CREATE Embedding advanced urban material stock methods within governance processes to enable circular economy and cities resilience

Development of a data enrichment action plan to address the circular economy needs

D 2.2

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Abstract	This report presents a set of recommendations for the development of tailored modules adapted to the specific existing pre-conditions in the urban living labs, fellow cities (own existing tools, databases etc.), and multiplier city. The main purpose is to support the public sector and private stakeholders by developing procedures that enrich their knowledge towards CE for the built environment. Recommendations have been co-jointly produced with and validated by representatives of the urban living labs.
Keywords	circular economy, construction sector, policies, lifecycle assessment, metabolism study, stock and flow analysis

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1 INTRODUCTION

1.1 CREATE

The CREATE project aims at supporting urban transformation processes towards the circular economy by making an inventory of the existing material stocks within urban construction, developing reliable scenarios for future expected material flows, and providing governance arrangements on how to approach the circular economy transition. The project will focus on the largest urban infrastructures and communal assets, namely buildings, municipal roads, water, and wastewater pipes. A truly transdisciplinary consortium will work with a mixed research design that integrates quantitative modelling with qualitative study and design of governance aspects.

The project will further improve already existing, validated, and applied tools and arrangements and combine them with new digitalization technologies to inform decision-makers and enable a circular built environment. This will be achieved by engaging with a wide range of stakeholders in a co-creation process with three urban living labs and six fellow cities in five countries, which will result in numerous capacity building moments throughout the entire project.

A thorough analysis of best practices of cities steering the circular economy transition together with new governance interventions will result in concrete proposals of tailored governance arrangements for the participating cities including a concrete proposal for an upscaling strategy for Europe.

The CREATE project follows a set of strategic underpinnings that connect the different work packages in three dimensions:

1. A living lab approach that is used throughout all work packages and allows for an integrated co-production of the project with stakeholders from the quadruple helix;
2. A multi-scalar capacity building approach, where the use of the living labs as the focal point of the work developed, complemented by the dissemination of knowledge to fellow cities and an outreach to urban networks in Europe, will allow for an optimized scalable process;
3. A tailored and adaptable approach that is based on the pre-existing conditions of the urban living labs and fellow cities, i.e., existing data, methods and governance procedures already being utilized by the stakeholders and providing them with new knowledge.

1.2 Objectives of WP2

WP2 aims at:

1. jointly **framing circular economy needs** in terms of data, assessment methods, visualization solutions and interactive platforms related to circular economy policies or projects lead by municipalities;
2. **defining the actions to be carried out** within the CREATE project to meet the needs of the municipalities.

1.3 Task 2.2: Development of a data enrichment action plan to address the circular economy needs

Task 2.2. aims at presenting a set of recommendations for the development of tailored modules/elements in an advanced and structured way for the specific existing pre-conditions in the urban living labs, fellow cities, and multiplier city, e.g., their own existing tools, databases etc.

The main purpose is to support the public sector and private stakeholders by developing procedures that enrich their knowledge towards CE for the built environment.

Recommendations should be co-jointly produced with and validated by representatives of the urban living labs.

2 METHOD

2.1 General method

2.1.1 Continuation of Task 2.1

Task 2.2. follows task 2.1 where an analysis of the stakeholder practices and needs related to circular economy in the constructions sector in the three living labs of the CREATE project (Rennes Métropole, Nijmegen and Gothenburg) was performed.

The work was based on the combination of 3 complementary investigation methods:

- a review of the technical and scientific literature, taking into account previous literature reviews conducted by the members of the consortium;

- an online questionnaire with the main actors of the circular economy in the living labs;

- semi-directed interviews with key players in the 3 living labs.

A specific survey of the three living labs and multiplier city of the CREATE project allowed us to understand precisely what the current practices and needs of these territories are. It illustrates the data, tools and achievements made and highlights the challenges and barriers. This survey was based on two complementary approaches: questionnaires, which provide synthetic information from a larger number of stakeholders and semi-structured interviews, which provide rich information from an optimized number of stakeholders (time for appointments, interviews, and reports).

47 people answered the questionnaire : 17 for Göteborg, 14 for Nijmegen and 16 for Rennes Métropole.

11 key representatives of the living labs were interviewed from October 2022 to March 2023.

