CENTRINNO

DELIVERABLE 2.2

CENTRINNO CARTOGRAPHY ALPHA VERSION

Submission date: 31/01/2022
Project start date: 01/09/2020
Duration: 42 Months

DELIVERABLE FACT SHEET

Work Package	WP2 Urban Resource Mapping
Deliverable	D2.2 CENTRINNO Cartography - Alpha Version
Due Date	M17: 31 January 2022
Submission Date	M17: 31 January 2022
Dissemination Level	[x] P – Public [ ] CO – Confidential
Deliverable Lead	META
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Status	[ ] Plan [ ] Draft [ ] Working [x] Final [ ] Approved
Abstract (for public dissemination only)	This deliverable demonstrates the development approach, concept and key functionalities of the CENTRINNO Cartography platform.
Keywords	Cartography; Circular Economy; Mapping; Urban Ecosystems
Statement of Originality	This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

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REVISION HISTORY

Version	Date	Author	Organization	Description
0.1	17/11/2021	Frenzi Ritter, Daniel Bieckmann, Eva Promes, Katerina Bakousi, Rona Yurismona, Gerardo Ezequiel Martín Carreño	META	Document Development Plan
0.2	06/12/2021	Frenzi Ritter, Daniel Bieckmann, Eva Promes, Katerina Bakousi, Rona Yurismona, Gerardo Ezequiel Martín Carreño	META	First Draft
0.3	08/12/2021	Tamara Streefland, Elizabeth Corbin	META	Internal review
0.4	13/12/2021	Frenzi Ritter, Daniel Bieckmann, Eva Promes	META	Inclusion of comments of internal review
0.5	03/01/2022	Alex Mezard, Vincent Guimas	FCGP	Peer reviews
0.6	10/01/2022	Milena Juarez, Sara Bosch	IAAC	Peer reviews
0.7	19/01/2022	Frenzi Ritter, Eva Promes, Jette Dingemans	META	Addressing reviewers' comments
0.8	20/01/2022	Armend Duzha	IAAC	Quality Check
0.9	25/01/2022	Frenzi Ritter, Eva Promes	META	Final version sent to the Steering Committee
1.0	31/01/2022	Frenzi Ritter, Eva Promes	META	Final version by the consortium to be submitted to the EC

Disclaimer

EXECUTIVE SUMMARY

The CENTRINNO Cartography constitutes one of the main web-based infrastructures, developed during the CENTRINNO project. It fulfills a dual purpose in the realization of the CENTRINNO approach for industrial regeneration.

First, as a **visualization and analysis tool** of productive communities and ecosystems in historic industrial areas it serves as a compass for the implementation of circularity-focussed innovation spaces. In the experimentation journey that CENTRINNO pilots take, the Cartography supports them in spotting and communicating opportunities and gaps for circularity, emerging out of the inherent resources flowing within and between urban neighbourhoods.

Second, as a **website**, the CENTRINNO Cartography presents curated case studies of mapped opportunities, ecosystems and networks to a wider audience. This website functions as a source of inspiration for other facilitators of productive systems and community-based urban regeneration. It also makes available tools and materials to adopt the methods applied in the CENTRINNO project.

Within this document, the concepts and functionalities of the visualization tool and the website are explained and demonstrated via clickable mock-ups and screenshots.

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ACRONYMS & ABBREVIATIONS

ACRONYM	DESCRIPTION
CENTRINNO	New CENTRalities in INdustrial areas as engines for inNOvation and urban transformation
MFA	Material Flow Analysis
WP	Work Package

GLOSSARY

TERM	DEFINITION
KUMU	KUMU is an open-source software, used for mapping stakeholder networks, complex systems or community assets. It is the platform that CENTRINNO pilots will use to organize, visualize and analyse data collected on the current and future CENTRINNO Network, its resources and resource flows
"View"	A "view" is a saved map visualization in KUMU. It is a set of rules that define what clusters, filters and design codes are applied to a full dataset within a KUMU mapping project.

1. INTRODUCTION

1.1 Purpose and Scope

The Cartography is one of the central infrastructures of the CENTRINNO project, aiming to support the project's pilots to leverage local resources towards a circular and inclusive urban economy. This infrastructure is iteratively developed and improved throughout the duration of the project. Each version (alpha, beta and final) is demonstrated in a respective deliverable due in M17, M28 and M40.

The Cartography Alpha version will consist of two parts, which are both demonstrated within this deliverable (Table 1).

