototyping on creating new circular loops for specific plastic containers; scaling this to other companies.



3. Creating better and more intuitive sorting systems and information in apartment buildings	Den Gamle Gård (Part of AAB - a Danish social housing organisation)	Building local community and citizen engagement; helping the inhabitants to sort better; developing prototypes to enable scaling and replication in other cities.
4. Empowering the local community to create alternatives to plastic	Spinderihallerne (Innovation centre and Fab Lab)	Executing citizens' engagement and capacity building activities through Fab Lab workshops and Bio-Lab; showcasing potential of reducing/reusing plastic through best practice, exhibitions, events.
5. Creating an online platform for material exchange through REFLOW OS	RessourceCenter (Waste management centre)	Online material exchange between waste-plant, SMEs, and citizens.

*Table 22. Summary of the envisioned scenarios and focus areas in Vejle pilot.*

The scenarios will be executed through specific activities. While many of them are assigned to a specific scenario, some activities can be grouped into overarching categories that apply universally throughout the project:

1. Mapping and research
  - a. Mapping plastic streams through qualitative and quantitative research;
  - b. Metabolic scans;
  - c. Value chain and stakeholder analysis.
2. Workshops
  - a. Prototype workshops for different test sites;
  - b. Development workshop for online material exchange platform.
3. Partnerships development
  - a. Partnerships to develop specific solutions for each scenario;
  - b. Partnerships to work with circular solutions on governance/policy level.
4. Communication and outreach
  - a. Engaging citizens through cultural and creative events and initiatives;
  - b. Communication activities e.g. exhibitions, unconference, Fab-Lab presentations, etc.
  - c. Knowledge exchange and capacity building in the Municipality of Vejle.

The scenarios and their respective activities are all underpinned by the idea to create solutions, models and methods that will be scalable to other contexts, in order to benefit public and private actors. At the end of the project, the Vejle pilot team wants their solutions to foster methods for reuse or replacement of plastic in products – making plastic flows more circular, and therefore reducing its negative environmental impacts.



### 3. Define – Project Challenges

The REFLOW consortium can be viewed as a *complex adaptive system*, i.e. “a system in which many independent components (or “agents”) interact with one another. As they do, they learn or adapt in response to their interactions” (Morrison et al. 2019). In fact, the organisation of REFLOW is built around the collaboration between different actors working at different levels in the joint effort to pursue the REFLOW Mission, that is to “understand and demonstrate how the reconfiguration of the urban metabolism can enable the transition to circular and regenerative cities” (REFLOW GA, p.6). From the work of the single pilot cities to the one of all the work packages (WPs), the REFLOW project is characterized by a constant learning experience, which shapes and influences the actions of the different working groups. Such complexity poses a challenge in the alignment and coordination among WPs as well as between WPs and pilot cities. Addressing this overarching alignment and coordination challenge in the REFLOW Project, while maintaining the flexibility and space for learning, is considered a crucial aspect for the effectiveness and accomplishment of the ambitious goals set by the project.

During the first 12 months of the project, several meetings with the WPs have been conducted to update the REFLOW Process to address the overarching challenge of improving alignment and coordination. This has been broken down into three interrelated challenges for which we present the inputs and suggestions proposed by the partners to address them.

#### 3.1 Adequately representing complexity

The complexity of the project poses a major challenge in relation to the creation of *shared meanings* that can facilitate alignment and coordination. This refers to the challenge of adequately representing the complex structure of the REFLOW project. In this context, complexity refers to the different “components” through which the transition towards circular and regenerative cities is understood, approached and pursued in REFLOW. In fact, the REFLOW project is characterized by a number of actors (e.g. pilot cities, work packages, local stakeholders), patterns of interactions (e.g. between WPs, between WPs and pilot cities, etc.), array of concepts (e.g. circular economy, urban metabolism, performance measurement, etc.) and activities (e.g. alignment and coordination; co-design; implementation on a local level). Moreover, these are expected to synergistically take place along a 3-year-long design thinking process, which entails pre-set tasks, milestones and deliverables. Altogether, these components shape and influence the direction and quality of the Cities' Action Plans towards the creation of circular and regenerative cities.

In this regard, while representing and visualizing these components and their underlying interactions might facilitate alignment and coordination, doing so in a way that adequately represents complexity has been identified as a major challenge. In fact, on the one hand overly simplified representations risk omitting some important interactions and key qualities of the process; on the other hand, a view that is too fragmented and detailed risks that REFLOW becomes a set of minor and disconnected activities.

Participants in the REFLOW Process update stressed that the objective should be to develop pilots that act at system level and explore interdependencies and connections across all aspects of their transitions, i.e. combining regulation, finance, capacity, and policy by enabling the identification of synergies and collaboration between WPs and between pilots and WPs. In this respect, the following actions have been identified and suggested to address this challenge:



- Design and visualize a simple-enough model to represent interdependencies and connections of the projects' components.
- Structuring knowledge sharing points in the form of focused, time-limited and well-structured feedback sessions.

### 3.2 Achieve a common understanding of theoretical assumptions and terminology

Although the approaches and activities guiding the REFLOW process have been agreed upon in the initial phases of the project design and represented in the Grant Agreement, a challenge encountered on a project level has been to achieve a common understanding of the practical and theoretical assumptions and terminology used by different work packages (WPs) throughout REFLOW.

In pursuing systemic innovation towards CE, the REFLOW project involves a diversity of actors with different personal and professional experiences. In fact, the experts involved in the project base their work on extremely diverse disciplines that span from business and management, engineering, and natural sciences to design and communication. Moreover, the consortium involves actors with different professional backgrounds, including policy makers, professors, makers, and consultants, to name a few. Not to mention the inherent differences that can influence the understanding of the *“transition towards circular and regenerative cities”* in culturally and historically diverse cities such as Amsterdam, Berlin, Cluj, Milan, Paris and Vejle. While this represents an opportunity in the sense that it allows to tackle a wicked-problem as the one of CE implementation from different perspectives, it also poses a challenge in terms of achieving a common understanding of the knowledge used and produced in the process.

In fact, having a shared understanding of the knowledge that informs the different agents involved in the process is crucial to address the REFLOW Mission for two main reasons. First, clarifying the theoretical and practical background of the activities undertaken in the project is essential to *“understand and demonstrate how the reconfiguration of the urban metabolism can enable the transition to circular and regenerative cities”* (REFLOW GA, Part B, p.5). The REFLOW Vision of a circular and regenerative city is the result of an adaptive learning process stemming from the interaction of the different REFLOW partners in CE development and implementation. The bodies of knowledge informing the agents involved represent the building blocks upon which the REFLOW Vision is developed. Indeed, it is through the *understanding* of these different bodies of knowledge – including underlying concepts, theories and methods - that a *demonstration* based on scientific evidence can be undertaken.

Second, a shared understanding of the knowledge and terminology characterizing the activities of the different working groups is crucial to inform the concrete actions and strategic choices in the implementation of the Cities' Action Plans. Indeed, such a shared understanding have been identified as a crucial aspect to support collaboration between the work packages and between pilots and work packages. The iterative and systemic nature underlying the common endeavour of these stakeholders requires a shared *sense making* and understanding of the complex and organised patterns of ongoing actions, in a way that support the identification of possible synergies between the working groups and support collaboration.

In order to address this challenge on a project level, the following actions have been proposed:



- Provide a clarification of the common practical and theoretical assumptions and terminology used through the REFLOW project to ensure a common understanding among participants and facilitate the alignment of their work.
- Provide clarification of the strategic and operational choices informed by the practical and theoretical assumptions and how these are operationalized in the support of the pilots.

### 3.3 Risk of working in silos

Although the REFLOW consortium is united by a common goal represented by the REFLOW Mission, each work package (WP) and pilot city is responsible for fulfilling its own specific objectives. On one hand, the pilot cities are focused on the implementation of their transition on a local level. On the other hand, each WP is focused on specific activities represented by the tasks listed in the Grant Agreement and resulting in the production of specific deliverables. This poses a challenge in creating the conditions for a smooth collaboration between WPs, as it might lead to working in silos, thereby overlooking potential synergies and resulting in inconsistent forms of interaction or simultaneous and similar requests to the pilots. In fact, this also creates the risk of work overload for the pilot Cities, as responsibilities and specific objectives of different WPs might place similar demands on the pilots.

In addressing this challenge, two possible solutions have been identified:

- Identifying and clarifying the common objectives which overarch WPs and building blocks. Such shared objectives could make relations and possible synergies between WPs more visible and facilitate the coordination between them and the pilots.
- Design a process that allows to systematically identify synergies between WPs and pilots; support collaboration between WPs; facilitate alignment between WPs and pilot activities.

## 4. Define – Pilot Challenges

The REFLOW pilot cities have encountered numerous challenges in their journey to re-design urban material flows and implement circular principles, as presented in Chapter 2: Understand – Pilot Case Studies. Often the challenges identified by the pilots are highly dependent on their individual context – i.e. the materials that are in focus, the strategies that pilots are pursuing, specific stakeholders involved, or the regulatory environment that are so different in each of the pilot cities. Nevertheless, some patterns can be uncovered, where REFLOW pilot cities – while so contextually different – face similar barriers in the implementation of circular principles. This chapter provides an overview of the challenges that are repeatedly observed in the pilot cities.

Many of the pilot-related challenges are complex and cross-cutting across different thematic areas. Based on the descriptions of the challenges provided by REFLOW pilot cities in their respective Case Studies (Chapter 2), six simplified categories have been identified to classify the challenges for easier reflection and analysis. The categories are presented in Table 23 below.

Challenge category	Description
Awareness challenges	Lack of knowledge and awareness regarding circular economy and its various aspects among different relevant stakeholders.
Business challenges	Difficulties in measuring and subsequently communicating the business and/or financial value of the proposed solutions.
Governance challenges	Challenges related to (1) working with partners and stakeholders from different sectors, and (2) influencing broader governance structures e.g. policymakers and regulators.
Project management challenges	Issues pertaining to ensuring scalability of the solutions and internal project management.
Technological challenges	Limited availability or access to relevant data.
COVID-19	The worldwide coronavirus pandemic escalated in early 2020, resulting in containment measures implemented in many countries.

Table 23. Categories of challenges encountered by REFLOW pilot cities.

### 4.1 Awareness challenges

In many ways, the lack of awareness among stakeholders about issues pertinent to the project is a key challenge encountered across nearly all REFLOW pilot cities. Challenges in this category refer, among others, to the lack of awareness about circular economy and its various aspects among e.g. citizens or private sector actors.

This is hardly surprising, as lack of awareness – especially from customers – has been frequently quoted as one of the main barriers to CE implementation (e.g. Xue et al. 2010; Kirchherr et al. 2018; Masi et al. 2018). In a recent study published by The Copernicus Institute of Sustainable Development (Utrecht University) and Deloitte, 47 percent of survey respondents from business and government institutions in the EU point to “*lacking consumer interest and awareness*” as one of the main impediments in the transition to CE (Deloitte and Utrecht University, 2017). A possible response can be found in

*“promoting a public awareness on circular economy, [...] which also addresses the different attitudes and values of individuals to more proactive behaviours in front of recycle and reuse practices”* (Urbinati et al. 2017: 489; also highlighted by e.g. Xue et al. 2010). It has been recognized also by REFLOW pilot cities, that the behavioural change in citizens' daily activities when it comes to handling materials such as textiles, plastic, or food will be critical to successful implementation of circular material flows in the city. The starting point for that change to unfold is indeed identified as outreach, awareness raising, and other key knowledge-sharing activities.

#### 4.2 Business challenges

Understanding, measuring and effectively communicating the (economic) value of a solution developed in a pilot city are some of the frequently mentioned challenges that fall under the business challenge category.

The question of how to measure the performance and progress in the implementation of circular principles is especially pertinent in times of growing need to monitor the CE transition and measure its effects (Saidani et al. 2019). The business case of circular economy - i.e. how to measure and report the economic value of circular solutions; what is the return on investment (ROI) - has been long debated among academics and practitioners (e.g. Park et al. 2010; Lacy and Rutqvist, 2015), and it has been indeed identified as a key driver in the potential large-scale transition to CE (e.g. de Jesus and Mendonça, 2018). Also REFLOW pilot cities have recognized the ability to measure and communicate the value of solutions they suggest for transitioning to circular material flows to be highly important, not least to communicate to investors and other stakeholders. The challenge is in selecting and/or developing the right methodology to evidence change and measure economic value and ROI of the solution.

#### 4.3 Governance challenges

Governance challenges seem to be common among REFLOW pilot cities, experienced across most of the pilot cities and affecting the implementation of their scenarios. The governance challenges mentioned by the pilot cities can be classified in two broad groups: (1) challenges related to cooperation with stakeholders in cross-sector partnerships, as well as (2) to influencing broader governance structures related to policymaking.

Coordination and alignment in any multi-stakeholder project can be challenging. REFLOW pilot cities individually constitute their own “projects”, i.e. operate with a range of partners in developing and implementing their scenarios, and they too experience challenges when it comes to working with a range of different stakeholders. Many pilot cities experience challenges that relate to aligning interests, incentives, and ways of working with partners from different sectors - an issue which has for long been recognized by practitioners and academics (e.g. Googins and Rochlin, 2000; Babiak and Thibault, 2009). These challenges often stem from the inherent structural and strategic differences between sectors, e.g. different governance models, different strategic focus and objectives, different values, mindsets, and ways of operating. Partnerships where value can be created only through mutual exchange of ideas, resources and effort - i.e. partnerships focused on “*symbiotic value creation*” (Googins and Rochlin, 2000: 139) - require higher level of engagement from the partners involved (ibid.). As the requirement of engagement increases, so does the complexity of management of such partnerships (ibid.). This is in many cases true for REFLOW Pilot cities, but also potentially in other cross-sectoral projects focused on circular economy implementation, where close collaboration between stakeholders will be critical to project's success.



The second of governance challenges related to influencing local policy and regulation in attempt to amplify the effects of individual solutions implemented and tested by pilot cities. Studies have indeed shown that the *“gap between policy-making and practical action is still a serious problem [in implementation of CE]”* (Xue et al. 2010: 1296) and that the local and national governments should play a leading role in widespread adoption of CE innovation (ibid.). With that in mind, it is only natural that REFLOW pilot cities aim to influence local legislators and policymakers in ways that promote the CE practices and allow for their innovation to be implemented on a larger scale. This also closely relates to the next challenge, which has been classified under the ‘project management’ category, that addresses the scalability of individual solutions.

#### 4.4 Project management challenges

Apart from the conventional issues related to internal project management (e.g. prioritizing solutions, time management, resources management etc.), challenges related to scalability of the solutions have been identified under this category. Many REFLOW pilot cities relate to a challenge of translating their high ambitions for long-term impact into activities that are aligned with the scope of the project. Ensuring scalability is indeed an inherent challenge under time- and resource-limited projects, such as REFLOW. Nonetheless, this challenge has been considered from the beginning, and is included in REFLOW by design – meaning that the project in itself is providing a platform for scaling up solutions, on top of generating resources and processes that help individual pilot cities in amplifying their impact.

#### 4.5 Technological challenges

Another key challenge identified by several pilot cities relates to the access and handling of data. This challenge seems to be especially pertinent in the pilot cities of Berlin and Cluj-Napoca – both working within the broad topic of energy efficiency. In the case of Berlin, the lack of available data has been solved by partnering with a relevant organisation, which provides access to data relevant to the scenarios planned by the Berlin pilot team. Nevertheless, a question of handling sensitive data in an open-source project like REFLOW, as well as a question of security of the data platform are still relevant in Berlin. For Cluj-Napoca, the key technological challenges relate to lack of access to data handled by a decentralized network of energy suppliers and distributors. The pilot team proceeded with “plan B” to only collect data on energy consumption in municipality-owned buildings – mainly because of easier access and handling of such data.

Data is a key component in successful transition to circular economy. A major part of CE transition lies in re-designing products for better end-of-life management in order to recapture their value and re-introduce the resources into the material flows. In a white paper published by University of Cambridge (2003), Parlikad et al. present a compelling argument for the importance of information and data in decision making for redesigning end-of-life management of products, where *“lack of information infrastructure [...] and unavailability of product information”* (2003: 20) were listed as major obstacles for effective decision-making. Lewandowski (2016) further builds on that argument in the context of information needs for management of products and services in circular economy: *“IT and data management systems are essential for the circular economy, because they allow to keep track of products, components and material data”* (Lewandowski, 2016: 15). The challenges related to access to relevant data and the related data management infrastructure are present and pertinent also in REFLOW, where one of the building blocks of the project focuses specifically on the technological part of circular economy transition.

#### 4.6 COVID-19

In mid-March 2020 a global pandemic of coronavirus disease (COVID-19) has been declared by the World Health Organisation (WHO, 2020). At that point, many countries worldwide have already been fighting the disease and implementing domestic measures to contain the outbreak. In the EU, which is an active centre of the coronavirus pandemic, the countries began imposing social distancing, self-isolation, school closures, and full lockdown measures - resulting in more than 250 million people being in lockdown as of March 18<sup>th</sup>. Italy was the first European country to introduce full lockdown on March 9<sup>th</sup> (CIDRAP, 2020).

The containment measures imposed by EU countries have had direct impact on the implementation of activities in REFLOW, especially in its Pilot cities. Amsterdam, Berlin, Cluj-Napoca, Milan, Paris, and Vejle have all experienced repercussions of the pandemic - team members working from home under social distancing measures, with activities key to implementing circular principles on hold for the foreseeable future. In Milan, the municipal markets are closed, and in Paris all events have been cancelled for months ahead. Across all pilot cities, all outreach and communication activities that were designed to take place physically are cancelled. The situation has forced the pilot teams to adapt and look for alternative strategies to their initially proposed scenarios.



## 5. Make – REFLOW Resources for project-level challenges

This section describes the resources developed on a project level to address the project level challenges identified and described in Chapter 3. These are three interrelated challenges related to the overall challenge of alignment and coordination, i.e.:

- (1) Adequately representing complexity
- (2) Achieve a common understanding of theoretical assumptions and terminology
- (3) Risk of working in silos

Two resources – the REFLOW Vision and the REFLOW Process – have been developed to address the above-mentioned interrelated challenges and pursue the REFLOW Mission. These are described below and visualised in Figure 6.

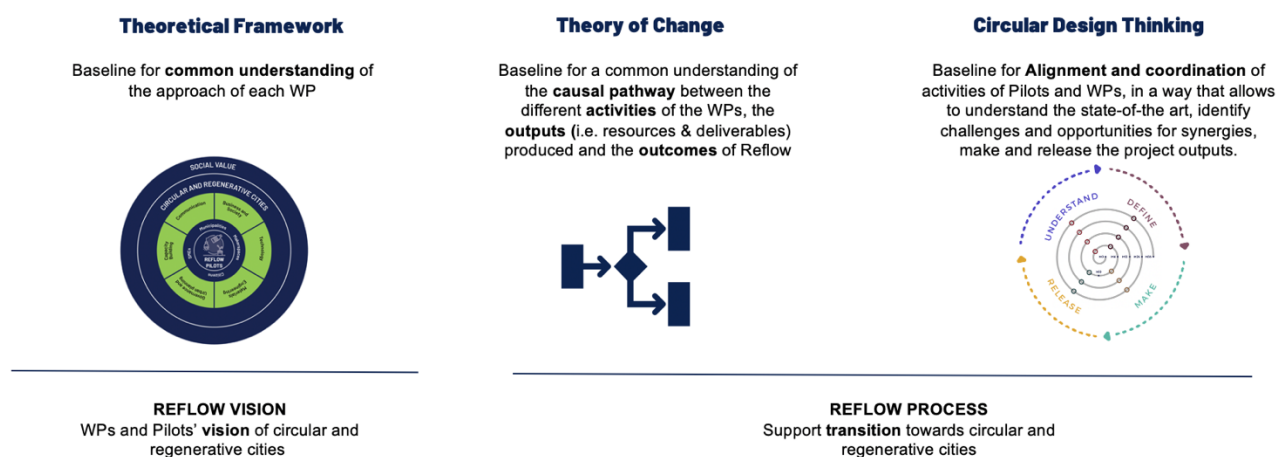


Figure 7. Resources developed in REFLOW to address project level challenges.

### The REFLOW Vision

This describes how REFLOW understands the transition towards circular and regenerative cities. It provides a baseline for a common understanding of the whole consortium of how different partners at different levels of the projects understand the transition towards circular and regenerative cities. This is based on two main elements: the REFLOW Theoretical Framework, and one survey which included different REFLOW stakeholders.

First, the REFLOW Theoretical Framework describes the knowledge underlying the different building blocks of REFLOW, contributing to the development of the Cities Action Plans. This is developed as an interdisciplinary theoretical framework, based on a model used to inform interdisciplinary research and practice.

Second, the survey describes how the different stakeholders involved in the Cities Action Plans understand circular economy and the main challenges in the transition towards circular and regenerative cities.

The two elements are integrated to show the different shared meanings that inform the vision of circular and regenerative cities in REFLOW and shape the action of the members in the consortium.

## The REFLOW Process

This resource addresses the project level challenges by describing a process informed by managerial accounting, performance management and circular design thinking to improve and facilitate alignment and coordination on a project level. The REFLOW Process provides a better understanding of the overall project objectives and overarching activities to pursue them. Moreover, it provides description of the coordination mechanisms introduced to facilitate alignment and coordination and address the challenges identified. The REFLOW Process is informed by two key elements.

First the **Theory of Change of REFLOW** describes the causal pathway that links the project activities, outputs and outcomes.

Second the **Circular Design Thinking Framework**, informed by the Ellen McArthur Foundation Circular Design guide and principles from design thinking and managerial accounting, provides a baseline for continuous improvement and coordination.

In the following paragraphs the elements used to develop the REFLOW Vision and Process are described.

## 5.1. The REFLOW Vision

### Background: objectives of the REFLOW Vision

In the process of scoping and analysing the process level challenges, the need for a common vision emerged. The REFLOW Vision has been developed to respond to the following suggested actions:

- Provide a clarification of the common practical and theoretical assumptions and terminology used through the REFLOW project to ensure a common understanding among participants and facilitate the alignment of their work.
- Provide clarification of the strategic and operational choices informed by the practical and theoretical assumptions and how these are operationalized in the support of the pilots.
- Identifying and clarifying the common objectives which overarch WPs and building blocks. Such shared objectives could make relations and possible synergies between WPs more visible and facilitate the coordination between them and the pilots.
- Design and visualize a simple-enough model to represent interdependencies and connections of the projects' components.

### What is the REFLOW Vision?

In REFLOW, several actors with different backgrounds collaborate to address a complex problem across multiple dimensions, may these be social, cultural, economic, political, technical or other. In so doing, the partners operate in a *problem space* that changes and evolves over time, along with the understanding that the partners have of the problem (Mitleton-Kelly, 2018). This is a natural aspect of a complex adaptive system such as REFLOW, which is characterized by *co-evolutionary dynamics* according to which the entities in the system continuously adapt, evolve and influence others within the environment (Kuhn, 2018). In this context the REFLOW Vision might serve as what in complexity science can be referred to as an *attractor* - that is an organising force that sustains behaviour and generates change (Kuhn, 2018). In this sense the REFLOW Vision is the attractor that holds the entities of the REFLOW system in particular patterns, acting as

organising principle guiding behaviour. Within this view, the Cities' Circular Action plans represent the roadmap within the pattern of change towards the REFLOW Vision.