Table 2.1. Interviews conducted during Task 2.1

Living lab	Organization	Role	Date
Rennes Métropole	Rennes Métropole	Responsible of the circular economy mission for the construction sector	2022/10/13
	Rennes Métropole	Responsible of the GIS team	2022/12/06
	Territoires	Project manager	2023/01/09
	Territoires and Rennes Métropole	Project manager Operations manager Urban planner	2023/01/09
Göteborg	City of Göteborg and Framtiden	Responsible for the municipal strategy for circular economy in the construction sector	2023/02/10
	City of Göteborg	Coordinator innovation and research Process developer	2023/03/06
Nijmegen	City of Nijmegen	Senior advisor in sustainable development	2022/11/24
	W/E Adviseurs	Senior advisor	2023/02/24

2.1.2 Workshops and complementary interviews

In order to co-jointly produce some recommendations with the key contacts in the living labs, a set of focused workshops followed by shared workshops and complementary interviews were organized from April to June 2023.

- **Focused workshops for each living lab (April 2023)**

Table 2.2. Participants in the living labs to the focused workshops

Living lab	Organization	Role	Date
Rennes Métropole	Rennes Métropole	Responsible of the circular economy mission for the construction sector	2023/04/06 and 2023/06/07
	Territoires and Rennes Métropole	Operations manager CE mission for construction	2023/06/22
Nijmegen	City of Nijmegen	Senior advisor in sustainable development Advisor in sustainable development	2023/04/06
	City of Nijmegen and W/E Adviseurs	Senior advisor in sustainable development Advisor in sustainable development Senior advisor	2023/05/22
Göteborg	City of Göteborg and Framtiden	Responsible for the municipal strategy for circular economy in the construction sector	2023/04/04

The focused workshops aimed at brainstorming with the representatives of each living lab about the following key questions:

- What new data could be produced during the CREATE project? (data about stocks and flows of construction materials and their environmental impacts)
- Which data could be better used in urban planning/urban projects and shared?
- Which new tool could be developed to produce/share/use this data?

The agenda for the workshops was as followed:

- Key results: practices about CE in construction in the CREATE living labs (LL) and existing data about stocks and flows and related environmental impacts
- Brainstorming about data production
- Brainstorming about data sharing
- Brainstorming about tool development

A report about the discussions and proposed action plan was sent to the representatives so that they could correct or complement them. When some questions remained unanswered during the meeting, representatives were asked to contact the key people in their living lab to get their opinion or clarification about missing information before the first shared workshop.

- **Shared workshops with all living labs (May and June 2023)**

Two shared workshops have been organized:

- May 11th: online workshop with the 3 living labs: each city presented its needs, brainstorming about common needs or differences

- June 22th - 23th: workshop with the 3 living labs in Rennes: needs were further detailed and validated

Representatives of each living lab presented their needs in terms of data and tools. Each presentation was followed by an open discussion to deepen the understanding of the needs. Common needs and differences across the living labs were also discussed.

- **Complementary interviews (May and July 2023)**

The first workshops raised questions that remained open after Task 2.1. These questions were generally about how to better link the data and tool development in CREATE to existing or under development tools. Extra interviews were organized to collect the information required.

Table 2.3. Interviews conducted for Task 2.2

Living lab	Organization	Role	Date	Object
Rennes Métropole	Circular economy research chair for Métropole du Grand Paris	Researcher	2023/05/30	Tool EvalMetab[1] (flows assessment of a construction project with carbon footprint and cost assessment for material transport)
Nijmegen	Groen Metropol Region Arnhem/Nijmegen	Manager conceptual circular building Manager circularity	26/05/2023	Tool Circulair Impact ladder of the GMR that will be applied at the project level
Göteborg	Framtiden	Responsible for the municipal strategy for circular economy in the construction sector	06/07/2023	Tool (Climate Calculation Tool-Renovation Modules) for calculating the climate impact of different types of renovation measures

[1] https://chaire-ecmu.univ-gustave-eiffel.fr/recherche/evalmetab

3 RESULTS

3.1 Practices and needs in the living labs

Task 2.1 and the focused workshops in Task 2.2 showed that the living labs share some common points about some challenges, barriers, practices and needs for data and tools. They are summarized in the table below. Please refer to D2.1. for detailed information.

