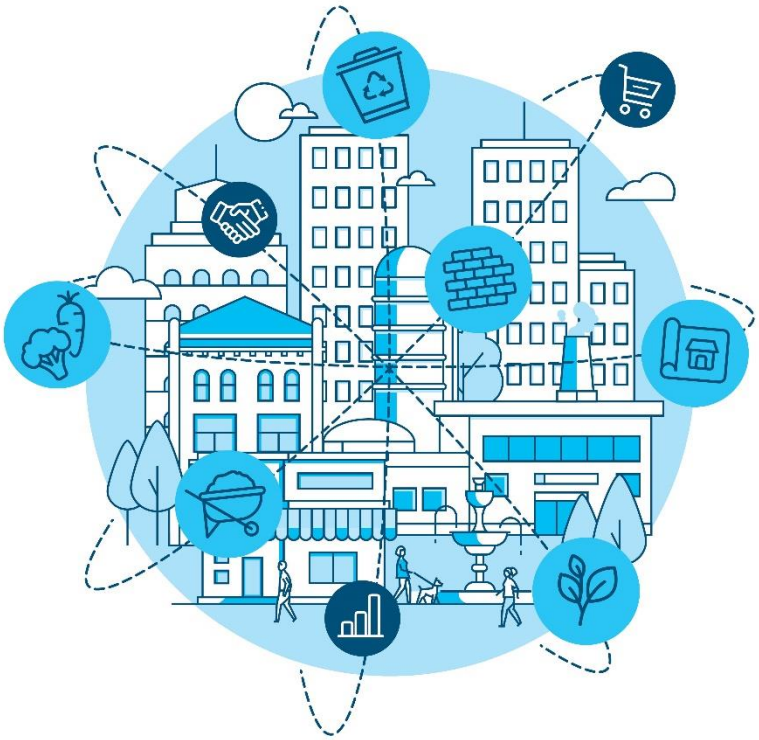
Evaluation Plan: Biowaste sector, Porto

Deliverable 6.2

2GO OUT Consulting



Version	2.0
WP	6
Deliverable	6.2 (Evaluation Plan: Biowaste, Porto)
Date	18 February 2022
Dissemination level	Public
Deliverable lead	2GO OUT Consulting
Authors	Carla Santos and Pedro Fonseca Santos, 2GO OUT Consulting
Reviewers	Sara Velho, CM Porto Sofia Gomes, Porto Ambiente Alice Martins; Susana Freitas and Telmo Machado, LIPOR Bjørn Vidar Vangelsten and Amsale Kassahun Temesgen, NRI Nikolai Jacobi, ICLEI
Abstract	This report details how the City of Porto will evaluate the impact of the CityLoops tools and demonstration activities aimed at improving the circularity of the Biowaste sector.
Keywords	Evaluation, Indicators, Porto, Biowaste
License	 This work is licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0). See: https://creativecommons.org/licenses/by/4.0/

Contents

1. Introduction

The objective of the CityLoops evaluation work is to ensure that a comprehensive evaluation framework is established for all demonstration actions to assess their impact on sustainability and to assess the progress towards a more Circular Economy (CE).

This document will guide the practical evaluation work based on the evaluation framework and CE indicators presented in CityLoops Deliverable 6.1 Circular City Indicator Set (Vangelsten, et al. 2021). The evaluation aims to cover all the four Vision Elements at the core of the CityLoops circular city definition from Vangelsten et al. (2021). Thus, the evaluation will monitor local level processes and behaviour aimed at improving circularity, impact in terms of more circular material flow and energy use, as well as outcomes in terms of improvements on the environment and on human wellbeing. The evaluation will focus both on the demonstration actions and on impacts at city scale.

This Evaluation Plan presents a list of specific indicators to be monitored over the duration of the Demonstration phase of the CityLoops project (Month 18-44). It further details what data needs to be collected, who is responsible for doing this, how it will be done, and when. The overall responsibility of the development of the Evaluation Plan and its implementation lies with the Evaluation Manager appointed in each city. The implementation of the Evaluation work will be documented in the Interim Evaluation Report to be submitted at Month 36 and the Final Evaluation Report, to be submitted at Month 46.

During the process of evaluation of the demonstration actions key stakeholders will be involved to discuss the interim and the final results of the demonstration actions, such as the representatives of the tourism and social economy sectors, universities and R&D units (like University of Porto and Polytechnic Institute of Porto), Porto Municipality departments and regional entities (like CCDR-N and AMP – Porto Metropolitan Area).The results of the project will be integrated into the Roadmap to Porto City Circular in 2030.

About the City of Porto

Located in the north coast of Portugal, along the river Douro, Porto is the second most important city of the country, with around 217 000 inhabitants (PORDATA 2019) and an average population density of 5 229.5 persons/km^2 (INE 2019). Surrounded by 16 other municipalities (AMP – Porto Metropolitan Area) that combine a unique range of assets, from industries and universities to agricultural land, gives it an innovative profile and a unique position to improve the food system through circular economy.

Porto has suffered high population decline in recent decades. However, it has seen a small population growth since 2017, in part as a result of the city's rising reputation as a place to live. There is, however, a continuous influx of population for reasons of work or study, equivalent to 72.3% of the population living in Porto (INE 2011). The City of Porto is one of the main economic drivers of the northern region, driven by a highly developed transport network for products. The economic activities of Porto are mainly focused on the tertiary sector, especially

financial activities, real estate and services. In the last years, there was a galloping growth in the tourism sector, with a record of growth in overnight stays, making tourism a more economically appealing sector of activity. The primary sector activity in the Municipality is of little economic relevance, employing only 0.27% of the working population.

In 2020 and in the first quarter of 2021, due to the COVID-19 crisis and the associated health restrictions imposed in Portugal, there was a large reduction in tourism activities in the City, with low hotel and restaurant reservations and related business closures. Other economic activities were also restricted, leading to an increase in unemployment in the Porto Municipality.

About the biowaste sector

Regarding the biowaste sector in Porto, an estimated 38.350 tonnes of biowaste were generated in 2019 (Porto Ambiente), of which only 30% was collected separately. All the biowaste collected separately was forwarded for organic valorisation at LIPOR composting plant, however there is yet a high potential of biowaste recovery and recycling from unsorted biowaste amounting to around 38%, which currently is being sent to LIPOR waste-to-energy plant. Both of these LIPOR facilities are located outside of the Porto Municipality boundary.

The management of biowaste has become a major concern in the City of Porto and is a priority in its urban agenda, due to increasing touristic activity and large numbers of work and study related commuters and the resulting generation of waste with its adverse impacts on public health and the environment. For the City of Porto, the reduction of food waste is also a great opportunity to decrease social inequalities, promote healthier food, generate new business opportunities and close the biomass cycle. It's also important to create mechanisms to support and scale up innovations that could boost practices to promote local and organic food, food waste prevention and urban food growing initiatives that help reduce environmental negative impacts, increase resources efficiency and reduce external dependencies of raw materials. Some steps were already taken to increase circularity in the city biowaste sector: Project 'Horta à Porta', Project 'Dose Certa'; Project 'Embrulha', 'Zero Desperdício' Network.

Beyond these projects, the City of Porto also introduced social- and sustainability principles in their public procurement processes and promotes education and awareness campaigns to ensure that healthy food is recognised and consumed by the public, as well to ensure that citizens understand the importance to reduce food waste. For the City of Porto is important to integrate policies related to food and health in an innovative perspective, ensuring quality food and healthy diet (Ellen MacArthur Foundation 2019), while increasing the sustainability of the food system with lower or zero carbon footprint to preserve or improve the local environment, promote social integration and inclusion and support employment.

One of Porto's ambitions is to boost the transition to a circular economy, especially in the food system, addressed in its Roadmap to Porto Circular City in 2030, developed in 2017. This roadmap is a process in constant update and already included some food system guidelines.

The transition to a circular economy in food system came from the previous work that Porto Municipality developed with Ellen MacArthur Foundation, Calouste Gulbenkian Foundation

and other relevant local stakeholders, related with *'Cities and Circular Economy for Food'* report (Ellen MacArthur Foundation 2019), launched in 2019, in which Porto was one of the study cities. Currently, Porto Municipality looks to detailed aspects of the food sector, identify priority initiatives considering the contributions of the several stakeholders and design a municipal program for the transformation to a regenerative food system based on the priorities of the Municipality to accelerate the transition.

CityLoops tools and preparation actions

The tools and preparation work are the basis of the Demo Actions that will be implemented in City of Porto. These demonstration actions will fill specific gaps, while promoting the transition to circularity in the management of biowaste in the social economy and tourism sectors (restaurants, hotels and associations) and also in residential neighbourhoods with high-rise buildings, mostly by reducing biowaste production, improving biowaste separate collection systems and facilitating valorisation as well as local treatment (home and community composting). In this context, the demonstration actions can be summarised as follows in next sub-chapters.

1.1. Demo Action 1: Biowaste selective collection and local treatment model

Short Description

Improvement of waste collection, specifically biowaste, through the implementation of 120 containers for biowaste separation that will be integrated in the surface bins network of the City of Porto. These containers will be complemented with the Smart Collection System tool that will allow to identify and locate every container.

At the same time, and as a complement to the biowaste selective collection, two community composting islands will be created in two neighbourhoods, together with food cultivation beds.

Both the biowaste selective collection and the community composting island will be supported with the implementation of the awareness campaigns to engage the citizens of Porto City in these activities.

