

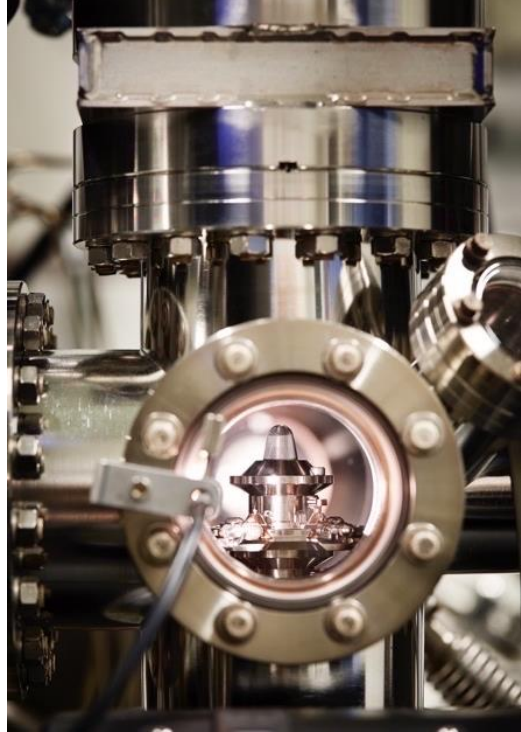
CREATE

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

June 1st 2023, La ville circulaire et régénérative

Leonardo Rosado

Chalmers University of Technology

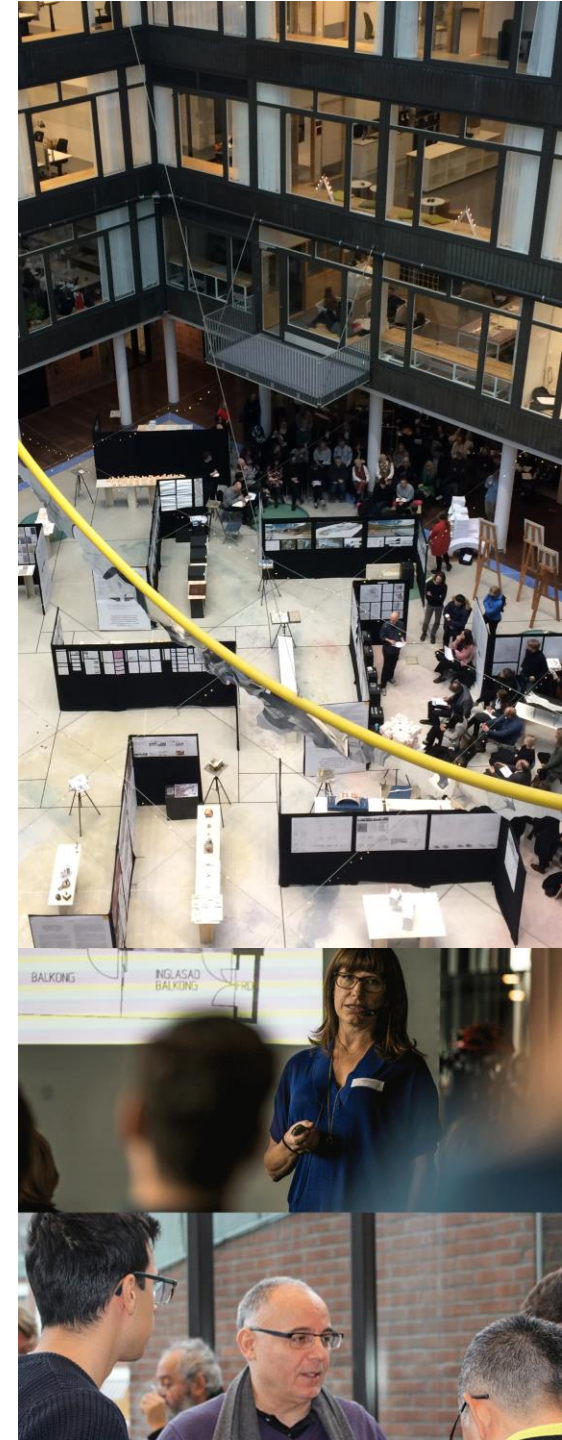


Chalmers University of Technology

- Based in Gothenburg, Sweden's west coast
- Conducts research and education in technology and natural science
- Offers education in engineering, natural sciences, shipping and architecture
- 10,000 students and 3,000 employees
- Founded in 1829

The Department of Architecture and Civil Engineering address global challenges

- Implications of rapid urbanisation
- Safe, sustainable & smart transportation solutions
- Housing, healthcare and social inclusion
- Reduced energy consumption
- Collaborative design and interdisciplinary knowledge production
- Sustainable materials and structures
- Future handling of storm- and wastewater, and supply of drinking water



We work with concepts, tools and strategies to enhance the sustainability performance of construction materials, building products, buildings as well as entire cities.