Identifying the attractor or an attractor set helps to make sense of the drivers of behaviour, thereby highlighting the pattern of change within which the entities of a system are moving (Kuhn, 2018). In the case of REFLOW, the Vision that the partners in REFLOW have of a circular and regenerative city, and the way they make sense of the transition towards it, is what determines the pattern of change of the project, and thus what shapes the Cities' Circular Action Plans. Therefore, the REFLOW Vision integrates the main principles that guide the behaviour of the project partners and aims at creating a shared understanding of these principles.

In fact, the success of efforts towards systemic change for sustainability hinges on developing a mutual understanding of the change process and finding a shared vision of an '**aspirational state**' (Bien and Sassen, 2020). For this to occur, some specific requirements have been highlighted in the literature (Bien and Sassen, 2020) including (1) giving meaning to the concept of sustainability in a specific context by multiple stakeholders; (2) ensuring interpretational flexibility to provide opportunities for discussion (3) embracing a vision of sustainability that is rooted in plurality and dialogue; (4) enabling freedom to explore the idea of sustainability in ways that make contextual sense. These same concepts have inspired the development of the REFLOW Vision, in the attempt of making sense of the aspirational state – or the organising principles - that drive the transition towards a circular and regenerative city.

#### **Development of the REFLOW Vision: from sensemaking to sensegiving**

The process underlying the development of the REFLOW Vision has to do with evolution from *sensemaking* to *sensegiving*. On the one hand, the REFLOW Vision is about making sense and integrating the main principles guiding the behaviour of the partners in the project. This effort requires a thorough reflection upon the multiple perspectives and abilities through which the transition towards a circular and regenerative city is understood and addressed. On the other hand, it requires to communicate these principles and enable a shared understanding among the project partners.

In the practical context of organisations, **sensemaking** can refer to managers' role in constructing plausible stories of what is going on in the organisation and ensuring a shared understanding of change, by picking certain cues from their organisational experience. **Sensegiving** on the other hand, is the communication of a vision or plan that succeeds (Bien and Sassen, 2020). While both processes create order in uncertain circumstances, thus enabling future action, sensegiving aims to provide a 'viable interpretation of a new reality' and a new sense of organisational identity (Bien and Sassen, 2020).

The development of the REFLOW Theoretical Framework (5.1.1.) and the survey with pilot cities (5.1.2) respond to the need of Sensemaking, with the objective of understanding what is the aspirational state behind a circular and regenerative city in REFLOW. On the one hand, the REFLOW Theoretical Framework integrates the different perspectives and worldviews of the work packages actively involved in supporting the implementation towards circular and regenerative cities. On the other hand, the survey with pilot cities helps to integrate the different understanding of circular economy, which drives the implementation of the Cities' Circular Action Plans on a local level. The process of sensemaking itself is



subject to interpretation, especially in organisations with different worldviews according to Bien and Sessen (2020), such as REFLOW. Nevertheless, this process is part of the learning and co-evolutionary dynamics of the REFLOW project which means that the REFLOW Vision will evolve throughout the project, in line with the learning and adaption process of the partners.

The process of sensegiving refers to the translation of the main principles into a common vision (5.1.3), which contributes to clarify the main principles guiding the behaviour of the partners involved. This will evolve in line with the same co-evolutionary dynamics characterizing the project.

### 5.1.1 The REFLOW Theoretical Framework

#### Background

In the attempt of creating the REFLOW Vision, the aim of the REFLOW Theoretical Framework is to make sense of the transition towards circular and regenerative cities from the perspective of the work packages supporting the pilot cities. In fact, the REFLOW project involves experts from a multitude of different disciplines, and it is from the interaction of these disciplines, and the practical application of the related theories and methods used, that the work packages contribute to the Pilot Cities' Action Plans.

The high level of complexity of the project, also in relation of the multiplicity of theoretical and methodological approaches used by different actors, has been identified as a critical project-level challenge to address. In this sense the REFLOW Theoretical Framework has been used as a tool for sensemaking, in order to create a common understanding of the different approaches used by the work packages to support the transition of the pilot cities.

According to Bien and Sessen (2020) sensemaking refers to the process of rationalizing what people do: *"It is a descriptive and organising approach to experiences that is concerned with identity in a social context"* (p. 3). For this reason, collective sensemaking requires to take into consideration the social context and the different worldviews through which problems, ideas and solutions are framed (ibid).

Therefore, the first version of the REFLOW Theoretical Framework has been developed through a participatory approach where all the work packages provided the different sources of knowledge that inform their work. These have been used as the *cues* to make sense of the different interrelated activities and approaches (Bien and Sessen, 2020) underlying the transition towards circular and regenerative cities in REFLOW. Ultimately the REFLOW Theoretical Framework is used as a baseline for *sensegiving* through the REFLOW Vision.

#### The REFLOW Theoretical Framework

The approach that REFLOW follows to enable the transition of the six pilot cities towards circular and regenerative practices is based on the intentional examination from multiple disciplines of the problems faced by the six pilot cities. In fact, such an approach is considered critical to tackle society's complex problems, such as the one of a transition towards a more circular economy (CohenMiller and Pate, 2019, Bar-Yam, Y., 2018). In this context, the solutions and resources developed to help the pilot cities, go beyond the specific disciplines informing each work package. Rather, the different solutions are the result of an iterative learning process based on knowledge sharing and discussion between work packages and pilot cities.



For this reason, the REFLOW Theoretical Framework consists in an interdisciplinary research (IDR) framework (CohenMiller and Pate, 2019) that integrates the complex set of disciplines, theories and methods that inform the work packages' activities in the project development. In particular, the *"Model for Developing an IDR Framework"* (CohenMiller and Pate, 2019) has been used and adapted to the specific context of REFLOW. Such model, is rooted in interdisciplinary research, that is:

*"...a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice."* (CohenMiller and Pate, 2019: 1212)

The REFLOW Theoretical Framework provides the theoretical foundation used across the REFLOW project to support the pilot cities and ultimately *understand and demonstrate* the project's result. In doing so, it consists in a system of interrelated disciplines for learning about and understanding how to enable the circular transition in the pilot cities.

The REFLOW Theoretical Framework described here represents a first version that will evolve throughout the project. It reflects the existing and current sources of knowledge, which the framework has been based on (Allen P. 2018). However, at the same time it is based on the recognition that, while the disciplines, theories or methods used in REFLOW are now set, at some point some new will be introduced, while other might be reconsidered or abandoned. In this sense, what it is presented below consists in an *"experiment that seeks a representation that is useful"* (Allen P. 2018). In fact, the aim of the REFLOW Theoretical Framework and thereby the REFLOW Vision, is not to present "a" or "the model" to enable a circular transition, but rather one of the possible qualitatively different models that can enable new behaviours and ideas and allow to address the challenges identified.

## Methodology

The Model for Developing and IDR Framework has been used as a starting point to integrate the different theoretical backgrounds of the work packages, thereby clarifying and providing the reason for the different methods on which the project is based and create the REFLOW Theoretical Framework. To do so, a five-steps process has been adapted to the specific context of the REFLOW project. The following steps provide an overview of this process.

**STEP 1: The central topic** has been framed according to the REFLOW mission: *"To understand and demonstrate how the reconfiguration of the urban metabolism can enable the transition to circular and regenerative cities"*. This represents the complex problem that cuts across the different disciplines that characterize the approach of the work packages.

**STEP 2: The concepts and constructs** within the central topic have been identified. In this context, the main concepts and constructs with which the central topic REFLOW is concerned are:

- a. Understanding and Demonstrating
- b. Reconfiguration of Urban Metabolism



- c. Transition
- d. Circular and Regenerative City

In REFLOW, each work package understands these concepts in a peculiar way, in line with the building block within which they operate. In this sense, each building block entails the source of knowledge that informs the activities of the related work package to support the pilot cities.

The ongoing process of discussion and sensemaking through the interaction between work packages and pilot cities in the implementation of the Cities' Action Plans, will allow for a “final” understanding of the concepts of “Reconfiguration of Urban Metabolism”; “Transition” and “Circular and Regenerative City”, resulting from the integration of this knowledge and represented as one of the outcomes of the project.

**STEP 3: The disciplines** that each work package uses to address a REFLOW problem have been identified, considered and described in a series of meetings with the work packages. In this sense, disciplines refer to the knowledge sources, including practical and theoretical approaches that inform the activities of the work packages. These are described by CohenMiller and Pate (2019: 1213) as:

*“fields of deep and detailed content knowledge, communities of professional practice, forms of discourse (of fine and precise semantic distinction and technicality), areas of work (types of organisation or divisions within organisations such as academic departments or research organisations), domains of publication and public communication, sites of common learning, shared experiences of apprenticeship into disciplinary community, methods of reading and analysing the world, ways of thinking or epistemic frames, even ways of acting and types of person.*

**STEP 4: Main theories and methods** within each discipline have been identified, considered and described. By theories and methods, we refer to the explicit or implicit frameworks that guides the work of the different work packages (CohenMiller and Pate, 2019) addressing the REFLOW central topic.

**STEP 5: Key terminology within theories and across disciplines** have been clarified and defined as shared language. This shared language was utilised to develop the REFLOW Glossary which will be used as baseline to enable discussion and sensemaking between the partners of the project.

### Building Blocks Overview

In the following paragraphs the main disciplines (Step 3), theories and methods (Step 4) informing the building blocks are described in general. A more detailed description can be found in the specific deliverables.



PROCESS COORDINATION	
	<p><b>Disciplines, theories and methods overview:</b></p> <p>The Theory of Change and the discipline of design thinking represent the two theoretical pillars of this building block.</p> <p>First, the Theory of Change is used as a lens to describe <b>the pathway of change</b> through which the Pilot Cities and the whole project expect to generate the desired impact. Anderson (2005) describes the pathway of change as “a map that illustrates the relationship between actions and outcomes and shows how outcomes are related to each other over the lifespan of the initiative (p. 3). Overall, <b>Theory of Change (ToC)</b> is used to critically approach the design, monitoring and evaluation of a program. In so doing it is a critical thinking approach to program design, and monitoring (De Silva et al. 2014). In this regard, the Theory of Change is described as “a roadmap, a blueprint, an engine of change, a theory of action and more” (Stein and Valters 2012, p.3). In fact, the Theory of Change provides an explanation of how the stakeholders involved in an intervention expect to reach a shared long-term goal (Anderson, 2006). In so doing, the Theory of Change has been used not only as a monitoring and evaluation tool with regards to the journey of the Pilot Cities, but also as a baseline to understand the dynamics of the whole REFLOW system and develop a coherent alignment and coordination process.</p> <p><b>Design thinking</b> refers to the development of design as an approach to tackling innovation challenges (Van der Bijl-Brouwer, Dorst, 2017). In this sense, it is increasingly considered a way not only to produce physical products, but most often as a process that leads to the creation of any type of intervention (Van der Bijl-Brouwer, Dorst, 2017). This design-based approach to innovation integrates traditional design practices, such as iterative design and prototyping as well as a system approach and a multidisciplinary approach (Van der Bijl-Brouwer, Dorst, 2017). In this context, <b>Human-centred design</b> refers to a “group of methods and principles aimed at supporting the design of useful, usable, pleasurable and meaningful products or services for people. The main principle of these methods is that they describe how to gain and apply knowledge about human beings and their interaction with the environment, to design products or services that meet their needs and aspirations (Van der Bijl-Brouwer, Dorst, 2017, p. 2). This approach is centred around the understanding of people needs and aspirations to inform the design of</p>

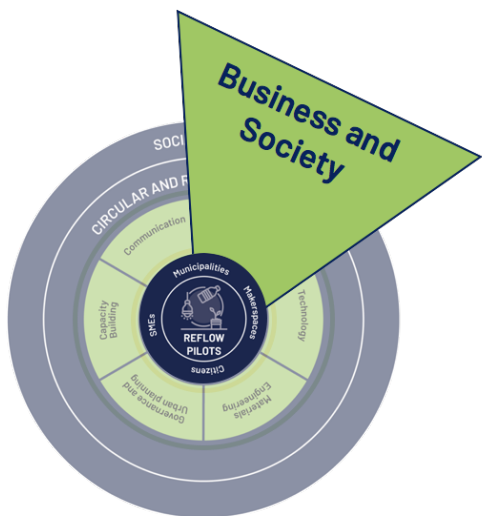


	<p>an innovation process for social interventions (Van der Bijl-Brouwer, Dorst, 2017).</p> <p>The emerging concept of <b>circular design thinking</b> holds a central role in the process coordination. More specifically, the circular design thinking process comprises four stages (The Circular Design Guide, 2018) which guide the iterations through which the Pilot Cities and the work packages will work on the development of the scenarios. These are:</p> <ul style="list-style-type: none"> <li>• <b>Understand</b> - Get to know the user and the system</li> <li>• <b>Define</b> - Put into words the design challenge and your intention as the designer</li> <li>• <b>Make</b> - Ideate, design, and prototype as many iterations and versions as you can</li> <li>• <b>Release</b> - Launch your design into the wild and build your narrative - create loyalty in customers and deepen investment from stakeholders by telling a compelling story</li> </ul> <p>The model is described as “an iterative process that never finishes” which allows to constantly test and refine along with the increasing understanding of the people that interact with the design. Most importantly a central aspect of the process is in building <i>feedback loops</i> that “help identify and address the unintended consequences of our design decisions”. The Circular Design model present significant analogies with other framework widely used in performance management. For example, the <b>PDCA cycle</b> describes four iterative phases (1) Planning, which refers to the definition of actions to be taken for desirable changes based on available data or possible new observations; (2) Doing, referring to the implementation of the change, possibly on a small scale; (3) Checking the effects of the change; (4) Acting, which refers to the immediate action informed by the changed occurred (Deming, 1993; Moen, 2009).</p>
Related Work-package: WP5	<b>Pilot Coordination in the Cities' Circular Action Plans</b>
For more information: D.5.1	

PILOT CITIES COORDINATION	
 <p>The diagram illustrates the Pilot Cities Coordination framework. It features a central blue circle with the text 'REFLOW PILOTS' and 'Cities'. Surrounding this is a yellow ring with the text 'Circular and Regenerative Cities'. The outermost ring is green and labeled 'SOCIAL VALUE'. The diagram is divided into four quadrants: 'Communication', 'Business', 'Innovation', and 'Policy'. A dark blue banner with the text 'Pilot Cities Coordination' is overlaid on the right side of the diagram.</p>	<p><b>Disciplines, theories and methods overview:</b></p> <p>The knowledge informing Pilot Coordination comes from three scientific disciplines. First, the literature on <b>environmental innovation and societal transitions</b> is concerned with a specific form of innovation aimed at the reduction of the impact products and production processes have on the natural environment. Standing in line with innovation literature at the economy and firm level, <b>eco-innovation</b> has emerged more recently (Ozusaglam, 2012).</p> <p>Within this strand of innovation literature, a concept pioneered by Geels (2011), is <b>value driven coordination for socio-tech-environmental transitions</b>. This refers to an understanding of systemic change in terms of a socio-technical transition, entailing changes across technology, policy, market, consumer practices, cultural meaning and scientific knowledge. Building on Geels' approach, the framework informing this building block details distinct yet interconnected competences that can be defined further to reach sustainability. Focus thus lies both on technical competences, as well as on systems, value-led transition, long term approach to sustainability, and collaboration.</p> <p>The intersection of technology with different societal systems is what lies at the centre of analysis of the second discipline relied on by WP5, <b>Science and Technology Studies</b>. This strand of literature has brought forward several models to explain interactions of actors like government, society, research, and business. Among these approaches, the work package relies most heavily on work by Carayannis and Campbell (2009). Their <b>quadruple helix innovation model</b>, later adapted by Fraunhofer (2016), emphasizes the capacity of knowledge systems to combine and integrate different knowledge and innovation modes via co-evolution, co-specialisation and co-opetition knowledge stock and flow dynamics (Carayanis &amp; Campbell 2009). The acknowledgement of these processes is of key importance in the multi-actor and multi-level context in which Pilot Coordination occurs.</p> <p>The third discipline informing the knowledge of WP5 is <b>Behavioural Change</b>. More specifically, work by Robinson (2011), emphasizing the importance of environment for behavioural change. Effective change in behaviour is only possible when the environment in which a society operates is enabling, i.e. when circumstances allow for habits and rituals to be altered towards the required change. In line with the insights from</p>

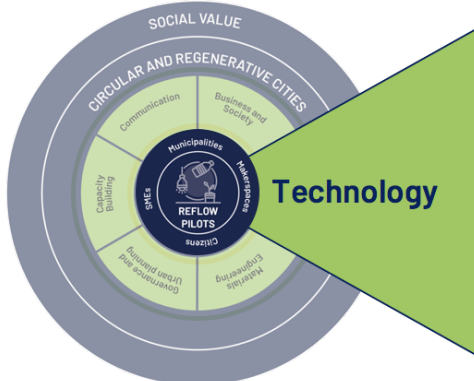
	<p>Science and Technology Studies, Behavioral Research helps to inform the work package by directing adequate attention to the social and environmental contexts and influences on desired change and innovation. A key methodology and tool to operationalize such insights is Waag's (2016) <b>relative change methodology</b>. It is a tool wheel that helps in assessing which steps are needed for an actor to change their behaviour.</p> <p><b>Design thinking</b> plays a central role in informing the approach towards the interaction with Pilot Cities and partners on a local level. In line with Brown (2010), Design thinking refers to a human-centered approach, where complex problems are tackled in an iterative manner and addressed as design challenges. This <b>iterative approach</b> is based on repeated rounds of analysis and re-adaptation of strategies and plans towards pre-set long-term goals (Larman and Basili, 2003).</p>
Related Work-package: WP5	<b>Pilot Coordination in the Cities' Circular Action Plans</b>
For more information: D.5.1	This Building Block provides the knowledge and expertise to support the development of the Pilot Cities, by enabling the space for them to pursue their long-term objectives.

### BUSINESS AND SOCIETY BUILDING BLOCK

	<p><b>Disciplines, theories and methods overview:</b></p> <p>The disciplines theories and methods characterizing this building block are concerned with two main project activities. On the one hand, the disciplines of Accounting for Sustainable Development and Performance Measurement, the Social Return on Investment (SROI) methodology and the Theory of Change (ToC) are used to address the performance evaluation and project impact assessment. On the other hand, the emerging field of Circular Economy oriented Business Model Innovation, informs the activities addressing the development of circular business models in the Pilot Cities.</p> <p><b>Accounting for Sustainable Development</b> is concerned with accounting practices related to sustainable development defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs (UNWECD, 1987, p. 8). Specifically, as argued by Bebbington and Larrianga (2014) it is concerned with the outcomes of “socio-economic arrangements” - and the setting in which these operate - with regard to a multiplicity of institutions (and</p>
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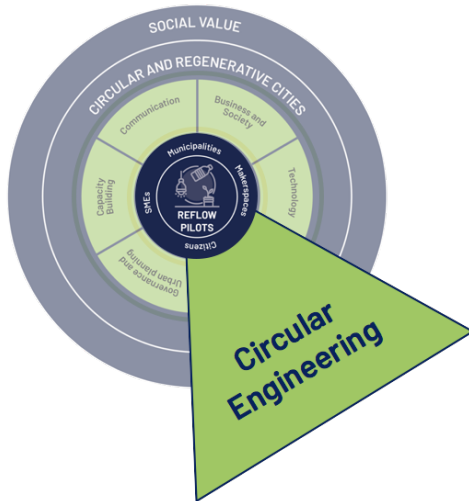
	<p>their modes of organising) which create the conditions that result in harm (or good) for a multiplicity of stakeholders (e.g. the environment, future generations, and the least well of present generations).</p> <p>The notion of “social accounting”, “can be thought of as <i>“the universe of all possible accountings”</i> (Gray et al 2014, p. 262), where matters can be taken “to the point where all of social life (including social interactions with the environment and with the economic for example) might be viewed as the giving and receiving of accounts” (ibid).</p> <p><b>Social Return on Investment.</b> The social return on investment (SROI) framework was first devised as an attempt to capture and monetize the full value creation of the often-unreported benefits of work integration activities that could then be set against programme investments to form a more holistic cost-benefit analysis. The SROI model is in three parts: the first calculates the full Blended Value of a project (combining its financial value creation and a monetized representation of its social impact value); the second maps all the resources invested in the project; the third then calculates the blended return on investment (combining the financial and social returns).</p> <p>These reporting practices not only account for financial performance but also disclose more nuanced and contingent social and environmental impacts and outcomes. Furthermore, they aim to provide more complete and transparent disclosure of a variety of performance assessment and impacts. It is furthermore based on the Theory of Change (SROI network, 2012).</p> <p><b>The Theory of Change</b> is a tool that is widely used among academics and practitioners to map out the steps that will lead them to have the intended positive change on society. In this context, the ToC is used in relation to the SROI method. In particular, the ToC supports the development financial proxies based on the outputs and outcomes identified in the ToC process. Ultimately, this process contributes to the definition of the social impact generated by the Pilot Cities (Anderson, 2006).</p> <p><b>Circular Business Model Innovation</b></p> <p>The stream of literature regarding Business Models (BMs) and Business Model Innovation (BMI) has been more recently linked to the CE and</p>
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	<p>sustainability literature, as BMs are conceived as a guiding framework combining to conjugate economic value capture with social and/or environmental value creation (Bocken et al. 2014; Bocken et al 2016; Pieroni et al. 2019). This reflects the need for companies to “<i>rethink their entire value creation, delivery and capture structures if they are to match the worldwide trends of globalisation, digitalisation and hypercompetition</i>” (Inigo et al., 2017; p.518). In this setting, CE-oriented BMI for sustainability and circularity (Pieroni et al. 2019) has emerged as a model that proposes innovative solutions to face the challenges of environmental impacts of value chains and maximises social and environmental benefits based on sustainable value propositions, while eventually creating competitive advantage (Lüdeke-Freund, 2010). In particular, the stream of literature of CE-BMI integrate principles and practices of CE as guidelines for BMI (Pieroni et al. 2019).</p>
Related Work-package: WP1	<b>Business and Society in the Cities' Circular Action Plans</b>
For more information:	

TECHNOLOGY BUILDING BLOCK	
	<p><b>Disciplines, theories and methods overview:</b></p> <p>WP2, IT Infrastructure and Tools, is concerned with the development of systems and software that enable the circular flow of materials.</p> <p>The Technology Building Block relies on methods and tools rooted in the disciplines of <b>software development</b>, as well as configuration and project management. The development process follows the <b>Agile methodology</b> (Atlassian, 2000).</p> <p>Agile development consists of many continuous improvement cycles, so that first prototypes and minimum viable products (MVPs) are already developed at a very early stage of the project. These early results go through several iterations before anything is final. As feedback is gathered and implemented continually, the method is very communication-oriented and people-focused. The agile methodology accepts that change cannot be avoided, and requirements, research and development happen in parallel. In addition, the iterations provide opportunities to assess the direction of a project throughout the development lifecycle (Atlassian 2020).</p>

	<p>The resources like the REFLOW OS are based on <b>P2P technology</b> that it constitutes distributive network architecture in which participants share part of their resources to make a service available. Resources are accessible by other peers directly without passing intermediary entities (Schollmeier, 2011). In REFLOW, <b>federated network</b> infrastructure is based on ActivityPub, an open, decentralized federated networking protocol that provides a client/server API for creating, updating and deleting content, as well as a federated server-to-server API for delivering notifications and content.</p> <p>To ensure the authentication and protection of information, WP2 draws on <b>cryptography</b>, i.e. the method of protecting information and communications through the use of codes so that only those for whom the information is intended can read and process it (Katz and Lindell, 2014). The models employ state of the art technologies based on elliptic curves, pairing-based cryptography, attribute-based credentials and implicit certificates. This not only served to ensure informational integrity but provides means to circulate information offline and verify the provenance and life cycle of physical objects.</p>
Related Work-package: WP2	<b>Technology in the Cities' Circular Action Plans</b>
For more information: D.2.1	<p>This building block provides the technical knowledge necessary for the development of the REFLOW Pilot Cities technological solutions. This is done by a direct engagement of the Pilots Cities that co-develop technical solutions based on their context-specific needs, in line with the key objectives and outcomes.</p>

CIRCULAR ENGINEERING BUILDING BLOCK	
	<p><b>Disciplines, theories and methods overview:</b></p> <p>The means and resources employed by work package 3 are interdisciplinary in nature. However, a significant contribution to the methodology of WP3 can be attributed to the field of <b>Industrial Ecology</b> (IE). IE is a field of study focused on the stages of the production processes of goods and services from the point of view of nature, trying to mimic a natural system by conserving and reusing resources (Chertow, 2008).</p> <p>A central concept for this building block is the one of <b>Urban Metabolism</b>. Kennedy et al. (2007) define Urban Metabolism as “the sum total of the</p>



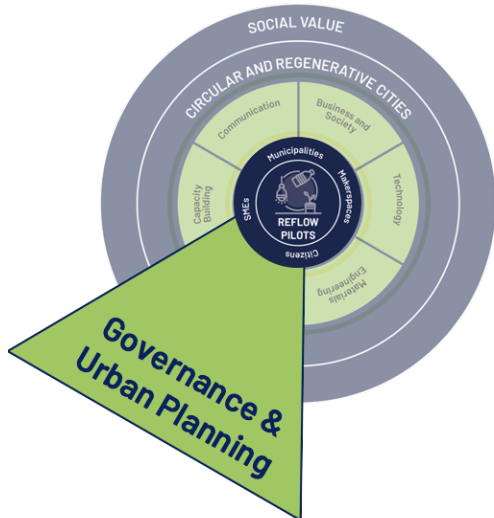
technical and socio-economic processes that occur in cities, resulting in growth, production of energy, and elimination of waste”. Analysing or scanning Urban Metabolism may, in practice, involve the quantification of inputs, outputs, and storage of energy, water, nutrients, materials and wastes for an urban region. Conceptually, urban regions are compared to organisms or ecosystems whose metabolism is characterized by energy self-sufficiency and the approximate conservation of mass through recycling (Kennedy et al. 2007). Assessing and fostering the potential of such mechanisms in cities can help in making them more sustainable and regenerative.