Table 3.1. Shared practices and needs in the living labs

Shared practices and needs	**Detail**
Main barriers for circular economy in the construction sector	Variety of barriers regarding issues such as lack of knowledge and information (information on potential secondary resources which is missing or produced/shared too late to help decision making), education (need for awareness and training), regulation and policy (waste status in legislation, national policies), economic, business and cost (information on cost, cost of reuse/recycling compared to cost of landfill/virgin materials, lack of markets for reuse/recycling)
Main challenges for circular economy in the construction sector	Variety of challenges regarding actions such as knowledge and information (LCA studies in construction projects which are mandatory for carbon emissions and energy, stocks/flows analysis at region/city level), regulation and policy (new legislation which promotes carbon emissions reduction, reuse/recycling, regional/local policies which set CE objectives or guidelines), economic, business and cost (development of online marketplace for secondary materials)
Practices	Circular economy strategy for the construction sector defined at the urban level (with different levels of objectives for each city) LCA assessment of new buildings
Data	Mapping of stocks at the regional/city level (and also sometimes of flows and local actors with online data share) Environmental impacts of new buildings based on LCA (with specific focuses on some impacts such as carbon emissions or energy consumption) Construction permits (with GIS databases)
Needs in terms of data and tools	Data on the availability of secondary materials and of their environmental impacts which would be produced and shared more systematically and earlier in construction/urban projects

However, each living lab also has specific practices and needs. Key particularities of the living labs are presented in the table below. Please refer to D2.1. for detailed information.

Table 3.2. Specific practices and needs of each living lab

Specific practices and needs	**Rennes Métropole**	**Gothenburg**	**Nijmegen**
Main barriers for circular economy in the construction sector	Rennes Métropole does not have a role defined in the legislation for the management of C&D waste	Missing platform to share information on potential secondary resources (existing marketplace but information shared too late to be used in decision making)	Missing regional/local marketplace for secondary materials
Main challenges for circular economy in the construction sector	To include CE criteria in the decision making of urban projects at the predesign and design stages To support the development of business offers for reuse and recycling and the production of local materials or materials with lower environmental impact	To set ambitious objectives at the local level about secondary material reuse To better share information on potential secondary materials for reuse	To assess at the region/city level the impact of CE practices of each construction project (real objectives reached, impact at city level)
Practices	Metabolism study (basis to exchange with all local stakeholders) Support to the creation of a physical platform for reuse (funds for the market study and assistance for renting a space)	Development of a local professional network to promote reuse (platform for carbon neutral construction, agreement with 50 professionals, share of information)	Existing advanced framework for the environmental and CE assessment of construction projects (GPR, MPG) Development of an assessment tool for housing projects and circular economy (Circulair Impactladder)
Data	Urban metabolism study : mapping of stocks and flows (diagnosis and forecasting at city level, BAU scenarios for 6 urban project level), mapping of local actors, online data shared with CirculApp Shared database on all ongoing urban projects Experiment of LCA assessment at the urban project level (Urban Print)	Mapping of stocks at the city level for residential buildings LCA assessment with details about materials from Byggsektorns miljöberäkningsverktyg Detailed data in construction permits (about the building, its materials and the waste generated during construction)	LCA assessment (GPR, MPG)
Needs in terms of data and tools	Data on material flows and impacts generated by urban projects: to produce this data at the predesign and design stages to compare scenarios and help decision making	Data on the availability of secondary materials and of their environmental impacts which would be produced and shared more systematically and earlier in construction/urban projects	Data at the region/city level about the impact of CE practices of each construction projects (real objectives reached, impact at city level)

In order to address those specific needs, a specific action plan needs to be developed for each living lab and for the multiplier city.

3.2 Action plans for each city (including multiplier city Vienna)

3.2.1 Rennes Métropole

Existing data on stocks and flows in Rennes Métropole:

Data specific to Rennes Métropole and owned by Rennes Métropole:

- Urban metabolism study: mapping of stocks, flows and local actors, online data shared with CirculApp. Data on stocks and flows is the result of a previous project between Rennes Métropole and CitéSource. Data on actors is updated and maintained by Rennes Métropole.
- Online database on all ongoing urban projects : UrbaMap. This database is owned and maintained by Rennes Métropole. It is a dynamic database monitoring the ongoing urban projects.
- LCA assessment tested for some urban projects with the tool Urban Print[2]
- Sourcing for local and bio-based materials for La Courrouze urban project

Data specific to Région Bretagne :