Firstly, main insights and curated interactive maps from the mapping process will be embedded into the CENTRINNO Cartography Website. This website functions as the external-facing exhibition space where pilots share the most important findings from their urban resource mapping progress to a wider audience outside of CENTRINNO.

In addition, the Cartography will contain a project-internal infrastructure for interactive data visualization and analysis, which will be built in the open-source mapping platform KUMU. These dashboards are collaboratively managed and accessed by pilot teams and Metabolic to add, analyse and visualize bottom-up information collected on each pilots' local ecosystem, urban metabolism, and local networks of stakeholders and their resources.[1]

The key objective of this deliverable is to explain and demonstrate the functionalities of these two components that together make up the Alpha Version of the CENTRINNO Cartography. The website will be demonstrated via a clickable mock-up of three web pages to show how an external user will navigate and experience the content. For the purpose of this demonstration, the Amsterdam pilot was chosen to illustrate the type of maps and information that will be featured on the website. To demonstrate the functionality of KUMU, screenshots from the pilots' already prepared data visualization will be accompanied by explanatory texts.

An overview of the Cartography elements and their scope demonstrated within this deliverable is presented in the table below.

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[1] *All bottom-up data collection in CENTRINNO complies with EU GDPR guidelines to protect personal and sensitive data. D7.4 ("Initial Data Management Plan") defines the project's plan to handle collected data in line with H2020 and EU regulations [1].*

Table 1 - Scope of the Cartography Demonstrator

COMPONENTS	DESCRIPTION	SECTION	FORMAT
Website Demonstrators (external)			
CENTRINNO Cartography Website Demonstrator	Externally-facing website that provides methodology, resources and pilot-specific mapping outputs to a wider audience	Section 3.1	Clickable mock-up
Exemplary embedded CENTRINNO Cartography slideshow	Example of an interactive online "journey" built in the open-source mapping platform KUMU to share contextual maps as well as interactive network maps on the website	Section 3.1	Clickable mock-up ("Pilot Cartography Page")
KUMU Demonstrators (internal)			
"Urban Metabolism" Map	Exemplary interactive map to visualize outcomes of waste flow analysis	Section 3.2	Screenshots of KUMU projects
"Full Ecosystem" Map	Exemplary maps of mapped networks of "resources owners" and their local resources	Section 3.2	Screenshots of KUMU projects
"Roles in Circular Economy" Map	Exemplary map of local stakeholders classified by their potential role in a circular economy transition	Section 3.2	Screenshots of KUMU projects

1.2 Contribution to other Deliverables

For the preparation of this deliverable, the following preceding and upcoming deliverables have been taken into account:

D2.1 **Urban Ecosystem Mapping Guidebook** (M08): The Cartography Alpha Version builds on the methodologies and frameworks for mapping urban ecosystems described in the Urban Ecosystem Mapping Guidebook (D2.1) [2].

Further, the Cartography Alpha Version (D2.2) directly feeds into and informs the development of **future iterations** of the Cartography platform (Cartography Beta Version, M28 and Cartography Final Version, M40). During these future iterations, learnings from the Cartography will be used to update urban resource mapping methodologies prepared in WP2 (T2.2 "Urban Resource Mapping").

D4.1 **Detailed Pilot Planning and Monitoring Framework** (M08) [3]: This deliverable further takes into account the planning timeline of pilots and other partners in relation to the remaining key concepts and their infrastructure. Further information on these interrelations can be found in Section 2.2.

D2.3 **Living Archive Alpha Version** (M17): The Living Archive and the Cartography are developed in parallel to each other. Since the Cartography and the Living Archive shall be compatible, this deliverable has been closely aligned with D2.3 in terms of its structure, functionality and content. The first demonstrator of the Living Archive is still under development and will be completed in January 2022.

D6.2 **Communication and Dissemination Plan** (M04) [4]: Lastly, the development of the CENTRINNO Cartography is aligned with the planned communication and dissemination activities, laid out in D6.2. Any addition of subdomains and click-through links that connect the CENTRINNO Cartography to the main website will be handled on a needs basis by IAAC and WP6 partners.

1.3 Structure of the Document

This document is divided into the following sections: Section 2 gives a brief introduction to the concept of the Cartography, and provides an explanation of the development and scoping decisions that were made during the project's first spring (M08-M12). Here, the key elements that are covered within the scope of the first iteration of this Cartography are outlined in detail.