SUSTAINABLE BUILDING RESEARCH GROUP

The research is related to ecological and economic life cycle assessment of construction materials, buildings and infrastructures, sustainability assessment tools for buildings, social-cultural and climate adapted design concepts as well as energy and material resource based building stock modelling and its visualization.



Holger Wallbaum

Full Professor, Vice-Head of
Department and Vice-Dean for
Research



Sustainable Development, Life
cycle assessment, Building Stock
Modeling



Leonardo Rosado

Associate Professor



Urban Metabolism, Systems
thinking, Circular Economy



Maud Lanau

Assistant Professor



Industrial Ecology,
Socioeconomic metabolism,
Circular economy, Built
environment stocks



Alexander Hollberg

Assistant Professor



Sustainable design, Optimization
processes, Stakeholder
interaction, Artificial Intelligence

WHAT IS THE CREATE PROJECT ABOUT?

Goals and approach, structure and partners

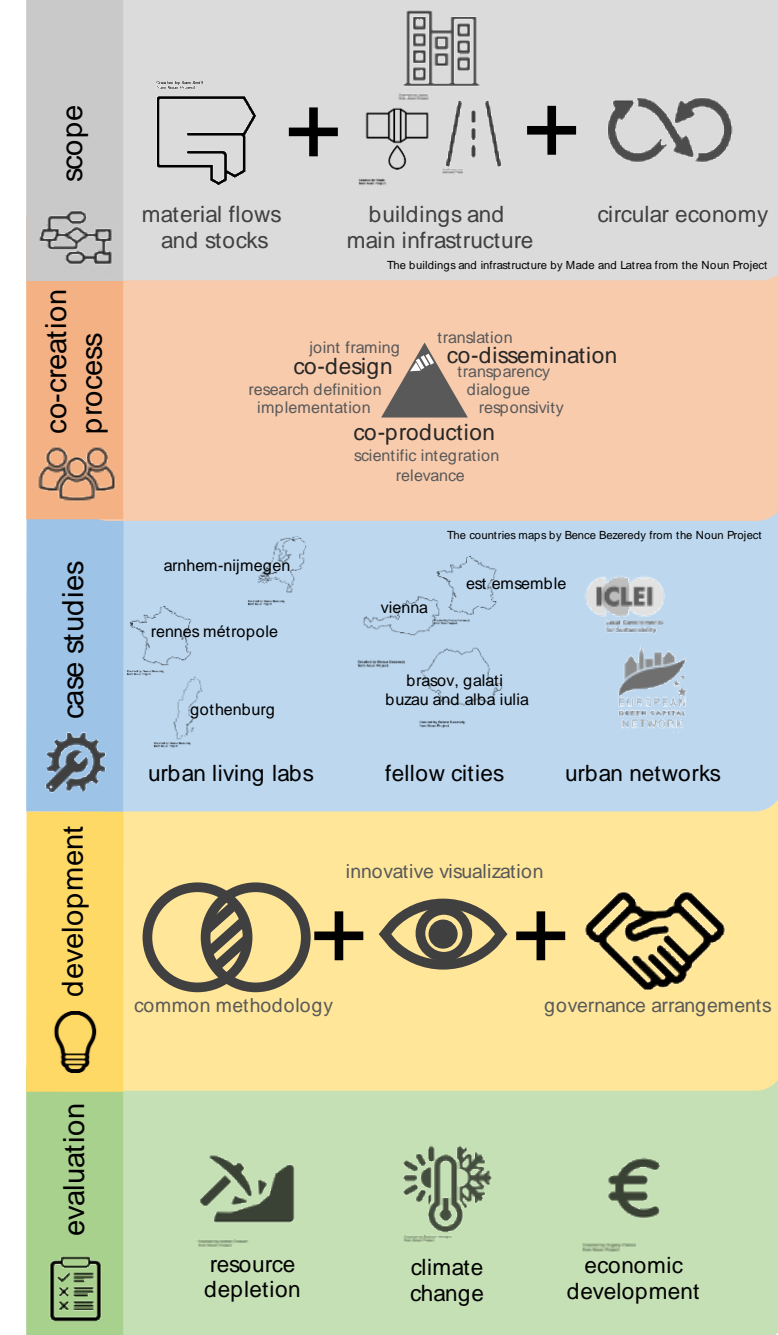
CREATE summary

Overarching goals of the project are to:

- develop and visualize material stocks and flows of the built environment
- provide tailored software solutions to cities to support a circular built environment
- co-create governance arrangements that enable a broader participation of stakeholders, experimentation with decision-support information, and the upscaling of best practices

Strategic approach in 3 dimensions:

- A living lab approach used throughout all work packages and allows for an integrated co-production of the project with stakeholders from the quadruple helix
- A multi-scalar capacity building approach to allow for an optimized scalable process
- A tailored and adaptable approach based on the pre-existing conditions, i.e, existing data, methods and governance procedures already being utilized by the stakeholders and providing them with new knowledge.