In this regard, one key tool in IE central for the Circular Engineering building block, is **Material Flow Analysis (MFA)**. MFA is defined as a systemic accounting of the flows and stocks of materials within a system defined in space and time. It connects the sources, the pathways and the intermediate and final sinks of a material. Because of the law of conservation of matter, the results of an MFA can be controlled by a simple material balance comparing all inputs, stocks, and outputs of a process (Brunner and Rehnberger, 2004).

Another powerful approach to model material flows and loops is presented by **System Dynamics (SD)**. SD is a computer-aided approach that applies to dynamic problems arising in complex social, managerial, economic, or ecological systems. By mathematically modelling and simulating dynamic problems, one model stage at a time, SD can provide greater confidence in models and their policy implications. The prevalence of feedbacks and loops allows for a continuous view that looks beyond events and shine slight on the dynamic patterns underlying them. Events and decisions are thus seen as surface phenomena affected by underlying system structure and behaviour (Richardson 2011). Another more theoretical framework employed to examine the more intertwined human and natural systems is based on the notion of a **social-ecological system (SES)**. The SES concept has been widely used in both the environmental and social sciences, as well as in economics. The challenge, according to Berkes and Folke (1998, 4), lies in finding ways to “match the dynamics of institutions with the dynamics of ecosystems for mutual social-ecological resilience and improved performance”.



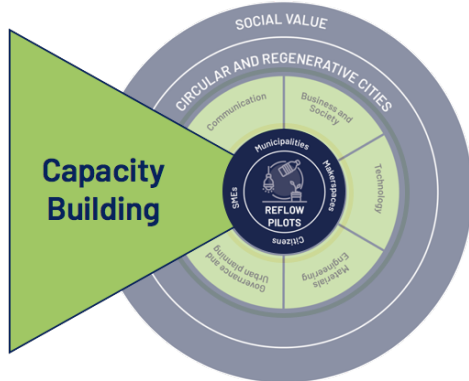
	<p>Circular Engineering Building Block crucially contributes in the REFLOW Vision of <b>Circular and Regenerative City</b>. Here, the term “regenerative” is used to place emphasis on net-positive outcomes and expand beyond a narrow focus on system optimization towards more generative, creative system outcomes. Second, the vision of a regenerative circular economy highlights the importance of place-based and context-specific circular economy work and analysis. In particular, the focus is placed on regional scales where latent regenerative potential can be found. Third, we take inspiration from living systems by foregrounding change and adaptive management of socio-ecological systems. We propose learning from the way materials in the biosphere flow. This leads us away from a mindset of engineering tightly controlled loops of materials that are insulated from living systems, to designing our products to be nutrients for living systems at local and regional scales.</p>
Related Work-package: WP3	<b>Circular Engineering in the Cities' Circular Action Plans</b>
For more information: D.3.1	<p>This building block contributes to register and analyse the nature of how resources flow in a city, the downstream and upstream consequences of resource consumption, and support the development of interventions &amp; strategies that enable systems change towards positive social and environmental impact.</p>

GOVERNANCE AND URBAN STRATEGY BUILDING BLOCK	
	<p><b>Disciplines, theories and methods overview:</b></p> <p>The Governance &amp; Urban Planning building block integrates knowledge from different fields to study, analyse, define, co-design and evaluate governance models and strategies in REFLOW pilot cities. This has a specific focus on policies, methodologies and tools for the circular economy transition in urban contexts.</p> <p>This building block conceives the concept of <b>Governance</b> in relation to “all processes of governing, whether undertaken by a government, market, or network, whether over a family, tribe, formal or informal organisation, or territory, and whether through laws, norms, power or language. Governance differs from government in that it focuses less on the state and its institutions and more on social practices and activities”. In this regard, the lens of Collaborative Governance is central in informing the development of governance models in pilot cities. Here, <b>Collaborative Governance</b> consists in a collective decision-making process that is initiated by public agencies, and that implies two-way</p>


	<p>communication and influence between agencies and stakeholders (Ansell and Gash, 2008). On the other hand, <b>Urban strategy</b> is understood as an explicit framework containing a set of articulated goals and policies with identified programs and activities which can address issues of growth, development or decline affecting the local communities (Warren, 1980).</p> <p>Concretely, this building block interprets innovation of governance and urban strategies with a direct involvement of the actors on a local level. Agents are involved in the creation or use of <b>Toolkits</b>, intended as fixed set of procedures, guidelines, criteria, etc, established to ensure a desired or required result or prevent oversights.</p> <p>In this regard, the field of design informs the knowledge and tools used to co-develop and innovate Governance Model models in the Pilot Cities, to support their circular transition. Here, the complex problems the cities are addressed through <b>Design Thinking</b>. This refers to a human-centred approach towards (complex) problems which are seen and (re)defined as design challenges, tackled in a non-linear, iterative way (Brown, 2012; Dorst, 2011). In this regard element of circularity is central in the building blocks' implementation of design thinking. <b>Circular design</b> aims at defining ways to deliver a product or a service, which is functional and made of optimum materials to deliver the best performance while minimizing its negative impact along their whole life cycle (The Circular Design Guide, 2018). In particular, a <b>circular design framework</b> inspired by the EMF Circular Design Guide (The Circular Design Guide, 2018) has been developed to assist the pilots in the co-design of collaborative governance models. In facilitating the co-design activities with the Pilot cities resulting in the implementation of toolkits for the innovation of governance and urban strategies, this building Block embraces a <b>Participatory mindset</b>. Participatory design is an approach to design that attempts to actively involve the people who are being served through design in the process to help ensure that the designed product/service meets their needs (Sanders, 2008).</p> <p>Another central lens used is <b>Systems Thinking</b>, a holistic approach to analysis that focuses on the way that a system's constituent parts interrelate and how systems work over time and within the context of larger systems. Here the concept of Sense System is used to understand the way of concrete actions are facilitated on a local level. A Sense</p>
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	<p>System is a collective artefact, a cultural construction resulting from a vast and complex social conversation, where shared awareness and understanding out of different individuals' perspectives and varied interests is taken into account. Anyone may confirm or reject a sense system, but no one can ignore it (Manzini, 2015, p. 84.)</p> <p>In terms of frameworks that inform the co-design activities, the building blocks follows a <b>Capability approach</b>. This is a theoretical framework that entails two core normative claims: first, the claim that the freedom to achieve well-being is of primary moral importance, and second, that freedom to achieve well-being is to be understood in terms of people's capabilities, that is, their real opportunities to do and be what they have reason to value.</p> <p>With this view the action to co-design and change governance models for circularity, <b>Urban Policy Levers</b> (EMF, 2019) are used to understand how to drive change. These are Impact areas for urban policy making to generate circular strategies and growth initiatives.</p> <p>A central aspect related to innovation of Governance Models and Urban strategies is rooted in the collaboration between different types of stakeholders on a local level. Here <b>the quadruple and quintuple innovation helix framework</b> (Carayannis et al., 2012) is used to describe university-industry-government-public-environment interactions within a knowledge economy. This model incorporates the public via the concept of a 'media-based democracy', which emphasizes that when the political system (government) is developing innovation policy to develop the economy, it must adequately communicate its innovation policy with the public and civil society via the media to obtain public support for new strategies or policies. In the case of industry involved in R&amp;D, the framework emphasizes that companies' public relations strategies have to negotiate 'reality construction' by the media. The quadruple and quintuple helix framework can be described in terms of the models of knowledge that it extends and by five subsystems (helices) that it incorporates; in a quintuple helix-driven model, knowledge and know-how are created and transformed, and circulate as inputs and outputs in a way that affects the natural environment. Socio-ecological interactions via the quadruple and quintuple helices can be utilized to define opportunities for</p>
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	the knowledge society and knowledge economy, such as innovation to address sustainable development, including climate change.
Related Work package: WP4	<b>Governance and Urban Strategy in the Cities' Circular Action Plans</b>
For more information: D.4.2	This building block contributes to register and analyse the nature of how resources flow in a city, the downstream and upstream consequences of resource consumption, and support the development of interventions & strategies that enable systems change towards positive social and environmental impact.

CAPACITY BUILDING BLOCK	
	<p><b>Disciplines, theories and methods:</b></p> <p>This building block embraces disciplines and methods to develop skills and competences of stakeholders involved in circular transition, by facilitating a deep level understanding of circular practices on a city level. These stakeholders not only include active practitioners and innovators involved in CE implementation in urban and peri-urban areas, but also teachers and students in higher education.</p> <p>The central concept of this building block is <b>Capacity building</b>, which refers to the "process of developing and strengthening the skills, instincts, abilities, processes and resources that organisations and communities need to survive, adapt, and thrive in a fast-changing world" (Philbin, 1996).</p> <p>Capacity building is considered at different levels to embrace the diversity of stakeholders involved in the REFLOW process. First, the individual level refers to the process of changing attitude and behaviour, typically through knowledge, skills exchange and training. Second, the organisational level focuses on mandates, tools, guidelines and management information systems that facilitate and catalyse organisational change. Third, it is concerned with the capabilities for overall policy, economic, regulatory and accountability frameworks within which organisations and individuals operate.</p> <p>Capacity building activities are informed by the field of <b>Education for Sustainability</b>, which focuses on the key competencies considered critical for teaching and learning sustainability-related topics (Wiek et al. 2011). Moreover, another central element is <b>Circular literacy</b>, a framework encompassing the type of knowledge relevant for a transition</p>

	<p>towards the CE: system, target, and transformation knowledge (Zwiers, 2020).</p> <p>Direct involvement and knowledge exchange between practitioners and experts involved in circular transition plays a fundamental role in the understanding of capacity building. In this regard, the concept of community of practice is central in informing this building block. <b>Community of Practice (CoP)</b> refers to groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly. Three components are required in order to have a CoP: (1) the domain, (2) the community, and (3) the practice (Wenger, 1998).</p>
Related work package: WP6	<b>Capacity Building in the Cities' Circular Action Plans</b>
For more information:	<p>This building block contributes by integrating the key learnings from WP2-5 within the REFLOW Capacity Building Strategic Implementation. This entails the development of resources, such as the Community of Practice, Best Practices Database and other Capacity Building Resources for the pilot cities to gain deep understanding of circular practices.</p>

COMMUNICATION BUILDING BLOCK	
	<p><b>Disciplines, theories and methods overview:</b></p> <p>This building block informs the dissemination of circular economy transition across different audiences at different scales, with the intent to inform and engage society. In particular, it aims at engaging those beyond the key stakeholders' own community and explains how society can benefit from the research.</p> <p>From a theoretical perspective, this building block conceives dissemination as strategic and integrated.</p> <p>First, <b>Strategic Communication</b>, refers to the purposeful use of communication by an organisation to fulfil its mission (Hallahan et al. 2007). In this regard communication is conceived as a constituent of management on different dimensions, such as marketing, public relations, technical and political communication (ibid). In line, with <b>System Thinking</b>, communication is based on a thorough understanding of the underlying dynamics affecting systems behaviour to build a <b>Collective Narrative</b> (The Omidyar Group, 2017). In fact, developing key messages to the target audience is one of the necessary elements to take into consideration in the pathway to impact for system change (The</p>

	<p>Omidyar Group, 2017). Altogether this strategic approach to communication aims at building awareness of the project amongst a target audience and ensure the commitment of a target group of stakeholders to the project goals, as well as encourage participation among researchers or partner bodies (ibid).</p> <p>Second, <b>integrated communication</b> refers to the process of systematically communicating with relevant stakeholders ensuring that all forms of communication and messages are carefully linked together with harmony and efficacy (Levy, 2018).</p> <p>A <b>Design Thinking</b> approach is used in order to create a common vision of the initiative and to engage the public from the outset by listening to the stakeholders involved. This approach allows to engage participants in opportunities to experiment, create and prototype models, gather feedback, and redesign solutions in a creative and analytic manner (Cea and Rimingron, 2019).</p>
Related Work-package: WP7	<b>Communication in the Cities' Circular Action Plans</b>
For more information:	<p>This block supports REFLOW Pilot Cities in developing, curating and communicating its circular economy vision. This is conceived as necessary element to mobilise local communities and enhance citizen engagement. In doing so the focus of the Communication building block is to support cities in disseminating their circular strategies and results in language that is accessible to a wide variety of audiences, beyond specialists, and facilitate dissemination between different types of stakeholders, thus enabling them to work together more effectively.</p>

### Integration of different theories in REFLOW

The REFLOW Framework describes how the project addresses the problem underlying the REFLOW Mission: *“To understand and demonstrate how the reconfiguration of the urban metabolism can enable the transition to circular and regenerative cities”*. In fact, the “transition from linear to circular economy is not straightforward and only a very limited number of examples do exist that illustrate the transposition of the EU Circular Economy Action Plan into national or regional policy.” (GA part B, p.5). Here, the pilot cities provide critical examples of ways in which cities can adopt a CE model and reach the 2030 Sustainable Development Goals. Through the implementation of Pilots' Action Plans, the cities are involved in the (1) mapping of city resources in terms of material streams, production, transformation and distribution; (2) redesign the local ecosystems involving a wide range of stakeholders; 3) develop and test tools and applications that support, manage the new systems, and consequently enable scaling and replication in other cities; and 4) execute citizen's engagement and capacity building activities.





Figure 8. Overview of REFLOW Theoretical Framework. Source: Copenhagen Business School.



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In REFLOW, the concepts **Understanding and Demonstrating** refer to the general approach informing the action of the work packages. For example, these differ from “*implementing*” or “*applying*”, as the process of Understanding and Demonstrating requires a critical ex-ante and ex-post analysis and reflection of the experience of the pilot cities, with the purpose of enabling replication from other cities in the future.

Altogether the work packages (WPs) provide their expertise to *understand* this complex process from different perspectives and undertake an ex post evaluation which will allow to *demonstrate* the results. In so doing, different WPs contribute to different extent by applying specific methodologies or developing resources for the pilot cities. For example, WP1 and WP3 are involved in the process of co-developing social, environmental and economic KPIs that will allow to evaluate the specific activities of the pilot cities. At the same time, each work package monitors specific activities relevant to their building blocks. In this process methodologies from Accounting for Sustainable Development and Environmental Impact Assessment are integrated and adapted to develop context specific KPIs for the REFLOW pilot cities. At the same, WP6 (Capacity Building) will develop an evaluation and monitoring system specifically for the evaluation of Capacity Building Resources; WP4 (Governance) is responsible for the evaluation of the governance-related initiatives, and so on. Finally, WP1 is responsible for the mapping and monitoring process of the whole project using the Theory of Change. The evaluation process entails the integration of the different monitoring activities of each work package. This also contributes to demonstrate the results and translate them into business plans for the REFLOW pilot cities and other cities to take inspiration.

The object of the process of understanding and demonstrating is the **Reconfiguration of Urban Metabolism**. The Circular Engineering Building Block provides the main knowledge in this regard. In fact, WP3 focuses on the development of resources that support the pilot cities in the understanding of Urban Metabolism in terms of flows and stocks of materials within the urban systems, downstream and upstream consequences of resource consumption and development of interventions and strategies. At the same time, the integration of perspectives from all the building blocks allow to consider the Reconfiguration of the Urban Metabolism more broadly than change in the flows of materials. For example, the Governance building block (WP4) supports the reconfiguration of the models for collective decision-making involving public and private agencies and the set of stakeholders involved in the pilot city. Similarly, all the building blocks provide knowledge and expertise to reconfigure different components of the urban systems, such as business practices (WP1 – Business and Society) and marketplaces (WP2 – Technology). In so doing, each WP uses different methods to develop the resources used to enable the reconfiguration of urban metabolism, such as Material Flow Analysis (WP3 – Circular Engineering) Agile Method (WP2 - Technology); the Quadruple and Quintuple Helix Innovation Framework (WP4 – Governance; WP5 Pilot Coordination). In order for these different approaches to result in a concrete Action Plan, pilot coordination and process coordination methodologies facilitate the integration of these approaches into coherent action plans.

The concept of **Transition** is strictly related to the process of Reconfiguring Urban Metabolism and is informed by the approaches through which the work packages assist the transition of the pilot cities, namely human-centred design and design thinking.

A **Circular and Regenerative City** represents the result of the reconfiguration of Urban Metabolism, and in this sense the outcome of the transition. WP3, within the Circular Engineering building block, sets the ground by clarifying the approach and meaning of a *regenerative circular economy* (Deliverable 3.1), highlighting three main themes.

- I. The term regenerative places emphasis on **net-positive outcomes** and expand beyond a narrow focus on system optimization towards more regenerative, creative system outcomes.
- II. The vision of a regenerative circular economy also foregrounds the importance of **place-based and context-specific circular economy work and analysis**. Rather than a one-size-fits-all approach to circular economy principles, we emphasize principles that focus on the economy at nested local, regional, national, and global scales of production and consumption. More precisely, local and regional scales are where latent regenerative potential can be found.
- III. The understanding of circular and regenerative city is inspired by living systems by foregrounding change and adaptive management of socio-ecological systems. We propose learning from the way materials in the biosphere flow. This leads us away from a mindset of engineering with tightly controlled loops of materials that are insulated from living systems, to designing our products to be nutrients for living systems at local and regional scales.

Because of the nature of the transition, rooted in a human-centred design approach, and built around the integration of the different building blocks, a circular and regenerative city simultaneously represents the ideal city where the methods and tools developed and used in REFLOW generate the expected outcome. For example, drawing upon the main concepts of the *Governance building block* it refers to a city where governance models are innovative and inclusive, and where citizens are involved in the creation or use of solutions to ensure a desired or required result or prevent oversights. The definition of a circular and regenerative city will be further developed throughout the project, as a result of the practical integration on the field, of the different methods and approaches of all the building blocks.

### 5.1.2 Shared understanding of circular economy

#### Background

Circular economy (CE) seeks to replace the traditional linear and unsustainable model of extract-produce-use-dump materials and energy with an economic system whereby the flow of energy and materials will be designed in such a way which will allow them to be reused, repaired, refurbished, remanufactured etc (Korhonen et al., 2018b). In so doing, CE, is a promising concept for a sustainable future and has been widely discussed at policy, business advocacy, and state levels (Korhonen et al., 2018a). The Ellen MacArthur Foundation for example was founded in 2010 to 'accelerate the transition to a circular economy' (EMF 2012, 2013) and has as its mission to put CE in the agenda of decision makers. Likewise, the EU, has put forward several initiatives to establish or accelerate the transition to CE (COM 2014, 2015), while China, has been the first country in the world to introduce a law in 2008 for the implementation of CE (Korhonen et al., 2018b). Along with the discussions on CE in top level which result in an increasing number of initiatives, the same happens with the definition of the concept. Korhonen et al. (2018b) argue that the variety of definitions, opinions, and meanings around CE make it 'essentially a contested concept'. According to the same scholars, this is only because the concept of circular economy is an emerging one at least in academia.



Considering the top-down development of CE initiatives and the plurality around its definition, REFLOW, builds on these efforts and seeks to contribute by adding a bottom-up approach and perspective. More precisely, REFLOW, while taking into consideration the global efforts for the promotion of CE by policy makers, states, and supranational organisations, and the already existing definitions, seeks to understand CE from a bottom up perspective. This means that REFLOW aims to redefine CE by paying attention to the mobilization and work of citizens and social innovators in bringing new and circular solutions and business model in their primary urban habitat. In order to do so, REFLOW, departs from its partners and stakeholders and in particular the way they make sense of the concept of circular economy and what it means for them.

### Overview of pilot cities' understanding of circular economy

A second way to address sense making has been to collect the different worldviews from the REFLOW stakeholders in relation to circular economy (CE). This is done thanks to the survey carried out by WP6 which provides an overview of how the stakeholders involved in the implementation of the cities' circular action plans understand circular economy. The survey's findings reveal seven major ways by which CE is understood among the project's stakeholders (Table 24). First, there are those who advance a holistic understanding of CE and stretch the systemic change that is required in all levels of economic and social life for it to make a difference. Here CE plays the role of an 'agent of change' and encompasses several if not all the visions that follow below. Second, and in contrast with the holistic vision, others understand CE as a matter of behavioural and habitual change. In this line of thought, CE is understood as a norm shaping individual and collective behaviours. Third, other stakeholders envision CE from a resource-based and material viewpoint. In this sense, CE is linked with the idea of changing the perception of waste from a remainder of other processes to a primary resource. A fourth vision of CE that was revealed through our survey was the governance-centred vision where stakeholders focus on how CE requires a change in the hierarchical mode of governance in modern societies. Indeed, many respondents highlighted that for CE to work a bottom-up mode of governance is necessary. Fifth, some stakeholders point out a technological vision of CE. According to this view, CE is a tool and instrument to multiply the impact of already existing projects. Similarly, but on a different level, the sixth vision of CE draws from stakeholders who approach CE from a business perspective. From their point of view, CE creates new opportunities for business and in so doing boosts both the economic and social role of businesses. Finally, the last and seventh vision of CE revealed by the survey focuses on how CE may offer solutions to challenges the world faces. In this sense, CE is seen rather as means to alleviate many of the problems modern life and mostly globalization has created in terms of environmental and social sustainability.

Vision of CE	Change	Impact
Holistic	Systemic	Sustainable future
Behavioural	Cultural	Sustainable behaviour
Resource-Based	Perceptions	Waste as a resource
Governance	Hierarchy	Bottom-up governance
Technological	Effectiveness	Productivity
Business	Role of business	Socio-economic contribution of business
Challenges	Response on problems	Alleviation of problems caused by globalization

Table 24. Overview of CE visions drawn from the survey conducted by WP6.