In Section 3, the CENTRINNO Cartography website architecture, functionalities and purpose are explained and demonstrated. This chapter serves as an explanation guide of the clickable website mock-up that was developed for this deliverable. It should be read alongside this website demonstrator, which can be accessed here.

Section 4 dives into the interactive mapping platform KUMU that forms the internally-facing backbone infrastructure of the CENTRINNO Cartography.

Section 5 lays out when and how pilots interact with the different Cartography elements and provides practical examples of how insights gathered through the Cartography trigger action within other elements of the CENTRINNO project.

The Annex to this document contains supporting documents that help to illustrate the structure and content of the CENTRINNO Cartography and will be referred to in-text where relevant.

2. BACKGROUND

2.1 The mission of the CENTRINNO Cartography

CENTRINNO's mission is to boost local circular and inclusive urban economies by leveraging the potential of urban craftsmanship, urban agriculture, local producers and vocationally trained professionals around industrial neighbourhoods. Since Europe's industrial areas have been transforming with far-reaching social and ecological consequences, there is an urgency to develop more place-based and socially inclusive patterns of urban transformation that ensure continued livelihoods for makership and small industries in times of gentrification and digitalization of urban economies.

Safeguarding and enlarging these **diverse economic spaces and activities** in cities is essential to ensure social inclusion, enable locally self-reliant economies, and increase community resilience and the cultural richness of cities [5]. **In light of the growing interest in the circular city, productive and creative communities, craftspeople and artisanry, are indispensable to meet the circularity targets that many cities have put forth. They provide repair, reuse and recycling infrastructure, remanufacturing capacity and the needed design skills to create durable and sustainable products for urban communities.**

Yet, those former industrial urban spaces, set aside for productive activities, are gradually changing in response to a changing economic climate. Similar to natural ecosystems, industrial districts undergo periods of growth, stabilization and decline. Whether or not industrial functions stay or disappear from urban space (and get replaced by other economic activities) depends on a community's adaptive capacity to respond to new economic trends and changing environmental conditions. As described by Bresanellini et al. [6], districts of industrial networks that can adapt to new trends, pressures and opportunities stand a higher chance of reorganizing into more resilient networks (Figure 1).

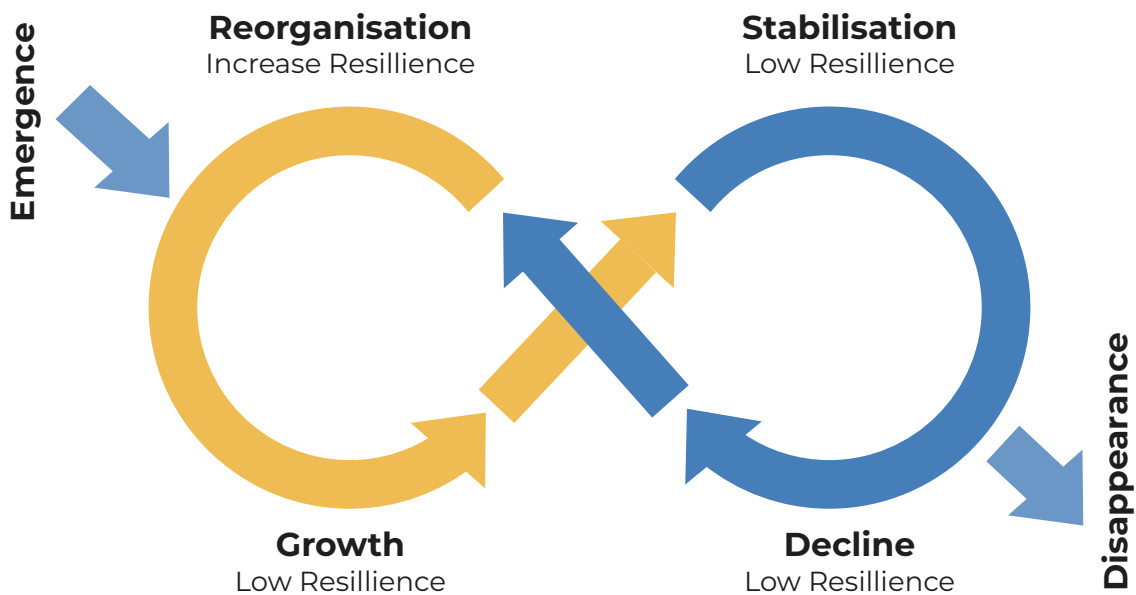*Figure 1 - Lifecycle of industrial districts.*
Adapted from Bressanelli, Visintin, & Saccani (2022).

