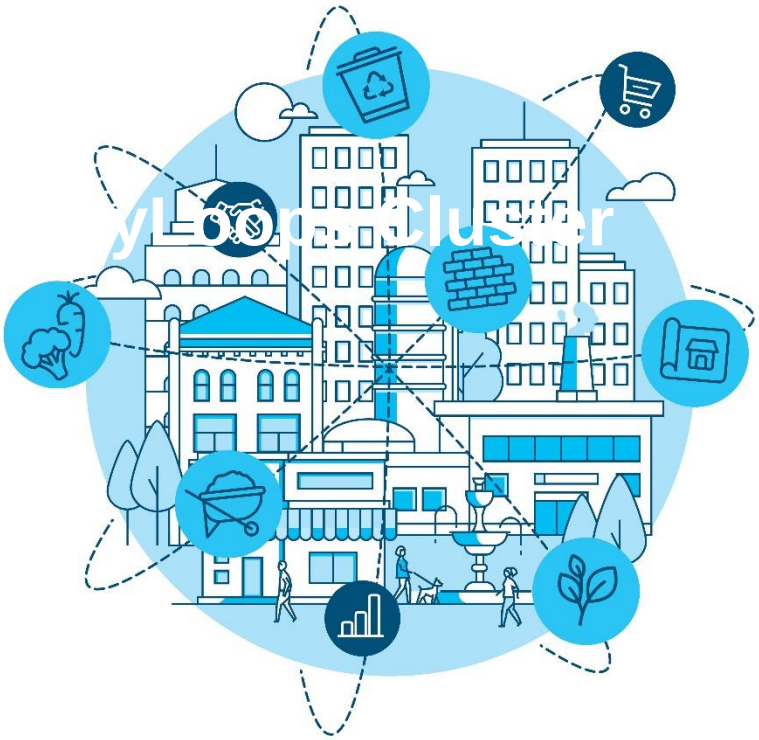
Evaluation Plan: Biowaste sector, Seville

Deliverable 6.2

City Council of Seville - Seville CityLoops Cluster



Version	4.2
WP	6
Deliverable	6.2 (Evaluation Plan: Biowaste, Seville)
Date	18 Feb 2022
Dissemination level	Public
Deliverable lead	Ayuntamiento de Sevilla
Authors	Pedro Cruces González, LIPASAM César Gallardo Soler, Ayuntamiento de Sevilla
Reviewers	Graciano Carpes Hortal, EMASESA Emilio Benítez Flores; LIPASAM Santiago Rodríguez Pérez, IDENER Jens Ørding Hansen, NRI Are Jensen, NRI Nikolai Jacobi, ICLEI Europe
Abstract	This report details how the city of Seville will evaluate the impact of the CityLoops tools and demonstration activities aimed at improving the circularity of the Biowaste sector.
Keywords	Evaluation, Indicators, Seville, 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 3

1.1. Demonstration Action 1: Implementation of a biowaste collection route in a neighbourhood of Seville 5

1.2. Demonstration Action 2: Biomethane production from biowaste in co-digestion with sludge 7

2. Indicators to be monitored 9

3. Plan for monitoring 14

3.1. CE-related knowledge building campaigns: Qualitative description | Demonstration action 14

3.2. CE-related knowledge building campaigns: Impact | Demonstration action 16

3.3. Circularity-related stakeholder activities | Demonstration action 18

3.4. Communication measures on circular transformations and waste prevention | Demonstration action 19

3.5. Procurement with circularity requirement beyond existing levels 21

3.6. Reduced costs due to improved circularity | Demonstration action 23

3.7. Total energy demand | Demonstration action 24

3.8. Quantity of material collected for composting destination | Demonstration action 26

3.9. Quantity of material collected per inhabitant | Demonstration action 27

3.10. Reduction in food waste | Demonstration action 28

3.11. Quantity of material for anaerobic digestion | Demonstration action 30

3.12. Quantity of sludge produced after anaerobic digestion | Demonstration action 31

3.13. Quantity of biogas produced | Demonstration action 33

3.14. End of Life Processing Rate | City 34

3.15. End of Life Processing Rate | Demonstration action 36

3.16. Quantity of pure biowaste mass collected | Demonstration action 38

3.17. Landfilling rate | City 39

3.18. GHG emissions per year | Demonstration action 40

4. References 43

1. Introduction

As part of the CityLoops project, and associated with the implementation of the demonstration actions to be carried out in the city of Seville, evaluation work will be done for both waste flows, biowaste and construction/demolition waste (BW and CDW), which are addressed in CityLoops.

The objective of the CityLoops evaluation work is to ensure 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.

This is the evaluation plan for the BW sector in the city of Seville, developing the rest of the cities participating in the project, a personalized plan for their demonstration actions and particular tools, but with a common base.

The means of this plan is to measure and monitor the progress of the cities involved, committing in becoming more circular.

CONTEXT

The city of Seville, located in the south of Spain, has around 700,000 inhabitants and a surface area of 140.42 km2. It is the most populated city in Andalusia, the fourth in Spain. The municipal solid waste management is one of the main concerns of the city management and a critical area of its circular economy approach.

Biowaste (BW) represents up to 37% of the total amount of municipal solid waste generated in the city, i.e., 110,000 tonnes of BW yearly. Currently, only 5% of BW is recycled, mostly as compost.

The demonstration actions of the CityLoops project represent another step towards advancing Seville's path towards a more circular city, which is aligned with the declaration that the city itself led in 2017, together with more than 200 municipalities in Spain in the which underlines the importance of Local Governments to put into practice the commitment, the need to implement the Circular Economy.

Seville's declaration for the Circular Economy is also aligned with its City Model of the Seville 2030 Strategic Plan.

On the other hand, the city of Seville understands its commitment to the 2030 Agenda for sustainable development of the United Nations, and assumes it as the standard of its strategic and sectoral planning. Likewise, the Seville 2030 Strategic Plan is aligned with the Sustainable Development Goals (SDG).

Other local and sectoral initiatives and plans converge in the Seville 2030 Strategic Plan, such as the Local Waste Management Program, currently the draft, which will incorporate, if the results are satisfactory, the actions piloted within the framework of the project CityLoops.

Seville's CityLoops cluster consists of the Municipality of Seville, LIPASAM (Municipal Solid Waste Management Company), EMASESA (Municipal Wastewater Treatment Management Company) and IDENER (Private Research Company). Together it is committed with the CityLoops' approach to close the loops of waste material in the city promoting a circular economy approach to the city's development.

Image 1. Example of surface container of high capacity (2,200 L) for biowaste installed in the city of Seville

The demonstration actions to monitor are described below.