Expected Outcomes

- A new separate collection optimized system connected with city sensors network (SCS Tool);
- 25.500 inhabitants of the City of Porto engaged in the biowaste separate collection;
- Collection of 1,500 t/year of biowaste (total of 3.250 tonnes by M44);
- 1 t/year/composting bin unit of local biowaste treatment (15 in total);
- 210.17 kg of avoided CO_2 eq. emissions for 1 ton of biowaste treated on composting islands;
- Improved awareness of citizens and stakeholders on circular BW management;
- New local stakeholder partnerships to promote biowaste selection collection and local treatment new models;
- Decreased costs associated with the waste treatment through increased selective collection of BW from residential sectors;
- Increased circular jobs at ratio: 1 BW separate collection system = 3 new jobs.

1.2. Demo Action 2: Biowaste Circularity Models, new CP practices and Training Courses

Short Description

Both tourism (hotels and restaurants) and social economy sectors (canteens) are big local producers of food waste and, at the same time, a source of opportunity for waste reduction and prevention, still under-explored.

A BW circularity model were developed for both tourism and social economy sector with the aim of support the implementation of several actions that will promote the change citizen behaviour towards biowaste while reducing its production, closing the loop of organic matter from farm to fork.

The models conceptualized aggregate a set of measures to be implemented along the biowaste life cycle. Most of the proposed measures are the result of the experience of the entities involved in waste management at City of Porto (LIPOR and Porto Ambiente).

In this Demo Action, two tools (the Food Demand Management Tool and the Circularity Decision Making Support Tool) will be tested. Furthermore, training courses about circular procurement in social economy and tourism sector will be offered as part of the demonstration action.

Expected Outcomes

- Local vegetable production of around 3 kg *per* month with a growbed kit;
- Food waste avoided ~30% in the pilot comparing with baseline (M44);
- ~300 g of food waste avoided *per* Embrulha package;
- Increased separate biowaste collection by 50 t/year *per* pilot;
- Local treatment by 400 kg/year of biowaste per compost bin (300 l capacity);
- Application of two new tools to promote circularity in BW management: (1) Food demand management tool, (2) Decision making support tool, validated and ready for replication and upscaling;
- Capacity building of circularity models pilots' staff on circular procurement, to promote the new guidelines for BW circular procurement;
- Two new local stakeholder partnerships to promote new biowaste circularity models and circular procurement practices;
- Reduced costs from waste collection due to demonstration action;
- Decreasing the GHG emissions related with BW production, collection and treatment – this outcome will be quantified after the calculation of baseline values.

1.3. Demo Action 3: Launch of Green Space Certification System

Short Description

A certification system guideline for urban green spaces, designed during preparation phase, will be launched and implemented in City of Porto during demonstration phase. The Certification System will disseminate dedicated gardening practices to promote and reuse the compost produced at LIPOR's composting plant or at home and community composting.

First the urban green spaces will be identified and one selected to be analysed for its gardening practices. After filling a check list with the gardening practices already in use, we will produce an action plan to improve sustainable urban garden practices.

This Demo Action intends to highlight the importance of returning biowaste to the soil, in the form of compost, and of applying sustainable management practices in public and private green spaces.

After identification, selection, analysis and implementation of the system in an urban green space of Porto Municipality, the certification will be attributed and the certification system disseminated.

Expected Outcomes

- A new certification of Sustainable Green Spaces, promoting the use of compost produced by LIPOR, is in place, validated and ready to be replicated and upscaled;

- Increased cost effectiveness in management and maintenance of green spaces;
- Reused nutrients present in compost on Porto City Green Spaces (kg NPK/m2);
- Reduction of garden waste generation and maintenance costs (kg/m2);
- Quantity of material for composting (local or centralised option) (kg/m2).

With exception of the first, the other outcomes of Demo Action 3 will be quantified after selection of pilot green space and calculation of baseline values.

1.4. Demo Action 4: Circular Entrepreneurship Initiatives

Short Description

A contest for circular ideas, designed during the preparation phase, will be implemented in the city during the demonstration phase in order to promote circular transition on biowaste and more broadly on the food system, following Porto's environmental strategy and the Porto's Roadmap for Circular Economy to become circular by 2030, that aims to encourage, support and empower entrepreneurs to turn environmental and social challenges into circular business opportunities and to bring together key players to co-create responses to the challenges and raise awareness of best practices.

The contest is directed not only to local entrepreneurs or companies but also to citizens and social institutions in order to create synergies between new ideas and established organizations with the purpose to upscale environmental, social and economic positive impacts at the city and contribute to a helathier and sustainable food system, applying the principles of circular economy. Ideas that encourage the creation of synergies between the several sectors and actors, mainly social and tourism sectors, promote and support food waste management innovative ideas, improve food donation circuits, satisfying the nutritional needs of vulnerable communities and, at the same time, reducing food waste, promote local/regional agri-food circuits and strengthen the multi sector and multi actor to raise awareness and fight against food waste will be valued.

During the implementation of the contest, 20 of the submitted ideas/teams will go through a bootcamp in order to improve and optimise ideas and business plan. The 5 winning ideas, after the evaluation of bootcamp results, will receive 6 months of high-quality mentorship from a multiple range of specialists, according to the needs of each idea/project. By the end of the contest, the objective is that each organisation can connect to similar projects and empower each other and be able to implement the project and make it sustainable and viable.

Expected Outcomes

- Generation 20 new business projects/ideas of which 5 will be winners;
- Improving the understanding of circular economy principles, by the participating teams;
- Improving the capacity of transforming challenges into opportunities through the design and implementation of circular business models, by the participating teams;

- Winning projects/ideas have developed detailed business plans ready to get financed.

Winning ideas will have a holistic approach to a specific problem and will have the tools needed to solve it, whether these tools are funding opportunities, contacts, synergies and/or cooperations.

1.5. Demo Action 5: Reducing food waste via a donation network

Short Description

This will support and expand the food donation network, already occurring in the city, which connects food distribution and social economy sectors to support citizens with low income and social needs in the city of Porto. This action will allow food waste reduction in the city.

Partnerships with Zero Desperdício will be promoted to expand the network, not only near Porto Municipality (to promote the involvement of municipal services related to social and school canteens and to events promoted by the municipality) but also near small, medium and large companies as food donors that are concerned with their ecological and social responsibility, such as: restaurants and similar, hotels and companies in the wholesale and retail sector; and social organizations as receivers, so that they can redistribute food with quality to citizens in unfavourable living conditions. The network partners will be identified (restaurants, supermarkets, festivals, events, social institutions and social canteens) and will receive food safety and security training in order to be entitled to be a food donor or a food receiver within the Zero Desperdício Network.

Expected Outcomes

Data related to the donation network with key indicators:

- Food donation network increment achieving at least 75 tonne/year of food donation and 2.000 benefited families;
- Tonnes of CO2 emissions avoided through the donation programme;
- Increment of the number of supported families.

2. Indicators to be monitored

This chapter presents an overview of the indicators that will be monitored during the CityLoops Implementation Phase (see table below). The indicator selection has been made based on several criteria:

- Relevance to the city's circularity strategies and the Demonstration Actions: Each selected indicator will monitor specific processes and impacts related to the Demonstration Action activities and serve to evaluate against the expected outcomes of the action. Indicators may be monitored either at Demonstration Action scale or at City scale or, in some cases, at both. For each evaluation scale, the indicator is paired with the expected outcome or target value listed in the table below. This will allow evaluation of the progress and impact of demonstration – and city-wide actions towards improved circularity as well as the effectiveness of activities and tools.
- Data availability and quality: Through dialogue with local stakeholders internally and externally to the CityLoops consortium, data availability, accessibility and quality has been mapped to ensure that the evaluation process for the selected indicators can be carried out in a practical and timely manner.
- Cross-City comparison and adherence to the Circular City definition (Annex 2) and the CityLoops project plans (Annex 1): As part of the process of developing the Evaluation Plans continuous dialogue between the cities and the CityLoops partner coordinating the evaluation work has been carried out to ensure some overlap and consistency in the selection of indicator between cities to allow comparison where practical. This dialogue has also ensured that indicators are selected to monitor progress towards circularity in a broad sense covering as much as possible all four Vision Elements of the Circular City definition as described in Vangelsten et al. (2021).

Table 1 to Table 4 list the selected indicators for each of the four vision elements in the CityLoops Circular City Definition (Vangelsten, et al. 2021). The tables describe at which level the indicators will be applied (Demonstration Action or City level) and which Demonstration Actions they will evaluate.