### 5.1.3 The REFLOW Vision

The REFLOW Theoretical Framework, together with a better understanding of the partners' interpretation of circular economy, allowed to better shape the vision of the *aspirational state* the project is pointing towards. This is represented by Figure 8. The centre of the figure represents the pilot cities, living through the interaction of the main stakeholders, namely municipalities, makerspaces (and Fab Labs), citizens and SMEs. The outer circle describes the pilots as circular and regenerative cities. Here, the main elements of a circular and regenerative city are represented by the building blocks (in green), which together represent different intertwined components of the urban system. Therefore, the REFLOW Vision has been described as follow:

*A circular and regenerative city in REFLOW represents an urban system with social and business practices which place equal attention to social, environmental and economic impact; where technology is open and represents a central enabler of positive social and environmental change; where the urban system ensures and support resilience of social and ecological systems; where governance is collaborative and inclusive; where knowledge is shared and stakeholders are active and involved.*



Figure 9. The REFLOW Vision Source: Copenhagen Business School

The REFLOW Vision describes in broad terms the “aspirational state” (Bien and Sassen, 2020) suggested by the process of sensemaking through the REFLOW Theoretical Framework and the cities' understanding of circular economy. It represents the *attractor that* sustains behaviour and generates change (Kuhn, 2018).

Yet, it is important to highlight that the REFLOW Vision is not set in stone but will evolve together with the project. Therefore, the vision is not built on discipline-specific definitions and it does not try to integrate the different identified



perspectives surrounding the concept of circular economy. Rather, it outlines the initial boundaries of the aspirational state – or the organising principles - that drive the transition towards a circular and regenerative city. In this sense, the REFLOW Vision has been developed to ensure the following 4 requirements:

- a) providing meaning to the concepts of circular and regenerative city
- b) ensuring interpretational flexibility to provide opportunities for discussion
- c) embracing a vision of circular economy that is rooted in plurality and dialogue.
- d) enabling freedom to explore the idea of circular and regenerative city in ways that make contextual sense.

The REFLOW Vision will be presented to the partners as part of the process of sensegiving. It will contribute to clarify the main principles guiding the pathway of change but will evolve in line with the same co-evolutionary dynamics characterizing the project.

## 5.2 The REFLOW Process

### Background: objectives of the REFLOW Process

In the process of scoping and analysing the process level challenges, the need for a common process emerged. The REFLOW Process has been developed to respond to the following suggested actions:

- Design a process that allows to systematically identify synergies between WPs and pilots; support collaboration between WPs; facilitate alignment between WPs and Pilot activities
- Design and visualize a simple-enough model to represent interdependencies and connections of the projects' components.
- Structuring knowledge sharing points in the form of focused, time-limited and well-structured feedback sessions.

The REFLOW Process describes the pathway of change to pursue the mission of the project and the alignment and coordination mechanism to enable the collaboration between the different stakeholders involved. The REFLOW Process is developed along two main frameworks.

### The REFLOW process as a pathway of change

First, the theory of change is used as a lens to describe **the pathway of change**. Anderson (2005) describes the pathway of change as *“a map that illustrates the relationship between actions and outcomes and shows how outcomes relate to each other over the lifespan of the initiative”* (2005: 3). Overall, **Theory of Change (ToC)** is used to critically approach the design, monitoring and evaluation of a program. In so doing, it is a critical thinking approach to program design, monitoring (De Silva et al. 2014). In this regard, the Theory of Change is described as *“a roadmap, a blueprint, an engine of change, a theory of action and more”* (Stein and Valters 2012: 3). In fact, the Theory of Change provides an explanation of how the stakeholders involved in an innervation expect to reach a shared long-term goal (Anderson, 2006). In so doing, the Theory of Change has been used not only as a monitoring and evaluation tool with regards to the journey of the pilot cities, but also as a baseline to understand the dynamics of the whole REFLOW system and develop a coherent alignment and coordination process.

Noteworthy, several limitations and drawbacks have been highlighted by scholars (Anderson, 2006; Bours et al. 2014)



and practitioners, especially with regards to the use of the ToC in situations which require to navigate complex change (Abercrombie et al. 2018). The most common pitfalls are:

- Keeping a narrow focus on the organisation while neglecting the context
- Emphasizing the attention on change towards *others* and overlook change towards ourselves
- Encouraging organisations to think in linear terms, with a narrow focus on simple cause and effect relations
- Becoming a 'safety tool' rather than a vehicle for social change, leading to focusing on a fixed plan while hindering continuous adaption to the context
- Viewing change as technical process bound to inputs and outputs rather than people and relationships
- ToC can be confusing to some and can lead to diagrams that difficult to interpret ('arrows going everywhere')
- ToC can be too abstract when it is limited to highlight a sequence of vague vision statements

To address and prevent these pitfalls it is necessary to develop a thorough understanding of the context, and critically reflect about the assumptions underlying the pathway of change (Anderson, 2006; Bours et al 2014; Abercrombie et al. 2018) and think systemically to the structures in which individuals are embedded (Abercrombie et al. 2018). Possibly, this should be done taking into consideration the entire group of organisations involved in the intervention (Abercrombie et al. 2018).

In REFLOW, each pilot city has developed a theory of change for each intervention, which focused on city-specific long-term desired change, and related intermediate outcomes, outputs, activities and assumptions made to address the pilot-specific problem. The development process included several months and several calls and meetings involving local partners to design the first version which informed the pilot case studies.

At the same time, in the attempt of developing the updated version of the REFLOW Process, a need emerged to develop a Theory of Change for the whole REFLOW project, which would describe the pathway of change in which all the partners in the consortium are involved. Being well aware of the pitfalls of the ToC, the project-level Theory of Change has been used as an initial attempt to clarify the Roadmap and blueprint of the project (Stein and Valters 2012), thereby informing the improvement of the coordination mechanism of the REFLOW Process.

### **The REFLOW Process as tool for alignment and coordination**

While the Theory of Change provides an understanding of the relationship between the project mission, desired outcomes, outputs and activities, The Circular Design Thinking phases framed by IDEO and the Ellen McArthur foundation have provided a general framework to describe the process that enables alignment and coordination between pilot cities and work packages.

More broadly, design thinking is defined as an approach (Brown, Wyatt, 2010) or a practice (Brown, Wyatt, 2010; Dorst, 2011) which nowadays *"is identified as an exciting new paradigm for dealing with problems in many professions, most notably Information Technology (IT) (e.g. Brooks, 2010) and business (e.g. Martin, 2009)."* (Dorst, 2011: 521). The leading design and innovation firm IDEO has pioneered the use of design thinking in different types of contexts and organisations and contributed to rethink the role of designers in social innovation processes (Bjögvinsson et al. 2012). In this regard, the IDEO chief executive Tim Brown provides the following suggestions (Bjögvinsson et al. 2012: 101):





*(1) that designers should be more involved in the big picture of socially innovative design, beyond the economic bottom line; (2) that design is a collaborative effort where the design process is spread among diverse participating stakeholders and competences; and (3) that ideas have to be envisioned, “prototyped,” and explored in a hands-on way, tried out early in the design process in ways characterized by human-centeredness, empathy, and optimism.*

In fact, design thinking refers to the development of design as an approach to tackling innovation challenges (Van der Bijl-Brouwer, Dorst, 2017). In this sense, it is increasingly considered a way not only to produce physical products, but most often as a process that leads to the creation of any type of intervention (Van der Bijl-Brouwer, Dorst, 2017). This design-based approach to innovation integrates traditional design practices, such as iterative design and prototyping as well as a system approach and a multidisciplinary approach (Van der Bijl-Brouwer, Dorst, 2017).

In particular, such an approach is considered to ‘humanising’ the innovation process, being this rooted in the understanding of people, their objectives and problems, aspirations and worldviews (Van der Bijl-Brouwer, Dorst, 2017). Here, the link between design thinking and human-centred design is evident. Human-centred design refers to a “*group of methods and principles aimed at supporting the design of useful, usable, pleasurable and meaningful products or services for people. The main principle of these methods is that they describe how to gain and apply knowledge about human beings and their interaction with the environment, to design products or services that meet their needs and aspirations*” (Van der Bijl-Brouwer, Dorst, 2017: 2). Today this approach is centred around the understanding of people needs and aspirations to inform the design of an innovation process for social interventions (Van der Bijl-Brouwer, Dorst).

In this context, many public and private organisations have turned to design thinking tools and techniques to tackle today’s societal complex, networked problems. However, this turned out not always to be a straightforward process. In particular, the effort to get a certain degree of control over the possibly confusing design processes, has led design practitioners to decouple complex design processes into simpler steps. This has resulted into models of designing that go from the initial problem to a solution in a series of divergent and convergent phases, commonly symbolized with the shape of a double diamond.

In REFLOW human-centred design and design thinking inform the approach to pursue the mission of the project. The three-year timeline of the project is represented with the double diamond. The convergent and divergent phases symbolize the process to develop the pilot cities’ interventions with the support of the work packages.



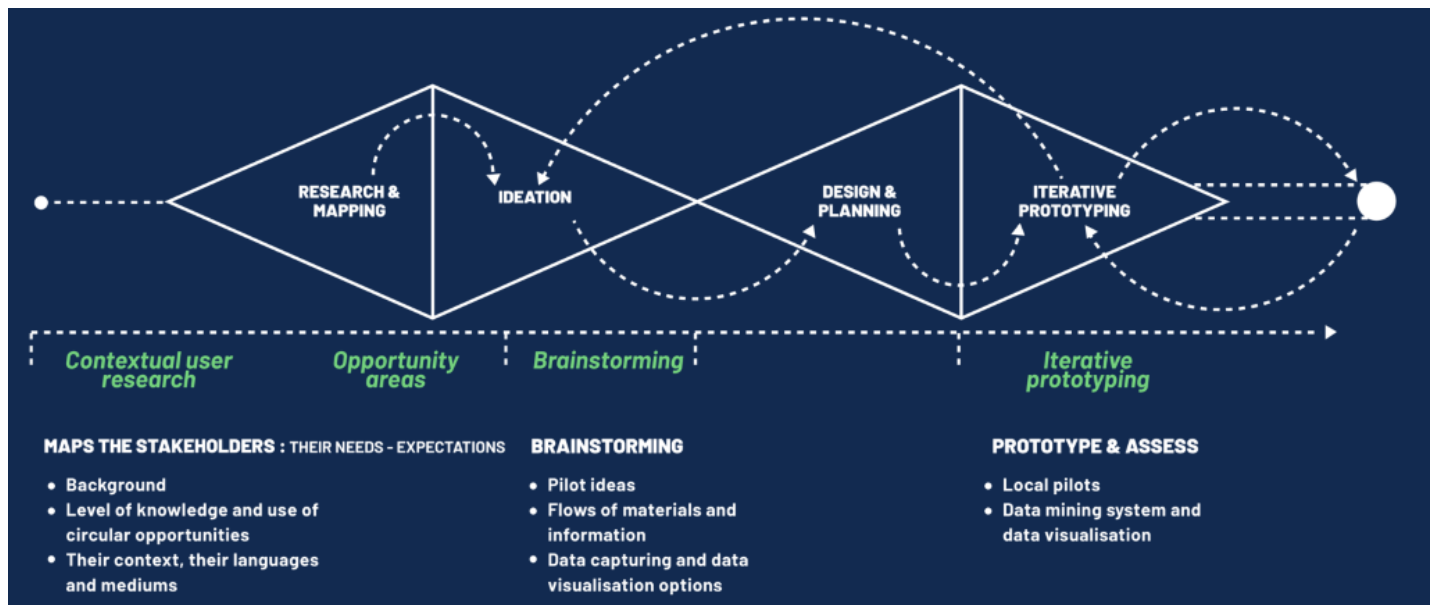


Figure 10. The REFLOW Process represented in a double diamond

In particular, the tasks of WP1 – responsible of facilitating the co-design activities of the project – structure on the four phases represented in the double diamond:

- **Research & Mapping** refers to the collection of insights into the behaviours of citizens and institutions through field research. In line with the human-centred design approach this focuses on understanding the needs of the pilot cities to adopt CE practices.
- **Ideation** focus on the exploration of different possible directions, in order to share and inspire a more defined solution. This step is aimed at grounding the results of the research phase into local pilots. In this stage the co-creation workshop in M8, served as a moment to collect feedback and modify the design directions accordingly. Ideation and brainstorming started early on with the project. On the one hand, the pilot cities focused on the ideation of initial solutions for their interventions, and the work packages – based on the insights from the local partners – focused on the development of the REFLOW resources.
- **Design & Planning** relates to the definition of the Action Plans in terms of flows of materials, stakeholders involved, public areas and building used, logistic, equipment, business agreements and regulations.
- **Iterative Prototyping** refers to the iterative development of the pilot cities' solutions.

Design thinking and human-centred design have been crucial in setting the overall approach to REFLOW. In fact, this has been based on constant interaction and co-design with the local partners, i.e. the users of the REFLOW resources. Moreover, it has provided a helicopter view of the project to set the pace of the development of the project. Nevertheless, it has not prevented for the challenges identified to emerge.

### Design thinking in REFLOW: from the Double Diamond to the Circular Design Framework

While the double diamond remains useful to have a helicopter view over the main phases of the process, it is not enough to develop an effective coordination and alignment process. Instead, the Circular Design Guide developed by IDEO and



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the Ellen MacArthur Foundation has been identified as a better framework to represent and facilitate the day-to-day activities of the project.

During the first 12 months the limits of the double diamond representation emerged. In particular, it has been noted how the different phases depicted in the double diamond in reality occur in shorter 'sprints' where "Design & Mapping", "Ideation", "Design and Planning" and "Iterative Prototyping" represent overlapping stages of a continuous iterative innovation process. For example, the research & mapping activities have been conducted by pilot cities and work packages, through the whole first year of the project, and will continue throughout the whole project as part of the continuous learning and adaptive process. Similarly, the ideation started early on with the initial development of the interventions. However, new ideas have been required as the context changed. One example is provided by the adjustment required by the COVID-19 pandemic in the end of the first year. On the same line, design & planning has been continuous throughout the first year, with incremental adjustment resulting from the research and mapping and ideation activities. Iterative prototyping has not started yet for the most part. However, some resources such the REFLOW OS (WP2) or the Action Event Tracker (WP7) have already gone through at least one prototyping sprint over the first year. Moreover, the prototyping of the possible solutions of the pilots will most likely occur at different times of the project timespan.

The Circular Design Framework is conceived as a model for the redesign of *"products, business models, cities, and the linear systems that have lasted for the past centuries."* (EMF, 2020).

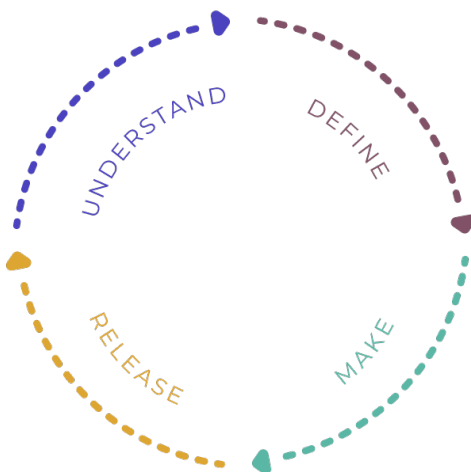


Figure 11. Circular Design Framework. Source: Ellen MacArthur Foundation and IDEO (2020).

Like the double diamond, the circular design process is informed by design thinking and human-centred design and consists of four different phases:

- **Understand** - Get to know the user and the system
- **Define** - Put into words the design challenge and your intention as the designer
- **Make** - Ideate, design, and prototype as many iterations and versions as you can

- **Release** - Launch your design into the wild and build your narrative - create loyalty in customers and deepen investment from stakeholders by telling a compelling story

The model is described as *“an iterative process that never finishes”* which allows to constantly test and refine along with the increasing understanding of the people that interact with the design. Most importantly a central aspect of the process is in building *feedback loops* that *“help identify and address the unintended consequences of our design decisions”*. This is done to be able to both *zoom in* on the user needs and *zoom out* to consider the systemic implications of the design innervation, thereby maintaining a critical perspective and being able to adapt if needed.

The model has been used to inform the redesign of the REFLOW Process, in order to address the alignment and coordination challenges identified on a project level. In so doing, the four phases of the circular design process will be used to inform alignment and coordination on a project level, facilitating the interaction between pilot cities and work packages.

In fact, the concept of circular iterative processes is not new in project management. For example, the PDCA (Plan-Do-Check-Act) cycle developed by Deming in 1993 is a milestone in the managerial accounting literature. Looking at one of its versions, the PDSA (Plan-Do-Study-Act) model (Moen, 2009) the link to the process described in this report appears even more relevant. These models introduced the principles of continuous improvement and adjustment in the management of adaptive processes. They are described as *“flow diagram[s] for learning, and for improvement of a product or of a process.”* (Moen, 2009: 7).

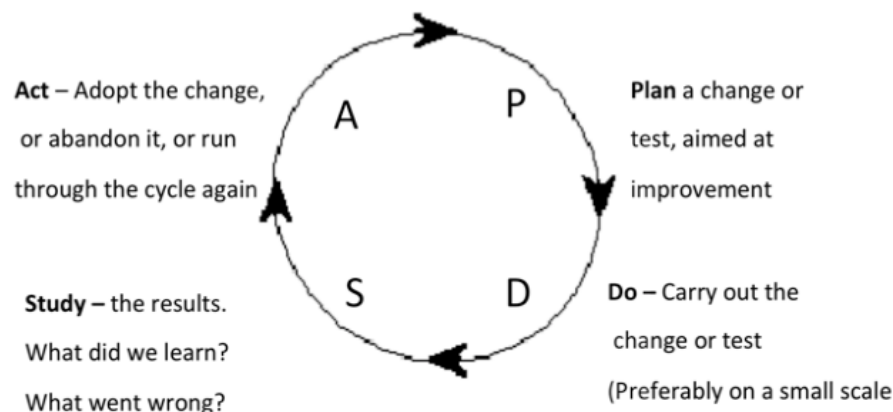


Figure 12. PDSA model. Source: Moen (2009).

Similarly to the Circular Design model, the PDSA model describes four iterative phases (1) Planning, which refers to the definition of actions to be taken for desirable changes based on available data or possible new observations; (2) Doing, referring to the implementation of the change, possibly on a small scale; (3) Studying the effects of the change; (4) Acting, which refers to the immediate action informed by the changed occurred (Moen, 2009).

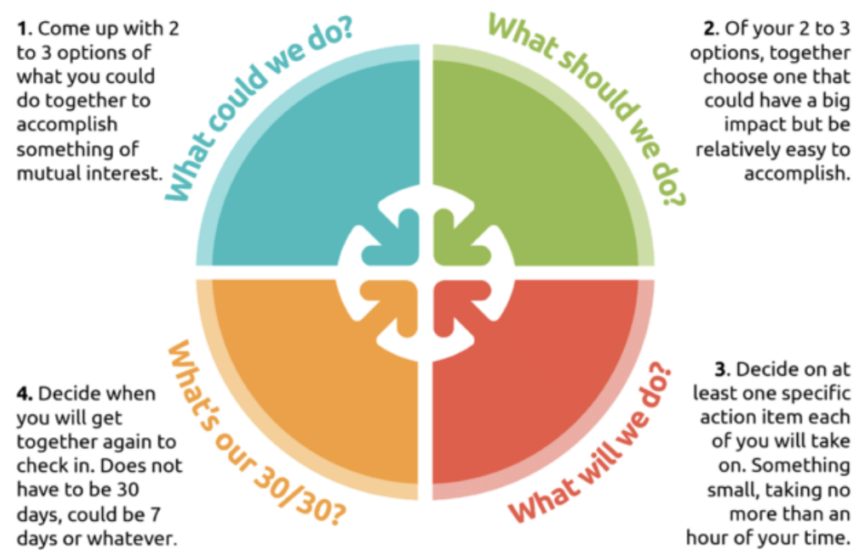


Figure 13. Strategic Doing Cycle. Source: Morrison et al. (2019).

More recently, Morrison et al. (2019) proposed the Strategic Doing Cycle as a model to develop organisational or ecosystem transformation when dealing with complex adaptive systems. The model has been developed and iterated over more than a decade with several interventions, in response of the challenges emerging with complex multi-stakeholder collaborations. Like the previous two, this is based on four questions (Figure 12) and the iteration of continuous learning loops to ensure support the effective working of a project.

### Theory of Change and design thinking

The Theory of Change (ToC) and the design thinking approach are used complementarily to develop the REFLOW Process. Both methods are widely used by organisations involved in innovation for social change. In fact, both the ToC and the design thinking approaches deal with the creation of a desired impact and have to do with the intermediate steps to achieve it (Anderson, 2009; Dorst, 2017). In regards of design, Dorst (2019) notices how:

*“According to formal logic, the world is made up of elements, which are the “what” of a reasoning process; the connections between these elements, which we may call the “how” of a process; and the outcome of the reasoning process, in which the elements have interacted.*

WHAT + HOW leads to OUTCOME

*There are four basic patterns of reasoning: deduction, induction, normal abduction, and design abduction. Leaving the first three aside, we will focus here on design abduction. In design abduction, to begin with, all we know is something about the outcome, the desired value.*

???? + ???? leads to OUTCOME

*The challenge lies in figuring out what new elements to create, even though there is no known (or chosen) how that will lead to the desired outcome. As they are dependent on one another, the what and the how have to be developed more or less simultaneously. This double creative step requires designers to devise proposals for both the what and the how and test them in conjunction. The only way to approach this open problem situation is to work backwards (from right to left in the equation): starting from the only known in the equation, the desired value, and then adopting or proposing a new how.” (2019: 119).*

In other words, the design process poses the challenge of simultaneously identifying what outputs to create, and how to do it, in order to achieve the desired impact. In so doing, designers have to work backwards, from the desired value to propose new ways of doing. Similarly to the design thinking process, while developing a Theory of Change the starting point is constituted by the desired long-term change to achieve, while the “what” – the activities, outputs, and mid-short-term outcomes – have to be “figured out” (Anderson, 2009). The same can be said for the “how” – the pathway of change (Anderson, 2009). Similarly to the design process described by Dorst, the Theory of Change proceeds “backwards” from the desired impact to the activities, outputs, outcomes to be achieved to fulfil the objective, with a thoughtful reflection on the assumption made in theorizing the pathway of change (Anderson, 2009).

In this sense, these two approaches are used in conjunction. On the one hand, the theory of change helps describing the pathway of change in terms of desired impact, outcomes, outputs and activities identified in the REFLOW project. On the other hand, design thinking, and in particular the Circular Design Framework, provide a guideline to facilitate the design process along the pathway of change.

### The REFLOW Theory of Change

The Theory of Change of REFLOW was introduced by the coordination team (see Pilot Coordination building block) as a lens to develop the REFLOW Process. The analysis presented in this report constitutes a first step to a more in-depth definition of the overall project Theory of Change (ToC) where the main stakeholders will be involved to fine-tune and better define the different elements of the ToC framework.

The ToC process is participatory by nature. In this sense, all the information included in the Theory of Change is the result of in-depth discussions between the project partners, although such discussions were not conducted with the explicit objective of developing a ToC. For example, the following sources were used to inform the project-level ToC.

- **The Grant Agreement (GA).** This document provides an in-depth description of the strategic objectives of the project, stakeholders involved in the project, planned activities and methodologies envisioned by the partners at the project outset. Being the GA the output of discussions and of the alignment of the partners’ interests, it was used as a starting point to develop the different elements of the ToC.
- **Meetings minutes.** During the first 12 months of the projects several meetings took place involving different partners at different times. These represented crucial moments of discussion regarding project objectives and activities. The meeting minutes were used to adapt the Theory of Change to the reality of the project.
- **Pilot Cities Theory of Change.** The theory of change process followed with the pilot cities provided the ground to relate the project-level activities to the reality of the Pilots.