1.1. Demonstration Action 1: Implementation of a biowaste collection route in a neighbourhood of Seville

DESCRIPTION

A selective biowaste collection route will be demonstrated within CityLoops in a city neighbourhood by LIPASAM, the municipal waste management company of Seville.

This project aims to improve both the quantity and purity of the biowaste collected by the city. A set of biowaste collection containers will be installed, for exclusive access to neighbourhood citizens and commercial establishments, with an information and awareness raising campaign to accompany this. A software tool designed to optimise the logistics of biowaste collection is also being developed and will be tested in the demonstration neighbourhood.

Alongside the demonstration action a further (mainly digital) awareness raising campaign will be launched across the whole city aimed at encouraging people, mainly large generators such as hotels, restaurants, etc. (the HORECA sector), to reduce food waste.

If the demonstration action is successful, recommendations will be developed for upscaling across the city.

OBJECTIVES & KEY ACTIVITIES

This demonstration action will be supported by two tools elaborated during the inception phase of the project:

- ***A Preliminary diagnosis report.*** The report analysing the current flow of biowaste in the city (in terms of quantity and quality – both separate biowaste collection and organic matter in mixed waste), together with an overview of current collection and treatment systems. It concludes with an implementation plan for the CityLoops demonstration actions.
- ***An OMSW flow optimisation tool.*** The software tool developed is based on Material Flow Analysis (MFA) to model different scenarios in terms of routes, as well as the location and expansion of containers. This should serve to improve the management of biowaste and efficiency of the routes implemented.

The key activities that conform the demonstration action are:

- ***Installation of 100 separate waste collection containers in one neighbourhood.*** 100 side-loading containers of 2,200 litre with electronic locks will be installed (with circularity criteria taken into account in their procurement) in a neighbourhood of Seville. Citizens who want to participate in the system will be able to open the

container with a card, in order to guarantee, in the long term, the purity of the waste fraction, which is essential for its subsequent valorisation.

- ***1 Neighbourhood communication campaign on the separated collection system.*** Associated with the installation of containers in the neighbourhood yet to be selected, a communication campaign will be developed. Various actions will be carried out, focused on improving citizen engagement.
- ***1 Citywide communication campaign on reducing food waste.*** It is considered necessary to carry out a pilot experience consisting of a communication campaign, aimed mainly at hotels, restaurants, etc. (the HORECA sector) in order to reduce food waste.
- ***Testing of OMSW flow optimisation tool.*** The tool will be tested in real conditions of operation. Also it is expected that it will support the analysis of biowaste collection in order to improve the efficiency of the different routes deployed in Seville. Ultimately, the tool is intendeds to be used to increase the biowaste collection separately to the whole city, including households and large generators.
- ***Analysis of the results.*** If the demonstration action is successful, recommendations will be developed for upscaling across the city, being integrated in the Local Plan for Waste Management of Seville.

EXPECTED OUTCOMES

- Strengthened alliances with relevant local and regional actors in the field of biowaste circularity.
- Raised awareness among citizens about the collection and segregation at source of biowaste, as well as its benefits.
- Raised awareness among large biowaste generators, mainly in the HORECA sector (hotels, restaurants and catering), about minimizing food waste.
- More sustainable street furniture deployed in the city as a result of the inclusion of circular specifications in tender documents and contracts.
- Increased amount of material that is recovered/recycled, and therefore reduced amount of material that is deposited in landfills. In particular:
    - 0.6% increase in the separate collection of biowaste in the city compared to the amount collected in 2020.
    - Reduced food waste from HORECA entities.
    - Increased quality of biowaste collected compared to the quality of biowaste at the start of the DA.
- Significant transport energy and cost savings in the waste management system, which will serve as the basis for assessing the potential expansion of the DA to the rest of the city.
- Reduced carbon emissions from waste collection activities.

In general, the DA will help Seville fulfil the European, national, and regional objectives related to selective collection, recycling, and landfilling disposal marked by EU Directives 851/2018 and 850/2018.

DEVIATIONS FROM THE PROPOSAL

In relation to the expected impact in terms of job creation, the adoption of a specific indicator is scrapped, due to the difficulty of collecting such data reliably. The initial employment estimate is based mainly on indirect employment, as a result of the activities to be carried out within the project (production and manufacture of containers and smart-locks, personnel for communication campaigns, etc.)

No other major deviations from what was originally foreseen in the proposal have been detected.

1.2. Demonstration Action 2: Biomethane production from biowaste in co-digestion with sludge

DESCRIPTION

The methane production capacity of the biowaste collected from Demo Action 1 will be tested through a process of co-digestion with sewage sludge in a wastewater treatment plant (WWTP). This is being tested as an alternative to the current collection and transportation of biowaste for composting in a treatment plant more than 32 km away from the city.

The aim of this action is to reduce the distance travelled by the biowaste (and consequent fuel consumption and CO2 emissions), and increase the energy self-sufficiency of the WWTP, which is significantly closer to the city. Furthermore, following this action, feasibility studies will likely be carried out to evaluate the use of biowaste, as source of biogas to be used as fuel for the fleet of municipal vehicles, urban buses and heavy-duty vehicles for waste collection, among others. If the demonstration action is successful, recommendations will be developed for upscaling across the city.

OBJECTIVES & KEY ACTIVITIES

- ***Physical characterisation of the biowaste collected.*** Several physical characterisations, to determine the purity of the biowaste fraction collected will be done.

- ***Lab analysis of COD, BMP and other parameters.*** Several chemical characterisations for COD, BMP, etc. to determine the capacity of methane production will be done using samples of biowaste collected from the route of the Demo 1.
- ***Pilot of energy generation from biowaste collected and sludge.*** Once these characterizations have been done, the dose of biowaste to introduce in the pilot plant can be calculated. The biowaste will be mixed with WWTP sludge before introducing it into the pilot digester. During the course of the test, the production of methane will be measured. The quality of the gas produced will also be analysed, in order to determine the amount of hydrogen sulphide, methane, CO2 and other gas concentrations.
- ***Revision of the results obtained.*** Data obtained will be used to define the methane production potential of the biowaste, in order to design the pre-treatment system or the process strategies for managing the anaerobic digestion of the WWTP.
- ***Economic and environmental benchmarking analysis.*** Economic and environmental comparison between the base scenario (transport to treatment plant for composting) and the demo action (and potential expansion) will be done, as part of the analysis results of the demo action.

EXPECTED OUTCOMES

- Increased amount of material recovered for biogas production purposes, and therefore reduced amount of material that is deposited in landfills.
- Increased efficiency of production of biogas per facility/unit.

In addition to the concrete outcomes above, the DA will also generate information that will be used to assess the potential for expanding the pilot to an industrial stage, such as the increment of quantity of sludge produced after the anaerobic digestion.