Table 1. List of indicators related with Vision Element 1 "Local Stakeholder Actions"

Indicator #	Indicator name	Scope (demo/city)	1. Biowaste selective collection and local treatment model	2. Biowaste circularity modes, new CP practices and training courses	3. Launch of green space certification system	4. Circular entrepreneurship initiatives	5. Reducing food waste by donation
#3	New tools for better mapping of resources and their location: For each tool, qualitative description	D/C	X				
#4	CE-related knowledge building campaigns: Qualitative description	D	X	X		X	
#5	CE-related knowledge building campaigns: Impact	D	X	X		X	
#6	Circularity related stakeholders' activities	D/C	X	X			X
#10	Stakeholder contribution to improved circularity	D/C	X				
#19	Progress towards circular city strategy objectives	C					
#21	New planning instruments/tools for improved circularity: Qualitative description	D		X			
#27	Reduced waste generation	D					X
#67	Open certified green space area ratio per 100.000 inhabitants	D			X		
#71	Percentage of city population with regular biowaste collection (residential)	D	X				

Table 2. List of indicators related with Vision Element 2 "Circular business models and behaviour patterns"

Indicator #	Indicator name	Scope (demo/city)	1. Biowaste selective collection and local treatment model	2. Biowaste circularity modes, new CP practices and training courses	3. Launch of green space certification system	4. Circular entrepreneurship initiatives	5. Reducing food waste by donation
#13	Increased provision of local, sustainable and healthy food	D		X			
#23	Eco-innovation: # of new CE business models/cases. This includes a qualitative description of model, its circular strategy (material, component, product, function)	D				X	

#24	Eco-innovation: Qualitative description	D				X	
#32	Reduced costs due to improved circularity	D	X	X	X		
#33	CE-based employment	D	X				
#89	Increased provision of local, sustainable and healthy food	D		X			

Table 3. List of indicators related to Vision Element 3 "Closing material loops and reducing harmful resource use"

INDICATOR #	INDICATOR NAME	SCOPE (DEMO/CITY)	1. BIOWASTE SELECTIVE COLLECTION AND LOCAL TREATMENT MODEL	2. BIOWASTE CIRCULARITY MODES, NEW CP PRACTICES AND TRAINING COURSES	3. LAUNCH OF GREEN SPACE CERTIFICATION SYSTEM	4. CIRCULAR ENTREPRENEURSHIP INITIATIVES	5. REDUCING FOOD WASTE BY DONATION
#27	Reduced waste generation	D		X	X		
#56	Quantity of material for composting	C/D	X	X	X		
#59	Waste-to-Energy rate	C					
#60	Waste-to-Energy rates per material fractions	C					
#88	Quantity of biowaste for collection avoided	C/D	X	X	X		X
#90	Reused nutrients present in compost on Green Spaces	D			X		

Table 4. List of indicators related to Vision Element 4 "Improving human wellbeing and reducing environmental impacts"

INDICATOR #	INDICATOR NAME	SCOPE (DEMO/CITY)	1. BIOWASTE SELECTIVE COLLECTION AND LOCAL TREATMENT MODEL	2. BIOWASTE CIRCULARITY MODES, NEW CP PRACTICES AND TRAINING COURSES	3. LAUNCH OF GREEN SPACE CERTIFICATION SYSTEM	4. CIRCULAR ENTREPRENEURSHIP INITIATIVES	5. REDUCING FOOD WASTE BY DONATION
#71	Percentage of city population with regular solid waste collection (residential)	D/C	X				
#85	GHG emissions per year	D/C	X	X			X
#86	Annual CO2 equivalent emissions per capita	C					
#87	Annual CO2 emissions per unit of GDP	C					

Links between the selected indicators and the expected outcomes for the specific Demonstration Actions are shown in the tables below.

Table 5: Linking expected outcomes to the selected indicators for Demonstration Action 1 "Biowaste selective collection and local treatment Model"

Vision Element	Expected outcome	Indicator
1 Local Stakeholder Actions	A new BW separate collection optimized system connected with city sensors network (SCS Tool)	New tools for better mapping of resources and their location
	Improved awareness of citizens and stakeholders on circular BW management	CE-related knowledge building campaigns
	New local stakeholder partnerships to promote biowaste selection collection and local treatment new models;	Circularity related stakeholders' activities
		Stakeholder contribution to improved circularity
2 Circular business models and behaviour patterns	Decreased costs associated with the waste treatment through increased selective collection of BW from residential sectors	Reduced costs due to improved circularity
	Increased circular jobs at ration: 1 BW separate collection system = 3 new jobs.	CE-based employment
3 Closing material loops and reducing harmful resource use	Collection of 1 500 t/year biowaste (total of 3.250 tonnes by M44)	Quantity of material for centralised composting
	1 t/year/composting bin unit of local biowaste treatment (15 in total)	Quantity of material for local composting Quantity of biowaste for collection avoided
4 Improving human wellbeing and reducing environmental impacts	21.660 of the population of the City of Porto engaged in the biowaste separate collection	Percentage of city population with regular solid waste collection (residential)
	210.17 kg of avoided CO_2 eq. emissions for 1 ton of biowaste treated on composting islands	GHG emissions per year

Table 6: Linking expected outcomes to the selected indicators for Demonstration Action 2 "Biowaste Circularity Models, new CP practices and training courses"

Vision Element	Expected outcome	Indicator
1 Local Stakeholder Actions	Capacity building of circularity models pilots' staff on circular procurement, to promote the new guidelines for BW circular procurement	CE-related knowledge building campaigns
	Two new local stakeholder partnerships to promote new biowaste circularity models and circular procurement practices.	Circularity related stakeholders' activities
	Application of two new tools to promote circularity in BW management: (1) Food demand management tool, (2) Decision making support too, validated and ready for replication and upscaling;	New planning instruments/tolls for improved circularity

Vision Element	Expected outcome	Indicator
2 Circular business models and behaviour patterns	Local vegetable production of around 3 kg per month with a growbed kit	Increased provision of local, sustainable and healthy food
	Reduced costs from waste collection due to demonstration action;	Reduced costs due to improved circularity
3 Closing material loops and reducing harmful resource use	Food waste avoided ~30% in the pilot comparing with baseline (M44)	Quantity of biowaste for collection avoided
	~300 g of food waste avoided per Embrulha package;	
	Increase separate biowaste collection by 50 t/year per pilot	Quantity of material for centralised composting
	Local treatment by 400 kg/year of biowaste per compost bin (300 l capacity);	Quantity of material for local composting Quantity of biowaste for collection avoided
4 Improving human wellbeing and reducing environmental impacts	Decreasing the GHG emissions related with BW production, collection and treatment – this outcome will be quantified after the calculation of baseline values.	GHG emissions per year

Table 7: Linking expected outcomes to the selected indicators for Demonstration Action 3 "Launch of Green Space Certification System"

Vision Element	Expected outcome	Indicator
1 Local Stakeholder Actions	A new certification of Sustainable Green Spaces, promoting the use of compost produced by LIPOR, is in place, validated and ready to be replicated and upscaled	Open certified green space area ratio per 100.000 inhabitants
2 Circular business models and behaviour patterns	Increased cost effectiveness in management and maintenance of green spaces;	Reduced costs due to improved circularity
3 Closing material loops and reducing harmful resource use	Reused nutrients present in compost on Porto City Green Spaces (kg NPK/m2)	Reused nutrients present in compost on Green Spaces
	Reduction of garden waste kg/m2)	Quantity of biowaste for collection avoided
	Quantity of material for composting (local or centralised option) (kg/m2)	Quantity of material for composting
4 Improving human wellbeing and reducing environmental impacts	N.A.	N.A.

Table 8: Linking expected outcomes to the selected indicators for Demonstration Action 4 "Circular Entrepreneuship Initiatives"

Vision Element	Expected outcome	Indicator
1 Local Stakeholder Actions	Improving the understanding of circular economy principles, by the participating teams	CE-related knowledge building campaigns
	Improving the capacity of transforming challenges into opportunities through the design and implementation of circular business models, by the participating teams	
2 Circular business models and behaviour patterns	Generation of 20 new business projects/ideas of which 5 will be winners	Eco-innovation: # of new CE business models/cases.
	Winning projects/ideas have developed detailed business plans ready to get financed.	
3 Closing material loops and reducing harmful resource use	N.A.	N.A.
4 Improving human wellbeing and reducing environmental impacts	N.A.	N.A.

Table 9: Linking expected outcomes to the selected indicators for Demonstration Action 5 "Reducing food waste by a donation network"

Vision Element	Expected outcome	Indicator
1 Local Stakeholder Actions	Increment of the number of supported families	Circularity related stakeholders' activities
2 Circular business models and behaviour patterns	N.A.	N.A.
3 Closing material loops and reducing harmful resource use	Food donation network increment achieving at least 75 tonne/year of food donation and 2.000 benefited families	Quantity of biowaste for collection avoided
4 Improving human wellbeing and reducing environmental impacts	Tonnes of CO2 emissions avoided through the donation programme;	GHG emissions per year

3. Plan for monitoring

The tables below detail the monitoring plan for each of the selected indicators. This will guide the CityLoops Evaluation work to be carried out and documented in the Interim Evaluation Report in Month 36 and the Final Evaluation Report in Month 46 of the project. The 16 metadata categories described for each of the selected indicators is based on the Circular City Indicator Set (Vangelsten et al., 2021). Metadata categories 1-5 and 7-8 are standard for all cities/waste streams whereas the others (6 and 9-16) vary from case to case and are therefore customized by each city to fit the scope and focus of their demonstration activities and the tools that they will test.

3.1. New tools for better mapping of resources and their location: Qualitative description

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	3
	2	Indicator name	New tools for better mapping of resources and their location: Qualitative description
Link to Circular City Definition	3	Vision Element	1. Local stakeholder actions
	4	Category	Engagement and capacity building Regulation and incentives Vision and urban management
Indicator definition and description	5	Definition / Description of indicator	Qualitative description of individual tools, including scope and scale (e.g. demonstration vs city level), target users.
	6	Rationale	New containers to biowaste selective collection and composting islands will be georeferenced allowing to know the source of material to compost production (DA1). The new smart sensor collection system will allow to collect information on the quantity of waste collected, together with data on usage patterns, and maintenance operations. This will be used to help optimise biowaste selective collection from the connected containers, to promote interaction with users and will also be made publicly available for businesses and the general public to enable other potential applications. At city level, both demo actions will contribute to know better the resources within the city. *(Selected together with indicator #20)*
	7	Methodology	Qualitative description
	8	Unit	Qualitative data
Data	9	Baseline data / definition	The tools are new and aren't implemented yet, so the baseline won't have information.