A transition to a circular economy can be seen as one such trend that has mostly been appropriated by the digital sector and larger corporations. Instead, smaller producers, makers and businesses are often left out of the narrative around a circular transition - despite the much needed technical and non-technical skills that are indispensable to implement a circular system [7].

The **guiding research question** in CENTRINNO is how urban innovation spaces, functioning as community hubs, network builders and physical fabrication spaces, can facilitate a regenerative pathway for industrial neighbourhoods that leaves communities stronger, more resilient and more circular. CENTRINNO's activities focus on building a **locally connected network** of agents that actively respond to the changing demands for a new economic model. CENTRINNO's mission is to build local infrastructure and capacity (in the form of innovation spaces) that prepare urban communities for the future needs and challenges of our society.

Within this broader mission, the CENTRINNO Cartography will become an integral open-source tool to mediate the reorganization of industrial and productive urban communities towards a circular system. The rationale for such a digital platform is grounded in the need for low-threshold, open-access and publicly owned tools that support local communities in self-organizing towards a circular economy [5].

The platform allows highlighting valuable resources inherent in a community, such as locally available materials, knowledge on high-quality material processing, and available machinery to facilitate this. The key goal is to enable communities to identify and make use of these resources. Building on these assets, circular synergies can be explored to build more resilient, circular local ecosystems. To empower residents and changemakers to shape their city, the Cartography in CENTRINNO is predominantly developed as a tool for network builders and facilitators, such as the to-be-built innovation spaces in CENTRINNO pilots.

2.2 Connection to the CENTRINNO Framework

As explained above, the Cartography is one of the central resources of the CENTRINNO Framework to support pilots in their experimentation processes around the key concept of the Circular Economy. As described in D1.2, the CENTRINNO Framework is the project's compass that provides a foundational structure and a common language for the experimentation activities taken on by pilots [8].

Within this umbrella structure, the Cartography is a digital resource supporting pilots in implementing their vision of a circular urban economy. It is most strongly related to the first level of action areas within the CENTRINNO Framework ("Mapping Local Ecosystems"), supporting pilots to store, visualize and analyze the information collected through the mapping methods introduced in D2.1 Urban Ecosystem Mapping Guidebook [2].

These include several state-of-the-art tools and methods, such as geospatial context mapping, community mapping and material flow mapping. Pilots combine these methods to convene local stakeholders, identify local opportunities and drive context-relevant innovation action. The mapping process allows pilots to be more cognizant of their local biological background, existing innovation networks, and the flows of materials, knowledge and cultural practices between them.

The Cartography is also a critical resource for pilots to build a strong community around a shared circular vision and to ultimately help with the implementation of a circular Fab City Hub (Figure 2). The digital platforms (KUMU and the website) shall enable pilots to effectively engage their network within the exploration of circular synergies.

Figure 2 visualizes the Cartography's role across the Framework's other key concepts and associated resources: the Living Archive, the CENTRINNO Network, the CENTRINNO School and Innovation Spaces. Some of these interplays between the Cartography and the remaining Framework concepts can already be leveraged through the first iteration of the Cartography (1, 2), while some others will roll out at a later stage of the project (3, 4).

1
Cartography can be used to identify potential stories about local materials, waste streams, skills or infrastructure that showcase local **heritage**.

2
The **Cartography** maps the current & potential ecosystem of the CENTRINNO **Network** and their resources.

It can also support pilots to create a **socially inclusive** network of local producers by identifying the resources of marginalized groups, and their specific resource needs.

4
CENTRINNO Blueprints will eventually codify the CENTRINNO approach to support the set-up of innovation spaces.

Templates of the Cartography's mapping methods will be integrated into these Blueprints.

3
Cartography maps locally relevant CENTRINNO Network, their resources and skills (or lack thereof) to help the **School** design adequate training programmes.

Newly developed skills, newly made connections or new Network members engaged in the **School** are feeding into the **Cartography**.