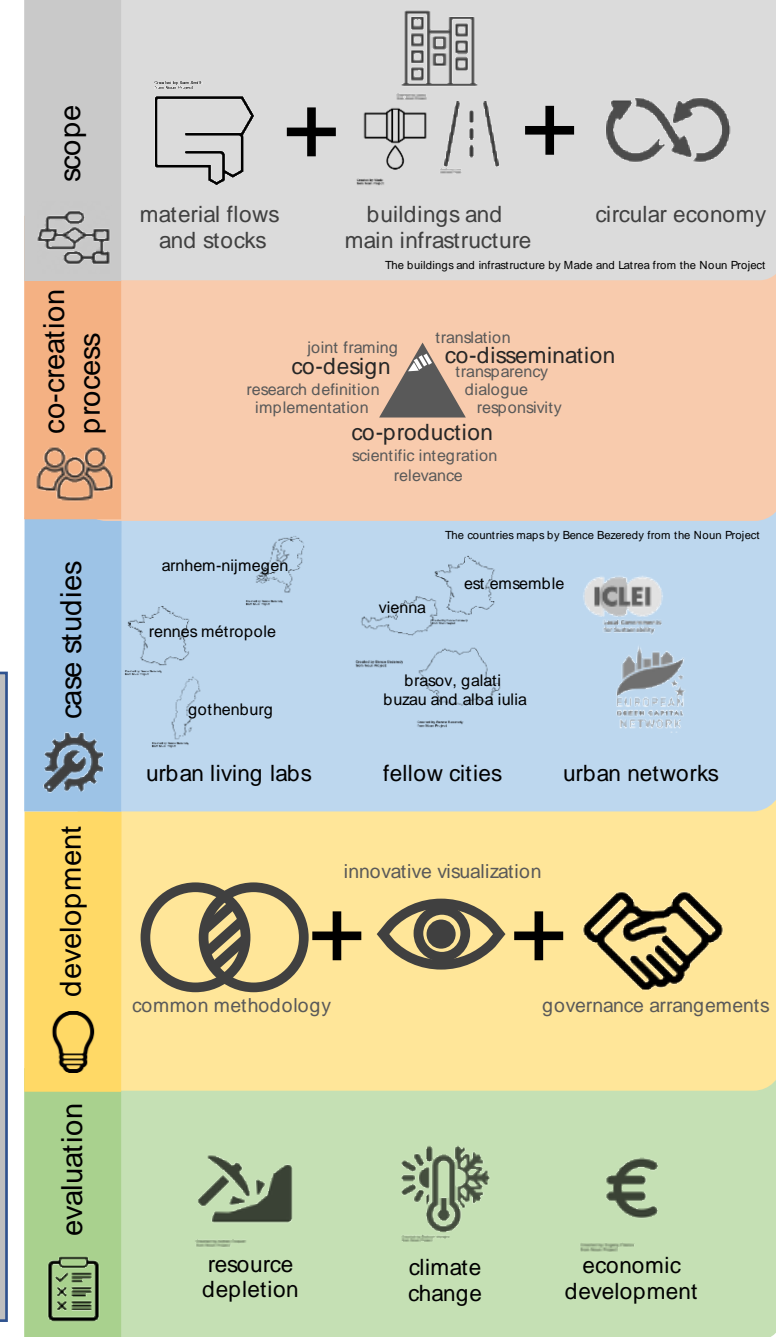
CREATE summary

Overarching goals of the project are to:

- develop and visualize ~~material stocks and flows of the built environment~~

MATERIAL STOCKS AND FLOWS DEFINITION Construction materials, elements, and components such as concrete, steel, windows, tiles will be accounted for, both in the amounts that exist accumulated in the stock of buildings and infrastructure in the municipalities, but also the inflows needed for new construction, renovation, refurbishment and the outflows of construction and demolition waste.