Metadata group	#	Metadata category	Description/comments
	10	Data Sources / Relevant Databases	The data related with qualitative description of the new tools will be given by LIPOR (DA1) and Porto Ambiente (DA1).
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Biowaste
	13	Reference area / Spatial implementation scale	City: Porto Demonstration Actions: DA1
	14	Reference period	Yearly Availability of data: Quarterly
	15	SDG Reference	12 - The local authority's capacity to encourage the establishment and successful operation of repair and reuse platforms and secondary material markets on their territory.
Other	16	Comments	

3.2. CE-related knowledge building campaigns: Qualitative description

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	4
	2	Indicator name	CE-related knowledge building campaigns: Qualitative description
Link to Circular City Definition	3	Vision Element	1. Local stakeholder actions
	4	Category	Engagement and capacity building
Indicator definition and description	5	Definition / Description of indicator	Description of knowledge building campaigns. The campaigns would normally be in the form of formalized education events, e.g. classes, courses, education workshops. Describe type of groups reached and type of knowledge building campaign.
	6	Rationale	Training courses and workshops will be performed to boost the transition to circular economy on individual actions and business. In DA1 composting workshops will be performed allowing citizens to contribute to the composting community islands. In DA2 training courses will be performed at several levels: to promote circular procurement practices, and to help the transition to circular economy on pilots (Hotel and IPSS) with training on the different actions that will be implemented. In DA4 a bootcamp and mentoring will be developed to allow the winners of the contest developing their business models. (Selected together with indicator #5)
	7	Methodology	a) Identify and categorise knowledge campaigns b) Identify groups reached
	8	Unit	Qualitative data

Metadata group	#	Metadata category	Description/comments
Data	9	Baseline data / definition	The baseline will be defined with the description of the training courses and workshops planned.
	10	Data Sources / Relevant Databases	The data related with qualitative description of the knowledge campaigns will be given by CMP (DA4) and LIPOR (DA1 and DA2).
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Biowaste, Tourism Sector (hotels and restaurants), Social Economy Sector and Entrepreneurship
	13	Reference area / Spatial implementation scale	Demonstration Actions: DA1, DA2 and DA4
	14	Reference period	Biannual Availability of Data: Quarterly
	15	SDG Reference	17 – The provision of training and other capacity building activities for public sector employees, as well as other stakeholders (such as local businesses) to increase skills relevant to fostering the circular transition.
Other	16	Comments	

3.3. CE-related knowledge building campaigns: Impact

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	5
	2	Indicator name	CE-related knowledge building campaigns: Impact
Link to Circular City Definition	3	Vision Element	1. Local stakeholder actions
	4	Category	Engagement and capacity building
Indicator definition and description	5	Definition / Description of indicator	# of campaigns # of people reached for each campaign
	6	Rationale	Training courses and workshops will be performed to boost the transition to circular economy on individual actions and business. In DA1 composting workshops will be performed allowing citizens to contribute to the composting community islands In DA2 training courses will be performed at several levels: to promote circular procurement practices, and to help the transition to circular economy on pilots (Hotel and IPSS) with training on the different actions that will be implemented. In DA4 a bootcamp and mentoring will be developed to allow the winners of the contest developing their business models. (Selected together with indicator #4)
	7	Methodology	a) Number of campaigns b) Number of people reached

Metadata group	#	Metadata category	Description/comments
	8	Unit	Number of campaigns Number of people
Data	9	Baseline data / definition	The baseline will be zero as no knowledge campaigns have yet been taken
	10	Data Sources / Relevant Databases	The data needed will be given by CMP (DA4) and LIPOR (DA1 and DA2).
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Biowaste, Tourism Sector (hotels and restaurants), Social Economy Sector and Entrepreneurship
	13	Reference area / Spatial implementation scale	Demonstration Actions: DA1, DA2 and DA4
	14	Reference period	Biannual Availability of Data: Quarterly
	15	SDG Reference	17 – The provision of training and other capacity building activities for public sector employees, as well as other stakeholders (such as local businesses) to increase skills relevant to fostering the circular transition.
Other	16	Comments	

3.4. Circularity related stakeholder activities

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	6
	2	Indicator name	Circularity related stakeholder activities
Link to Circular City Definition	3	Vision Element	1. Local stakeholder actions
	4	Category	Engagement and capacity building
Indicator definition and description	5	Definition / Description of indicator	Description of activity type and dialogue methods, which stakeholder groups and when in the process # of people involved
	6	Rationale	Porto Municipality has a previous work done in circularity related stakeholder activities and is strategic for Porto continuing this work. The indicator will be monitoring for all Demo Actions.
	7	Methodology	a) Identify stakeholder activity b) Describe process and when stakeholders are involved c) Identify dialogue methods used d) Number of people involved
	8	Unit	Qualitative data Number of people

Metadata group	#	Metadata category	Description/comments
Data	9	Baseline data / definition	The baseline related with Demo Actions will be zero. For City Level, the baseline will be considered the number of stakeholders engaged on development of Roadmap and involved on activation of local community for circular economy – food system.
	10	Data Sources / Relevant Databases	The data needed will be provided by CMP (City Level), LIPOR (DA1, DA2 and DA5) and Porto Ambiente (DA1) in accordance with each Demo Action and the stakeholders activities developed.
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Biowaste, Tourism Sector (hotels and restaurants), Social Economy Sector, Residential Sector (citizens), Schools, Universities and R&D Units
	13	Reference area / Spatial implementation scale	City: Porto Demonstration Actions: DA1, DA2 and DA5
	14	Reference period	Biannual Availability of Data: Quarterly
	15	SDG Reference	17 – Increased involvement of, and collaboration with, relevant stakeholders (including civil society, businesses, the research community, and other public sector actors) at the local and regional level at all different stages of CE planning, implementation, monitoring, reviewing, as a fundamental prerequisite to systemic transformation. This objective thus refers to the degree and quality of interaction and collaboration. This includes actions aimed at developing or upscaling activities to the regional level where appropriate.
Other	16	Comments	

3.5. Stakeholder contribution to improved circularity

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	10
	2	Indicator name	Stakeholder contribution to improved circularity
Link to Circular City Definition	3	Vision Element	1. Local stakeholder actions
	4	Category	Engagement and capacity building
Indicator definition and description	5	Definition / Description of indicator	Qualitative description of input from stakeholder activities and how it has contributed to improved circularity
	6	Rationale	Porto Municipality has a previous work done in circularity related stakeholder activities and is strategic for Porto continuing this work. The indicator will be monitoring for all Demo Actions.

Metadata group	#	Metadata category	Description/comments
	7	Methodology	a) List of inputs from stakeholders b) Describe how it has been used by those that promoted the stakeholder activity c) Describe how it has contributed to improved circularity
	8	Unit	Qualitative data + potential quantitative impact data
Data	9	Baseline data / definition	The baseline related with Demo Actions will be zero. The City Level baseline will take in consideration the inputs from stakeholders during roadmap development and constitution of local community for circular economy.
	10	Data Sources / Relevant Databases	CMP (City Level) Porto Ambiente (DA1)
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Biowaste, Tourism Sector (hotels and restaurants), Social Economy Sector, Residential Sector (citizens), Schools, Universities and R&D Units
	13	Reference area / Spatial implementation scale	City: Porto Demonstration Actions: DA1
	14	Reference period	Biannual Availability of Data: Quarterly
	15	SDG Reference	17 – Increased involvement of, and collaboration with, relevant stakeholders (including civil society, businesses, the research community, and other public sector actors) at the local and regional level at all different stages of CE planning, implementation, monitoring, reviewing, as a fundamental prerequisite to systemic transformation. This objective thus refers to the degree and quality of interaction and collaboration. This includes actions aimed at developing or upscaling activities to the regional level where appropriate. 17 – Given that the circular transition will require the adjustment of policy and regulatory frameworks at all levels of government, multi- level governance collaboration will be crucial. Local governments must be proactive in sharing experiences, knowledge, and good practices within the national and European arena.
Other	16	Comments	

3.6. Progress towards circular city strategy objectives

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	19
	2	Indicator name	Progress towards circular city strategy objectives
Link to Circ...	3	Vision Element	1. Local stakeholder actions

Metadata group	#	Metadata category	Description/comments
	4	Category	Vision and urban management
Indicator definition and description	5	Definition / Description of indicator	Describe to which degree the city is making progress towards its circularity objectives. Identify categories of relevant strategy documents, select documents and relevant selected CE targets.
	6	Rationale	Understand the progress towards Porto 2030 Roadmap objectives, related with biowaste, with CityLoops Project implementation it is an important analysis to make since it is possible to know the progress towards its circularity objectives. The ambition is to move from “little progress” to some “progress” on reaching Porto 2030 Roadmap objectives related with CityLoops Project.
	7	Methodology	For each of the identified targets: Describe ambition and judge on scale 1. No progress, 2. Little progress, 3. Some progress, 4. Ambition nearly reached, 5. Ambition reached or beyond
	8	Unit	Score on categorical scale (1-5)
Data	9	Baseline data / definition	The baseline to be considered will be 2. Little progress
	10	Data Sources / Relevant Databases	CMP (Porto Circular 2030 Roadmap)
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Biowaste and Public Sector
	13	Reference area / Spatial implementation scale	City: Porto
	14	Reference period	Yearly Availability of Data: Yearly
	15	SDG Reference	11, 16 – The existence of a city-wide strategy on the development of a local circular economy and/or local contribution to a more circular economy in general, including specific objectives and measures, as a key enabler, based on scientific/evidence-based (metabolic) analysis.
Other	16	Comments	