Circular Economy
CENTRINNO Cartography

Implementing a Fab City Hub
Building a community
Mapping Local Ecosystem

Heritage
CENTRINNO Living Archive

Social Inclusion
CENTRINNO Network

Innovation Spaces
CENTRINNO Blueprints

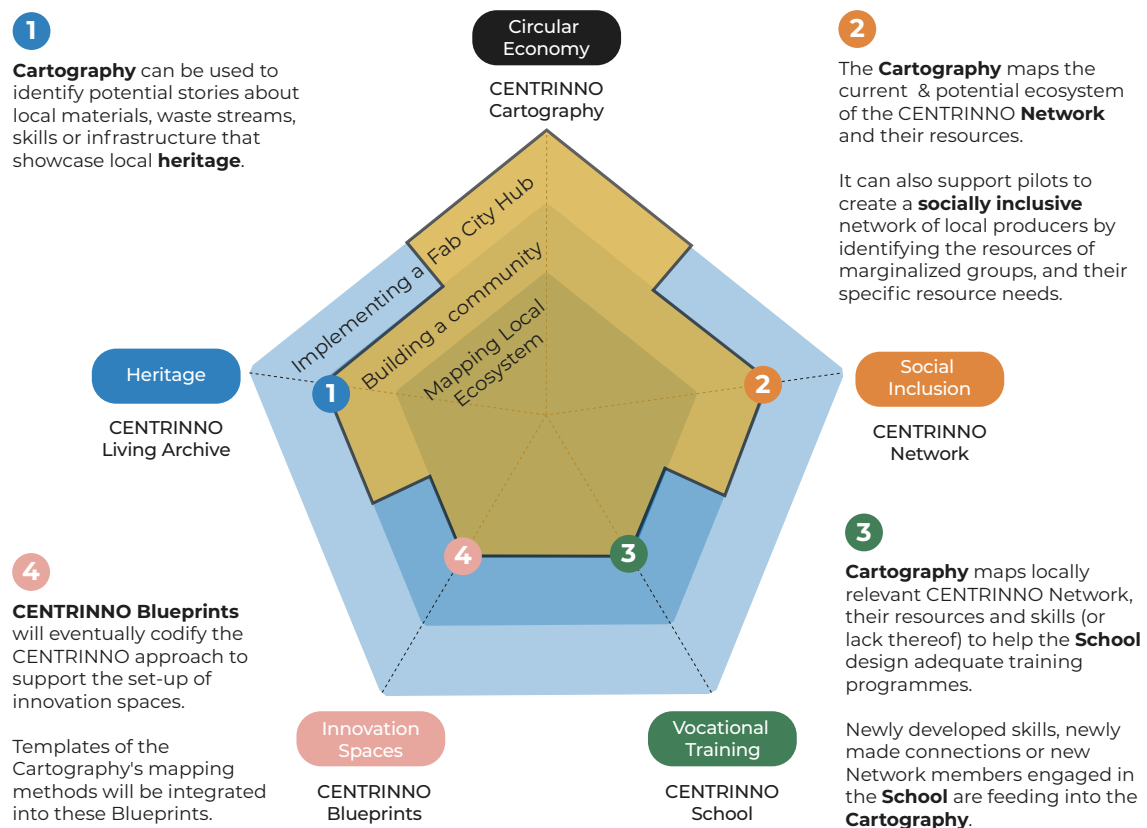Vocational Training
CENTRINNO School

Figure 2 - The Cartography within CENTRINNO's Framework.
Adapted from CENTRINNO (2021) [8]

3. CARTOGRAPHY – ALPHA VERSION

3.1 Overview of the Cartography Infrastructure

As explained above, the Cartography consists of two main infrastructural components: a website and a data visualization platform developed in KUMU. The decision to split the Cartography into these two elements is justified by the project's internal and external requirements from the Cartography.

Internal needs of the Cartography are those functionalities that support the pilots in preparing and setting up their activities during the project's sprints. Consultations within one-to-one sessions with pilots and Metabolic also highlighted that pilots need to develop their internal capacity to integrate circularity into their pilot action planning. These needs were the foundation when developing the Cartography infrastructure. Further, the Cartography infrastructure had to meet the pilots' demands for flexible and dynamic visualization of the collected data on their local ecosystems and the interconnections between local stakeholders. Within the Cartography infrastructure, these requirements are met by using the mapping platform KUMU as an easy-to-use dashboard in which pilots and partners can collaboratively store, visualize and analyse bottom-up data collected on urban ecosystems, local stakeholders and their resources.