- Regional waste planification document. In Bretagne the regional plan is based on C&D waste management statistics of 2015. It provides an overview of the situation (waste generated in the 4 provinces of the Bretagne region, map of main C&D wastes facilities and capacities). The Plan sets also the targets for the next years.
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French national databases (excluding stocks and flows) :

- National building database[3]. It is a national building database maintained by CSTB (Building technical institute) with building footprints and main characteristics (age, materials, etc.).
- INIES. French database for construction materials Product Environmental Footprint.
- Industrial plants database ICPE. This database includes all plants or facilities requiring an environmental authorization. Concerning raw materials, it includes quarries, recycling plants and landfills.
- RNDTS. National waste register database. This database ensures the traceability of excavated earths (waste origin, waste destination). For the instance no public data is provided.

Please refer to D2.1. for detailed information.

[2] https://efficacity.com/en/low-carbon-districts/our-software-solutions/urbanprint/

[3] https://www.data.gouv.fr/fr/datasets/base-de-donnees-nationale-des-batiments/

Which new data about stocks and flows of construction materials and their environmental impacts could be produced during the CREATE project?

Table 3.3. Data production for Rennes Métropole

Question	Specification
Which data	Data on the flows of materials, potential waste and associated environmental impacts generated by different scenarios related to materials in an urban project (for example demolishing a building or refurbishing it, using timber or concrete)
Why	To include CE criteria in the decision making of urban projects and reach CE objectives such as reducing material flows, reusing secondary materials and recycling waste, reducing the environmental impacts related to materials, developing local activities related to material supply, reuse and recycling
When	During the predesign (*programmation*) and design stages of urban projects (*projets d'aménagement, ZAC, NPNRU*…)
Who would produce data	To be analyzed in 2 steps : 1. Data generation without any new tool and based on the previous work by CitéSource on stocks/flows of materials in buildings and roads for all Rennes Métropole, where data can be generated for the 2 test projects (Technicentre and Bégassière) and development of a tool for the visualization of the results (scenario comparison for decision making) 2. Analysis of the results and option to enable some automatic calculations of flows and impacts
Who would use the data	Managers of urban projects within Rennes Métropole or the public urban developer Territoires in association with the predesign and design teams (*MOE conception urbaine, urbaniste, AMO*) and with CE engineering firms
Who could also access the data	Departments of Rennes Métropole which work on circular economy for the construction sector (CE mission, urban planning, waste management…)
Challenges	Few information is available at the predesign stage of an urban project. Difficulty for most urban project management teams today to fully understand the issues related to material resources and impacts. Variety of data formats and tools used during the predesign and design stages of urban projects. Uncertainty related to stocks/flows modeling at a building level.
Enablers	Existing database on stocks of materials in buildings and roads for all Rennes Métropole (by CitéSource). Previous assessments of flows generated by BAU scenarios of urban projects (by CitéSource). Potential connections with tools which are being/could be experimented: Urban Print, Eval Metab .

Which new tool could be developed to produce/share/use this data ?

Table 3.4. Tool development for Rennes Métropole

Question	Specification
Which function	3 main functions for the tool are identified: 1. To help setting parameters of the scenarios related to materials in an urban project (for example: demolishing a building or refurbishing it, using timber or concrete) 2. To support the comparison of scenarios for decision making at the predesign and design stages by visualizing the impacts of scenarios related to key criteria/indicators about material resources and impacts 3. To support the calculation of data on flows and impacts (function to be confirmed)
Why	1. Support data collection about the scenarios (focus on the parameters which have the biggest impacts, use an adapted format for the data collected and used) 2. Enable a better understanding of the impacts by using an optimized visualization format (providing only the information which is useful and well understood) 3. Enable managers of urban projects to perform calculations without any external expertise (to be confirmed)
When	During the predesign (*programmation*) and design stages of urban projects (*projets d'aménagement, ZAC, NPNRU*…) : - definition of the scenarios (which building to be demolished or refurbished, which building to be constructed, which roads, which materials, which waste management…) - comparison between the impacts of the scenarios
Who would use the tool	Managers of urban projects within Rennes Métropole or the public urban developer Territoires in association with the predesign and design teams (*MOE conception urbaine, urbaniste, AMO*) and with CE engineering firms
Who could also access to the tool	Departments of Rennes Métropole which work on circular economy for the construction sector (CE mission, urban planning, waste management…). These departments could have access to the data on the impacts of scenarios
Challenges	Variety of data formats and tools usde during the predesign and design stages of urban projects. Scenarios need to be based on objectives for CE in urban projects which are still being defined by Rennes Métropole. Visualization needs to be adapted to the general level of understanding of the users about the issues related to material resources and impacts.
Enablers	Potential connections with tools which are being/could be experimented: Urban Print, Eval Metab.