The ToC was developed and discussed in different sessions within the Pilot Coordination team and approved by the reviewers of the deliverable. In order to better understand all the concepts included in the Theory of Change, the following table (Table 25) summarizes the main terms.

Term	Definition	Project-level example	Pilot-level example
<b>Impact</b>	The real-world change you are trying to affect. The program may contribute towards achieving this impact, and not achieve it solely on its own.	Enabling transition towards becoming a circular and regenerative city.	Increase efficiency in energy consumption and reduce CO2 emission through a circular model.
<b>Long-term changes</b>	The outcome the program can change on its own. Long-term changes are the results that derive from an accumulation of outcomes. This will be the primary outcome of the evaluation.	Created knowledge and resources for European cities to learn and replicate how to implement a transition to become circular and regenerative.	Increase energy efficiency of buildings in the greater metropolitan area of Cluj-Napoca.
<b>Outcomes</b>	What we achieve. The intended results of the activities undertaken. Things that don't exist now but need to exist for the logical causal pathway not to be broken and the impact achieved. **The logical and sequential connections between shorter-term outcomes and longer-term outcomes that are illustrated on the ToC diagram as arrows.	Implementing a common strategic vision of circular and regenerative cities by tailoring it to the different urban and peri-urban experimentations areas.	a) Development of a system (i.e. business model) to increase circularity of food markets b) Changes in knowledge, attitudes and skills of citizens to enable the engagement in circular practices.
<b>Outputs</b>	What we produce. Outputs are the tangible products as a result of the activities. They are usually expressed as nouns, are tangible and can be counted.	REFLOW Resources (e.g. REFLOW OS).	Workshop to raise awareness about food waste.
<b>Activities</b>	What we do. Concrete actions undertaken by different teams in the consortium (provide, coordinate, make, deliver, etc.	Co-design sprint for the REFLOW OS.	Organising Workshop about food waste.
<b>Stakeholders</b>	All the actors that are involved in the pathway to generate the expected impact.	REFLOW Consortium and organisational bodies (e.g. WPs, pilot cities, others).	Local Consortium.
<b>Audience / Beneficiaries</b>	The actors that are affected by the problem and will benefit from the intervention.	(1) Pilot cities (2) other cities (3) EU.	Citizens, Municipalities, SMEs, Fab Labs.
<b>Problem (challenge)</b>	What we want to solve. The problem statement describes the problem,	Lack of evidence in how to enable this transition in a	Municipal covered markets at risk of divestment and

	why it is a problem (incl. root causes).	systemic way is an obstacle to provide European urban systems with the knowledge and resources required to enable this change.	abandonment by commercial operators.
<b>Pathway</b>	The sequence outcomes must occur in order to reach your long-term goal. Most initiatives have multiple pathways which lead to the long-term goal.		

Table 25. Glossary of terms used in Theory of Change methodology.

Based on the Theory of Change methodology, the following first iteration of Theory of Change of REFLOW has been developed in order to inform the development of REFLOW Process. Further iterations will take place with the key REFLOW stakeholders to fine-tune and further develop the diagram, taking the ToC below (Table 26) as a starting point.

THE THEORY OF CHANGE OF REFLOW	
<b>Problem</b>	<b>What is the Problem that REFLOW is addressing?</b> Only a very limited number of examples do exist to understand how to implement CE in urban ecosystems. This hinders the translation of the EU Circular Economy Action Plan into concrete actions that European cities can implement to undertake the transition to become circular and regenerative. Lack of evidence in how to enable this transition in a systemic way is an obstacle to provide European cities with the knowledge and resources required to enable this change.
<b>Beneficiaries</b>	<b>Who will benefit from the REFLOW intervention?</b> The beneficiaries of the REFLOW intervention will be <ul style="list-style-type: none"> <li>• <b>Pilot Cities</b>, which are experimenting and implementing new solutions to become circular and regenerative.</li> <li>• <b>Other Cities</b>, that will be able to replicate the experience of the REFLOW pilot cities.</li> <li>• <b>The EU</b>, that will benefit from real-life examples of CE implementation which can inform European, national or regional policies.</li> </ul>
<b>Stakeholders</b>	<b>Who are the stakeholders involved?</b> <ul style="list-style-type: none"> <li>• <b>Internal stakeholders</b> involve the whole REFLOW Consortium and organisational bodies (e.g. WPs, pilot cities, others).</li> <li>• <b>External Stakeholders</b> involve the stakeholders of the REFLOW pilot cities and other external factors involved during the project (e.g. Community of Practice; Covenant of Mayors).</li> </ul>
<b>Activities</b>	<b>Which are the activities undertaken within REFLOW?</b> The partners involved in the project undertake a broad number of interrelated activities. For the sake of simplicity, these can be grouped into 4 categories: <ul style="list-style-type: none"> <li>• <b>Pilot Activities.</b> The concrete actions undertaken by the pilots in their pathways of change (e.g. organising workshops; map stakeholders). These refer to the activities listed in each pilot's Theory of Change. The related outputs are the pilots' outputs.</li> </ul>



	<ul style="list-style-type: none"> <li>• <b>WP Activities.</b> The concrete actions undertaken by the WPs to produce their deliverables (e.g. interview pilots, do desk research, look for best practices, write deliverables). The activities are informed by the theories and methods upon which the WPs base their work. Each activity is related to one or more of the tasks listed in the REFLOW Grant Agreement and is always related to at least one Deliverable. The related outputs are the REFLOW Deliverables.</li> <li>• <b>Co-Design Activities.</b> The concrete actions undertaken by the WPs and the Pilot's together to develop the REFLOW Resources (co-develop REFLOW OS, co-develop PCT, co-develop KPIs, co-develop MFAs, co-develop CCAP). The related outputs are the REFLOW Resources.</li> <li>• <b>Coordination Activities.</b> The concrete activities that are aimed at coordinating and aligning the stakeholders involved in the project (e.g. understand synergies, align roadmaps, organise REFLOW workshops, develop REFLOW Process, set-up COVID-19 taskforce). Coordination activities are based upon the REFLOW Theoretical Framework, which integrates the different methods and approaches selected and used by the WPs along the process. The related output is the REFLOW Vision and Process.</li> </ul>
<b>Outputs</b>	<p><b>What are the main outputs that REFLOW expects to generate?</b></p> <ul style="list-style-type: none"> <li>• <b>REFLOW Vision.</b> The REFLOW Vision is the common strategic vision and understanding of circular and regenerative cities developed in the project, tailored to different urban and peri-urban environments. This is periodically updated as a result of an ongoing learning process.</li> <li>• <b>REFLOW Process.</b> The REFLOW Process is the iterative process to update the vision and implement it in the pilot cities. Both the Vision and the Process are the result of an iterative learning process, informed by the evolving experience generated in the Consortium. The REFLOW Process is the result of the ongoing coordination activities and is periodically updated.</li> <li>• <b>Pilots' Outputs.</b> Each Pilot cities generate different specific outputs from the specific activities they work on. These are represented in the pilots' specific Theory of Change.</li> <li>• <b>REFLOW Deliverables.</b> These are specific outputs listed in the REFLOW Grant Agreement that must be produced at a given moment during the project timeline. Each deliverable is assigned to one work package.</li> <li>• <b>REFLOW Resources.</b> These are outputs (e.g. <i>information, special report, a technical diagram brochure, list, a software milestone or other building block of the project</i>) developed or used during the REFLOW Process to enable the transition towards circular and regenerative cities.</li> </ul>
<b>Outcomes</b>	<p><b>What are the main outcomes that REFLOW expects to create?</b></p> <p>The overall long-term change that REFLOW expects to have is to create knowledge and resources for European cities to learn and replicate the path to becoming circular and regenerative. The outputs of the project are linked to the following outcomes, which altogether contribute to achieve the long-term impact:</p> <p><b>1) Implementing a common strategic vision of circular and regenerative cities</b> by tailoring it to the different urban and peri-urban experimentations areas.</p>

	<p><b>2) Defining the social, environmental and economic impact of the transition towards a circular and regenerative model.</b> This element will allow other cities to perform an assessment of the impact <i>ex-ante</i> based on the experience of the REFLOW pilots.</p> <p><b>3) Creating a set of digital sustainable tools</b> to implement the vision of circular and regenerative cities.</p> <p><b>4) Ensuring replication and sustainability</b> for the long-term governance transition of European cities towards CE.</p> <p><b>5) Increasing circularity of six materials</b>, one for each pilot city involved in REFLOW. Generated sustained active engagement of the citizens (and grassroots organisations involved during the project) in supporting the city's circular transition.</p> <p><b>6) Understanding and demonstrating</b> how the reconfiguration of the urban metabolism can enable the transition to circular and regenerative cities (i.e. achieve the mission).</p>
<b>Long Term Impact</b>	<p><b>What is the ultimate impact that REFLOW wants to have?</b></p> <p>The real-world change that REFLOW wants to contribute is to enable the transition towards circular and regenerative cities.</p>

Table 26. Theory of Change of REFLOW.

### Circular Design Thinking for Alignment and Coordination

The Theory of Change makes evident several intertwined activities taking place in the project to produce different *types* of outputs. In particular, the development and facilitation of the REFLOW Process consist in a Coordination Activity. In so doing, it mainly focuses on the facilitation of the co-design activities, since both the WP activities and pilot activities refer to the actions taken by the individual WPs and pilot cities in the deployment of their work. In this regard the co-design activities are those that have the REFLOW Resources as main outputs, which in fact require a in depth understanding of the pilot cities' context, and of the users of these resources on a local level.

The process not only has to guarantee enough coordination for all the REFLOW Resources, but also the space for synergies between WPs to be identified, and for plans to be adjusted according to the co-evolutionary dynamics affecting the pilot cities on a local level and the work packages on a project level. Moreover, this must be done in a way that prevents confusion and most importantly work overload for the pilot cities.

The REFLOW Process is based on the 4 phases of the Circular Design Framework and on learning loops framed as Knowledge Sharing Points. These are considered as regular "pauses" to share the knowledge gained throughout the co-design activities.

The REFLOW Process has been framed as follows:

## 1) Preparation: Development of WP Roadmaps with Co-Design Activities

The starting point of the process is the understanding of each roadmaps of each work package (WP). This refers to the representation on a timeline of all the specific activities that the WP envision for the development of their work. Within the roadmap the expected moments of interactions with the pilots are highlighted. WP-pilot interactions are learning points for both the WPs and the pilots. These are periods of meetings / conversations / co-design sprints between WPs and pilots as part of specific activities of the WPs. During these interactions, the WP learns something new about the pilots, such as:

- New WP specific information (e.g. policy screening, material flows, preferred business models, etc.).
- New challenges for the pilots.
- Any other relevant information.

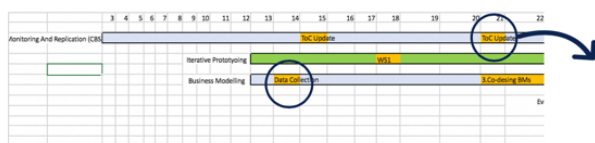
The ideal period of Co-Design activities is included in the overall project Roadmap (i.e. 6 months) in advance by the WP. This can be in general the month(s) in which the interaction might take place.

This process allows on the one hand to the other WP to be aware of the next steps of the other partners, thereby gaining a better understanding of the overall project development. On the other hand, it facilitates the coordination of the pilot cities, by helping the Pilot Coordinator to have an overview of the expected work of the pilot cities and coordinate the local partners accordingly.

Once the period of Co-Design activities is identified and set, an initial date for the related Knowledge Transfer Point (described below) is selected based on the WPs' Roadmaps.

To facilitate this step, a series of interviews with the WPs took place in order to provide an initial draft of the Roadmaps, which will be then revised by each WP.

## WP-Pilots interaction



### Co-Design Activities

**WPs-Pilots interactions are learning points for both WPs and Pilot Cities**

These are periods of meetings / conversations / Co-design sprints between WPs and Pilots.

During these interactions, the WP learns something new about the Pilots, such as

- New WP specific information (e.g. policy screening, material flows, preferred business models, etc.)
- New challenges for the Pilots
- Any other relevant information

#### FORMAT

**Duration:** depending on WP's need. For interactions with all the Pilots to be completed, It might take from few days to weeks.

**Dates:** the period of WP-Pilot interaction is decided in (i.e. 2 months) in advance by the WP as part of the Roadmapping process. This can be in general the month(s) in which the interaction will take place.

Figure 14. WP-Pilots interaction. Source: Copenhagen Business School

## 2) Alignment and coordination through Circular Design Thinking

Knowledge Transfer Points constitute the beginning of the Circular Design Thinking iteration, across the understand, define, make and release phases.

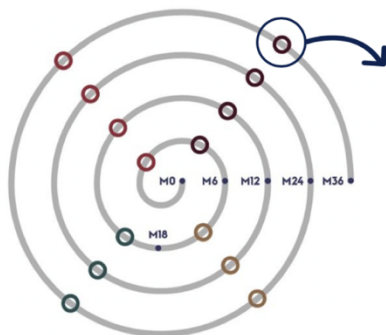
In general, three meetings are aimed at identifying synergies between WPs and align WPs Roadmaps to better support the pilot cities and fine-tune the development of REFLOW Resources.

Knowledge Transfer point take place after a one round of Co-Design Activities is completed. Here, the WP that just completed the interaction with the cities shares the new learnings and discoveries. These are discussed to:

- Understand in-depth information about the pilot cities from the WP's perspective.
- Identify opportunities for synergies between WPs.
- Adjust the WPs Roadmaps accordingly.

Knowledge Transfer points might actively involve pilot cities either actively, directly sharing new knowledge gained or presenting new challenges emerged or participating to the presentation and discussion from one WP.

## Knowledge transfer points



### Knowledge transfer point

**Knowledge Transfer Points are meetings to identify synergies and align WPs Roadmaps**  
These meetings / conversations occur after a WP-Pilot interaction is completed. During these meetings, the WP that just completed the interaction shares the learnings and discoveries with the partners. These are discussed to:

- Understand in-depth information about the Pilot cities from the WP's perspective
- Identify opportunities for synergies between WPs
- Adjust the WPs Roadmaps accordingly

#### FORMAT

**Duration:** 1.5 hour

**Facilitation:** Structured meeting (agile-type) with time set for 1) learnings; 2) synergies; 3) next steps

**Dates:** the day of the meeting is agreed with the responsible WP in advance based on when the WP-Pilot interaction is expected to be concluded



Figure 15. Knowledge transfer points. Source: Copenhagen Business School

Starting with the Knowledge Transfer Point, the whole process develops according to the four phases of the Circular Design Framework.

The **Understand** phase refers to the moment in which WPs discuss the outcomes of the interaction with the Pilot cities. This is concluded when the problem/challenge/context to address has been identified and understood. As part of this first step, follow ups to complete the discussion and complete the **Understand** phase can be set up if needed.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement number 820937.

The **Define** phase refers to the moment where opportunities for synergies are discussed and eventually identified. This phase is concluded when intention for next steps have been communicated to the other WPs, and the Roadmap(s) updated accordingly. Next steps might involve more than one WP in case of relevant synergies or opportunities for collaboration have been identified and agreed upon.

The **Make** phase entails the ideation, design, and prototype of as many iterations and versions needed (i.e. in regards of the update of REFLOW Resources, development of new ones, or implementation of had hoc solution to address a pilot challenge). This might lead to another sprint of Co-Design Activities, which would then be included in the roadmap and linked to a subsequent knowledge transfer point. The make phase is completed when the *solution* is released to the pilot cities for use.

The **Release** phase consists in the presentation of the solution, i.e. the REFLOW Resource, to the pilot cities. The REFLOW Resource will be used, and feedback will be collected from the pilot cities. A knowledge transfer point can be set up as a moment for sharing feedback or to address challenges emerging after the use of the resource.

## Circular Design Thinking

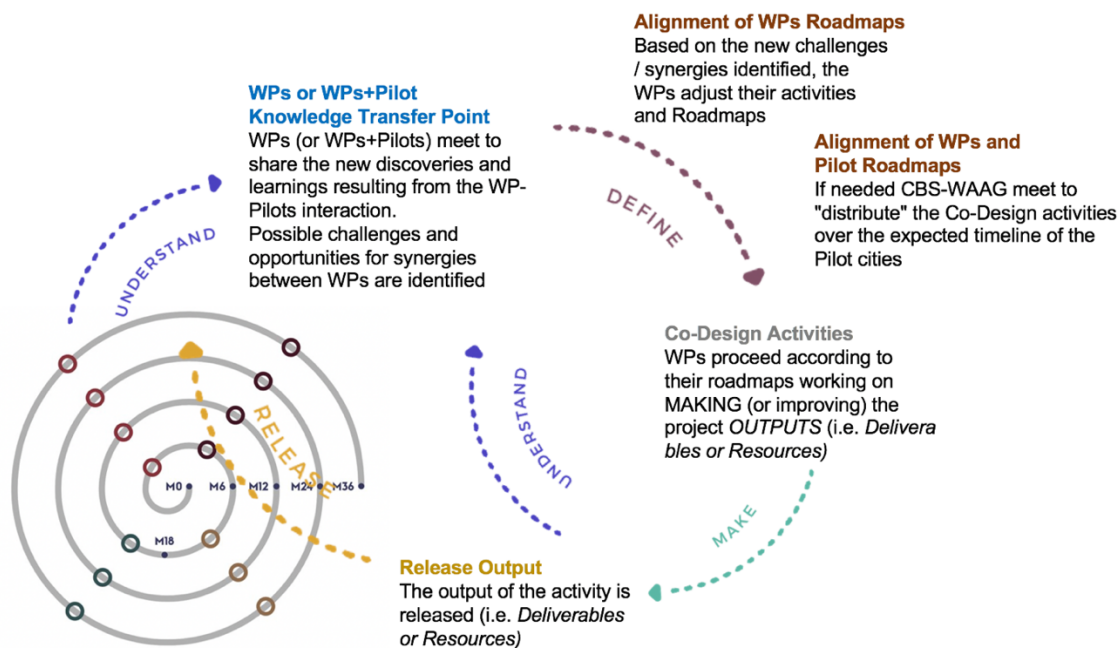


Figure 16. Circular Design Thinking. Source: Copenhagen Business School

## 6. Make - REFLOW Resources for circular transitions

### Background

In the previous section we have introduced the REFLOW Process and the REFLOW Vision, the two resources developed to address the project-level challenges identified.

First, the REFLOW Vision outlines the aspirational state the REFLOW mission points towards. It is based on the building blocks of Business & Society, Technology, Circular Engineering, Governance & Urban Strategy, Capacity Building and Communication, which represent the components of an aspirational circular and regenerative city. The REFLOW Vision is based on the REFLOW Theoretical Framework, which describes the sources of knowledge of each building block, including those of Pilot Coordination and Process Coordination.

Second, the REFLOW Process represents the alignment and coordination mechanism that supports the co-design activities of the project, in which the work packages and pilot cities interact to develop the resources to enable the development of the Cities' Circular Action Plans.

This section describes the resources under development in the REFLOW Process that support the pilots in their transition to become circular and regenerative cities. Each resource is the result of the co-design activities that took place in the first 11 months of the project. These activities were carried out by the REFLOW work packages and local partners and can be linked to the Cities' Action Plans.

### 6.1 REFLOW Resources overview

Figure 16 provides an overview of all the Resources developed in REFLOW so far. Each resource is developed under the responsibility of one work package informed by the knowledge of the related building block. Some of the resources are developed in collaboration between more work packages, when synergies are identified. In Figure 16, the orange hexagon (Pilot Framework) represents the resource developed by WP5 – within the Pilot Coordination Building Block. The green hexagons (REFLOW Vision, REFLOW Process, Cities' Circular Action Plans) represent the project level resources.

In the following tables, the main characteristics and features of each resource are described. The table specifies the name of the resources, the main related building block and work package and provides the link to access additional information.



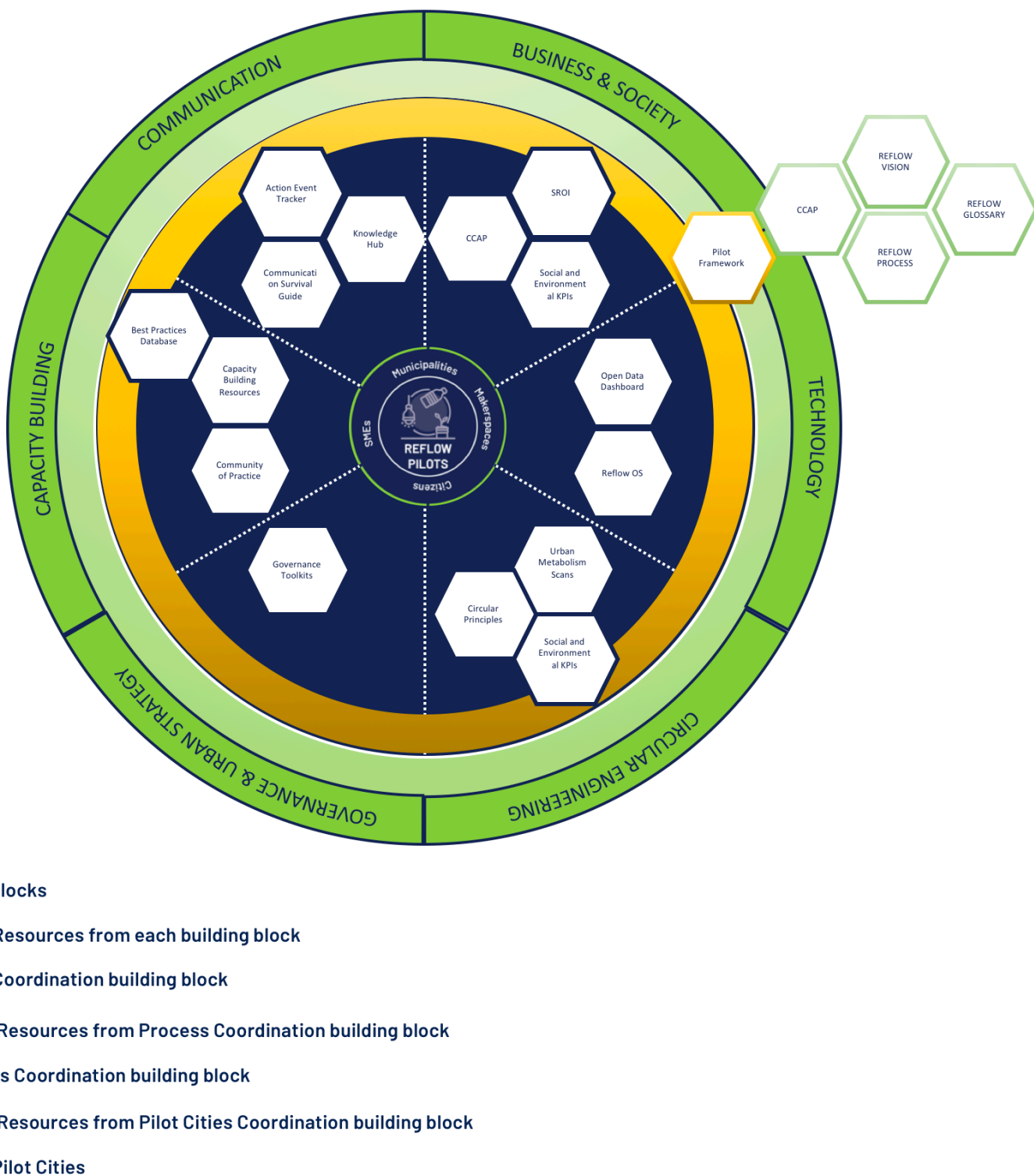


Figure 17. Overview of resources in REFLOW within each building block. Source: Copenhagen Business School



Resource Name	Cities' Circular Action Plans
Main Building Block	Process Coordination
Responsible WP	WP1
Other WPs Involved	
Description	<p>The Cities' Circular Action Plans (CCAP) are roadmaps for the transition toward circular and regenerative cities. The report containing the CCAP gathers the competences of the consortium to create viable ways for the pilot cities to implement CE practices and ensures replicability. In line with the overall structure of the project, The REFLOW Cities' Circular Action Plan operates on two levels: Project Level and Pilot Level. On a Project Level, the CCAP is described as the overall Roadmap that determines the general direction and modes of organising of the whole consortium. On a Pilot Level, the CCAP refers to the specific action plans created by the REFLOW cities, within the broader Roadmap of the project. The action plans are mainly concerned with the management and implementation of local activities aimed at achieving the pilot-specific objectives. The CCAP gathers the resources created and implemented by the project consortium to overcome the challenges encountered or expected by the pilot cities.</p>
Additional information	See Introduction
REFLOW Cities Using this	All the cities
Contribution to the REFLOW Objectives	<p><b>Implement a common strategic vision.</b> The CCAP plays a central role in the alignment of the consortium to the overall strategy of the project. In fact, its focus is to foster and support the development of Cities' Action Plans by aligning the numerous competences present in the project to their support.</p> <p><b>Replication.</b> The CCAP will be translated into a living, online resource (a replication handbook) that will remain active beyond the life of the project itself. This will ensure a relevant support to the pilot cities throughout the project length and will foster replication beyond the project's duration.</p> <p><b>Understand and demonstrate.</b> The CCAP has been thought as a resource to translate and operationalise the project's overall strategy. Its role is to support the pilot cities and define best practices that describe efficient business models for circular and regenerative cities.</p>
Current status	The CCAP as a report was completed in May 2020 (month 12 of the project) and the online CCAP will be developed throughout the project and will last beyond the life of the project itself.