DEVIATIONS FROM THE PROPOSAL

No major deviations from what was originally foreseen in the proposal have been detected for DA2.

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 and Tools: Each selected indicator will monitor specific processes and impacts related to the Demonstration Action activities (and if relevant the application of CityLoops tools outside the scope of the demonstration actions) 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 group the indicators selected by Seville according to which of the four Vision Elements in the CityLoops circular city definition they belong to (Vangelsten et al., 2021). The tables describe at which level the indicators will be applied (Demonstration Action or City level) and which Demonstration Actions and tools they will evaluate.

The total number of indicators selected reflects an attempt to strike a balance between enabling a comprehensive evaluation and keeping the complexity of the evaluation task within manageable limits.

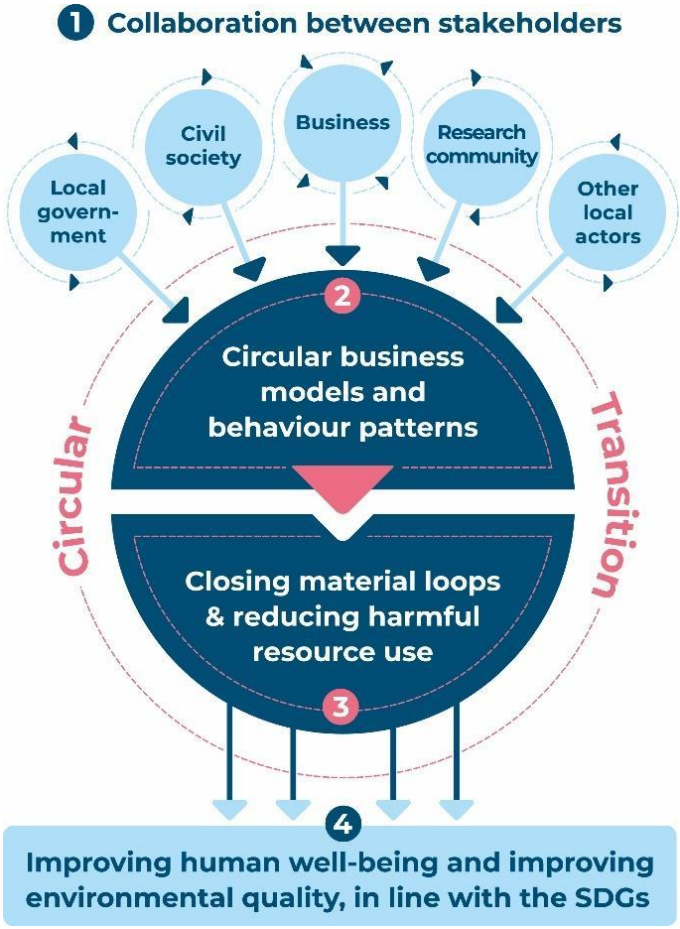


Figure 1. The four Vision Elements of the Circular City vision and causal links for CE transition. Source: D.6.1 Evaluation framework and indicator

The indicators were selected considering the impact of the demonstration actions and their relevance for analysing the circularity progress.

Many of the indicators refer to pilot actions that are going to take place in the city for the first time so that no previous data are available. In addition, it will be necessary to create new datasets.

Also, the indicators selected will allow comparison with other cities in the project in order to detect areas for improvement.

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

INDICATOR #	INDICATOR NAME	SCOPE (DEMO/CITY)	DEMO ACTION 1	DEMO ACTION 2
4	CE-related knowledge building campaigns: Qualitative description	D	X	
5	CE-related knowledge building campaigns: Impact	D	X	
6	Circularity-related stakeholder activities	D	X	
11	Communication measures on circular transformations and waste prevention	D	X	

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

INDICATOR #	INDICATOR NAME	SCOPE (DEMO/CITY)	DEMO ACTION 1	DEMO ACTION 2
15	Procurement with circularity requirements beyond existing levels: Impact	D	X	
32	Reduced costs due to improved circularity	D	X	
36	Total energy demand	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)	DEMO ACTION 1	DEMO ACTION 2
52.1	Quantity of material collected for composting destination	D	X	
52.2	Quantity of material collected per inhabitant	D	X	
53.1	Quantity of material for anaerobic digestion	D		X
53.2	Quantity of sludge produced after anaerobic digestion	D		X
53.3	Quantity of biogas produced	D		X

58	End of Life Processing Rate	C/D	X	X
58.1	Quantity of pure biowaste mass collected	D	X	
52.3	Reduction in food waste	D	X	
61	Landfilling rate	C	X	

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

INDICATOR #	INDICATOR NAME	SCOPE (DEMO/CITY)	DEMO ACTION 1	DEMO ACTION 2
85	GHG emissions per year	D	X	

Links between the selected indicators and the expected outcomes for the specific Demonstration Actions (and, if relevant, application of tools outside the scope of the DAs) are shown in the tables below.

Table 5. Linking expected outcomes to the selected indicators for Demonstration Action 1: Implementation of a biowaste collection route in a neighbourhood of Seville.

Vision Element	Expected outcome	Indicator
1 Local Stakeholder Actions	Strengthened alliances with relevant local and regional actors in the field of biowaste circularity.	**6. Circularity-related stakeholder activities**
	Raised awareness among citizens about the collection and segregation at source of biowaste, as well as its benefits.	**4. CE-related knowledge building campaigns: Qualitative description** **5. CE-related knowledge building campaigns: Impact**
	Raised awareness among large biowaste generators, mainly in the HORECA sector (hotels, restaurants, and catering), about minimizing food waste.	**11. Communication measures on circular transformations and waste prevention**
2 Circular business models and behaviour patterns	More sustainable street furniture deployed in the city as a result of the inclusion of circular specifications in tender documents and contracts.	**15. Procurement with circularity requirements beyond existing levels: Impact**

Vision Element	Expected outcome	Indicator
	Significant transport energy and cost savings in the waste management system, which will serve as the basis for assessing the potential expansion of the DA to the rest of the city.	**32. Reduced costs due to improved circularity** **36. Total energy demand**
3 Closing material loops and reducing harmful resource use	0.6% increase in the separate collection of biowaste in the city compared to the amount collected in 2020.	**52.1 Quantity of material collected for composting destination** **52.2 Quantity of material collected per inhabitant** **61. Landfilling rate**
	Reduced food waste from HORECA entities.	**52.3 Reduction in food waste**
	Increased quality of biowaste collected compared to the quality of biowaste collected at the start of the DA.	**58 End of Life Processing Rate** **58.1 Quantity of pure biowaste mass collected**
4 Improving human wellbeing and reducing environmental impacts	Reduced carbon footprint from waste collection activities.	**85. GHG emissions per year**

Table 6. Linking expected outcomes to the selected indicators for Demonstration Action 2: Biomethane production from biowaste in co-digestion with sludge.