Action plan for data production

Table 3.5. Action plan for data production for Rennes Métropole

Task	Objective	What	Who	When
1. Exchange with managers of 2 test urban projects and the predesign and design teams	To better know which scenarios are defined today	Minimum 1 meeting for each urban project	Lead for CREATE: CitéSource with AIT and BRGM	Before November 2023
2. Exchange with the CE mission (Zoé Henry)	To make a list of the objectives and criteria to be used as the basis for the scenarios	Meeting	Lead for CREATE: CitéSource with AIT and BRGM	Before November 2023
3. Production of data on flows for the scenarios	Test how flows could be calculated, at first based on the existing data on stocks Use of other databases to be analyzed	Calculation	Lead for CREATE: CitéSource with BRGM	Before May 2024
4. Production of data on the environmental impacts of the scenarios	Demonstrating how the impact assessment concept is being conducted	Calculation	Lead for CREATE: AIT	Before May 2024
5. Analysis of the 1st results, further data production if necessary	Presenting first scenario results to the city stakeholders, receiving feedback for improvement of scenario assumptions	Meeting and extra calculation if necessary	Lead for CREATE: CitéSource with AIT and BRGM	Before July 2024

Action plan for tool development

Table 3.6. Action plan for tool development and test for Rennes Métropole

Task	Objective	What	Who	When
1. Exchange with managers of 2 test urban projects and the predesign and design teams	To better know which data format and tool they use for the predesign	Minimum 1 meeting for each urban project	Lead for CREATE: CitéSource with AIT, BRGM, BEIA	Before October 2023
2. Definition of the data that would be used as input by the tool	To make a list of the data used as input (which information, which format, which use)	Research meeting	Lead for CREATE: BEIA, with CitéSource, AIT and BRGM	Before November 2023
3. Definition of the criteria/indicators used to compare scenarios	To make a list of the criteria/indicators, the format for visualization (type of graph…)	Research meeting	Lead for CREATE: BEIA, with CitéSource, AIT and BRGM	Before December 2023
4. Integration of the data	To integrate the data about flows and impacts (calculated without any new app at first)	Programming	Lead for CREATE: BEIA, with CitéSource, AIT and BRGM	Before May 2024
5. Pilot version of the tool	To develop a pilot version of the tool	Programming	Lead for CREATE: BEIA	Before May 2024
6. Test second version of the tool	To test the tool with the targeted users and make the required corrections/improvements	Meetings with the targeted users	Lead for CREATE: BEIA, with CitéSource, AIT and BRGM	Before September 2024
7. Add extra services for flow calculation	To improve the tool by enabling managers of urban projects to perform calculations without any external expertise (to be confirmed)	Programming	Lead for CREATE: BEIA, with CitéSource, AIT and BRGM	Before March 2025

3.2.2 Göteborg

Existing data on stocks and flows in Göteborg:

- **Stock and flow** modeling of residential buildings in Göteborg
- **LCA assessment** for every construction project (mandatory for carbon emissions and energy)
- **Database Byggsektorns miljöberäkningsverktyg** about the impacts of materials used in every construction project
- **Building database** of Framtiden
- **Historical database on construction/refurbishment/demolition permits**, with plans and data on **waste production and management**
- CCBuild **market place** : offers for secondary materials

Please refer to D2.1. for detailed information.

Which new data about stocks and flows of construction materials and their environmental impacts could be produced during the CREATE project?

Table 3.7. Data production for Göteborg

Question	Specification
Which data	Material intensity data for non-residential buildings Data about stocks of materials in all buildings in Göteborg, future availability of secondary construction materials and components for reuse, and associated environmental impacts Data about environmental impacts related to outflows from stocks
Why	To help estimate outflows of construction materials from demolition and refurbishment projects for reuse and recycling (residential and non-residential buildings)
When	During the planning, predesign and design stages of urban projects
Who would produce data	Chalmers
Who would use the data	Chalmers and City of Göteborg and Framtiden
Who could also access the data	Material Intensity database is open access Building stock model: subject to agreement with Läntmateriet
Challenges	Time consuming MI data collection for non-residential buildings Uncertainty related to stocks/flows modeling at a building level
Enablers	Past and ongoing research by Chalmers on the inventory of stocks in the city. Detailed available information in building permits (and historical database of permits). Ongoing collaboration with planning division of City of Gothenburg (Stadsbyggnadskontoret).