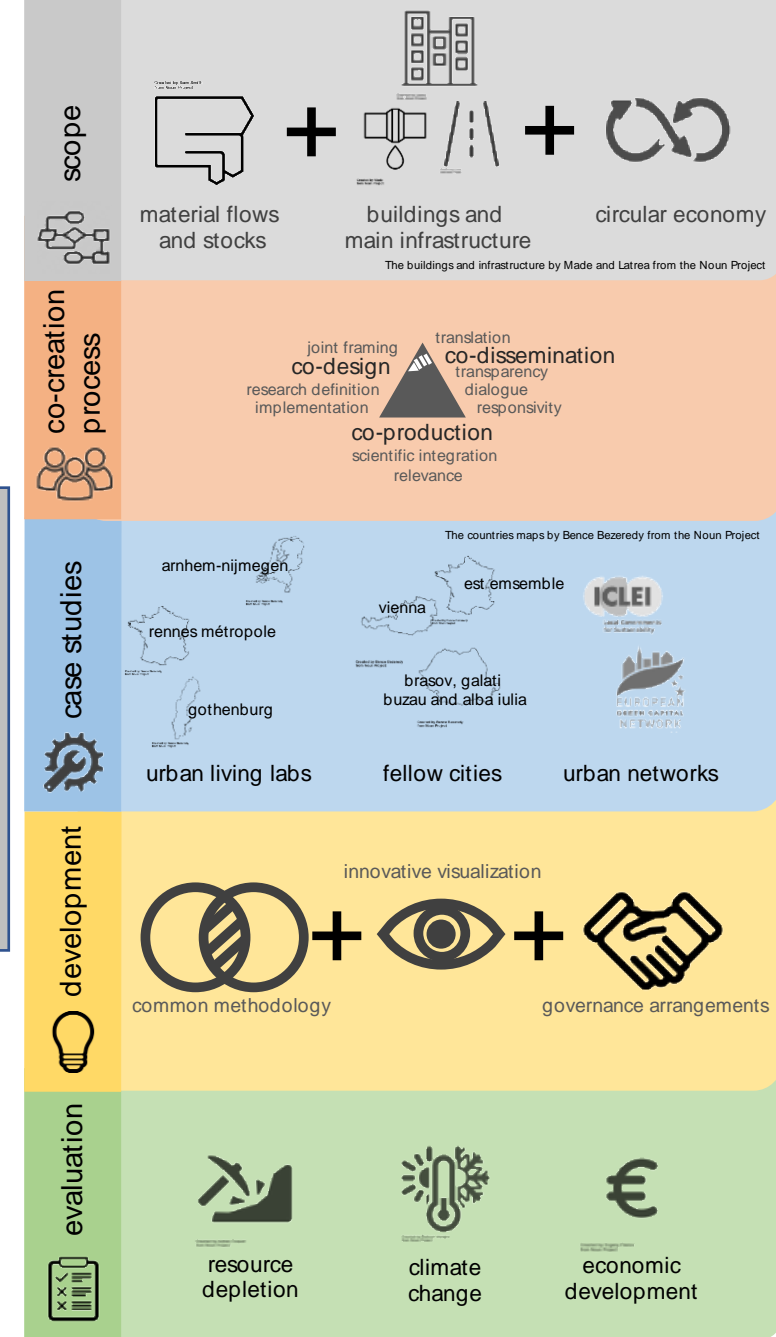
BUILT ENVIRONMENT Buildings, roads and pipe infrastructure.



CREATE summary

URBAN LIVING LAB DEFINITION “physical regions or virtual realities in which stakeholders form public-private-people partnerships of firms, public agencies, universities, institutes, and users all collaborating for creation, prototyping, validating, and testing of new technologies, services, products, and systems in real-life contexts.”

- A living lab approach used throughout all work packages and allows for an integrated co-production of the project with stakeholders from the quadruple helix
- A multi-scalar capacity building approach to allow for an optimized scalable process
- A tailored and adaptable approach based on the pre-existing conditions, i.e, existing data, methods and governance procedures already being utilized by the stakeholders and providing them with new knowledge.