Vision Element	Expected outcome	Indicator
3 Closing material loops and reducing harmful resource use	Increased amount of material recovered for biogas production purposes, and therefore reduced amount of material that is deposited in landfills.	**53.1 Quantity of material for anaerobic digestion** **58 End of Life Processing Rate**
	Increased efficiency of production of biogas per facility/unit.	**53.3 Quantity of biogas produced**
	Information generated that allows the evaluation of the potential for expanding the pilot to an industrial stage.	**53.2 Quantity of sludge produced after anaerobic digestion**

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 are 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) are particular for the demo actions scope and objectives for the city of Seville.

The Seville team involved in the evaluation work is presented below:

Table 7. Evaluation team for Seville

EVALUATION TEAM		
Role	**Tasks**	**Organizations**
Evaluation manager	▪ Data collection ▪ Monitoring and analysis	Seville city council – César Gallardo Sóler
Supporters	▪ Data reporting ▪ Analysis	Demo manager wp3: LIPASAM – Pedro Cruces González Rest of the Seville CityLoops Cluster
Local stakeholder groups	▪ Analysis and data reporting ▪ Results sharing	Treatment plant, waste and water managers (private and public), suppliers, public administration, universities, merchant associations, distributors, social organizations, and citizens

3.1. CE-related knowledge building campaigns: Qualitative description | Demonstration action

Metadata group	#	Metadata category	Description / comments
Identifier	1	Indicator number	4
	2	Indicator name	CE-related knowledge building campaigns: Qualitative description

Metadata group	#	Metadata category	Description / comments
Link to Circular City Definition	3	Vision element	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, mailing, information points, and education workshops. Describe type of groups reached and type of knowledge building campaign. (To be selected together with indicator number 5)
	6	Rationale	During the CityLoops project, communication campaigns will take place in order to improve the circularity of BW in the city of Seville. In those campaigns, awareness will be raised and knowledge will be disseminated about this issue. In DA1, communication campaigns will be performed allowing citizens to contribute to the new collection system to be implemented and to build up this capacity in order to learn more sustainable daily practices with the aim of promoting the segregation at source.
	7	Methodology	1. Identify and categorise knowledge campaigns 2. Identify groups reached
	8	Unit	Qualitative data
Data	9	Baseline data / definition	Baseline 0 (only activities during the project are measured)
	10	Data sources / relevant databases	Report of actions carried out within the communication campaign. Meetings minutes. Participant lists. List of other networking meetings and interviews (date and participants).
	11	Overall accuracy	Exact number of actions within the campaigns done. Estimated and/or number of groups reached (depends on the action).
Context	12	Sector coverage	BW

Metadata group	#	Metadata category	Description / comments
	13	Reference area / spatial implementation scale	Demonstration Actions: DA1.
	14	Reference period	Project period 1.10.2019 – 30.9.2023. Report Frequency: Yearly.
	15	SDG reference	17. Partnerships for the Goals.
Other	16	Comments	

3.2. CE-related knowledge building campaigns: Impact | Demonstration action

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	Local stakeholder actions
	4	Category	• Engagement and capacity building
Indicator definition and description	5	Definition / description of indicator	Number of campaigns. Number of people reached for each campaign.
	6	Rationale	During the CityLoops project, several campaigns will take place in order to improve the circularity of BW in the city of Seville. In those campaigns, awareness will be raised and knowledge will be disseminated about this issue. In DA1, communication campaigns will be performed allowing citizens to contribute to the new collection system to be implemented and to build up this capacity in order to learn more sustainable daily practices with the aim of promoting the segregation at source.

Metadata group	#	Metadata category	Description / comments
			(Selected together with indicator #4)
	7	Methodology	1. Number of campaigns 2. Number of people reached
	8	Unit	Number of campaigns, Number of people
Data	9	Baseline data / definition	Baseline 0 (only activities during the project are measured).
	10	Data sources / relevant databases	Report of actions carried out within the communication campaign. Meetings minutes Participant lists List of other networking meetings and interviews (date and participants)
	11	Overall accuracy	Exact number of campaigns done Exact or estimated number of people
Context	12	Sector coverage	BW
	13	Reference area / spatial implementation scale	Demonstration Actions: DA1.
	14	Reference period	Project period 1.10.2019 – 30.9.2023. Report Frequency: Yearly.
	15	SDG reference	17. Partnerships for the Goals.
Other	16	Comments	

3.3. Circularity-related stakeholder activities | Demonstration action

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	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 Number of people involved
	6	Rationale	Participation in CE-related activities makes local and regional stakeholders (local business, civil society associations, etc) more aware of the impact and benefits of improving Circular Economy in the City. During the CityLoops project, several workshops, meetings, events and communication actions will be carried out with the Local Stakeholder Group and the Collaborative Learning Network established by the Seville cluster in order to boost circularity in the city.
	7	Methodology	Identify stakeholder activity Describe process and when stakeholders are involved Identify dialogue methods used Number of people involved
	8	Unit	Qualitative data, Number of people
Data	9	Baseline data / definition	During February 2020, a workshop was held aimed at involving local stakeholders previously identified in the demonstration actions as well as in the work package related to the evaluation of the circularity of the city's materials. Likewise, prior to this workshop, several preparatory actions took place: - Personalized emailing explaining project and purpose of the workshop. No. of people reached: 13.

Metadata group	#	Metadata category	Description / comments
			- Individual phone calls and snowball sampling: No. of people reached: 13. - First round of preparation meeting for workshops: No. of people reached: 13. - Workshop: No. of people reached: 24.
	10	Data sources / relevant databases	Meetings minutes, participant lists, list of other networking meetings and interviews (date and participants)
	11	Overall accuracy	Exact or estimated number of stakeholders involved
Context	12	Sector coverage	BW.
	13	Reference area / spatial implementation scale	Region of Andalusia mainly City of Seville Local Stakeholder group.
	14	Reference period	Project period 1.10.2019 – 30.9.2023 Report Frequency: Yearly.
	15	SDG reference	17. Partnerships for the Goals.
Other	16	Comments	Reference: *Seville Stakeholder Engagement Plan.* *Local Stakeholder Group* *Collaborative Learning Network*

3.4. Communication measures on circular transformations and waste prevention | Demonstration action

Metadata group	#	Metadata category	Description / comments
Identifier	1	Indicator number	11

Metadata group	#	Metadata category	Description / comments
	2	Indicator name	Communication measures on circular transformations and waste prevention
Link to Circular City Definition	3	Vision element	Local stakeholder actions
	4	Category	Engagement and capacity building
Indicator definition and description	5	Definition / description of indicator	Describe type of communication measures, e.g. campaigns, provision of information, events for the public/companies.
	6	Rationale	In DA1, a communication campaign will focus mainly on the HORECA sector (hotels, restaurants, and catering) with the aim of building up their capacity in order to learn more sustainable daily practices in the field of avoiding food waste.
	7	Methodology	Number of communication measures towards general public on CE transformation Number of people reached
	8	Unit	Number of communication measures, Number of people
Data	9	Baseline data / definition	Baseline 0 (only activities during the project are measured)
	10	Data sources / relevant databases	Reports of communications actions List of communications (date and participants)
	11	Overall accuracy	Exact or estimated number of communications actions done Exact or estimated number of people reached
Context	12	Sector coverage	BW
	13	Reference area / spatial implementation scale	Demonstration Actions: DA1.
	14	Reference period	Project period 1.10.2019 – 30.9.2023. Report Frequency: Yearly.