3.7. New planning instruments/tools for improved circularity: Qualitative description

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	21
	2	Indicator name	New planning instruments/tools for improved circularity: Qualitative description
Link to Circular City Definition	3	Vision Element	1. Local stakeholder actions
	4	Category	Vision and urban management

Metadata group	#	Metadata category	Description/comments
Indicator definition and description	5	Definition / Description of indicator	Define and select planning instruments/ tools relevant to improve circularity
	6	Rationale	New tools will be tested in DA1 and DA2 in order to improve circularity of biowaste. *(Selected together with indicator #22)*
	7	Methodology	Qualitative description of each instrument/tool
	8	Unit	Qualitative data
Data	9	Baseline data / definition	Since the tools are new, the baseline will be zero as no actions have yet been taken.
	10	Data Sources / Relevant Databases	The information related with tool description will be provided by LIPOR (DA2).
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Biowaste, Tourism Sector and Social Economy Sector
	13	Reference area / Spatial implementation scale	Demonstration Actions: DA2
	14	Reference period	Yearly Availability of Data: Quarterly
	15	SDG Reference	9, 11 - This objective refers to the aim to include circularity principles into public asset management, including for instance publicly owned land, buildings and infrastructure. Such principles could have manifold aims but can sensibly be determined as those that increase the use of secondary materials, extend product/stock lifetimes or intensify their use. Including such principles in urban asset management means in practice to give those principles a certain importance, if not prioritise them among other existing principles. Examples of relevant outputs are e.g. asset management procedures and guidelines, procurement, maintenance, assessment schemes etc.
Other	16	Comments	

3.8. New planning instruments/tools for improved circularity: Impact

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	22
	2	Indicator name	New planning instruments/tools for improved circularity: Impact
Link to Circular City Definition	3	Vision Element	1. Local stakeholder actions
	4	Category	Vision and urban management

Metadata group	#	Metadata category	Description/comments
Indicator definition and description	5	Definition / Description of indicator	Quantify impact of all planning instruments/tools described in indicator # 21.
	6	Rationale	New tools will be tested in DA2 in order to improve circularity of biowaste. *(Selected together with indicator #21)*
	7	Methodology	For each instrument/tool: # of projects where tool was used Total mass of materials that the tool has impacted on per year Recirculated mass of materials that the tool has impacted on per year
	8	Unit	Number of tools Tonnes/year
Data	9	Baseline data / definition	Since the tools are new the baseline will be zero as no actions have yet been taken.
	10	Data Sources / Relevant Databases	The information related with tool description will be provided by LIPOR (DA2).
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Biowaste, Tourism Sector and Social Economy Sector
	13	Reference area / Spatial implementation scale	Demonstration Actions: DA2
	14	Reference period	Yearly Availability of Data: Yearly
	15	SDG Reference	9, 11 - This objective refers to the aim to include circularity principles into public asset management, including for instance publicly owned land, buildings and infrastructure. Such principles could have manifold aims but can sensibly be determined as those that increase the use of secondary materials, extend product/stock lifetimes or intensify their use. Including such principles in urban asset management means in practice to give those principles a certain importance, if not prioritise them among other existing principles. Examples of relevant outputs are e.g. asset management procedures and guidelines, procurement, maintenance, assessment schemes etc. 9, 11 - The inclusion of CE principles in urban planning decisions, such as zoning and planning decisions, construction and demolition permits, and mobility planning. Such principles could have manifold aims but can sensibly be determined as those that increase the use of secondary materials, extend product/stock lifetimes or intensify their use. Systematically incorporating such principles in urban planning decisions is one of the most important levers for local authorities in promoting the transition to a CE on their territory.
Other	16	Comments	

3.9. Eco-innovation: Qualitative description

Metadata group	#	Metadata category	Description/comments
Indicator definition and description	1	Indicator number	23

Metadata group	#	Metadata category	Description/comments
	2	Indicator name	Eco-innovation: Qualitative description
Link to Circular City Definition	3	Vision Element	2. Circular business models and behavioural patterns
	4	Category	Circular design and business models Private investments, jobs and gross value added
Indicator definition and description	5	Definition / Description of indicator	Describe the business model, including how it contributes to moving up the waste hierarchy
	6	Rationale	Under Circular Entrepreneurship Initiatives a contest will be promoted in order to acquire new business ideas that contribute to circular economy. *(Selected together with indicator #24)*
	7	Methodology	# of new CE business models For each model, a qualitative description of model, its circular strategy
	8	Unit	Qualitative data
Data	9	Baseline data / definition	The initiatives have yet been taken so the baseline is zero.
	10	Data Sources / Relevant Databases	The information about new business ideas/models will be provided by CMP (DA4).
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Biowaste, Social Economy Sector and Tourism Sector
	13	Reference area / Spatial implementation scale	Demonstration Action: DA4
	14	Reference period	Yearly Availability of Data: Yearly
	15	SDG Reference	9, 12 - Increasing the lifetime of assets (equipment, machinery, buildings, infrastructure and consumer goods) in order to reduce waste generation and resource use. This can occur through different kinds of interventions, induced by different urban actors, including e.g. permit extensions, eco-design, modular design & design for repair, maintenance etc. 3, 12 - Recognising that local food production and distribution entails clear health and climate benefits, this objective refers to increasing the share of locally produced and consumed food. 9, 12 - Increasing the exploitation rate of assets (e.g. equipment, machinery, buildings, infrastructure and consumer goods), intensifying their use and increasing their utility. One of the main mechanisms, through which this can occur, is through sharing activities (e.g. car sharing, sharing office- or production space). An increased rate of exploitation of assets is a key circularity objective as it increases the utility of existing assets for society and counteracts the use of virgin materials.
Other	16	Comments	

3.10. Eco-innovation: Impact

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	24
	2	Indicator name	Eco-innovation: Impact
Link to Circular City Definition	3	Vision Element	2. Circular business models and behavioural patterns
	4	Category	Circular design and business models Private investments, jobs and gross value added
Indicator definition and description	5	Definition / Description of indicator	For each case of implementation of CE business models in indicator #23, describe impact in terms of value creation and material flow
	6	Rationale	Under Circular Entrepreneurship Initiatives a contest will be promoted in order to acquire new business ideas that contribute to circular economy. It is expected that will be generated 20 new business project/ideas of which 5 are winners. *(Selected together with indicator #23)*
	7	Methodology	For each case of implementation of CE business models a) Turnover b) Materials impacted
	8	Unit	Monetary value Tonnes/year
Data	9	Baseline data / definition	The initiatives have yet been taken so the baseline is zero.
	10	Data Sources / Relevant Databases	The information about new business ideas/models will be provided by CMP (DA4).
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Biowaste, Social Economy Sector, Tourism Sector
	13	Reference area / Spatial implementation scale	Demonstration Action: DA4
	14	Reference period	Yearly Availability of Data: Yearly

Metadata group	#	Metadata category	Description/comments
	15	SDG Reference	9, 12 - Increasing the lifetime of assets (equipment, machinery, buildings, infrastructure and consumer goods) in order to reduce waste generation and resource use. This can occur through different kinds of interventions, induced by different urban actors, including e.g. permit extensions, eco-design, modular design & design for repair, maintenance etc. 3, 12 - Recognising that local food production and distribution entails clear health and climate benefits, this objective refers to increasing the share of locally produced and consumed food. 9, 12 - Increasing the exploitation rate of assets (e.g. equipment, machinery, buildings, infrastructure and consumer goods), intensifying their use and increasing their utility. One of the main mechanisms, through which this can occur, is through sharing activities (e.g. car sharing, sharing office- or production space). An increased rate of exploitation of assets is a key circularity objective as it increases the utility of existing assets for society and counteracts the use of virgin materials.
Other	16	Comments	

3.11. Reduced costs due to improved circularity

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	32
	2	Indicator name	Reduced costs due to improved circularity
Link to Circular City Definition	3	Vision Element	2. Circular business models and behavioural patterns
	4	Category	Private investments, jobs and gross value added Well-being
Indicator definition and description	5	Definition / Description of indicator	For selected cost type(s) (e.g. transport, virgin material costs, waste treatment costs), direct impacts on costs should be estimated.
	6	Rationale	Improve circularity it's a way to reduce costs mainly related with acquisition of new materials and waste treatment. A serial of analyses will be taken under demonstrations actions developed in the City of Porto. In DA1 will be analysed the avoided costs related with the biowaste local treatment, that will be not collected and transported to centralised treatment. It will also be analysed the avoided costs with biowaste selective collection instead of mixed waste collection. In DA2 will also be analysed the avoided costs with biowaste selective collection instead of mixed waste collection, but most important will be analysed the costs avoided with implementation with waste prevention projects, that will allow reduce costs on business related with food waste. In DA3 will be analysed the avoided costs with more sustainable practices in management and maintenance of green spaces.
	7	Methodology	Quantification of cost savings for the selected cost type using a practical method. The estimate should be accompanied by a qualitative description of the method, which cost items are included and which are excluded, with a justification of the choice.