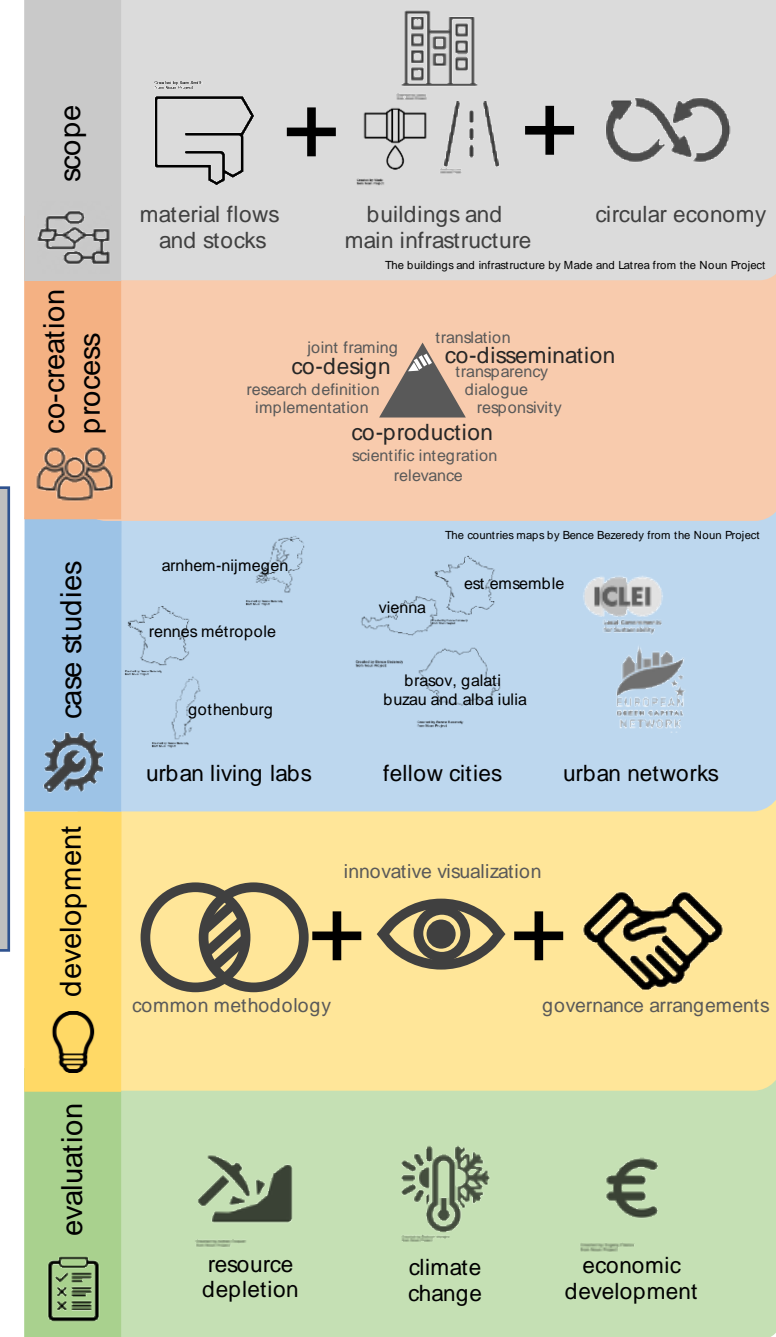


CREATE summary

CAPACITY BUILDING The project aims at creating knowledge for civil servants, citizens and institutions to use in their every day life activities incorporating new ideas for transitioning to a circular economy system.

TAILORED AND ADAPTABLE APPROACH The project will not create new tools and models but instead use the existing ones in the living labs to simplify the processes of creating new knowledge and practices.

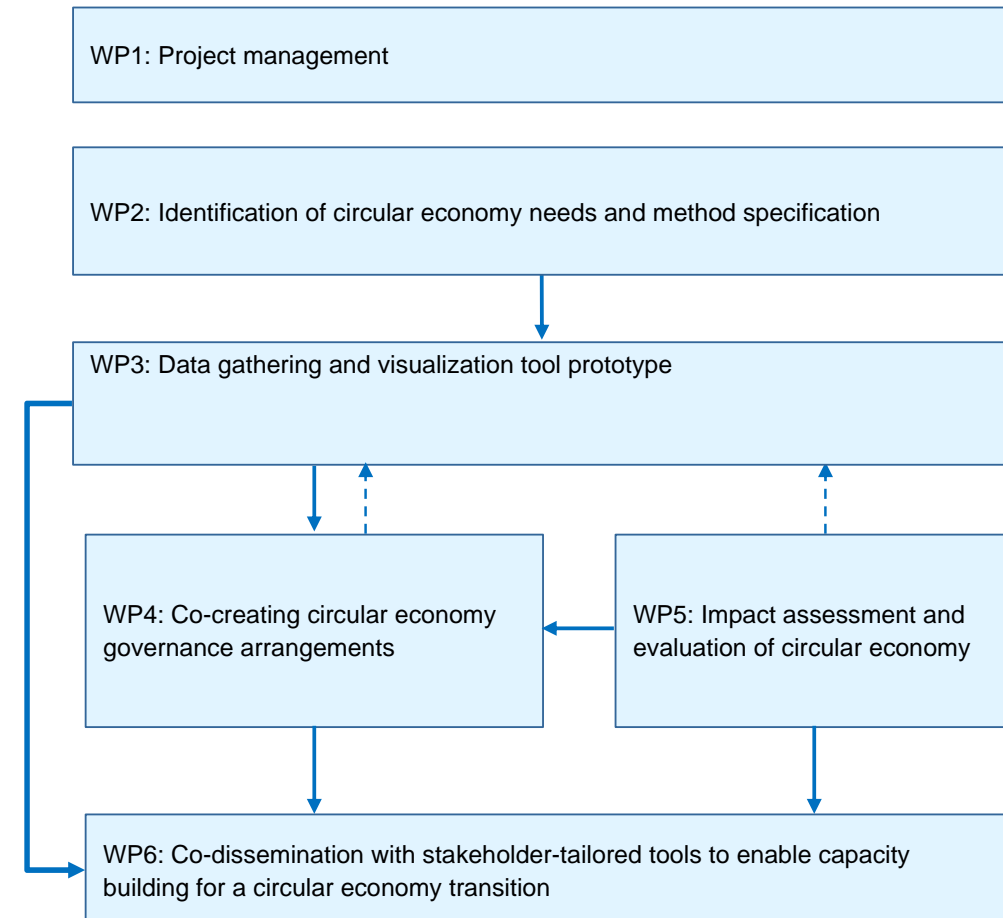
- A living lab approach used throughout all work packages and allows for an integrated co-production of the project with stakeholders from the quadruple helix
- A multi-scalar capacity building approach to allow for an optimized scalable process
- A tailored and adaptable approach based on the pre-existing conditions, i.e, existing data, methods and governance procedures already being utilized by the stakeholders and providing them with new knowledge.