Note: data is gathered during the CREATE project to be used in the developed tool during regular Framtiden operations

Which new tool could be developed to produce/share/use this data ?

Table 3.8. Tool development for Göteborg

Question	Specification
Which function	Share information about flows of potential secondary materials for reuse for any demolition or heavy refurbishment project (residential and non-residential buildings) Shared information could include: • types and/or mass of materials in the buildings to be refurbished or demolished • associated environmental impacts • building ownership • building location and footprint (GIS data on map) • key building information e.g., the construction year, the structure, the number of floors Data could be added by the project owner when they are available: for example, building diagnosis about materials. Data from the current refurbishment/demolition permit could be added when available. The objective would be to share information as soon as possible so that project owners could contact each other and plan to reuse materials. The platform should be interactive, i.e., data can be added directly by project owners.
Why	To support planning for reuse and recycling of secondary materials generated by demolition or heavy refurbishment projects in Göteborg (today this information is only available for some projects, and it is usually shared at a late stage of a project with a short delay to collect materials and without any tool to collect and share data in a structured way)
When	When plans for demolition/refurbishment/construction are issued
Who would use the tool in priority	Framtiden Project owners in Göteborg (public or private)
Who could also access to the tool	City of Göteborg (the city would have a coordinating role and would promote the tool to project owners) Chalmers
Challenges	Uncertainty from data added by third parties Uncertainty related to stocks/flows modeling at a building level Uncertainty from environmental impact calculation
Enablers	Past and ongoing research by Chalmers on the inventory of stocks in the city Detailed available information in building permits (and historical database of permits) Framtiden interest in developing and using the tool

Action plan for data production

Table 3.9. Action plan for data production for Göteborg

Task	Objective	What	Who	When
1. Continuation of data collection and analysis	To better know which data can be used to calculate stocks in an optimized way	Analysis	Lead for CREATE: Chalmers	Before October 2023
2. Production of data on stocks	To produce data	Calculation	Lead for CREATE : Chalmers	Before November 2023
3. Production of data on the environmental impacts of outflows from stocks	Test how impacts could be calculated	Calculation	Lead for CREATE : AIT	Before May 2024
4. Production of data on the environmental impacts of the scenarios	Demonstrating how the impact assessment concept is being conducted	Calculation	Lead for CREATE: AIT	Before May 2024
5. Analysis of the 1st results, further data production if necessary	Analyze the pros and cons of the previous work, identify avenues for improvement	Meeting and extra calculation if necessary	Lead for CREATE : Chalmers with AIT	Before December 2024

Action plan for tool development

Table 3.10. Action plan for tool development and test for Göteborg

Task	Objective	What	Who	When
1. Definition of the data that would be used as input by the tool	To make a list of the data used as input (which information, which format, which use)	Research meeting	Lead for CREATE: Chalmers	Before November 2023
2. Definition of the criteria/indicators used to compare scenarios	To make a list of the criteria/indicators, the format for visualization (type of graph…)	Research meeting	Lead for CREATE: BEIA, with Chalmers, AIT and BRGM	Before December 2023
3. Integration of the data	To integrate the data about flows (calculated without any new app at first)	Programming	Lead for CREATE: BEIA, with Chalmers, AIT	Before May 2024
4. Pilot version of the tool	To develop a pilot version of the tool and	Programming	Lead for CREATE: BEIA	Before October 2024
5. Test and second version of the tool	To test the tool with the targeted users and make the required corrections/improvements	Meetings with the targeted users	Lead for CREATE: BEIA, with Chalmers, AIT	Before March 2025
6. Add extra services for flow calculation	To improve the tool by enabling some extra calculations (to be confirmed)	Programming	Lead for CREATE: BEIA, with Chalmers, AIT	Before March 2025

3.2.3 Nijmegen

Existing data on stocks and flows in Nijmegen:

- **Urban metabolism study**: material stocks and flows in Nijmegen in 2016 by Metabolic, ongoing study for all Netherlands
- **LCA assessment** for every construction project, LCA assessment with **GPR and MPG**
- Tool **Circulair Impactladder** (Circular Impact Ladder) developed recently by the region: 5 Key Performance Indicators (LCA score, adaptivity of the building in time, construction methods and use of recycled and biobased materials)

Please refer to D2.1. for detailed information.