Resource Name	REFLOW Vision
Main Building Block	Process Coordination
Responsible WP	WP1
Other WPs Involved	All WPs
Description	<p>The REFLOW Vision describes in broad terms the “aspirational state” guiding the pathway of change of the Pilot Cities in the transition toward becoming circular and regenerative.</p> <p>By describing how the partners understand Circular Economy and envision the transition toward circular and regenerative cities, the REFLOW Vision aims at holding the REFLOW process and the Cities’ Action Plans in particular patterns, acting as organising principle guiding behaviour.</p> <p>In doing so, it provides a baseline for a common understanding of the whole consortium of how different partners at different levels of the projects understand the transition. This is based on two main elements. First, it is informed by the REFLOW Theoretical Framework, which describes the knowledge underlying the different building blocks of REFLOW, contributing to the development of the Cities Action Plans.</p> <p>Second, the REFLOW Vision is informed by how the different stakeholders involved in the Cities Action Plans understand circular economy, in light of their learning experience through the transition process.</p> <p>By taking into account the evolving experience of the partners involved in the transition, the REFLOW Vision is not set in stone but will evolve together with the project. In fact, the vision is not built on discipline-specific definitions and it does not try to integrate the different identified perspectives surrounding the concept of circular economy. Rather, it outlines the initial boundaries of the aspirational state – or the organising principles - that drive the transition towards a circular and regenerative city. In this sense, the REFLOW Vision has been developed to ensure the following 4 requirements:</p> <ul style="list-style-type: none"> <li>a) providing meaning to the concepts of circular and regenerative city</li> <li>b) ensuring interpretational flexibility to provide opportunities for discussion</li> <li>c) embracing a vision of circular economy that is rooted in plurality and dialogue.</li> <li>d) enabling freedom to explore the idea of circular and regenerative city in ways that make contextual sense.</li> </ul> <p>Based on these principles, the REFLOW Vision will contribute to clarify the key</p>

	principles guiding the pathway of change but will evolve in line with the same co-evolutionary dynamics characterizing the project.
Additional information	See Section 5
REFLOW Cities Using this	All the Cities
Contribution to the REFLOW Objectives	<p><b>Implement a common strategic vision.</b> The REFLOW Vision consists in the common strategic vision that will be implemented through the project. In this sense, its successful development represents one of the main objectives of the project.</p> <p><b>Replication.</b> By the end of the project the REFLOW Vision will describe the key features of the ideal circular and regenerative city based on the learning experience and evolution of the REFLOW Pilot Cities. This will facilitate the replication of the REFLOW process for other cities interested in starting the transition.</p> <p><b>Understand and demonstrate.</b> By mapping the shared understanding of Circular Economy and Circular and regenerative cities the REFLOW Vision will contribute to better understand these concepts by contextualising them according to the experience of the REFLOW partners.</p>
Current status	<b>Under development.</b>

Resource Name	REFLOW Process
Main Building Block	Process coordination
Responsible WP	WP1
Other WPs Involved	All WPs
Description	<p>The REFLOW Process provides a general framework to align and coordinate the REFLOW partners in their transition. It consists of coordination mechanisms introduced to facilitate collaboration and implementation of the Cities' Action Plans. The REFLOW Process is based on two main pillars. Firstly, the <b>Theory of Change of REFLOW</b> describes the causal pathway that links overall project activities, outputs and outcomes.</p> <p>Secondly, the <b>Circular Design Thinking Framework</b>, informed by the Ellen McArthur Foundation Circular Design guide and principles from design thinking and managerial accounting, provides a baseline for continuous improvement and coordination between WPs and Pilot Cities.</p>
Additional information	See Section 5
REFLOW Cities Using this	All Cities
Contribution to the REFLOW Objectives	<b>Implement a common strategic vision.</b> By facilitating the alignment and coordination between WPs and Pilot Cities, the REFLOW Process enable the implementation of a common strategic vision toward a more circular economy.

	<p><b>Replication.</b> The REFLOW Process is the result of a constant dialogue between the partners involved in the transition. The evolution of the process is recorded and integrated in the Cities' Circular Action Plans in order for other city to learn and replicate the process.</p> <p><b>Understand and demonstrate.</b> The REFLOW process supports the effective collaboration for the reconfiguration urban systems towards a circular economy. The recording of this learning experience through the whole REFLOW process represents key resource to understand and demonstrate how the reconfiguration of urban metabolism can enable the transition towards a more circular economy.</p>
Current status	<b>Under development.</b>

Resource Name	REFLOW Glossary
Main Building Block	Process Coordination
Responsible WP	WP1
Other WPs Involved	All WPs
Description	<p><b>The REFLOW Glossary</b> is developed to enable sensemaking and the alignment of the project's partners by providing a baseline for the use of terminology and a shared language. As key concepts within theories and across disciplines emerge and are clarified by the consortium partners, they are added to the Glossary. This process avoids misunderstandings, ensures alignment in the terminology in the project and guarantees a common understanding of the content produced in REFLOW.</p>
Additional information	
REFLOW Cities Using this	All Cities
Contribution to the REFLOW Objectives	<p><b>Implement a common strategic vision.</b> By clarifying the key terminology used in the project, the glossary aims at facilitating the creation of a common strategic vision.</p> <p><b>Replication.</b> The collection of keywords and terminology used in the project will facilitate the learning process and will create a baseline for other cities interested in the transition towards regenerative and circular cities.</p> <p><b>Understand and demonstrate.</b> The glossary aims to provide clarity in the attempt of understanding and demonstrating the role of the different concepts, tools and methods used in the pilots' CE implementation process. Furthermore, it provides examples of how an interdisciplinary approach can be implemented in practice with the goal of transitioning towards circular and regenerative cities.</p>

Current status	<b>Undergoing.</b> The Glossary was created and shared among the consortium at the beginning of the project. This resource will grow as new contents are produced by the project partners until the end of the project itself.
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Resource Name	COVID-19 Risk Assessment
Main Building Block	Process Coordination; Pilot Coordination
Responsible WP	WP1
Other WPs Involved	REFLOW Risk Manager and WP5
Description	<p>Numerous activities performed by the partners at European Level can take place online. However, pilot cities mostly rely on in-person interactions with stakeholders and events to take place. In order to assess how the COVID-19 situation impacts the pilots and work packages and to define possible mitigation strategies, the Project Coordinator asked the consortium to fill in the risk assessment table described in the deliverable 8.2 "Quality Assurance and Risk Management". This initial assessment was discussed in a dedicated Steering Committee meeting. As a result of this initial analysis, it emerged that a more detailed analysis of the situation of the pilot cities was needed as they are the more affected partners in the project.</p> <p>For this reason, the REFLOW Risk Manager and the pilot coordination completed a detailed Risk Management Register in close dialogue with the cities. This work aims at allowing REFLOW to assess the impact of the current situation and to determine whether pilot plans and objectives need to be adjusted due to the current situation around COVID-19. At the same time, the Project Coordination team performed another round of risk assessment involving the Work Package Leaders and portraying different scenarios based on the possible evolution of the COVID-19. While the situation is very challenging, the partners are extremely motivated and creative to achieve and re-structure their activities. This exercise will be a recurrent and continuous one in order to support the whole partnership face the uncertainties linked to the risks ahead.</p>
Additional information	
REFLOW Cities Using this	All the pilot cities
Contribution to the REFLOW Objectives	<b>Implement a common strategic vision.</b> The Risk assessment process is supporting the implementation of the project objectives and monitor the impact of the current health situation. It allows pilot cities to perform an in-depth analysis of their current and future situation based on the possible evolution of the pandemic. Moreover, it facilitates the common definition and sharing of best practices among partners.

	<p><b>Replication.</b> By the creation of best practices to overcome critical, unforeseeable events that can affect the transition towards circular and regenerative cities, the risk assessment process fosters the replicability of REFLOW by external cities and stakeholders.</p> <p><b>Understand and demonstrate.</b> The Risk Assessment process is supporting the project partners in general, and the pilot cities in particular, to understand the ways in which the project can be implemented despite the limits imposed by the current pandemic. This process will result in practical solution to overcome obstacles and challenges in the implementation of CE practices.</p>
Current status	<p><b>Undergoing.</b> The Risk Assessment process will be reiterated throughout the whole duration of the project and will focus both on the specific challenges faced by the cities and on the problems flagged by the WP Leads.</p>

Resource Name	COVID-19 IT Task Force
Main Building Block	Process Coordination; Pilot Coordination
Responsible WP	WP1
Other WPs Involved	The whole consortium
Description	The COVID-19 IT Task Force, led by the Coordinating Organization, gathers the IT experts in the consortium. Its aim is to support the REFLOW partners to best approach their activities online by testing specific tools and platforms that can support their work. The COVID-19 IT Taskforce responds to the needs and questions raised by the consortium and tests different tools to assess their accessibility and relevance for the project.
Additional information	
REFLOW Cities Using this	To support the implementation of the project objectives and help the partnership achieve their goals and action plans.
Contribution to the REFLOW Objectives	<p><b>Implement a common strategic vision.</b> The COVID-19 IT Taskforce will support the project partners throughout the project by providing software that enables online collaboration. This taskforce will solve various issues that the partnership will face beyond the COVID-19 emergency.</p> <p><b>Replication.</b> The COVID-19 IT taskforce will provide advices and define best practices that other cities interested in the transition towards a circular and regenerative city can adopt.</p> <p><b>Understand and demonstrate.</b> The Taskforce helps the partnership become aware of the technological possibilities to support their plans and projects.</p>

	Hence, it will help demonstrate the concrete applicability of the transition towards circular and regenerative cities.
Current status	<b>Undergoing.</b> The COVID-19 IT Taskforce will remain active for the whole duration of the project and will respond to specific needs expressed by the partners.

Resource Name	Open Data Dashboard
Main Building Block	Technology
Responsible WP	WP2
Other WPs Involved	
Description	<p>The <b>Open Data Dashboard</b>, is an online platform that will enable pilots to publish, visualize and enrich their data as open data. Such data refers for example to the description of materials, public information about material flows, and information about the involved organisations. Specifically, the dashboard will allow to:</p> <ul style="list-style-type: none"> <li>• Provide access to open data circulated/generated in REFLOW for both humans (GUI) and machines (API)</li> <li>• Provide a possibility to collect relevant data from other sources or publish own data</li> <li>• Download and visualize data collected in the REFLOW Open Data Dashboard</li> </ul> <p>The Dashboard thus provides quick access to data, allowing pilots to track and facilitate circular activities. The GUI as access points for users will be data-driven and modular, allowing users to combine models or “cards” according to the individual needs of each pilot. The API will focus on enabling machine-to-machine interactions as well on possibilities to link existing systems used in the industry with REFLOW.</p>
Additional information	
REFLOW Cities Using this	<b>Milan, Cluj-Napoca.</b> The Open Data Dashboard can be used to demonstrate the impact of the measures taken by the pilots. This solution can help in addressing the challenge of attracting stakeholders, by demonstrating the business case. This, moreover, can support intended behavioural changes by presenting the impact of measures to the general public.
Contribution to the REFLOW Objectives	<b>Implement a common strategic vision.</b> The Open Data Dashboard is relevant to the implementation a common strategic vision of circular and regenerative cities since it provides quick access to data to track and facilitate relevant circular activities.



	<p><b>Replication.</b> Since it will be developed as an application and data openly available, it is available to future users.</p> <p><b>Understand and demonstrate.</b> Given the openness of the resource, people can gain access to and more awareness of circular processes.</p>
Current status	<b>Under development.</b> The Open Data Dashboard will be co-developed with a series of iterations for the whole duration of the project.

Resource Name	REFLOW OS
Main Building Block	Technology
Responsible WP	WP2
Other WPs Involved	WP3, WP4, WP5, WP6
Description	<p>The <b>REFLOW OS</b> is an Operating System based on GNU/Linux distribution technologies that helps incentivising the circular practices in local ecosystems by monitoring and optimising urban metabolic processes. It presents a secure, peer-to-peer network that allows to conduct economic activities like monitoring, track and tracing, and coordination among participants online and without central control. Specifically, the REFLOW OS will allow to:</p> <ul style="list-style-type: none"> <li>• Track and trace materials</li> <li>• Observe real time economic activities</li> <li>• Create a Material Marketplace</li> </ul> <p>The REFLOW OS will enable stakeholders to insert manually or automatically data about the material flows they want to track, at custom level of detail. It will allow interested stakeholder to trace back the whole material flow at any time and observe changes and updates of data in real time. Users will be able to customize data visualizations charts according to the metrics they want to highlight and monitor. The development of a ledger will allow for the safe storage and update of data on available materials exchanged (for free, with tokens, or with other material) between stakeholders.</p>
Additional information	
REFLOW Cities Using this	<b>Amsterdam, Paris, Vejle.</b> REFLOW OS can help the pilot cities' stakeholders in facilitating and mapping material exchanges among the actors involved in the value chain. This supports the overall objective of creating circular supply chains.
Contribution to the REFLOW Objectives	<b>Implement a common strategic vision.</b> The REFLOW OS contributes to the creation of a circular and regenerative city by enabling users to track and trace resource flows, observe circular activities in real time, create a material marketplace, and connect stakeholders and citizens to create new economies and behavioural change in the municipalities.

	<p><b>Replication.</b> The provision of open source code as docker image and the system's capability to run via major cloud providers at low consumption allows for an easy replication by other cities.</p> <p><b>Understand and demonstrate.</b> Ongoing data collection and monitoring of economic activities on the platform will help to understand and demonstrate the impact of the initiatives of the pilot cities involved.</p>
Current status	<p><b>Under development.</b> The development of the REFLOW OS follows continuous improvement cycles, where prototypes are iterated with pilots before value proposition are validated, features and improvements added, and finally iterated again.</p>

Resource Name	Circular Principles
Main Building Block	Circular Engineering
Responsible WP	WP3
Other WPs Involved	
Description	<p>The 10 <b>Circular Principles</b> help guide pilot cities in their transition to more regenerative circular economies. They distil the aims of a regenerative circular economy and provide guidance and support for place-based circular economy initiatives to take root in the pilot cities. To illustrate the use of the principles and provide a point of reference, each of them is accompanied by a case study. The 10 principles are:</p> <ol style="list-style-type: none"> <li>1) Design for biological or technical loops</li> <li>2) Pursue efficient use of materials and energy</li> <li>3) Build with abundant accessible materials and harness freely available energy</li> <li>4) Use life-friendly chemistry</li> <li>5) Foster diversity and redundancy</li> <li>6) Manage connectivity</li> <li>7) Incorporate system feedback</li> <li>8) Encourage learning and experimentation</li> <li>9) Enable broad participation</li> <li>10) Promote polycentric governance</li> </ol>
Additional information	
REFLOW Cities Using this	<b>All Pilots</b>
Contribution to the REFLOW Objectives	<p><b>Implementation of a common strategic vision.</b> The principles distil common aims and help to guide all pilots towards their achievement.</p>

	<p><b>Replication.</b> By sharing aims and guidelines in form of principles and accompanying them with case studies, the resource aids the replication in other circular projects.</p> <p><b>Understand and Demonstrate.</b> Making the summary of common principles and their practical implementations in case studies available can demonstrate possible paths to a more regenerative future.</p>
Current status	<b>First version completed.</b> The development will be continued with a series of iterations.

Resource Name	Social, Economic, Environmental KPIs
Main Building Blocks	Business and Society; Circular Engineering
Responsible WP	WP1 WP3
Other WPs Involved	
Description	<p>The Social, Economic, and Environmental KPIs monitor circular material flows within cities, thus communicating principles for and measuring for the progress towards regenerative circular economy transitions. By making the progress towards a regenerative circular economy measurable, they can help in making the transition more achievable.</p> <p>The KPIs originate from twelve impact areas identified through a co-creation exercise with the pilot teams. Under each impact area, a list of scientific KPIs were assembled through an extensive literature review. Through a 4-step process, each pilot city arrived at their list of final KPIs calibrated to best assess their activities and progress towards a circular economy.</p>
Additional information	
REFLOW Cities Using this	<b>All Pilots</b>
Contribution to the REFLOW Objectives	<p><b>Implementation of a common strategic vision.</b> Providing common measurement for the desired goals of regenerative circular cities helps to work the goal in a united manner.</p> <p><b>Replication.</b> Other cities looking to become more circular and regenerative are provided with means to measure their progress and are guided in the selection of achievable goals.</p> <p><b>Understand and Demonstrate.</b> Measurement and definition of indicators can make the effects and processes of regenerative and circular economy more easily accessible.</p>
Current status	<b>Beta version completed.</b> The development will be continued with a series of iterations.

Resource Name	Urban Metabolism Scans
Main Building Block	Circular Engineering
Responsible WP	WP3
Other WPs Involved	
Description	<p>The <b>Urban Metabolism Scans</b> are the result of Urban metabolism analysis, which helps build a deep understanding of the state of circularity in each of the pilot cities. The analysis is based on a quantitative mapping of material flows through a material flow analysis (MFA) to understand and visualize material flows in each pilot city.</p> <p>Urban Metabolism Scans are site-specific and show how key materials flow throughout the city and/or the chosen focus site. It helps understand at a granular level how they might be recalibrated and re-circled back into use for productive purposes. This can help pilot cities to:</p> <ol style="list-style-type: none"> <li>1) Understand closely the challenges and pain points stakeholders have with some of the inflows and outflows related to their activities</li> <li>2) Facilitate the quantification and understanding of these recurrent issues from a material and metabolism perspectives</li> <li>3) Enhance the ability to create practical interventions catered to the stakeholder to implement in their day-to-day operations</li> </ol> <p>The results of the scan will support the evolution of how the pilot frames its challenges and scenarios as well as developed its objectives and activities. Further iterations of the scan will support the pilot throughout its planning and programming activities.</p> <p>In addition, a neighbourhood-level waste assessment focused allows to assess on site-level change; cross-site comparison (i.e. REFLOW neighbourhoods vs. baseline neighbourhoods); and spatial analysis of waste flows site-collection to end-of-life management.</p> <p>First, the analysis will map the location points of where materials accumulate throughout their lifecycle. This map will include: The location of key actors within the city including producers, wholesalers, and retailers, etc.; The location of pilot stakeholders. The locations relating to the city's waste collection and management utilities (collection points, recycling centres, landfills, incinerators, etc.).</p> <p>Second, we will map the directional flow of materials across the city that is enabled by REFLOW OS. This map will show the location of REFLOW OS actors,</p>

	categorize their activity type (i.e. producer, recycler, etc.). It thus maps how materials flow from one actor to another, showing what form the material is taking at each step, and its total volumes.
Additional information	
REFLOW Cities Using this	<b>All Pilots</b>
Contribution to the REFLOW Objectives	<p><b>Implementation of a common strategic vision.</b> Mapping material flows ensures that all pilots follow a common vision of what circularity entails.</p> <p><b>Replication.</b> Demonstrating material flows in cities can help other cities to understand the potential for regenerative and circular transformation.</p> <p><b>Understand and Demonstrate.</b> Mapping material flows and visualizing short comings and ways to improve can demonstrate the action and purpose behind circular transformations.</p>
Current status	<b>Beta version completed.</b> The development will be continued with a series of iterations.

Resource Name	REFLOW Collaborative Governance Toolkit
Main Building Block	Governance and Urban Strategies
Responsible WP	WP4
Other WPs Involved	
Description	<p>The <b>REFLOW Collaborative Governance Toolkit</b> (beta) is a collection of tools, techniques, and resources that help cities on their path towards policy innovation for circular economy. It thus represents and fosters the learning process for city-level transition towards more open, circular, and sustainable governance.</p> <p>The toolkit is conceived as an evolving process based on a timeline, ranging from local to national, in which the peer-to-peer and bottom-up dynamics of stakeholders in the short term meet the top-down dynamics of more advanced public agencies and government in the long term.</p>
Additional information	See D.4.2
REFLOW Cities Using this	<b>All Pilots</b>
Contribution to the REFLOW Objectives	<p><b>Implementation of a common strategic vision.</b> The REFLOW Collaborative Governance Toolkit provides cities with the means and concepts to implement circular governance models and policy, thus contributing to a common vision of regenerative cities.</p> <p><b>Replication.</b> The resource with the models and concepts it provides can be made available online.</p>

	<b>Understand and Demonstrate.</b> The implementation and testing of governance models and strategies, as well as a thorough monitoring of the iterative prototyping process will allow to understand the role of governance models and concepts for sustainable transition in the transition towards circular and regenerative cities.
Current status	<b>Beta version completed.</b> The REFLOW Collaborative Governance Toolkit will be developed throughout the project. The first version (RCGT beta) will evolve in iterations along the whole project duration. Next steps are: (1) Finalizing the understanding phase of every Pilot scenario; (2) Co-design of local governance models and strategies; (3) Implementation and testing of governance models and strategies, iterative prototyping.