Metadata group	#	Metadata category	Description / comments
	15	SDG reference	17. Partnerships for the Goals.
Other	16	Comments	

3.5. Procurement with circularity requirement beyond existing levels

Metadata group	#	Metadata category	Description / comments
Identifier	1	Indicator number	15
	2	Indicator name	Procurement with circularity requirements beyond existing levels: Impact
Link to Circular City Definition	3	Vision element	Local stakeholder actions
	4	Category	Regulation and incentives
Indicator definition and description	5	Definition / description of indicator	# of procurements with circularity requirements Value of procurement with circularity requirements
	6	Rationale	The implementation of circular procurement practices is a vehicle for making the city more circular. Parts of the demonstration actions to be carried out in the city of Seville require the purchase of equipment, materials, etc. In the cases that are mandatory, clauses will be established that result in a greater circularity of the elements / solutions to be purchased. Circular procurement practices will be applied in DA1 in the tenders related to the acquisition of containers, materials for communication campaigns, etc.

Metadata group	#	Metadata category	Description / comments
	7	Methodology	For each action: ● Type of procurement action ● Value of procurement For the whole period considered: ● Time period ● Number of procurement contracts ● Sum up the total value of these contracts
	8	Unit	Number of indicators
Data	9	Baseline data / definition	In January 2021, the procurement of 100 side-loading containers for Demo Action 1 was launched. In the specifications it was mentioned that it would be valuable to incorporate recycled material in the manufacture of the containers to be purchased. The specification included in the tender about this issue was: "*When materials from recycled materials are used in the manufacturing process, the proportion of these materials with respect to virgin material, the origin of these recycled materials and the cleaning and granulation process. The incorporation of recycled material will be positively valued, provided that the technical characteristics required in the European regulations EN 12574 are maintained".*
	10	Data sources / relevant databases	Reports of contracts, agreements and grants by: LIPASAM, EMASESA and City Council of Seville. Procurement of 100 containers: https://contrataciondelestado.es/wps/wcm/connect/e2e197d9-d747-4f0e-98b1-c781b4c2b4ce/DOC_CD2021-752328.pdf?MOD=AJPERES
	11	Overall accuracy	Description of the specifications established in procurement tenders:
Context	12	Sector coverage	BW
	13	Reference area / spatial implementation scale	Demonstration Actions: DA1.
	14	Reference period	Project period 1.10.2019 – 30.9.2023

Metadata group	#	Metadata category	Description / comments
			Report Frequency: Yearly.
	15	SDG reference	12 – Sustainable Consumption and Production.
Other	16	Comments	

3.6. Reduced costs due to improved circularity | Demonstration action

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	Circular business models and behavioural patterns
	4	Category	Private investments, jobs and gross value added
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	Improving circularity is also a way to reduce costs. The demonstration actions to be carried out aim to optimize mainly the logistics of biowaste collection. That is why, during the demonstration action, the logistics costs will be evaluated. A comparison will be done between a scenario with a fixed frequency collection and the alternative (to be piloted) where the frequency will be determined from the correlation between the volume of waste disposed in the containers and the number of times that they have been used. In DA1 the avoided costs related to optimization of the logistics of the biowaste collection will be analysed, using the OMSW optimization tool developed by IDENER.
	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

Metadata group	#	Metadata category	Description / comments
			method, which cost items are included and which are excluded, with a justification of the choice.
	8	Unit	Monetary value
Data	9	Baseline data / definition	Baseline: 0% (only activities during the project are measured)
	10	Data sources / relevant databases	Internal Benchmarking report elaborated ad hoc for the project by LIPASAM and IDENER.
	11	Overall accuracy	%; €/tons waste collected
Context	12	Sector coverage	BW
	13	Reference area / spatial implementation scale	Demonstration Actions: DA1
	14	Reference period	Project period 1.10.2019 – 30.9.2023 Report Frequency: At the end of DA1.
	15	SDG reference	12 – Sustainable Consumption and Production.
Other	16	Comments	

3.7. Total energy demand | Demonstration action

Metadata group	#	Metadata category	Description / comments
Identifier	1	Indicator number	36
	2	Indicator name	Total energy demand
Link to Circular City Definition	3	Vision element	Closing material loops and reducing harmful resource use
	4	Category	Material / energy flow

Metadata group	#	Metadata category	Description / comments
Indicator definition and description	5	Definition / description of indicator	Total energy demand for all sectors in the city.
	6	Rationale	Part of the demonstration actions are based on achieving greater optimization of the collection logistics, fundamentally, so it is considered appropriate to control the energy demanded from the biowaste management activity. In DA1, the energy demand (litres of fuel) related with optimization of the logistics of the biowaste collection will be analysed using the OMSW optimization tool developed by IDENER.
	7	Methodology	Total energy demand in the city, if possible, broken down by key sectors. Data from statistical offices/power companies.
	8	Unit	KWh/year
Data	9	Baseline data / definition	Baseline: 0% (only activities during the project are measured)
	10	Data sources / relevant databases	Internal Benchmarking report elaborate ad hoc for the project by LIPASAM and IDENER.
	11	Overall accuracy	TEP/ton of waste
Context	12	Sector coverage	BW
	13	Reference area / spatial implementation scale	Demonstration Actions: DA1.
	14	Reference period	Project period 1.10.2019 – 30.9.2023 Report Frequency: At the end of DA1.
	15	SDG reference	12 – Sustainable Consumption and Production.
Other	16	Comments	