CREATE structure

The project includes 6 WPs that focus on:

- WP1 - the Project Management
- WP2 - understanding stakeholder needs and the requirements for decision-support methods to enable implementation of CE in the built environment
- WP3 - data gathering and IT development to provide solutions to the identified needs and requirements
- WP4 - governance arrangements that enable urban governments to realize CE ambitions with their investment decisions
- WP5 - process to evaluate the sustainability implications of the identified reuse and recycling solutions
- WP6 - co-disseminating the results with emphasis on developing urban capacities



CREATE consortium

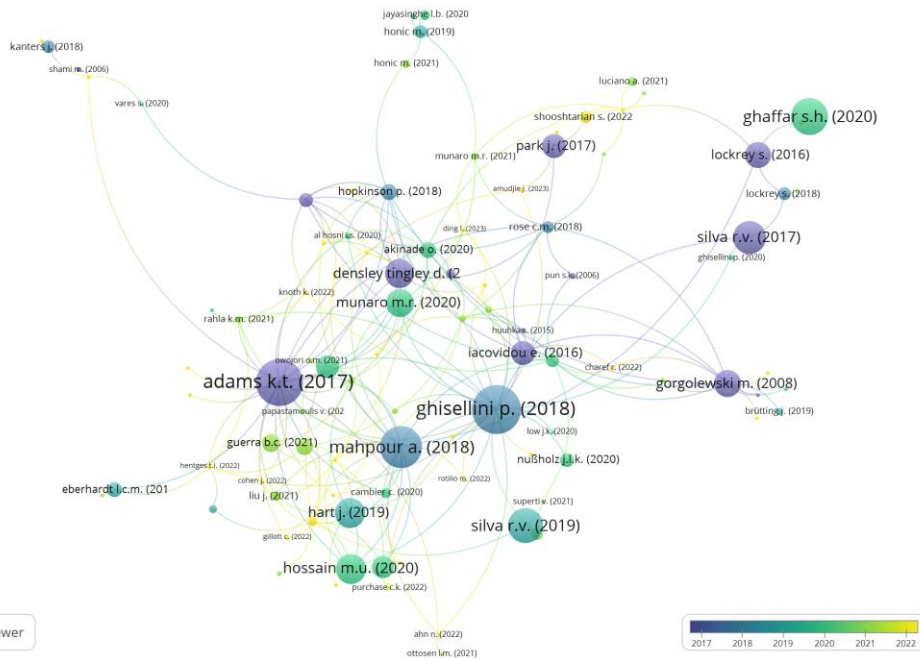
	Organisation	Type of organisation	Country / Funding agency	Contact Person (first name and family name)
Project Coordinator/Main Applicant	Chalmers University of Technology (CTH)	University or Other Educational Institution	SE	Holger Wallbaum
Project Partner 2	Austrian Institute of Technology (AIT)	Public or Private Research Organisation	AUT	Ali Hainoun
Project Partner 3	CitéSource (CS)	Business – SME	FR	Vincent Augiseau
Project Partner 4	Wageningen University and Research (WUR)	University or Other Educational Institution	NL	Wieke Pot
Project Partner 5	Municipality of Nijmegen (MoN)	City Authority/Municipality	NL	Maarten van Ginkel
Project Partner 6	French Geological Survey (BRGM)	Other Public/Governmental Institution (1)	FR	Daniel Monfort Climent
Project Partner 7	BEIA Consult International (BEIA)	Business – SME	RO	Victor Suci
Project Partner 8	Brasov Metropolitan Agency for Sustainable Development (BMA)	City Authority/Municipality	RO	Catalin Frangulea
Project Partner 9	Göteborgs Stad, Kretslopp och vatten (GS)	City Authority/Municipality	SE	Glen Nivert

Information needs for recycling and reuse

In-depth interviews with Living Labs

Strategic literature review

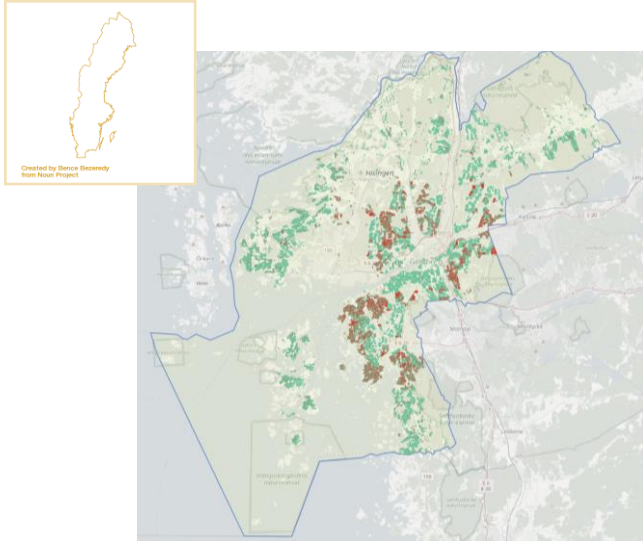
Survey deployment in Sweden, France, the Netherlands and Austria