Beyond this internal function, pilots also stressed the need to create a public outlet to share curated maps of local networks, context maps and emerging insights into circular opportunities with a broader audience. Hence, we decided to develop an external-facing website that fulfills this need by providing a space to share selected materials. Figure 3 sketches out how the two infrastructural components speak to each other.

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[2] *CENTRINNO's pilot activities are structured in three sprint periods and iteration periods. Sprint periods consolidate pilot experimentation activities and stakeholder engagement activities, while iteration periods are "low-action" phases. CENTRINNO's first sprint ran from April 2021 to October 2021. The second sprint will run from March 2022 to September 2022, and the third sprint will run from February 2023 to August 2023 [3].*
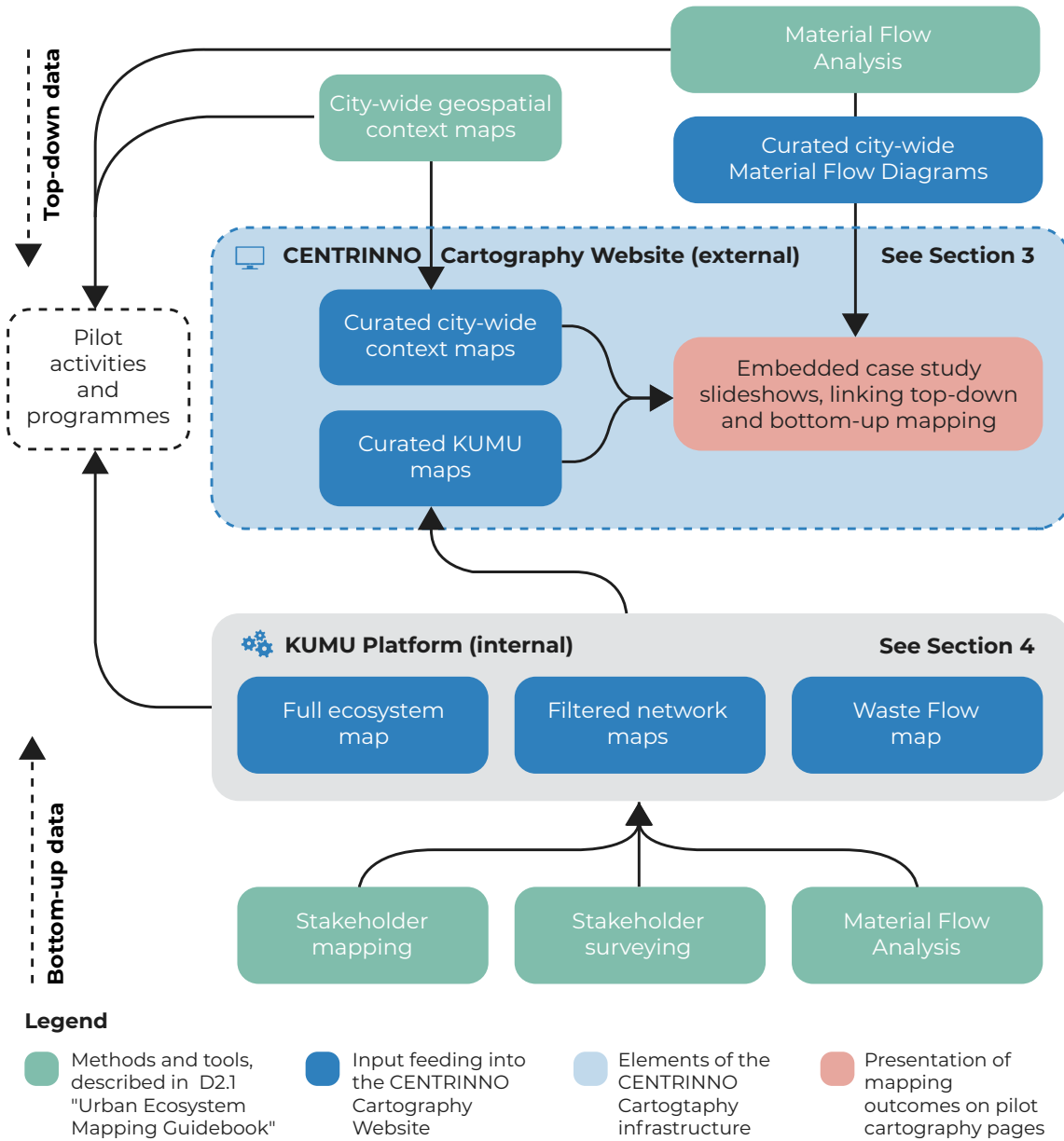
Figure 3 - Interconnections between cartography infrastructure and urban resource mapping methods