Resource Name	Pilot Framework
Main Building Block	Pilot Coordination
Responsible WP	WP5
Other WPs Involved	All WPs
Description	<p>The <b>Pilot City Framework</b> is a digital system for guiding and aligning the project's pilot cities, monitoring the progress and boosting knowledge exchange between cities and partners. It is a living and flexible system with the purpose of iterative exchange of structured information and map out the path towards circularity for each of the six pilot cities with a strong empirical basis.</p> <p>It is thus directed at pilot cities and partners and is used by all pilots. While the resource is completed, new features and macro sections are developed together with the project partners in an iterative way.</p>
Additional information	
REFLOW Cities Using this	<b>All Pilots</b>
Contribution to the REFLOW Objectives	<p><b>Implementation of a common strategic vision.</b> The Pilot City Framework is relevant to the implementation of a common strategic vision of circular and regenerative cities, since it provides a strategy that aims to guide cities in becoming aware of the opportunities that arise along with the interactions with partners. Its form and structure translate these concepts and aims into a vision for long term use to facilitate support in the replicability of the outcomes, possibly even after the project's lifetime.</p> <p><b>Replication.</b> The Pilot Framework is accessible online, either fully open or partly restricted. Consortium members are to take a collective decision regarding the level of openness of the framework.</p>

	<b>Understand and Demonstrate.</b> It helps to capture and crystallize lessons learned from the interplay of pilot cities and partners in their circular transition and makes these lessons available to others and thus demonstrates how the reconfiguration of urban metabolism can support circular transitions.
Current status	<b>First version completed.</b> The Pilot City Framework will be further developed across the lifespan of the project). New features, forms and macro sections in an iterative way, together with the project partners.

Resource Name	Best Practices Database
Main Building Block	Capacity Building
Responsible WP	WP6
Other WPs Involved	WP1, WP4, WP7
Description	<p>The <b>Best Practices Database</b> collects the best initiatives found in the European Union and beyond related to circular economy actions, policies, business models, and citizen-focused initiatives supporting the transition to a circular city. This database is made available online as part of the REFLOW Community of Practice section as well as in a Word document that will be used by other partners to expand it and to be used in other tasks or deliverables.</p> <p>The database is primarily developed to inspire REFLOW pilot cities in engaging with circular practices. The resource is made available online to be freely accessible to anyone interested in circular initiatives. The online tool is designed to allow an easy transfer to an online tool and a user-friendly consultation.</p>
Additional information	
REFLOW Cities Using this	<b>All Pilots</b>
Contribution to the REFLOW Objectives	<p><b>Implementation of a common strategic vision.</b> Exploring and researching existing best practices from other cities may help clarify and frame action plans and related implementation activities.</p> <p><b>Replication.</b> Online access through the REFLOW website will allow others to access and replicate best practices.</p> <p><b>Understand and Demonstrate.</b> By providing examples at policy level, business level, and citizen level, the best practices database exemplifies how the reconfiguration of urban metabolism can take place in practice.</p>
Current status	<b>First version completed.</b> The Best Practices Database will be further developed across the lifespan of the project). New features, forms and macro sections in an iterative way, together with the project partners.



Resource Name	Community of Practice
Main Building Block	Capacity Building
Responsible WP	WP6
Other WPs Involved	
Description	<p>The <b>Community of Practice</b> is part of the REFLOW Capacity Building Framework strategic implementation. This refers to the REFLOW strategy to enable capacity building among different target groups along three dimensions: the individual, organisational and system level.</p> <p>The REFLOW Community of Practice consists of a group of professionals and practitioners sharing insights on the skills, competences, knowledge and tools necessary to facilitate the transition to circular cities. This involves academics, innovators, dreamers, entrepreneurs, and policy makers who are creating tangible solutions to cities' most pressing issues.</p> <p>This resource is based on a dedicated 24/7 online space for collaboration, discussion, archiving meetings and webinars, and sharing resources hosted the REFLOW website. It will entail, member profiles including photos; link to library of resources (reports, projects); discussion space to allow for reflections of participants (forum.reflowproject.eu).</p> <p>The Community of Practice will include the partners of REFLOW and will be expanded through a recruitment strategy addressing the specifically defined target audience. Subsequently the community will be based on a snowballing strategy, and specific incentive systems to enhance participation.</p>
Additional information	
REFLOW Cities Using this	<b>All Pilots</b>
Contribution to the REFLOW Objectives	<p><b>Implementation of a common strategic vision.</b> In the complex dynamics of cities, there is an increasing need for knowledge management across different organisations, public authorities, businesses and citizens. In that context, Communities of Practice can become a key component of knowledge sharing and collective action building. Circular platforms, knowledge networks developed by and for Communities of Practice can accelerate the realization of the circular economy by sharing knowledge, promoting innovation, highlighting promising case studies and facilitating collaboration.</p> <p><b>Replication.</b> Every interested individual can join the CoP on the REFLOW website.</p>

	<b>Understand and Demonstrate.</b> Participant data evaluation will allow to understand the social dynamics of the community. Impact data evaluation will allow to understand and demonstrate the quality and scale of change created with the community. This will be based on both quantitative and qualitative monitoring.
Current status	<b>Under development.</b> The Community of Practice will be further developed across the lifespan of the project). Next steps are technical implementation (WP7); recruitment; launch, all supported by ongoing community management.

Resource Name	Capacity Building Resources
Main Building Block	Capacity Building
Responsible WP	WP6
Other WPs Involved	All WPs
Description	<p>The <b>REFLOW Capacity Building Resources</b> are part of the REFLOW Capacity building framework strategic implementation. This refers to the REFLOW strategy to enable capacity building among different target groups along three dimensions: the individual, organisational and system level. Capacity Building Resources include a curated collection of written reports (library), a best practice database (detailed above), a curated list of online courses, podcasts, webinars.</p> <p>The development of Capacity Building Resources is organised according specific areas of competences based on a skills gap assessment aimed at identifying skills and competences needed at local level to enable the development of circular cities. The different resources are collected in a Resource Catalogue, where different resources are collected for specific target groups and level of learning objectives required.</p>
Additional information	
REFLOW Cities Using this	<b>All Pilots</b>
Contribution to the REFLOW Objectives	<p><b>Implementation of a common strategic vision.</b> Knowledge transfer and capacity building through learning resources is key to accelerate the transition to regenerative and circular cities.</p> <p>By equipping practitioners with relevant knowledge, skills and competences, this enabling building block aims to support the uptake of circular skills necessary for a transition.</p> <p><b>Replication.</b> Free online access to learning resources will allow others to benefit from the knowledge and capacities built in the REFLOW project.</p>

	<b>Understand and Demonstrate.</b> Monitoring and evaluation will provide a basis for proper planning, managing and documenting of activities. Monitoring will be an obligatory component of all the capacity building projects and activities REFLOW intends to carry out. Targets and success indicators will be defined in order to help monitor results, evaluate progress and propose corrective measures if needed.
Current status	<b>Under development.</b> The Capacity Building Resources will be further developed across the lifespan of the project according to the needs that emerge throughout the project.

Resource Name	Knowledge Hub
Main Building Block	Communication
Responsible WP	WP7
Other WPs Involved	All WPs
Description	The <b>Knowledge Hub</b> is a dissemination tool voluntarily developed by WP7 as part of REFLOW website even though it is not specifically mentioned in the project's Grant Agreement. This resource provides public access to basic information about the public reports of the project i.e. an abridged version of the deliverables and links to the original documents and datasets. Its purpose is to disseminate project outputs and findings both internally in a clear and concise manner, as well as externally (i.e. beyond the project partnership) in order to increase the exploitation of project outputs and results.
Additional information	
REFLOW Cities Using this	<b>All Pilots</b>
Contribution to the REFLOW Objectives	<p><b>Implementation of a common strategic vision.</b> The Knowledge Hub can help the internal sharing of knowledge. The pre-processing of the information can aid accessibility.</p> <p><b>Replication.</b> Free online access to the Knowledge Hub will allow others to get an initial understanding of the content produced from the knowledge built in the REFLOW project's deliverables.</p> <p><b>Understand and Demonstrate.</b> By supporting the dissemination and sharing of the knowledge produced in REFLOW with external stakeholders, the Knowledge Hub can support the dissemination of the REFLOW deliverables and practices.</p>
Current status	<b>Under Development.</b> There will be iteration between the REFLOW website in the knowledge hub section and other deliverables. The website will be updated after every deliverable is officially published and it will contain an abridged version to support their dissemination.

Resource Name	Action & Event Tracker
Main Building Block	Communication
Responsible WP	WP7
Other WPs Involved	
Description	<p>The <b>Action &amp; Event Tracker</b> will support pilot cities and partners in tracking their most relevant actions and events and aligning them with REFLOW's project dissemination strategy. It presents a central point of dissemination regarding actions and events between the WP7, the consortium members, and the Pilots (<u>Deliverable 7.1 - 1.4.1</u>).</p> <p>The Action &amp; Event Tracker will be linked to the Pilot Framework, in order for the information provided by the pilot cities in the online tool to be directly transferred (via a csv file) to the Action &amp; Event Tracker.</p>
Additional information	
REFLOW Cities Using this	<b>All Pilots</b>
Contribution to the REFLOW Objectives	<p><b>Implementation of a common strategic vision.</b> It can help addressing and reaching a specific target audience (e.g. public administration, general public or SMEs) to engage them in different parts of the implementation process.</p> <p>It can help to find the best way to share and align the strategic vision with the needs and vision of stakeholders outside the consortium</p> <p><b>Replication.</b> No replication, the Action &amp; Event Tracker is a REFLOW consortium internal tool.</p> <p><b>Understand and Demonstrate.</b> The resource can be used to plan a dissemination and engaging strategy to collectively understand how the reconfiguration of urban metabolism supports transition to circularity with stakeholders.</p>
Current status	<b>First version completed.</b> A first version was released as part of D.7.1. Next steps include the integration of the Action & Event Tracker into the Pilot Framework.

Resource Name	Communication Survival Guide
Main Building Block	Communication
Responsible WP	WP7
Other WPs Involved	
Description	<p>The <b>Communication Survival Guide</b> provides shortcuts to the Communication &amp; Dissemination Plan's important resources and where to find them in the Plan, as well as listing each resource's objectives and rules. Empowerment of pilot cities in communication campaign.</p>
Additional information	See Deliverable 7.1 - 1.4.1.



REFLOW Cities Using this	All Pilots
Contribution to the REFLOW Objectives	<p><b>Implementation of a common strategic vision.</b> The Communication Survival Guide provides resources that help keeping one same language through the consortium communication and dissemination activities, including those developed by the pilots. Thus, providing a common and coherent identity throughout the consortium to target specific stakeholders or audiences.</p> <p><b>Replication.</b> No, the resource is a REFLOW consortium internal tool.</p> <p><b>Understand and Demonstrate.</b> The resource supports a common understanding through visual and narrative consistency.</p>
Current status	<b>First version completed.</b> Some links will be updated after integrating the A&E tracker to the Pilot Framework.

## 6.2 Pilot Challenges and REFLOW Resources

Altogether, the REFLOW Resources here presented have been developed as a result of co-design activities involving pilots and WPs. Therefore, some of the challenges identified in the case studies have been taken into consideration in the development of the REFLOW Resources. Even when this is not the case, the resources described have the potential to address at least some of the challenges identified, being the latter to some extent related to one building block of the project.

In this paragraph, we present the most evident links emerged between the resources developed in the first 12 months and the challenges identified by the pilot cities in the same period. The objective of this is to scoping potential of the REFLOW Resources to provide further support in the Cities' Circular Action Plans. Noteworthy, in the implementation of the REFLOW Process the outcome of this initial scoping will be presented and discussed with the work packages/building blocks to align and coordinate on how to best address the challenges, and leverage on the opportunities identified.

Challenge Category	Related Resource
Awareness challenges	Cities' Circular Action Plans / Communication Survival Guide / Best Practice Database
Business challenges	Business modelling (will be introduced after M12)
Governance challenges	REFLOW Collaborative Governance Toolkit / REFLOW Vision
Project management challenge	REFLOW Process / COVID-19 resources
Technological challenges	REFLOW OS/Open data dashboard
COVID-19	COVID-19 Risk Assessment / COVID-19 IT Task Force

Table 27. Challenges experienced by pilot cities and related REFLOW resources.

Table 27 highlights the relationship between the challenges identified and the resources developed in the first 12 months of the project that might contribute to address them. These relationships are further addressed in the short descriptions and diagrams below.



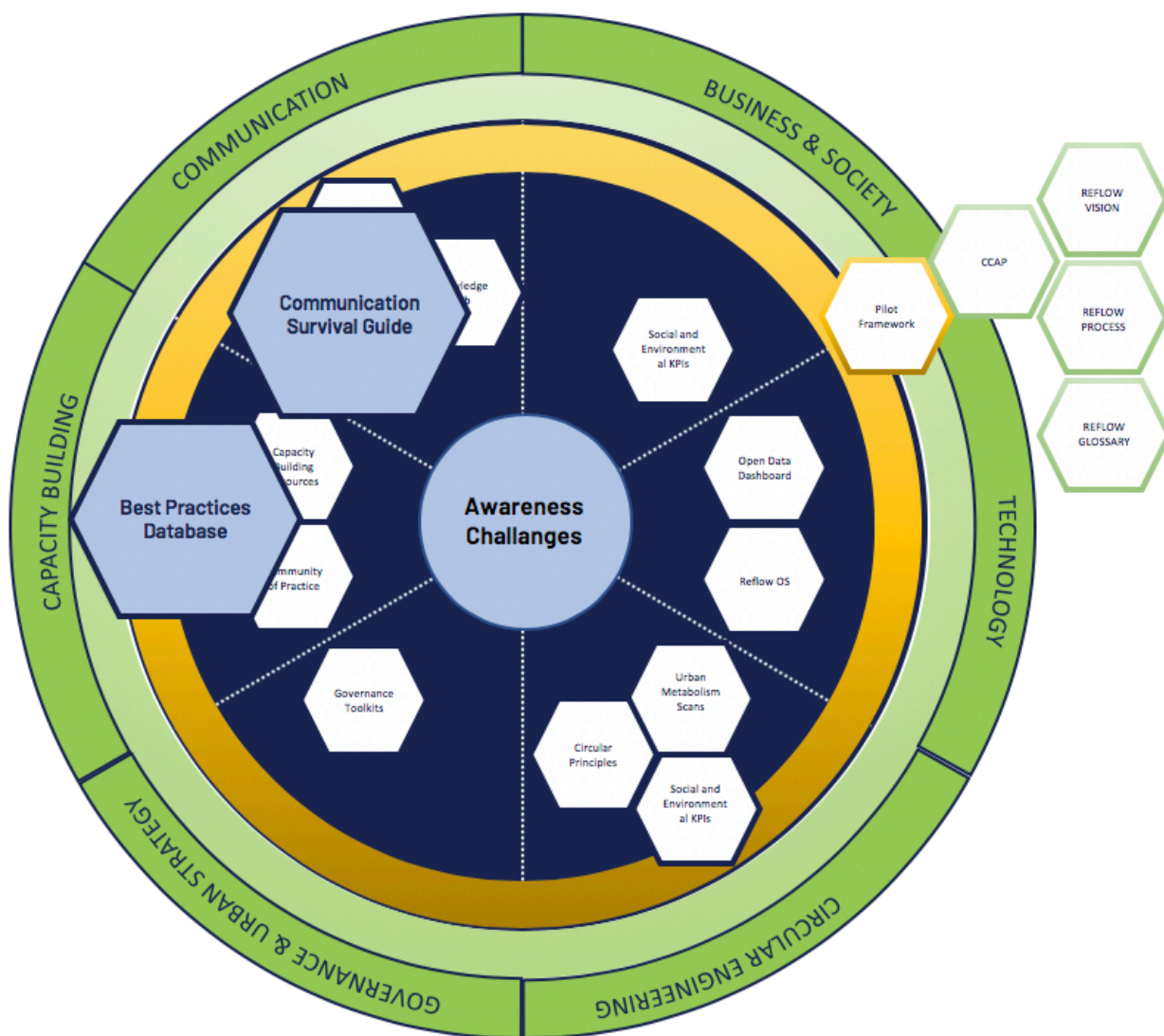


Figure 18. Potential REFLOW Resources to address Awareness Challenges. Source: Copenhagen Business School

**Awareness Challenges** refer to the lack of knowledge and awareness regarding circular economy and its various aspects among different relevant stakeholders outside REFLOW. Here different resources hold the potential to help the pilots addressing these challenges. The present deliverable contains a detail description of REFLOW's vision on circular economy and all the relative building blocks. Additionally, the Best Practices Database provides a set of best practices for the pilot cities to take inspiration to address this challenge. Finally, the Communication Survival Guide, with the support of WP7 – Communication, can help the pilots to develop integrated communication strategies to involve the stakeholders.





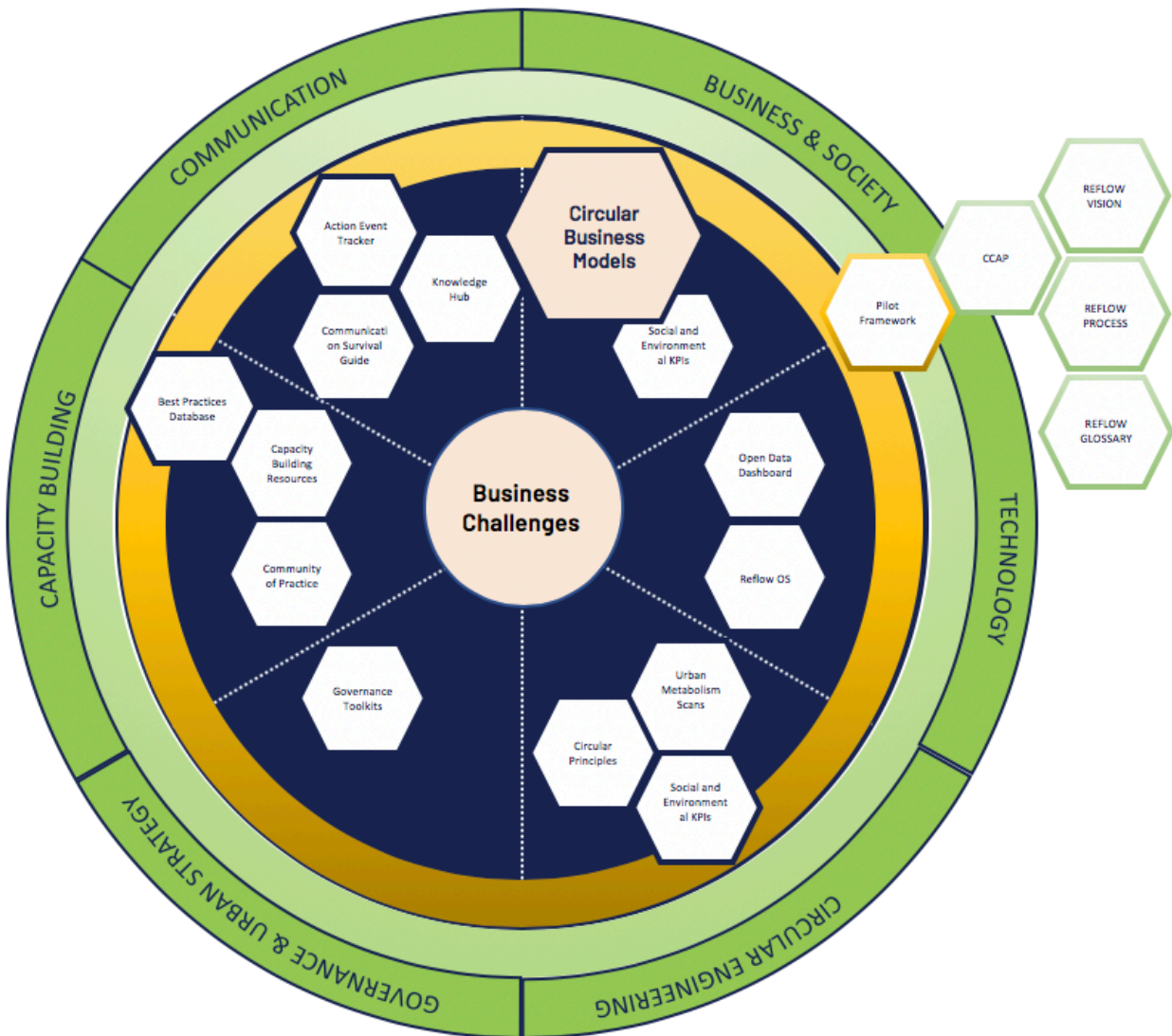


Figure 19. Potential REFLOW Resources to address Business Challenges. Source: Copenhagen Business School

**Business Challenges** refer to difficulties in measuring and consequently communicating the business and \ or financial value of the proposed solutions. In this regard, the Theory of Change process started in the first 12 months represent a first step to develop financial proxies of the social outputs of the pilot cities through the **Social Return on Investment** methodology. Moreover, from month 12 to month 24 the Business and Society building block (CBS – WP1) will co-develop the Circular Business Models and Business Plans for each pilot city, in order to allow for the cities to define the value proposition of their projects in the long term.



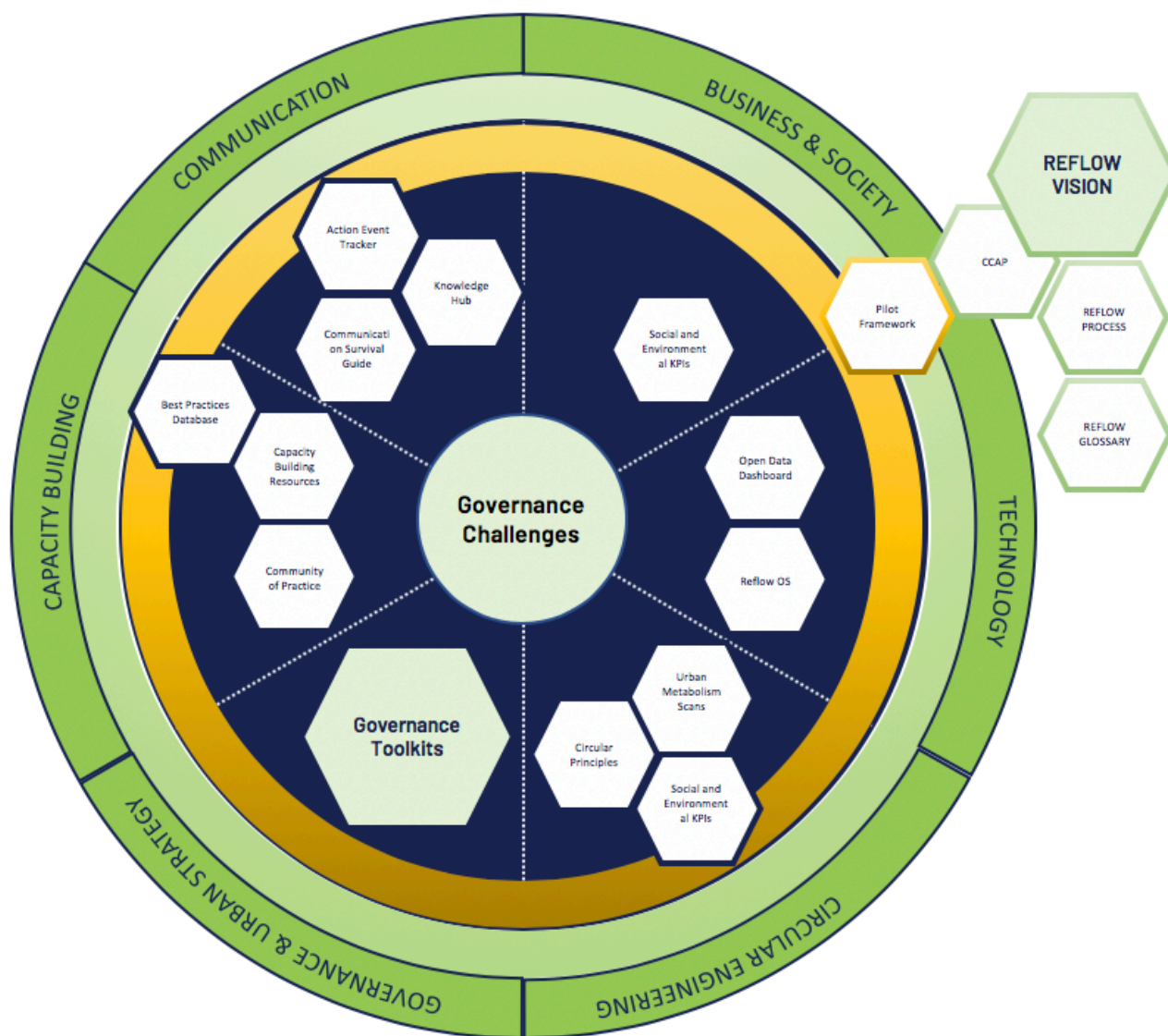


Figure 20. Potential REFLOW Resources to address Governance Challenges. Source: Copenhagen Business School

**Governance Challenges** are challenges related to (1) working with partners and stakeholders from different sectors, and (2) influencing broader governance structures e.g. policymakers and regulators. In this case the **REFLOW Collaborative Governance Toolkit** will equip the pilot cities a set of tools to address public-private collaborations and stakeholders management in circular transitions. Moreover, the **REFLOW Vision** might provide a useful framework to align the local ecosystem around one common and integrated vision.