3.8. Quantity of material collected for composting destination | Demonstration action

Metadata group	#	Metadata category	Description / comments
Identifier	1	Indicator number	52.1
	2	Indicator name	Quantity of material collected for composting destination
Link to Circular City Definition	3	Vision element	Closing material loops and reducing harmful resource use
	4	Category	Re-use and recycling
Indicator definition and description	5	Definition / description of indicator	Amount of material collected in containers for the fraction of separate collection of biowaste destined for composting.
	6	Rationale	The main objectives of actions related to biowaste in the project are recycling this fraction and increasing its purity. DA1: Biowaste mass will be collected through the installation of a separate collection system in an area of Seville.
	7	Methodology	Sum up mass of biowaste material collected. Data come from LIPASAM and ABORGASE, operator of the treatment plant to which the biowaste will be destined.
	8	Unit	Tonnes/year
Data	9	Baseline data / definition	Baseline: 0 (only activities during the project are measured)
	10	Data sources / relevant databases	Internal report of the monitoring of demo action 1 (biowaste collected) By LIPASAM. ABORGASE Supporting.
	11	Overall accuracy	tonnes/year,
Context	12	Sector coverage	BW

Metadata group	#	Metadata category	Description / comments
	13	Reference area / spatial implementation scale	Demonstration Actions: DA1.
	14	Reference period	Project period 1.10.2019 – 30.9.2023 Report Frequency DA1: Once DA 1 runs, monthly.
	15	SDG reference	11. Sustainable Cities and Communities.
Other	16	Comments	

3.9. Quantity of material collected per inhabitant | Demonstration action

Metadata group	#	Metadata category	Description / comments
Identifier	1	Indicator number	52.2
	2	Indicator name	Quantity of material collected per inhabitant.
Link to Circular City Definition	3	Vision element	Closing material loops and reducing harmful resource use
	4	Category	Re-use and recycling
Indicator definition and description	5	Definition / description of indicator	Estimation of amount of biowaste material generated in the demo area per inhabitant covered.
	6	Rationale	DA1: Biowaste mass will be collected through the installation of separate collection containers with smart-

Metadata group	#	Metadata category	Description / comments
			locks. It is considered interesting to measure the mass of biowaste disposed by users (citizens) in order to get information about the participation in the collection system.
	7	Methodology	Data come from the smart-lock management platform procured in the framework of DA1.
	8	Unit	Tonnes per Inhabitant (user).
Data	9	Baseline data / definition	Baseline: 0 (only activities during the project are measured)
	10	Data sources / relevant databases	Smart-lock management platform, operated by LIPASAM. In addition, work will be done so that this information feeds the platform developed by IDENER.
	11	Overall accuracy	Tonnes/Kilograms per user.
Context	12	Sector coverage	BW
	13	Reference area / spatial implementation scale	Demonstration Actions: DA1.
	14	Reference period	Project period 1.10.2019 – 30.9.2023 Report Frequency DA1: Once DA 1 runs, monthly.
	15	SDG reference	11. Sustainable Cities and Communities
Other	16	Comments	

3.10. Reduction in food waste | Demonstration action

Metadata group	#	Metadata category	Description / comments
Identifier	1	Indicator number	52.3

Metadata group	#	Metadata category	Description / comments
	2	Indicator name	Reduction in food waste
Link to Circular City Definition	3	Vision element	Closing material loops and reducing harmful resource use
	4	Category	Waste generation / management
Indicator definition and description	5	Definition / description of indicator	Estimation of reduced or non-generated biowaste, thanks to the communication campaign aimed at avoiding food waste.
	6	Rationale	Within DA1, an action campaign will be carried out mainly aimed at the HORECA sector, with the aim of minimizing food waste. It is considered appropriate and interesting to try to evaluate the mass of non-generated biowaste, thanks to the impact of said campaign.
	7	Methodology	To be defined. The methodology is being discussed between LIPASAM and a potential stakeholder, within the food sector, with great power of mobilization within the HORECA sector. The plan is to define the methodology before mid-February 2022.
	8	Unit	To be defined
Data	9	Baseline data / definition	Baseline: 0 (only activities during the project are measured)
	10	Data sources / relevant databases	Report of the monitoring of demo action 1. LIPASAM
	11	Overall accuracy	%, estimation
Context	12	Sector coverage	BW.
	13	Reference area / spatial implementation scale	Demonstration Actions: DA1.
	14	Reference period	Project period 1.10.2019 – 30.9.2023. Report Frequency: At the end of DA 1.

Metadata group	#	Metadata category	Description / comments
	15	SDG reference	11. Sustainable Cities and Communities.
Other	16	Comments	

3.11. Quantity of material for anaerobic digestion | Demonstration action

Metadata group	#	Metadata category	Description / comments
Identifier	1	Indicator number	53.1
	2	Indicator name	Quantity of material for anaerobic digestion
Link to Circular City Definition	3	Vision element	Closing material loops and reducing harmful resource use
	4	Category	Re-use and recycling
Indicator definition and description	5	Definition / description of indicator	Estimate mass of materials going to anaerobic digestion.
	6	Rationale	Anaerobic digestion or biomethanization is considered one of the best options in the market for mature waste treatment technologies. Part of the actions planned by the city of Seville, particularly in DA2, consists in testing the methane production capacity of the biowaste collected through a process of anaerobic co-digestion with sewage sludge in a wastewater treatment plant (WWTP). Co-digestion has the benefit of taking advantage of infrastructure close to the city and lengthening the useful life of the infrastructure itself. As part of this pilot, it is essential to know the quantity of biowaste introduced in the anaerobic co-digestion plant, in order to optimize the process itself.
	7	Methodology	Sum of organic material going to anaerobic digestion. Data come from EMASESA.

Metadata group	#	Metadata category	Description / comments
	8	Unit	Kilograms per cycle of digestion
Data	9	Baseline data / definition	Baseline 0 (only activities during the project are measured).
	10	Data sources / relevant databases	Internal report of demo action 2 by EMASESA.
	11	Overall accuracy	Kilograms per cycle of digestion, weighted.
Context	12	Sector coverage	BW
	13	Reference area / spatial implementation scale	Demonstration Actions: DA2.
	14	Reference period	Project period 1.10.2019 – 30.9.2023 Report Frequency DA2: At the end of the DA2.
	15	SDG reference	12 – Sustainable Consumption and Production.
Other	16	Comments	Key elements: - Physical characterisation of the biowaste collected.