Which new data about stocks and flows of construction materials and their environmental impacts could be produced during the CREATE project?

Table 3.11. Data production for Nijmegen

Question	Specification
Which data	Data about the circularity of the Hezelpoort project based on the Circulair Impactladder framework
Why	To test the tool Circulair Impactladder (Circular Impact Ladder) developed recently by the region to produce data on a project in Nijmegen so as to set some future recommendations to produce a database that would enable the city of Nijmegen to assess the CE impacts of all projects
When	During the design of the Hezelpoort project
Who would produce the data	City of Nijmegen and W/E Advisers with the help of WUR and other researchers if necessary
Who would use the data	City of Nijmegen and W/E Advisers
Who could also access the data	/
Challenges	No direct link to previous research work on stocks and flows Coordination required between the region, the city, project managers and design team
Enablers	Existing tool Ongoing exchanges between the region and the city

Which new tool could be developed to produce/share/use this data ?

Table 3.12. Tool development for Nijmegen

Question	Specification
Which function	To support the region and the city to set the specifications for a future tool that would enable the city to assess the CE impacts of all projects based on the data collected with the tool Circulair Impactladder (Circular Impact Ladder) developed recently by the region
Why	To assess systematically the CE impacts of projects based on already collected information and report to the city council/citizens
When	Annual reporting
Who would use the tool	City of Nijmegen other cities of the region
Who could also have access to the tool	Project owners
Challenges	Tool recently developed and still being tested
Enablers	Test of the Circulair Impactladder tool on a project to better understand which data could be extracted

Action plan for data production

Table 3.13. Action plan for data production for Nijmegen

Task	Objective	What	Who	When
1. Analysis of the tool Circulair Impactladder	To analyse the Circulair Impactladder tool on the case of the Hezelpoort project (which data is collected, how it is implemented in the tool, which indicators are calculated, how are results communicated)	Documentation and interviews about the tool	Lead for CREATE : WUR with City of Nijmegen	Before December 2023
2. Recommendations	To set some recommendations for an extra tool development (assessment at city level)	Meeting	Lead for CREATE : WUR with City of Nijmegen	Before July 2024

Action plan for tool development

Table 3.14. Action plan for tool development and test for Nijmegen

Task	Objective	What	Who	When
1. Definition of the data that would be used as input by the tool	To make a list of the data used as input (which information, which format, which use)	Research meeting	Lead for CREATE: WUR with City of Nijmegen	Before September 2024
2. Definition of the criteria/indicators used to analyze the CE impacts	To make a list of the criteria/indicators, database format	Research meeting	Lead for CREATE: WUR with City of Nijmegen	Before September 2024
3. Specification for a future tool	To define the specifications for the development of a future tool by the region and/or city	Analysis	Lead for CREATE: BEIA	Before October March 2025

3.2.4 Vienna

The CREATE multiplier city Vienna follows a similar work plan as the living lab cities Gothenburg, Nijmegen, and Rennes. A case study is set up in the development area Rothneusiedl and all relevant work steps of WP5 are applied within the framework of the case study and in coordination with the city stakeholders. However, as Vienna does not participate in CREATE as a living lab city, the remaining tasks of other work packages are not applied in their entirety. Hence, the differentiation through the label "*multiplier city*". The case-study in Vienna closely resembles the design and requirements in the Rennes living lab, with the notable difference of being a greenfield development and no major demolition activities being conducted. Therefore, the task of visualization tool application will be closely related to the tool development action plan found in Rennes and tables 3.3 and 3.6.

Existing data on stocks and flows in Vienna:

- **Urban metabolism study**: material stocks and flows analyses have been conducted and published by TU Vienna
- **LCA assessment** will be provided for scenarios of circular economy implementation in the development of Rothneusiedl
- **Tool** developed within CREATE will be applied to visualize the results

Please refer to WP5 for detailed information.

Which new data about stocks and flows of construction materials and their environmental impacts could be produced during the CREATE project?