Metadata group	#	Metadata category	Description/comments
	8	Unit	Monetary value
Data	9	Baseline data / definition	For DA1 and DA2, the baselines will be the cost of mixed waste collection and valorisation instead of biowaste selective collection and valorisation.
	10	Data Sources / Relevant Databases	The data needed will be provided by LIPOR (DA2), Porto Ambiente (DA1 and DA2), CMP (DA3) and LIPOR (DA3). From Porto Ambiente the database where the data will be extracted is the tonnes of waste collected. From LIPOR the database where data will be extracted is that related with Dose Certa, Embrulha initiatives; community composting islands and Zero Desperdício network.
	11	Overall accuracy	Estimative will be calculated through the tonnes of mixed waste collection and valorisation avoided. .
Context	12	Sector coverage	Biowaste
	13	Reference area / Spatial implementation scale	Demonstration Actions: DA1, DA2 and D3.
	14	Reference period	Yearly Availability of Data: Biannual
	15	SDG Reference	8 - Increasing the value generated by local economic activities that increase repair, reuse, sharing and recycling of materials and products including recovery and exploitation of waste. The continued, gradual increase of value added from those activities, is a potential indication for reduced resource use, and highlights the growing economic significance of the sector.
Other	16	Comments	

3.12. CE-based employment

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	33
	2	Indicator name	CE-based employment
Link to Circular City Definition	3	Vision Element	2. Circular business models and behavioural patterns
	4	Category	Private investments, jobs and gross value added Well-being
Indicator definition and description	5	Definition / Description of indicator	Assess the impact of demonstration actions or at sector/city level by estimating the increase in CE related jobs
	6	Rationale	Are expected to be created CE related jobs in DA1. Increased circular jobs at ratio: 1 BW separate collection system = 3 new jobs.

Metadata group	#	Metadata category	Description/comments
	7	Methodology	For a selected time period (e.g. year, project period etc) estimate: # of new CE related jobs # of existing jobs becoming circular If deemed practical for the evaluation, jobs that have a range of responsibilities, of which some are related to circularity and some are not, can be assigned a "percentage of circularity". Using this principle, a change in the percentage can be assigned for existing jobs that become more circular.
	8	Unit	Jobs
Data	9	Baseline data / definition	Considering the demo actions the value will be zero.
	10	Data Sources / Relevant Databases	The data need will be provided by LIPOR (DA1) and Porto Ambiente (DA1)
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Biowaste
	13	Reference area / Spatial implementation scale	Demonstration Action: DA1
	14	Reference period	Yearly Availability of Data: Quarterly
	15	SDG Reference	8 - Increasing the number of jobs in the local circular economy and the share of employment in the latter but also the rate of employment in general, providing an indication for both the value and size of the circular economy but also for a just transition from the linear model.
Other	16	Comments	

3.13. Quantity of material for composting

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	56
	2	Indicator name	Quantity of material for composting
Link to Circular City Definition	3	Vision Element	3. Closing material loops and reducing harmful resource use
	4	Category	Re-use and recycling
Indicator definition	5	Definition / Description of indicator	Estimate mass of materials going to composting at demo, sector and city level.

Metadata group	#	Metadata category	Description/comments
	6	Rationale	Composting is one way to give a new life to biowaste and return it to the soil contributing to improve circularity in a city. DA1 and DA2 will have biowaste selective collection which destination is the LIPOR's Organic Valorisation Plant to produce compost. For example, in DA1 the goal is to achieve a collection of 1,500 t/year of biowaste (total of 3.250 tonnes by M44) and in DA2 to increase separate biowaste collection by 50 t/year per pilot, with a total of 100 t/year in the two pilots (M44) Also, in DA1 we will produce compost in the community composting island. In DA1 the goal is to achieve 1 t/year/composting bin unit of local biowaste treatment (15 in total) and in DA2 the goal is to increase local treatment by 400 kg/year of biowaste per compost bin, with 300 l capacity (M44). In DA3, the green waste will be collected and sent to LIPOR's Organic Valorisation Plant.
	7	Methodology	Mass of organic material going to composting. Data may come from demo managers, waste management companies or the Sector Circularity Assessment Method.
	8	Unit	Tonnes/year
Data	9	Baseline data / definition	The baseline will consider the estimation for 2020 of materials going to composting at city level. Considering the demo actions the value will be 11 550 tonnes/year of biowaste (2019).
	10	Data Sources / Relevant Databases	The data needed will be provided by LIPOR (DA1, DA2 and city level), Porto Ambiente (DA1 and DA3) and CMP (DA3).
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Biowaste
	13	Reference area / Spatial implementation scale	Demonstration Actions: DA1, DA2 and DA3
	14	Reference period	Quarterly Availability of Data: Monthly
	15	SDG Reference	12 - The increase of material amounts for the next cycle of use by following the 2018 EU waste hierarchy with the preference starting from the top, namely through preserving materials and products (extending lifetimes), reusing products or materials (i.e. use of the same product and function by another user), repairing products (as to maintain its original function), repurposing products (using products or their components in a new product with different function), through refurbishing or remanufacturing, and recycling of products or materials (obtaining higher or lower grade recycled materials for the same function or for inferior products (backfilling)).
Other	16	Comments	Mandatory in accordance with D4.3

3.14. Waste-to-Energy rate

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	59
	2	Indicator name	Incineration rate (original name) Note: the name of this indicator to the City of Porto is “Waste-to-Energy rate”
Link to Circular City Definition	3	Vision Element	3. Closing material loops and reducing harmful resource use
	4	Category	Waste generation/management
Indicator definition and description	5	Definition / Description of indicator	Mass percentage of waste which is send to Waste-to-Energy (WtE).
	6	Rationale	The implementation of CityLoops project, will contribute to the prevention of food waste production (DA2, DA3, DA5) and to increase the percentage of biowaste treated locally or collected (DA1, DA2) that will be organically treated to produce compost that will be return to soil, closing the loop. This will contribute to the reduction of the WtE rate of waste produced at Porto City (from 78,45% to 77,35% in 2019).
	7	Methodology	Mass of materials send to LIPOR WtE Plant divided by total amount of waste. Data from waste management companies.
	8	Unit	%
Data	9	Baseline data / definition	The baseline will consider the estimation for 2019 of materials going to LIPOR WtE Plant, at city level. The baseline will be 78,45% of undifferentiated waste send to WtE, in 2019.
	10	Data Sources / Relevant Databases	The data needed will be provided by LIPOR.
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Waste, Biowaste
	13	Reference area / Spatial implementation scale	City: Porto
	14	Reference period	Biannual Availability of Data: Quarterly
	15	SDG Reference	12 - Reduced waste generation, assessed according to different waste fractions, including biodegradable material (e.g. zero avoidable food 12 waste). 12 - Reduced amounts of (waste) materials, assessed according to different waste fractions, including biodegradable materials, subjected to final destinations such as incineration, WtE and landfilling.
Other	16	Comments	

3.15. Waste-to-Energy rates per material fractions

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	60
	2	Indicator name	Incineration rates per material fractions (original name) Note: the name of this indicator to the City of Porto is “Waste-to-Energy rates per material fractions”
Link to Circular City Definition	3	Vision Element	3. Closing material loops and reducing harmful resource use
	4	Category	Waste generation/management
Indicator definition and description	5	Definition / Description of indicator	Mass percentage of waste which is send to Waste-to-Energy (WtE) for each material fraction as defined by local waste management companies.
	6	Rationale	The implementation of CityLoops project, will contribute to the prevention of food waste production (DA2, DA3, DA5) and to increase the percentage of biowaste treated locally or collected (DA1, DA2) that will be organically treated to produce compost that will be return to soil, closing the loop. This will contribute to the reduction of the WtE rate of biowaste produced at Porto City (from 69,6% to 65,7% in 2019).
	7	Methodology	Per fraction: Mass of materials send to WtE divided by total amount of waste. Data from waste management companies.
	8	Unit	%
Data	9	Baseline data / definition	The baseline will consider the estimation for 2019 of biowaste going to LIPOR WtE Plant, at city level.
	10	Data Sources / Relevant Databases	The data needed will be provided by LIPOR.
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Waste, Biowaste
	13	Reference area / Spatial implementation scale	City: Porto
	14	Reference period	Yearly Availability of Data: Yearly
	15	SDG Reference	12 - Reduced waste generation, assessed according to different waste fractions, including biodegradable material (e.g. zero avoidable food waste).
Other	16	Comments	Mandatory in accordance with D4.3