3.12. Quantity of sludge produced after anaerobic digestion | Demonstration action

Metadata group	#	Metadata category	Description / comments
Identifier	1	Indicator number	53.2
	2	Indicator name	Quantity of sludge produced after anaerobic co-digestion.
Link to Circular City Definition	3	Vision element	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	Estimate mass of sludge produced after the anaerobic digestion.
	6	Rationale	The production of residual sludge after the anaerobic digestion process is an interesting indicator when evaluating the suitability of a substrate, since higher production of this residual sludge means higher treatment management costs.
	7	Methodology	Amount of sludge produced. Data come from EMASESA.
	8	Unit	Tonnes/year
Data	9	Baseline data / definition	Baseline 0 (only activities during the project are measured).
	10	Data sources / relevant databases	Internal report of demo action 2 by EMASESA.
	11	Overall accuracy	- Kilograms per cycle of digestion, weighted or increase in % sludge compared to a standard digestion (only sludge), measured.
Context	12	Sector coverage	BW
	13	Reference area / spatial implementation scale	Demonstration Actions: DA2.
	14	Reference period	Project period 1.10.2019 – 30.9.2023 Report Frequency DA2: At the end of the DA2.
	15	SDG reference	12 – Sustainable Consumption and Production.
Other	16	Comments	

3.13. Quantity of biogas produced | Demonstration action

Metadata group	#	Metadata category	Description / comments
Identifier	1	Indicator number	53.3
	2	Indicator name	Quantity of biogas produced.
Link to Circular City Definition	3	Vision element	Closing material loops and reducing harmful resource use
	4	Category	Re-use and recycling
Indicator definition and description	5	Definition / description of indicator	Estimate volume of biogas produced from anaerobic co-digestion of biowaste with sewage sludge in a wastewater pilot treatment plant (WWTP).
	6	Rationale	Part of the actions planned by the city of Seville consists in testing the methane production capacity of the biowaste collected through a process of anaerobic co-digestion with sewage sludge in a wastewater pilot treatment plant (WWTP). The city's wastewater treatment plants have biogas production systems based on an anaerobic digestion of their sludge. Furthermore, in recent years, EMASESA has opted for the co-digestion, together with its sewage sludge, of other industrial effluents with significant biodegradable organic matter content, to increase the production of renewable biogas. It is considered interesting to evaluate production of biowaste obtained using biowaste as co-feedstock in the anaerobic digestion process.
	7	Methodology	Quantity of biogas produced. Increase in % of biogas produced, compared to a standard digestion (only sludge). Data come from EMASESA.
	8	Unit	Litres/day

Metadata group	#	Metadata category	Description / comments
Data	9	Baseline data / definition	Baseline 0 (only activities during the project are measured).
	10	Data sources / relevant databases	Internal report of the biogas production measured during the demo action 2 by EMASESA.
	11	Overall accuracy	Litres/day, measured.
Context	12	Sector coverage	BW
	13	Reference area / spatial implementation scale	Demonstration Actions: DA2.
	14	Reference period	Project period 1.10.2019 – 30.9.2023 Report Frequency DA2: At the end of the DA2.
	15	SDG reference	12 – Sustainable Consumption and Production.
Other	16	Comments	Key elements: 1) Lab analysis of COD, BMP and other parameters to determine the capacity of methane production. 2) Measuring of the methane production. 3) Analysis of the gas produced (sulphide, methane, CO2, etc.).

3.14. End of Life Processing Rate | City

Metadata group	#	Metadata category	Description / comments
Identifier	1	Indicator number	58
	2	Indicator name	End of Life Processing Rate
Link to Circular City Definition	3	Vision element	Closing material loops and reducing harmful resource use
	4	Category	Waste generation / management

Metadata group	#	Metadata category	Description / comments
Indicator definition and description	5	Definition / description of indicator	The End-of-Life Processing Rate (EoL PR) measures the efficiency of the end-of-life processing process.
	6	Rationale	Taking into account the current local and regional ecosystem of recycling plants, it is crucial for a higher rate of recovery of materials to promote separation at source. Project activities aim to increase recycling and upcycling of materials instead of landfilling. For instance, several actions of the city of Seville in the project promote the recycling of biowaste, through the installation of a separate collection system and pilot alternatives of treatment further than composting (DA1 & DA2). For DA1, the monitoring of this indicator will help to understand how the improvement in the purity of the collected biowaste affects the performance of the subsequent composting process of the total amount of biowaste collected in the city.
	7	Methodology	Mass of material obtained (compost produced) divided by the mass of biowaste collected.
	8	Unit	%
Data	9	Baseline data / definition	EoL PR for 2020: Biowaste:12.5%. Mass collected: 1,693 / Compost produced: 212. Losses for fermentation are included.
	10	Data sources / relevant databases	Annual Declaration of Municipal Waste Collection (LIPASAM). ABORGASE Internal Management Report. Characterizations Biowaste Report (LIPASAM)
	11	Overall accuracy	%, estimated, weighted.
Context	12	Sector coverage	BW
	13	Reference area / spatial implementation scale	City of Seville, Demonstration Actions: DA1.

Metadata group	#	Metadata category	Description / comments
	14	Reference period	Project period 1.10.2019 – 30.9.2023 Report Frequency: at the end of DA1.
	15	SDG reference	11. Sustainable Cities and Communities
Other	16	Comments	

3.15. End of Life Processing Rate | Demonstration action

Metadata group	#	Metadata category	Description / comments
Identifier	1	Indicator number	58
	2	Indicator name	End of Life Processing Rate
Link to Circular City Definition	3	Vision element	Closing material loops and reducing harmful resource use
	4	Category	Waste generation / management
Indicator definition and description	5	Definition / description of indicator	The End-of-Life Processing Rate (EoL PR) measures the efficiency of the end-of-life processing process.
	6	Rationale	Taking into account the current local and regional ecosystem of recycling plants, it is crucial for a higher rate of recovery of materials to promote separation at source. Project activities aim to increase recycling and upcycling of materials instead of landfilling. For instance, several actions of the city of Seville in the project promote the recycling of biowaste, through the installation of a separate collection system and pilot alternatives of treatment further than composting (DA1 & DA2). For DA2, the monitoring of this indicator will help to understand what the yield is of obtaining "pulp"

Metadata group	#	Metadata category	Description / comments
			applicable to anaerobic digestion, coming from biowaste municipal collection.
	7	Methodology	Mass of material introduced into the digester, which comes from the separate collection of biowaste, divided by the mass of biowaste collected destined for co-digestion.
	8	Unit	%
Data	9	Baseline data / definition	Baseline: 0.
	10	Data sources / relevant databases	Annual Declaration of Municipal Waste Collection (LIPASAM). Characterizations Biowaste Report (LIPASAM) Report DA2 by EMASESA.
	11	Overall accuracy	%, estimated, weighted.
Context	12	Sector coverage	BW
	13	Reference area / spatial implementation scale	Demonstration Actions: DA2
	14	Reference period	Project period 1.10.2019 – 30.9.2023 Report Frequency: at the end of DA2.
	15	SDG reference	11. Sustainable Cities and Communities
Other	16	Comments	