Table 3.15. Data production for Vienna

Question	Specification
Which data	Data about the impacts and feasibility of circular economy concepts in the Rothneusiedl development area.
Why	To employ available data models for stocks and flows in Vienna and quantify the impacts of circular economy scenarios
When	During the pre-design phase of the Rothneusiedl project
Who would produce the data	AIT, City of Vienna, TU Wien (TU Wien has already developed stock and flow data for Vienna)
Who would use the data	City of Vienna, real estate developers for Rothneusiedl, Do Tank Circular City Vienna
Who could also have access to the data	/
Challenges	The development area is in an early planning phase, greenfield development precludes onsite reuse, communication with city representatives.
Enablers	Existing stock and flow data, local expertise and network in Vienna, commitment of Vienna regarding circular economy topics.

Which new tool could be developed to produce/share/use this data?

Table 3.16. Tool development for Vienna

Question	Specification
Which function	To provide decision making basis for the implementation of circular economy strategies and policies based on a modeling of the Rothneusiedl case study. To couple existing stock and flow data with life cycle assessment methods and derive potential impacts of circular economy strategies.
Why	To assess systematically the CE impacts of projects based on already collected information and report to the city council/citizens
When	By project finalization
Who would use the tool	City of Vienna and other cities of the region
Who could also have access to the tool	Project owners
Challenges	The coupling of stock and flow data with LCA models is a relatively new field. Uncertainties and data availability can therefore be challenging.
Enablers	The test of the coupling between stock and flow data with LCA models will also be conducted in other living labs. The work will benefit from these experiences.

Action plan for data production

Table 3.17. Action plan for data production for Vienna

Task	Objective	What	Who	When
1. Test of the developed methodology	Test of the coupling between stock and flow data and LCA models	Data collection and modelling	Lead for CREATE : AIT	Before January 2024
2. Analysis of the results of the test	Come to recommendations that on what aspects of circular economy to prioritize and how to extend the model and available data	Analysis and meeting with stakeholders	Lead for CREATE : AIT	Before May 2024

4 CONCLUSION

This report presents a set of recommendations for the development of tailored modules adapted to the specific existing pre-conditions in the urban living labs, fellow cities (own existing tools, databases etc.), and multiplier city. The main purpose is to support the public sector and private stakeholders by developing procedures that enrich their knowledge towards CE for the built environment. Recommendations have been co-jointly produced with and validated by representatives of the urban living labs.

In order to co-jointly produce some recommendations with the key contacts in the living labs, a set of focused workshops followed by shared workshops and complementary interviews were organized from April to June 2023.

Results of task 2.1 and the focused workshops and complementary interviews carried on in Task 2.2 show that the living labs of the CREATE project (Göteborg, Nijmegen and Rennes Métropole) and the multiplier city (Vienna) share some common points about some challenges, barriers, practices and needs of data and tools relating to the implementation of circular economy strategies in the construction sector. For instance, a variety of barriers regarding issues such as lack of knowledge and information (information on potential secondary resources which is missing or produced/shared too late to help decision making) can be observed for all the living labs.

However, each city also has some very specific practices and needs. Indeed, for Rennes Métropole, the main challenges for circular economy in the construction sector are to include CE criteria in the decision making of urban projects at the predesign and design stages and to support the development of business offers for reuse and recycling and the production of local materials or materials with lower environmental impact. In Göteborg, the main challenge is to set ambitious objectives at the local level about secondary material reuse and therefore to better share information on potential secondary materials for reuse. In Nijmegen, it is to assess at the region/city level the impact of CE practices of each construction project (real objectives reached, impact at city level)

Therefore, in order to address those specific needs, 4 different action plans are developed. These actions are defined in this report firstly by analysing for each city the questions related to the new data that could be produced during the CREATE project (data about stocks and flows of construction materials and their environmental impacts), in particular information about which data, why, when, who would produce and use the data, who could also have access to the data, and identified challenges and enablers. Answers to these questions lead to the definition of an action plan for data production for each city which includes specifications for each task of the plan about its objective, content (what), organizations in charge (who) and timeline (when).

Secondly, questions related to the tool(s) that could be developed to produce/share/use this data are analysed : which service would be delivered, why, when, who would use the and who could have also access to the tool, and which challenges and enablers are identified. Answers to these questions lead to the definition of an action plan for tool development for each city which includes specifications for each task about its objective, content (what), organizations in charge (who) and timeline (when).