3.16. Open certified green space area rate

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	67
	2	Indicator name	Open green space area ratio per 100,000 inhabitants (original name) Note: the name of this indicator for the City of Porto is “Open certified green space area rate”
Link to Circular City Definition	3	Vision Element	4. Improving human well-being and reducing environmental impacts
	4	Category	Well-being
Indicator definition and description	5	Definition / Description of indicator	Define requirements for an open green space, for example using the EEA definition for publicly accessible green space per inhabitant.
	6	Rationale	With implementation of Demo Action 3 the goal is to promote sustainable practices in green spaces management, as using composting instead of chemical fertilizers in order to improve the environment as well as the well-being of the citizens. The indicator was divided in two to understand the impact of the Demo Action 3.
	7	Methodology	#67.1 (original) The total area of green spaces divided by number of inhabitants multiplied by 100 000. #67.2 The total area of certified green spaces per total area of green spaces.
	8	Unit	#67.1 (original) hectare / 100 000 people #67.2 %
Data	9	Baseline data / definition	The baseline for #67.1 will be the actual total area of green spaces divided by number of inhabitants multiplied by 100 000. The baseline for #67.2 will be zero since the demo action aren’t take yet.
	10	Data Sources / Relevant Databases	The data needed will be provided by CMP (DA3) and LIPOR (DA3).
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Social economy, public and tourism (hotel and restaurant) sectors
	13	Reference area / Spatial implementation scale	City: Porto Demonstration Action: DA3
	14	Reference period	Yearly Availability of Data: Yearly
	15	SDG Reference	11, 15 - Improving recreational ecosystem services is a key component of human well-being. This objective refers to the impacts of integrated urban planning measures on the quantity and quality of green spaces in the city.
Other	16	Comments	

3.17. Percentage of city population with regular biowaste collection (residential)

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	71
	2	Indicator name	Percentage of city population with regular solid waste collection (residential) (original name) Note: the name of this indicator to the City of Porto is “Percentage of city population with regular biowaste collection (residential)”
Link to Circular City Definition	3	Vision Element	4. Improving human well-being and reducing environmental impacts
	4	Category	Well-being
Indicator definition and description	5	Definition / Description of indicator	Total houses getting regular waste management service (namely of biowaste stream). Total inhabitants living in these houses.
	6	Rationale	The implementation of CityLoops project, mainly DA1, will contribute to increase the percentage of city population with regular solid waste collection (namely of biowaste stream), achieving the goal of 25.500 inhabitants of the City of Porto engaged in the biowaste separate collection. This will allow increase the circularity of the city, since the biowaste collected will be organically treated to produce compost that will be return to soil, closing the loop.
	7	Methodology	Population connected with regular waste management service divided by city population. The indicator will be disaggregated to know the city population covered by biowaste selective collection.
	8	Unit	%
Data	9	Baseline data / definition	The baseline to be considered will be the percentage of city population covered with regular solid waste collection (residential), highlighting and individualising the information on biowaste collection
	10	Data Sources / Relevant Databases	The data needed will be provided by Porto Ambiente (DA1), from their registries of operational service.
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Waste, Biowaste
	13	Reference area / Spatial implementation scale	City: Porto Demonstration Action: DA1
	14	Reference period	Yearly Availability of Data: Biannual
	15	SDG Reference	6,7,9,11 - This objective refers to the impact the circular economic model has on people’s access to basic services such as sanitation, drinking water, shelter etc.
Other	16	Comments	

3.18. GHG emissions per year

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	85
	2	Indicator name	GHG emissions per year
Link to Circular City Definition	3	Vision Element	4. Improving human well-being and reducing environmental impacts
	4	Category	Environment impacts (global)
Indicator definition and description	5	Definition / Description of indicator	The indicator measures annual emissions of the so called 'Kyoto basket' of greenhouse gases. The indicator should be calculated at city level and when relevant, for demonstration actions. Focus is on direct emissions.
	6	Rationale	All demonstration actions have an impact on the reduction of emissions of GHG associated with the management of biowaste, through diversion from landfill or Waste-to-Energy promoted by selective collection and local treatment (DA1), as well as measures to reduce food waste (DA2 and DA5).
	7	Methodology	Direct GHG emissions pr. year demo level Direct GHG emissions pr. year city level
	8	Unit	Tonnes/year of CO_2-equivalents
Data	9	Baseline data / definition	For city level analysis the baseline will take in consideration the "Annual Report of Energy and Emissions (Agência de Energia do Porto 2018)" of the City of Porto, developed by Agência de Energia do Porto (AdE Porto - Local Energy Agency). For city level, will be considered GHG emissions (CO_2e) related with energy consumption. At demo level will only be accounted the CO_2 emissions taking in account the quantity of biowaste that are not sent to landfill that is diverted by biowaste prevention projects (DA2 and DA5) or diverted from undifferentiated collection (DA1 and DA2). It will also be considered the information from entrepreneurship projects.
	10	Data Sources / Relevant Databases	The data related with biowaste selective collection will be provided by Porto Ambiente (DA1). The data related with the implementation of biowaste prevention projects and biowaste local treatment will be provided by LIPOR (DA1, DA2, DA5). The data related with the estimates related with the entrepreneurship initiatives will be provided by CMP (DA4). The data at city level will be provided by AdEPorto (CO_2 emissions).
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Biowaste
	13	Reference area / Spatial implementation scale	City: Porto Demonstration Action: DA1, DA2 and DA5
	14	Reference period	City: Yearly | Availability of data: Yearly Demonstration Action: Biannual | Availability of data: Biannual
	15	SDG Reference	7, 13 - Reducing emissions locally through shifting from a linear to a more circular production and consumption model, realizes its impact globally through reduced global warming potential. This objective thus aims at achieving a reduction of GHG-emissions through CE interventions, in line with local agendas and EU targets.

Metadata group	#	Metadata category	Description/comments
Other	16	Comments	

3.19. Annual CO_2 equivalent emissions per capita

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	86
	2	Indicator name	Annual CO_2 equivalent emissions per capita
Link to Circular City Definition	3	Vision Element	4. Improving human well-being and reducing environmental impacts
	4	Category	Environment impacts (global)
Indicator definition and description	5	Definition / Description of indicator	The indicator measures annual emissions of the so called 'Kyoto basket' of greenhouse gases per capita at city level.
	6	Rationale	For benchmarking opportunities at city level will be calculated the annual GHG emissions per capita
	7	Methodology	Direct GHG emissions per year at city level divided by the number of inhabitants
	8	Unit	Tonnes CO_2-equivalents / capita / year
Data	9	Baseline data / definition	The baseline will be calculated for 2018 (year) with the total GHG emissions from indicator #85 and the total of inhabitants in that year.
	10	Data Sources / Relevant Databases	The data related with number with inhabitants in year 2018 will be from INE databases.
	11	Overall accuracy	The total population is an annual estimate made by INE (Statistic National Institute)
Context	12	Sector coverage	Biowaste
	13	Reference area / Spatial implementation scale	City: Porto
	14	Reference period	Yearly Availability of Data: Yearly
	15	SDG Reference	7, 13 - Reducing emissions locally through shifting from a linear to a more circular production and consumption model, realizes its impact globally through reduced global warming potential. This objective thus aims at achieving a reduction of GHG-emissions through CE interventions, in line with local agendas and EU targets.
Other	16	Comments	

3.20. Annual CO_2 emissions per unit of GDP

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	87
	2	Indicator name	Annual CO_2 emissions per unit of GDP
Link to Circular City Definition	3	Vision Element	4. Improving human well-being and reducing environmental impacts
	4	Category	Environment impacts (global)
Indicator definition and description	5	Definition / Description of indicator	The indicator measures annual direct emissions of CO_2 at city level per GDP at city level.
	6	Rationale	For benchmarking opportunities at city level will be calculated the annual GHG emissions per GDP
	7	Methodology	Direct CO_2 emissions divided by GDP at city level. Calculated per year.
	8	Unit	Tonnes CO_2 eq./ Monetary unit
Data	9	Baseline data / definition	The baseline will be calculated for 2018 (year) with the total GHG emissions from indicator #85 and the GVA (Gross Value Added) at city level. There is no information of GDP at city level.
	10	Data Sources / Relevant Databases	The data related with GVA at city level in year 2018 will be from INE databases.
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Biowaste
	13	Reference area / Spatial implementation scale	City: Porto
	14	Reference period	Yearly Availability of Data: Yearly
	15	SDG Reference	7, 13 - Reducing emissions locally through shifting from a linear to a more circular production and consumption model, realizes its impact globally through reduced global warming potential. This objective thus aims at achieving a reduction of GHG-emissions through CE interventions, in line with local agendas and EU targets.
Other	16	Comments	

3.21. Quantity of biowaste for collection avoided

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	88
	2	Indicator name	Quantity of biowaste for collection avoided
Link to Circ...	3	Vision Element	3. Closing material loops and reducing harmful resource use

Metadata group	#	Metadata category	Description/comments
	4	Category	Waste generation/management
Indicator definition and description	5	Definition / Description of indicator	Amount of biowaste generation for collection avoided with the promotion of biowaste prevention and local treatment projects, assessed according to biowaste fractions (food waste and garden waste).
	6	Rationale	DA1 and DA2 will promote local composting treatment. For example, in DA1 the goal is to achieve 1 t/year/composting bin unit of local biowaste treatment (15 in total). DA1 will promote the production of compost in the community composting island, avoiding the generation of biowaste for collection. In DA2 the goal is to avoid food waste generation, with prevention reaching ~30% in the pilot comparing with baseline (M44), including a specific goal of ~300 g of food waste avoided per Embrulha package. In addition, it was defined a specific goal for local treatment of biowaste in the two pilots: 400 kg/year of biowaste per compost bin (300 l capacity). In DA3 one of the outcomes is the reduction of garden waste (kg/m2), through sustainable practices in the management and maintenance of green spaces. In DA5 the goal is to promote food donation network increment achieving at least 75 tonne/year of food donation and 2.000 benefited families, avoiding the generation of food waste with this DA.
	7	Methodology	Mass of biowaste going to local treatment (like community composting islands) and avoided through biowaste prevention projects (like Embrulha project) and avoided by entering a new cycle of use (Food donation network). Data may come from demo managers.
	8	Unit	Tonnes/year
Data	9	Baseline data / definition	Considering the demo actions the value will be zero.
	10	Data Sources / Relevant Databases	The data need will be provided by LIPOR (DA1, DA2 and DA5), Porto Ambiente (DA1) and CMP (DA3).
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Biowaste
	13	Reference area / Spatial implementation scale	Demonstration Actions: DA1, DA2, DA3 and DA5.
	14	Reference period	Yearly Availability of Data: Biannual
	15	SDG Reference	12 - The increase of material amounts for the next cycle of use by following the 2018 EU waste hierarchy with the preference starting from the top, namely through preserving materials and products (extending lifetimes), reusing products or materials (i.e. use of the same product and function by another user), repairing products (as to maintain its original function), repurposing products (using products or their components in a new product with different function), through refurbishing or remanufacturing, and recycling of products or materials (obtaining higher or lower grade recycled materials for the same function or for inferior products (backfilling)).
Other	16	Comments	New indicator created.