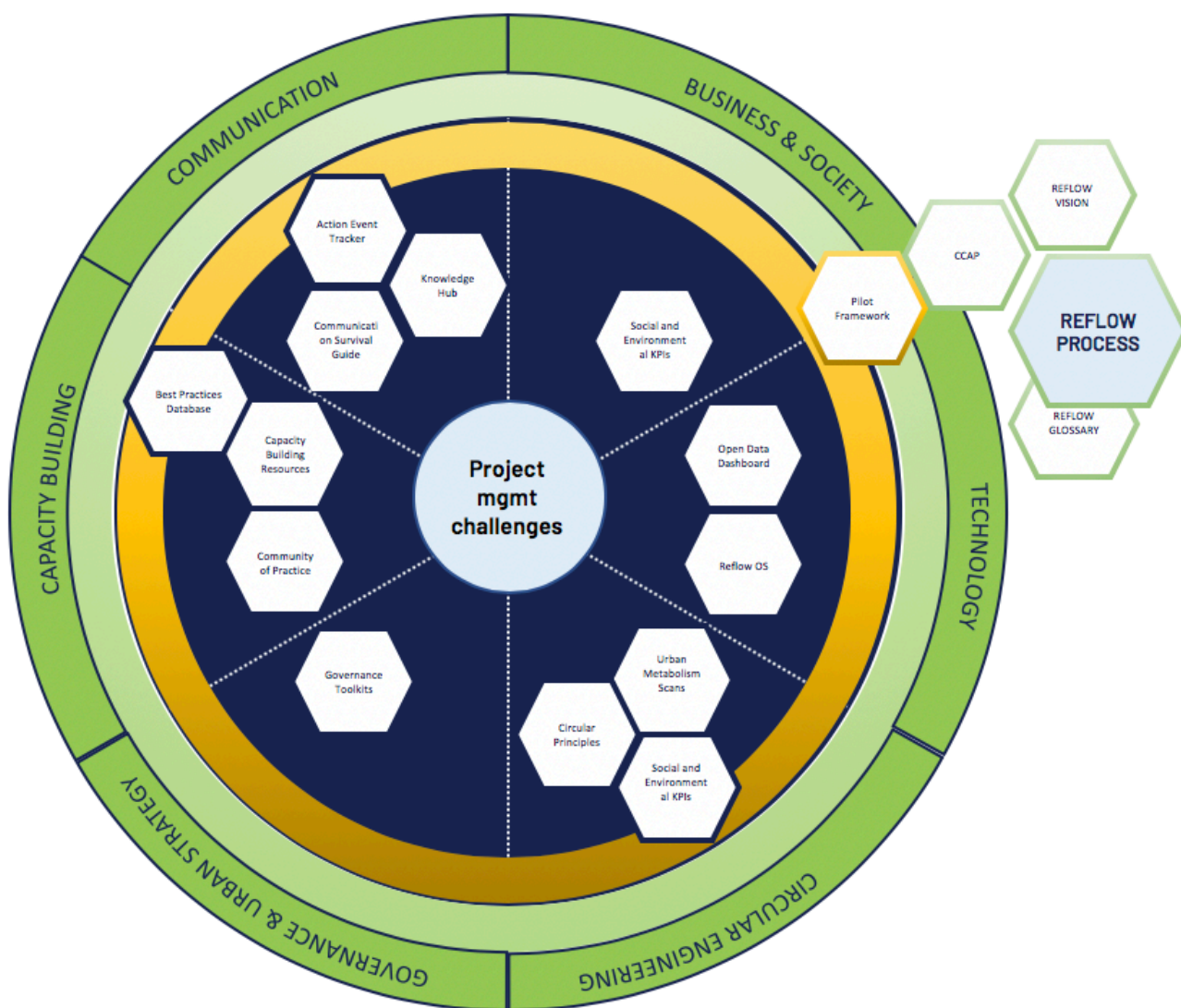


Figure 21. Potential REFLOW Resources to address Project Management Challenges. Source: Copenhagen Business School

**Project Management Challenges** relate to issues of replicability of the results obtained to the external stakeholders and the need to coordinate the project partners to reach the objectives. In this regard, the **REFLOW process** will ensure a constant alignment which will provide support to better structure internal project management practices and assist the pilot cities to plan the process from the prototyping to the scaling phase.

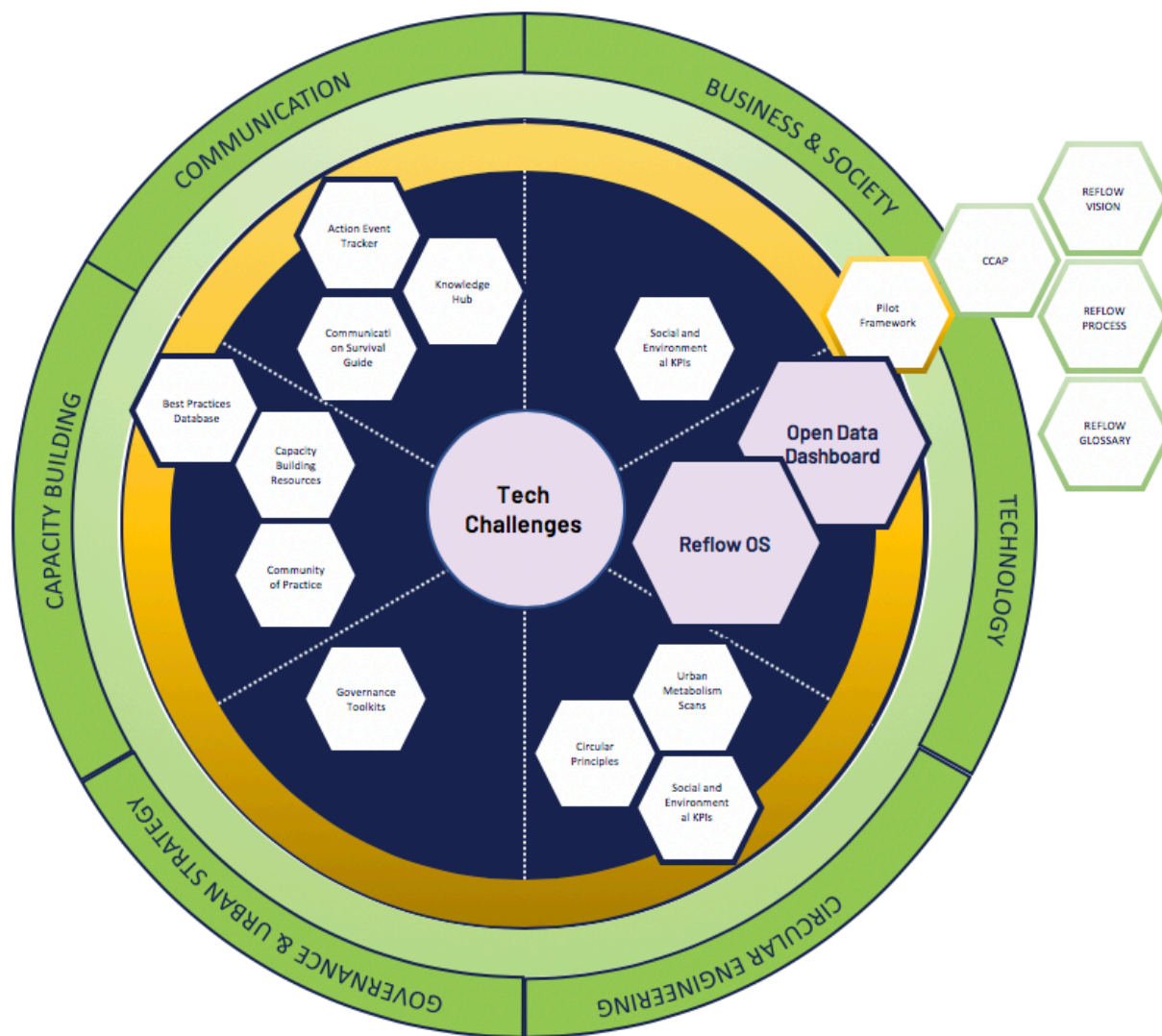


Figure 22. Potential REFLOW Resources to address Technological Challenges. Source: Copenhagen Business School

**Technological Challenges** mainly refer to the limited availability or access to relevant data. The Agile Methodology on which the development of REFLOW tech solutions – the REFLOW OS and the Open Data Dashboard – is based on iterative adjustments based on user experience and requirements. Although these technical solutions do not have control over the possibility of accessing certain types of data, the technological building block will support constant improvement of the solutions based on the available options.



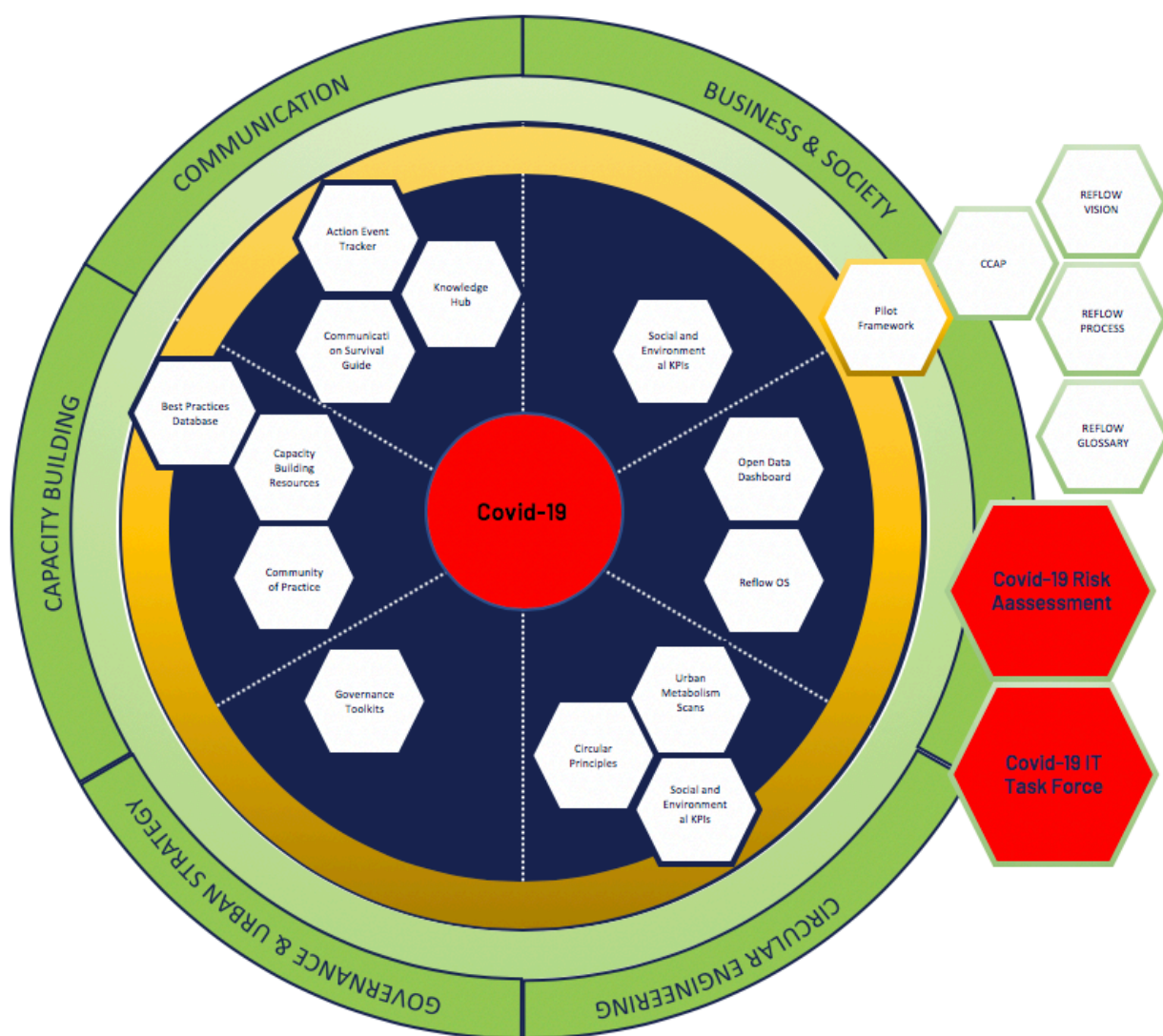


Figure 23. Potential REFLOW Resources to address Covid-19-related Challenges. Source: Copenhagen Business School

**COVID-19** has affected the operations of pilot cities. In REFLOW the COVID-19 Risk Assessment will support the pilots and the partners at European level in critically evaluating and reconsidering how to adjust the development of the project given the situation. Moreover, the COVID-19 IT task force will support the pilot cities and the whole partnership finding in alternative ways of working online.

## 7. REFLOW Resources for circular transitions: inspiration

### 7.1 The Best Practices Database

The **Best Practices Database** collects the best initiatives found in the European Union and beyond related to circular economy actions, policies, business models and citizen-focused initiatives supporting the transition to a circular city.

This database is made available online as part of the REFLOW Community of Practice section as well as in a separate, editable document that will be used by other partners to expand it and to be used in other tasks or deliverables.

This database has a close relationship with many other tasks and deliverables foreseen by other WPs, in particular with:

- D1.2 Cities' Circular Action Plans
- D4.2 REFLOW Collaborative Governance Toolkit (beta).

The database on best practices has been structured in three specific categories: (1) City Policies Best Practices, (2) Citizen Engagement Best Practices, and (3) Business-led Best Practices. The categories reflect the expected strategies that are being pursued by the pilot cities - defined in e.g. REFLOW Deliverable 5.1. Planning and Evaluation Framework - including the three different groups of stakeholders involved in those strategies (i.e. municipalities, citizens, and businesses, respectively). The categories are further filtered with sub-categories, associated with the focus topic of the pilot cities:

- *Textile*
- *Food/municipal markets*
- *Energy*
- *Water*
- *Plastic*
- *Wood and material waste/event*
- *Other*

The data-base fields differ substantially for each category. The aim of the fields structure is to allow an easy transfer to an on-line tool and a user- friendly consultation. The structure of each category is described in Table 28.

Category 1: City Policies Best Practices	Category 2: Citizen Engagement Best Practices	Category 3: Business-led Best Practices
City context and objective	Context and objective	Challenge description
Who's involved		
Description of the policy	Description of the initiative	Solution description: <ul style="list-style-type: none"> <li>Value proposition</li> <li>Value creation and delivery</li> <li>Value capture</li> </ul>
Quick facts	Quick facts	Quick facts
Name of city	Name of city	Name of company
Policy type <ul style="list-style-type: none"> <li>Shared narratives</li> <li>Roadmaps</li> <li>Urban diagnostic and metabolism</li> <li>Data and technological assets</li> <li>Strategic alliances</li> <li>Hosting and Convening</li> <li>Unleash the potential of social economy organisations</li> <li>Business support</li> <li>Capacity building</li> </ul>	Engagement strategy <ul style="list-style-type: none"> <li>Awareness campaign</li> <li>Co-creation</li> <li>Support bottom up initiatives</li> </ul>	Company type: <ul style="list-style-type: none"> <li>start-up</li> <li>not-for-profit</li> <li>existing company</li> </ul>
Sector focus	Sector focus	Location
Tags/ key words.	Tags/key words.	Sector focus
		Business model archetype: use of Bocken SBM archetypes
		Tags/key words.
More info/Link	More info/Link	More info/Link

Table 28. Description of fields in each of the three categories in Best Practice Database. Source: WP6.

In each category, a set of tags/keywords are defined and referred to specific strategies allowing the end user to further filter individual entries. An illustration of how a practice will be presented in the database, and how the information will be structured is provided below.



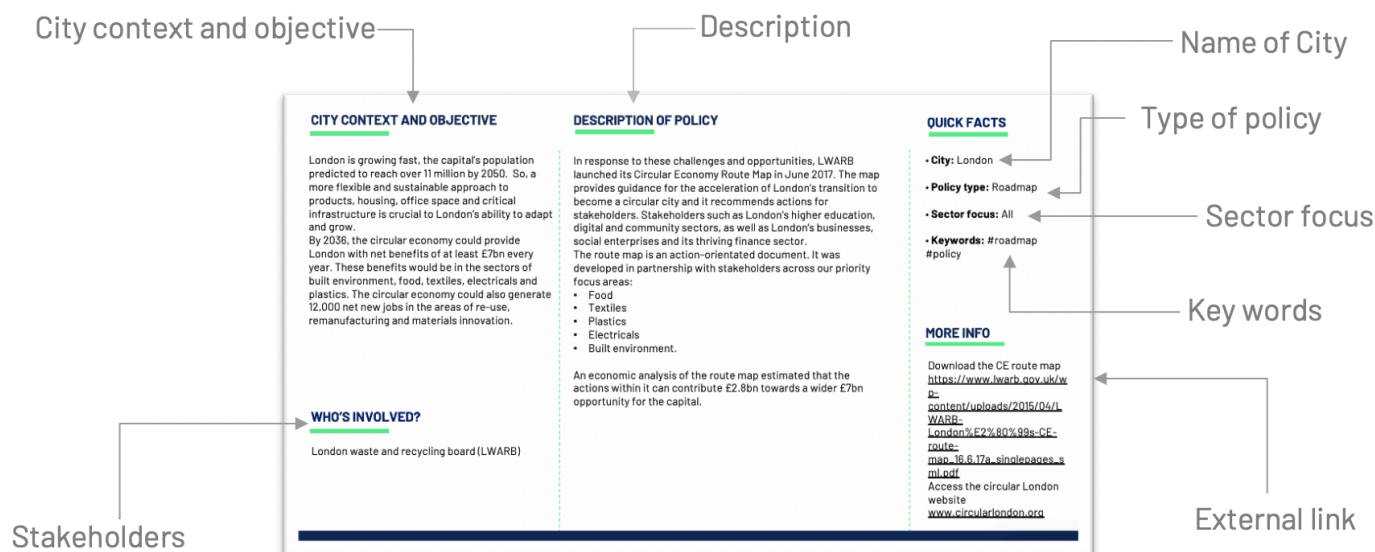
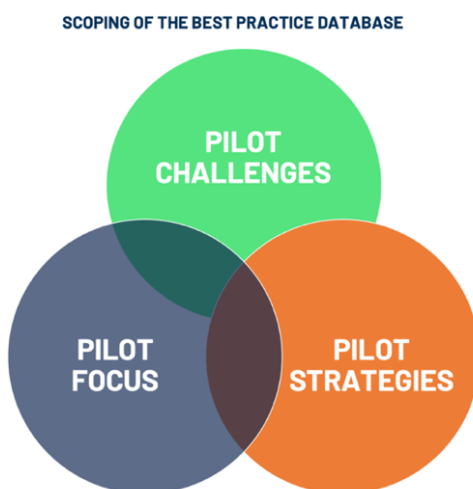


Figure 24. Example of a practice structure in Best Practice Database. Here: City Policy Best Practice.

### Scoping of the selection

Individual best practices were searched and selected based on three criteria: (1) an overview of key challenges experienced by the pilot cities (e.g. How to involve citizens in the planned activities? How to convince businesses to be co-creating with us?), (2) pilot focus (e.g. textile waste, municipal markets) and (3) expected strategies (business engagement, governance, citizen engagement) of REFLOW pilot cities. The scoping criteria are illustrated in the figure below.



The best practices selection criteria differ for each category. Among these however, there are some common criteria adopted:



- *Availability of information*
- *Referenced in one or more existing databases, reports or articles*
- *Award-winning practices*
- *Suggested by members of the REFLOW Community of Practice*
- *Innovativeness of the practice though not yet widespread*

To kickstart the process, best practices have been described through factsheets, which contain all the information and fields that will be further uploaded in the on-line database.

The identification of best practices began with analysing the existing publications, databases and reports that already described the characteristics of each practice in detail. The documentation taken as a reference has some general characteristics: it is written on either European or national level, it provides detailed information content including data and figures, it is a recent publication, and is publicly available.



## 8. Release: Cities' Circular Action Plans

### Next Steps

This deliverable presents the main challenges identified in the first 12 months of the project and introduces all the resources developed to support the implementation of the Cities' Circular Action Plans.

Overall, this deliverable contributes to frame and clarify how the REFLOW project is moving towards the development of circular and regenerative cities. It does so by introducing the REFLOW Vision, describing the REFLOW Process and providing an overview of all the other REFLOW resources developed to support the pilot cities in the circular transition.

The immediate next steps entail the implementation of concrete actions to ensure a shared understanding of the REFLOW Vision and a collective development of the REFLOW Process.

Moreover, discussions with WPs and pilot cities will follow about how to *Understand, Define, Make* and *Release* future developments of the REFLOW Resources based on the knowledge produced with this and the other deliverables due in M12.

The learnings of these future iterations will be collected and presented in future iterations of the Cities' Circular Action Plans. In fact, this deliverable will live as a digital tool which will allow to collect and translate the development of the REFLOW Journey.

### Digital Cities' Circular Action Plans

This section aims to describe how the Cities' Circular Action Plan will evolve in parallel with the development of the REFLOW project in order to create a strong and clear legacy for the actors and the cities involved. Moreover, it will serve as a basis for replication (a replication handbook) for users who would like to work actively on promoting and implementing regenerative cities through the adoption of CE practices based on the project's experience.

The legacy of REFLOW will manifest itself in the Cities' Circular Action Plan through its adaptation as an accessible resource online. The CCAP as an online tool will contain the project strategy, challenges faced by the REFLOW cities and the necessary tools to address these. Moreover, it will evolve and update its content as the project unfolds. Translating REFLOW's experience to an online platform will provide cities with the means to replicate the REFLOW cities' journey towards becoming circular and regenerative.

The online version of the Cities' Circular Action Plan will target all the REFLOW's intended users. For this reason, it will provide inputs for individuals, businesses, citizens' associations, municipalities and other agencies in their transition towards regenerative cities through the adoption of CE practices (GA Part B p. 36). With this in mind, the digital platform will be designed to be easily accessible and navigated by these intended users from their perspective and existing technical skillsets. Moreover, it will ensure that the key stakeholders for the project are actively participating throughout the various implementation phases of the project.

Throughout the project period the overall RELOW methodology will continuously be iterated and refined. The result will be a thoroughly tested method that can be translated into a generic model, describing the actions needed in the REFLOW transformation process. This process will be visualized in the online version of the Cities' Circular Action Plan. A number of touch points, also represented in the Cities' Circular Action Plan, will guide the project team through the process and make sure that the process progresses as intended. Examples of digital platforms that being evaluated for the translation of the Cities' Circular Action Plan into an online resource include Wiki, GitBook, or GitHub.



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