Practices	Rennes Métropole	Nijmegen	Gothenburg
Circular economy strategy defined at the urban level	Strategy defined in April 2023 for all activities and specific strategy for the construction sector	Objectives integrated in two urban plans: Woondeals for 2030 (region Arnhem / Nijmegen), Nijmegen 2040 (city)	Circular economy strategy, including one specific to the construction sector integrated in the Environment and climate program for the city of Gothenburg 2021-2030
Main objectives of the city for circular economy in construction	To support the development of business offers for reuse and recycling and the production of local materials or materials with lower environmental impact (bio-sourced or geo-sourced) Reduce material flows	National objectives: 50 % of the buildings in the country should be "circular" by 2030 Woondeals: 25 % circular in 2025, 50 % in 2030	-50 % of CO ₂ emissions by 2025 and -90 % of CO ₂ emissions by 2030 To minimize material flows and optimize the building use, then to reuse, to recycle, and finally to use biobased materials and other resources To reduce waste by 40 % by 2030 for the municipal projects
Actions related to circular economy in construction led by the city; urban level	Support to the creation of a physical platform for reuse (funds for the market study and assistance for renting a space) Other similar projects : production site for compressed raw earth bricks, physical platform for reuse for private individuals, plaster recycling site Urban metabolism study	Every new project for Nijmegen must reach the objectives of Nijmegen 2040	Agreement with 50 construction companies to promote reuse
Actions related to circular economy in construction led by the city; urban project level	Local toolkit for urban and construction projects 12 pilot sites for waste reuse/recycle, or use of local materials or with less environmental/carbon impact Experiment of a sourcing study for local and renewable materials and of a LCA assessment for an urban project	Targets in the municipal policies which are applied in urban projects Systematic LCA assessment of buildings	LCA assessments in construction projects Production of a database about materials for all construction projects

Living Labs

Sweden: Gothenburg



Framtiden

- Public housing company of the city of Gothenburg with the mission to offer apartments with affordable rent levels for all citizens
 - Ambition: Identify supply and demand of recycled building materials and reusable elements
- Provide support to market actors to stimulate reuse and recycle

Netherlands: Nijmegen



Hezelpoort project

- A double tower (120m high): 383 housing; 573 parking places
- Ambition: A circular icon with solutions for energy consumption reduction and construction waste reduction

France: Rennes Metropolitan



Bégassière & EuroRennes – Technicentre projects

- Remaking a city district with mixed activities & reconverting the site into a city district with a cultural vocation
- Ambition: Reducing flows with the preservation of part of the existing buildings, the reuse-recycling of waste and land

Existing tools and databases

Mapping of used tools in Living Labs

Identified needs for tools and studies

Desk research on existing tools and features

	General informations				Access way			Geographic perimeter					
	URL	Name	Author (country)	Type	OA (Open access)	OS (Open source)	Access	Neighborhood or city	National	Europe or EU 28	world	Stock	Flows
International Stock and Flows	https://pano	Panorama	CML-Leiden,	Web, data p	X	x	Free for			X	x	X	X
	https://www	MaterialFlow	TU Wien (W)	Web, data p	X	?	Free for all				X	X	X
	https://open	Sourcemap	Sourcemap	Platform			Some p				X		
	https://reso	Resource tra	Chatam hou	Web, data p	X		CC non				X		X
	https://data	Datavizta	Boavizta (Fr)	Online data	X	X	Free						
	https://www	Climatiq	Climatiq (US)	Online Data	x		Both				X		X
Mapping tools for "smart city" data	https://www	Snap4City	SNAP4CITY	Platform			Not fre	X					
	http://www	CitiSim	Abalia (Es)	Platform	?	X	?	X					
	https://www	CityVis	(Wo)	Mapping too	X	X					X	X	X
	https://www	ArcGIS	ESRI	Mapping tool			Not fre				X	X	X
	https://carto	Builder	CARTO	Mapping tool			Not fre				X	X	X
	https://www	Smart City p	SIRADEL	Mapping tool			Not fre				X	X	X
Material exchange platform	https://meti	Platform U	Metabolism	Material exc	x	X	Free		X (Be)			X	X
	https://refa	Repair	La Fab (Fr)	Material exc	X	?	Free	X (Bordeaux)				X	
Database inventory	https://data	Circular ecor	DigiCirc (Fr)	Online data	X	x	Free			X		x	x
Local Stock and Flows and other local data for district and building	https://effic	Urban Print	Efficacity, CS	Software			Not fre	X					
	https://www	EvalMetab	Gustave Eiff	Tool online	X	?	Free or	X				x	x
	https://www	CirculaApp	CiteSource	Platform			Case stu	X				x	x
	https://www	Demolition	APUR, CSTB	Report+ too	?	?	?	X (city)				X	
	https://www	Building Nat	URBS (Fr)	Platform			Free wi		X (France)				
Passport product	https://mad	Madaster	Madaster (N)	Platform			Not fre			x (progressive d)			