3.22. Increased provision of local, sustainable and healthy food

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	89
	2	Indicator name	Increased provision of local, sustainable and healthy food
Link to Circular City Definition	3	Vision Element	2. Circular business models and behaviour patterns
	4	Category	Circular business models
Indicator definition and description	5	Definition / Description of indicator	Recognising that local food production and distribution entails clear health and climate benefits, this indicator will quantify the amount of locally produced and consumed food in two DA2 pilots (tourism and social sector).
	6	Rationale	In DA2 the goal is to achieve a local vegetable production of around 3 kg per month with a growbed kit.
	7	Methodology	Mass of local vegetable production in two DA2 pilots (tourism and social sector). Data may come from demo managers.
	8	Unit	Tonnes/year
Data	9	Baseline data / definition	Considering the demo actions the value will be zero.
	10	Data Sources / Relevant Databases	The data need will be provided by LIPOR (DA2).
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Biowaste
	13	Reference area / Spatial implementation scale	Demonstration Actions: DA2.
	14	Reference period	Biannual Availability of Data: Quarterly
	15	SDG Reference	
Other	16	Comments	New indicator created.

3.23. Reused nutrients present in compost on Green Spaces

Metadata group	#	Metadata category	Description/comments
Identifier	1	Indicator number	90
	2	Indicator name	Reused nutrients present in compost on Green Spaces
Link to Circ	3	Vision Element	3. Closing material loops and reducing harmful resource use

Metadata group	#	Metadata category	Description/comments
	4	Category	Re-use and recycling
Indicator definition and description	5	Definition / Description of indicator	Recognising that the re-use of nutrients present in compost in green spaces entails clear climate benefits, this indicator will quantify the amount of re-use of nutrients present in compost applied in Porto City green spaces in DA3.
	6	Rationale	In DA3 the goal is to promote the re-use of nutrients present in compost on Porto City Green Spaces
	7	Methodology	Mass of reused nutrients present in compost on Porto City Green Spaces (kg NPK/m2). Data may come from demo managers.
	8	Unit	Kg NPK/m2
Data	9	Baseline data / definition	Considering the demo actions the value will be zero.
	10	Data Sources / Relevant Databases	The data need will be provided by CMP (DA3).
	11	Overall accuracy	n.a.
Context	12	Sector coverage	Biowaste
	13	Reference area / Spatial implementation scale	Demonstration Actions: DA3.
	14	Reference period	Biannual Availability of Data: Quarterly
	15	SDG Reference	
Other	16	Comments	New indicator created.

4. References

Agência de Energia do Porto. *Relatóio Anual de Energia e Emissões.* 2018. https://adeporto.eu/pt/projetos/relatorio-anual-de-energia-e-emissoes/ (acedido em 29 de march de 2021).

Bjorn Vidar Vangelsten (NRI), Bjarne Lindelov (NRI) and Carolin Bellstedt (MoC). “Revised Indicator Set Including definitions and evaluation methodology; CityLoops supporting note - Task 6.2 Evaluation Plan.” 2021.

Câmara Municipal do Porto. “PAPERSU do Município do Porto.” Porto, 2015.

Ellen MacArthur Foundation. “Cities and Circular Economy for Food: Porto.” 2019.

INE. *Densidade populacional (Nº/Km2) por local de residência (NUTS - 2013); Anual.* 2019.

INE. *Proporção da população que entra na unidade territorial (movimentos pendulares) (%) por Local de residência (à data dos Censos 2011); Decenal - INE, Recenseamento da população e habitação - Censos 2011.* 2011.

PORDATA. *População residente, estimativas a 31 de Dezembro.* 2019.

Vangelsten, B.V., et al. “Circular City Indicator Set. CityLoops Deliverable 6.1.” 2021.

Annex 1: CityLoops impacts as listed in the Grant Agreement

Scientific impacts

- Sector and City-Wide Material Flow and Stock Accounting Methodology
- Development of an open-source urban metabolism data repository
- Circular Procurement tools and indicators
- Operationalisation of EC circular economy monitoring framework to small and medium cities
- IT decision making support tools
- Planning and decision-making framework for reuse and recycling of CDW

Innovation/economic impacts

- Increased CE jobs potential in demonstration and replication cities
- New innovative CE related procurement partnerships and dialogues in demonstration and replication cities
- Growth in green economy (e.g. increase in reuse / recycling infrastructure capacity)
- Business cases for valorisation of CDW and soil
- Increased use of new decision-making support tools to improve circular management practices
- Optimised and new links between the social economy and other sectors, promoting circularity (e.g. links between food distribution sector and the social economy sector decreasing food waste production)

Societal impacts

- Sustained community benefits including skills, training and green jobs
- Improved Well Being (e.g. QoL indicators)
- Provision of food support to economically disadvantaged families in the social economy sector
- New jobs for currently unemployed people due to development of CE

Environmental impacts

- Increased reuse and recycling of CDW and soil resulting in reduced energy consumption, improved resource efficiency and reduced heavy-duty transport
- Recycling of OW
- Reduced landfill
- Reduced greenhouse gas emissions

Annex 2: Strategic objectives defined in D6.1

Vision Element 1 “Local stakeholder actions”: Strategic Objectives

- Facilitation of repair and reuse platforms, and the secondary materials market
- Increased capacity building on CE for public employees and other local stakeholders
- Increased collaboration with local and regional stakeholders in CE planning and implementation, and the promotion of regional upscaling
- Increased engagement with national and international policy makers and researchers on the CE
- Increased provision of information on CE to local stakeholders
- Improved regulatory framework to support circularity
- Increased use of economic incentives and fiscal measures to promote circularity as well as removal of subsidies hindering circularity
- Integration of circularity principles into public procurement and financing processes
- Existence of city-wide strategy on CE with measurable objectives translated into targeted actions
- Integration of circularity principles into asset management, including publicly owned land, buildings and infrastructure
- Integration of circularity principles into urban planning decisions such as zoning and planning decisions, construction and demolition permits and mobility planning

Vision Element 2 “Circular business models and behaviour patterns”: Strategic Objectives

- Increased asset lifetimes, including through flexible design and use
- Increased provision of local, sustainable and healthy food
- Increased rate of exploitation of assets (including equipment, machinery, buildings, infrastructure)
- Increased sustainable urban mobility options
- Enhanced waste collection, treatment and processing systems, including increased on-site reuse and treatment of waste
- Increased cooperation among sectors
- Increased use of repair and reuse platforms, and the secondary materials market
- Localisation of supply chains
- Increased gross value added of circular economy activities (repair, reuse, sharing, recycling)

- Increased number of jobs in the local circular economy (repair, reuse, sharing, recycling, eco-design)

Vision Element 3 “Closing material loops and reducing harmful resource use”: Strategic Objectives

- Reduced (harmful) raw material consumption
- Reduced overall energy demand and increased share of renewable energy
- Increased share of renewable and secondary raw materials in overall material demand
- Increased self-sufficiency / self-reliance
- Increased quantity of materials available for the next cycle
- Reduced waste generation
- Reduced incineration, Waste-to-Energy and landfilling activities and amounts subjected

Vision Element 4 “Improving human wellbeing and reducing environmental impacts”: Strategic Objectives

- Improved education
- Improved public health
- Improved recreational services
- Improved access to basic services
- Reduced unemployment
- Reduced poverty and inequality
- Human-centred land-use and urban planning
- Biodiversity loss and deforestation
- Improved water quality
- Improved air quality
- Reduced soil degradation
- Mitigate climate change
- Reduce global adverse environmental impact of local consumption
- Transformed, sustainable local economy
- Increased resilience of local economy
- Reduced risk of urban infrastructure against natural disasters

CITYLOOPS

CityLoops is an EU-funded project focusing on construction and demolition waste (CDW), including soil, and organic waste (OW), where seven European cities are piloting solutions to be more circular.

Høje-Taastrup and Roskilde (Denmark), Mikkeli (Finland), Apeldoorn (the Netherlands), Bodø (Norway), Porto (Portugal) and Seville (Spain) are the seven cities implementing a series of demonstration actions on CDW and OW, and developing and testing over 30 new tools and processes.

Alongside these, a sector-wide circularity assessment and an urban circularity assessment are to be carried out in each of the cities. The former, to optimise the demonstration activities, whereas the latter to enable cities to effectively integrate circularity into planning and decision making. Another two key aspect of CityLoops are stakeholder engagement and circular procurement.

CityLoops runs from October 2019 until September 2023.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 821033.