3.16. Quantity of pure biowaste mass collected | Demonstration action

Metadata group	#	Metadata category	Description / comments
Identifier	1	Indicator number	58.1
	2	Indicator name	Quantity of pure biowaste mass collected
Link to Circular City Definition	3	Vision element	Closing material loops and reducing harmful resource use
	4	Category	Waste generation / management
Indicator definition and description	5	Definition / description of indicator	Mass of pure biowaste collected in the containers destined for the selective biowaste collection fraction.
	6	Rationale	The purity of the waste is an interesting parameter since it generates useful information to know if citizens are correctly separating the waste at source. The purity of the waste affects its subsequent valorization.
	7	Methodology	Physical characterization of waste from a sample of biowaste collected from the demonstration area.
	8	Unit	%
Data	9	Baseline data / definition	Baseline 0 (only activities during the project are measured)
	10	Data sources / relevant databases	Characterizations reports. LIPASAM.
	11	Overall accuracy	%; tonnes weighted/estimated.
Context	12	Sector coverage	BW
	13	Reference area / spatial implementation scale	Demonstration Actions: DA1.
	14	Reference period	Project period 1.10.2019 – 30.9.2023 Report Frequency: at the end of DA1.

Metadata group	#	Metadata category	Description / comments
	15	SDG reference	11. Sustainable Cities and Communities
Other	16	Comments	

3.17. Landfilling rate | City

Metadata group	#	Metadata category	Description / comments
Identifier	1	Indicator number	61
	2	Indicator name	Landfilling rate
Link to Circular City Definition	3	Vision element	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 landfilled.
	6	Rationale	The current targets for landfill disposal state that at most only 10% of the waste may be destined for disposal. Currently, in Andalusia and Seville, this percentage is around 70%, which is why it is crucial to implement measures that limit the amounts of waste that are destined for landfilling annually, consistent with the European pyramid of waste management. Project activities aim to increase recycling and upcycling of materials instead of landfilling (DA1 and DA2). It is considered appropriate to evaluate the impact of these activities at the city level.
	7	Methodology	Mass of materials landfilled divided by total amount of waste. Data come from ABORGASE.
	8	Unit	%
Data	9	Baseline data / definition	For 2020: a) Total of waste not collected separately: 258,118 tons.

Metadata group	#	Metadata category	Description / comments
			b) Light-packaging waste collected separately: 8,800 tons. c) Material recovered + losses for fermentation: 84,721 tons. Formula: ((a+b) – c)/(a+b). Landfilling rate: 68.26%.
	10	Data sources / relevant databases	Plan de Residuos no peligrosos de la Provincia de Sevilla (Non-hazardous Waste Plan of the Province of Seville). Annual Declaration of Municipal Waste Collection (LIPASAM). ABORGASE Internal Management Report.
	11	Overall accuracy	%; weighted/estimated.
Context	12	Sector coverage	BW
	13	Reference area / spatial implementation scale	City of Seville, Demonstration Actions: DA1 and DA2.
	14	Reference period	Project period 1.10.2019 – 30.9.2023 Report Frequency: Yearly.
	15	SDG reference	11. Sustainable Cities and Communities
Other	16	Comments	It is estimated that the rest of the selectively collected fractions are 100% recycled.

3.18. GHG emissions per year | Demonstration action

Metadata group	#	Metadata category	Description / comments
Identifier	1	Indicator number	85

Metadata group	#	Metadata category	Description / comments
	2	Indicator name	GHG emissions per year
Link to Circular City Definition	3	Vision element	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. See here for more info on the Kyoto basket.
	6	Rationale	Parts of the demonstration actions are based on achieving greater optimization of the collection logistics, so it is considered appropriate to control the energy demanded from the biowaste management activity. In DA1, CO2 emission reductions (litres of fuel) related to optimization of the logistics of the biowaste collection will be analysed using the OMSW optimization tool developed by IDENER.
	7	Methodology	Direct GHG emissions per year at demo level
	8	Unit	Tonnes CO2-equivalents / year
Data	9	Baseline data / definition	Baseline: 0 (only activities during the project are measured)
	10	Data sources / relevant databases	Internal Report of the monitoring of the demo action 1 by LIPASAM and IDENER.
	11	Overall accuracy	Estimation of ton CO2 eq.
Context	12	Sector coverage	BW.
	13	Reference area / spatial implementation scale	Demonstration Actions: DA1
	14	Reference period	Project period 1.10.2019 – 30.9.2023.

Metadata group	#	Metadata category	Description / comments
			Report Frequency: At the end of DA 1.
	15	SDG reference	13: Climate Actions.
Other	16	Comments	

4. References

- Seville Declaration: the commitment of cities to the Circular Economy. *Declaración de Sevilla: el compromiso de las ciudades por la Economía Circular.* http://www.femp.es/sites/default/files/multimedia/declaraciondesevilladefmaquetada.pdf
- Seville 2030 Strategic Plan. *Plan Estratégico Sevilla 2030* https://www.sevilla.org/planestrategico2030/documentos/sevilla-2030/plan-estrategico-sevilla-2030/objetivos-y-estrategias-sevilla2030.pdf
- Comprehensive Waste Plan for Andalusia. Towards a Circular Economy in the 2030 Horizon. *Plan Integral de Residuos de Andalucía. Hacia una Economía Circular en el Horizonte 2030 (PIREC 2030).* *http://www.juntadeandalucia.es/medioambiente/portal_web/web/temas_ambientales/residuos/planificacion_materia_residuos/PIRec_2030.pdf*
- *Non-hazardous Waste Plan of the Province of Seville 2020 – 2035.* Plan de Residuos no peligrosos de la Provincia de Sevilla 2020 – 2035. https://www.dipusevilla.es/export/sites/diputacion-sevilla-corporativo/planderesiduos/.galleries/plan-definitivo/Plan-Provincial-Residuos_COMPLETO-docum.-final-standard.pdf
- Vangelsten, B.V., Bjarne Lindeløv, Nhien Nguyen, Jens Ørding Hansen, Are Jensen, Nikolai Jacobi, Simon Clement, Carolin Bellstedt, Aristide Athanassiadis, Pernille Kern Kernel, Edwin Keijsers (2021). Circular City Indicator Set. CityLoops Deliverable 6.1. 2021.
- CityLoops - Seville Optimised Implementation Plan for Biowaste by Limpieza Pública y Protección Ambiental S.A.M.
- Plan of Action for Climate and Sustainable Energy of Seville. *Plan de Acción por el Clima y la Energía Sostenibles (PACES)*.

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.

Disclaimer: The sole responsibility for any error or omissions lies with the editor. The content does not necessarily reflect the opinion of the European Commission. The European Commission is also not responsible for any use that may be made of the information contained herein.