3.3.4 Summary of the tools and studies used in the 3 living labs

Tools and studies	Rennes Métropole	Nijmegen	Gothenburg
City level	Urban metabolism study.: mapping of stocks, flows and local actors, online data share Shared database on all ongoing urban projects	Urban metabolism study.: mapping of stocks, flows	Stock assessment (research project) and database of <i>Framtiden</i> about its buildings
Urban project level	Material flow assessment Sourcing for local and renewable materials LCA assessment at the urban project level		
Building level	NF Habitat HQE label LCA assessment (energy and carbon)	LCA assessment (GPR, MPG) Assessment tool for housing projects and circular economy (circular ladder)	LCA assessment with details about materials from <i>Byggspektors miljöberäkningsverktyg</i>

3.4.4 Summary of the needs in terms of tools and studies for the 3 living labs

Studies / data	Rennes Métropole	Nijmegen	Gothenburg
Inflows and outflows	Data on origin of materials consumed in the territory, destination of materials produced and construction waste Frequent data on waste flows for monitoring (waste production waste management)	Data on origin of materials consumed in the territory, destination of materials produced and construction waste	
Local and renewable materials	Data on the availability of local and renewal materials and of their environmental impacts	Data on the availability of local and renewal materials and of their environmental impacts	
Secondary materials	Data on the availability of secondary materials and of their environmental impacts	Data on the availability of secondary materials and of their environmental impacts	Data on the availability of secondary materials and of their environmental impacts
Cost	Cost of reuse/recycling	Cost of reuse/recycling	
Building use	Data on building use		Data on building use
Environmental evaluation	Scenario comparison in terms of waste management, CO2 emissions, resource uses	More LCA at urban level	

Impact assessment for Living Labs

Technical scope considered

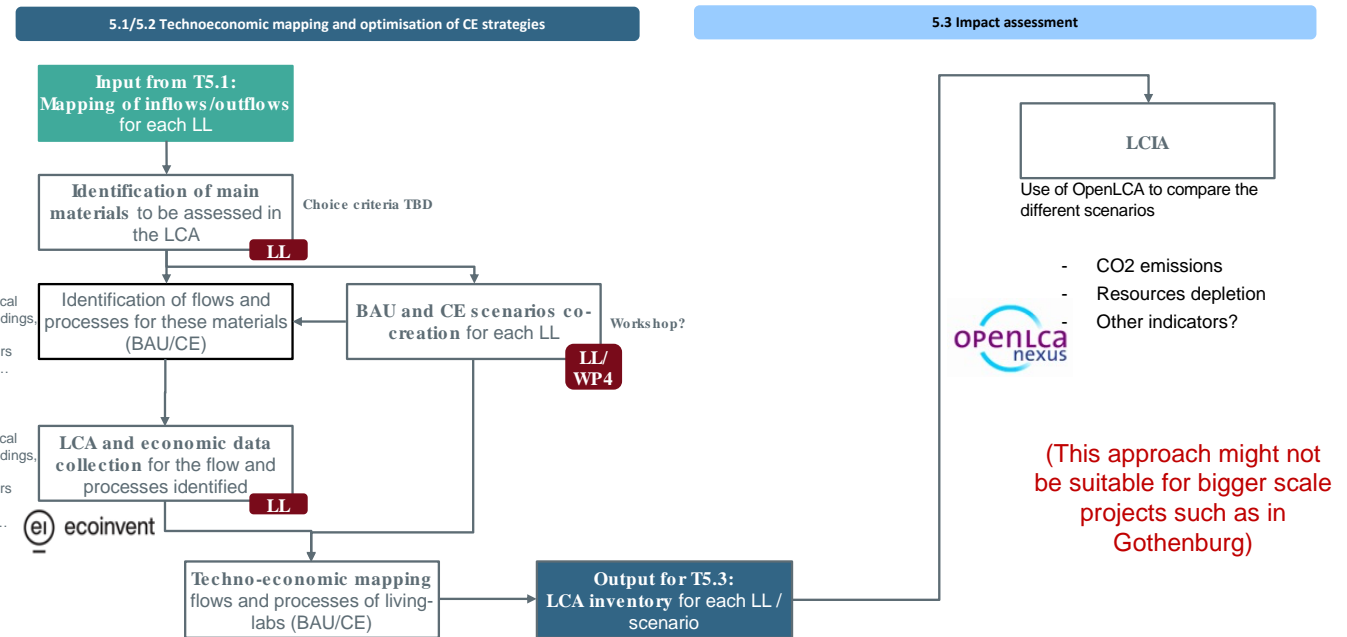
- construction materials (in buildings and infrastructure)
- if available data: construction components

CE strategies assessed

- Reuse & Recycling of construction materials

LCA stages considered

- Focus on waste treatment and use of secondary materials during the product and construction phases



CREATE

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