3.1.1 Website structure

The CENTRINNO Cartography website is a curated space to share emerging case studies of mapped urban ecosystems, interactive maps and resources on mapping methods with a broader audience. It is the platform that embeds pilots' KUMU maps and augments them with additional static context maps, material flow diagrams and additional insights. While the backbone mapping dashboard built in KUMU is explained in Section 4, this chapter first walks through the key components and purposes of the website. The website will be fully developed by Metabolic at the start of sprint 2 (M19-M25). To explain the intended functionality and audience of this website, Metabolic developed a current clickable mock-up as a demonstrator (accessed here). The following pages will be a reading guide for this clickable mock-up, each referring to one of the pages presented below:

- **Landing page:** It is the first page that visitors see when finding the Cartography either via the CENTRINNO main page or through other channels. This page introduces the purpose of the Cartography and links to additional information about its role in CENTRINNO.

- **About page:** The website's About page will give more background information of the whole CENTRINNO project and the vision of the Cartography.

- **Methodology page:** This page gives visitors concrete actions, tools, and templates for engaging in urban ecosystem mapping and replicating the Cartography.

- **Pilot Cartography pages:** These pages showcase mapping case studies, contextual information and mapping outcomes for each of the nine pilots.

- **Library page:** This page provides resources for each mapping step. While the library page is not included in the clickable demonstrator, the proposed featured materials are listed in Table 2 (Section 3.6).

- **Footer:** The website's footer will guide users of the Cartography website to the CENTRINNO's main page, find contact information and subscribe to the project news.

Figure 4 - Landing Page

3.1.2 Users & target audience

Catering to a range of external audiences, the CENTRINNO Cartography website invites users to think about urban regeneration and social inclusion in the circular economy transition. While the website aims to be a source of inspiration for the general public, four key user groups have been defined as a target audience for the content shared on this website: (1) CENTRINNO pilots, (2) potential replicators of the CENTINNO approach, (3) public agencies and (4) the local community members of pilots.

These four user groups and their needs were identified by analysing the results of workshops held together with each pilot and Metabolic at the beginning of Sprint 2 (M08). Within these workshops, CENTRINNO pilots mapped the key preferred functionalities of the CENTRINNO Cartography, and discussed how they imagined a range of different actors to use the future Cartography. Section 4.2 further elaborates on the results of these workshops.

Most predominantly, the **CENTRINNO pilots** are the key intended users and target audience. They play an essential role in curating content for the website and adapting it to meet the needs of their target audiences. They use the CENTRINNO Cartography website to showcase their mapping progress and insights on circular opportunities through the embedding of KUMU's interactive maps, static maps and case studies that highlight circular opportunities within their local ecosystems. The main value proposition of the CENTRINNO Cartography website for pilots is to provide a customizable space in which pilots can present the CENTRINNO Network and its resources to a wider audience by sharing maps and curated insights about their roles in a local circular economy.

The second relevant user group consists of potential **replicators of CENTRINNO's innovation spaces**. This includes community-based maker spaces, innovation hubs and other bottom-up initiatives that convene members of the local productive ecosystem. To this target group, the Cartography Website provides materials from pilots on how to inventory resources in their networks, and how to use this information to build local synergies. One of the website's value propositions for this group is access to inspiring case studies that demonstrate how innovation processes can be guided by the mapping of urban ecosystems, using public and bottom-up data. The Cartography intends to become a source of knowledge for other innovation spaces to consider the local resources more thoroughly as a driver in local innovation ecosystems.

Thirdly, urban development advisors, city planners or circular economy-focused **municipal government departments** can also draw inspiration for their processes of regeneration and a circular production ecosystem. What combines both public agencies as well as the aforementioned innovation spaces is that they both fulfil the role of what has been defined by the authors of "Foundries of the Future" as *curators* [9]. Curators are defined as agents that mediate between the needs of local businesses, community members and public authorities. They build partnerships, find common interests and identify shared opportunities across different stakeholders in urban ecosystems. Urban governance institutions that act as curators through their role as planners and developers can profit from the holistic approach to inventory resources, skills, and needs in multi-stakeholder environments. Here, the main value proposition is that the Cartography provides a knowledge source on how CENTRINNO's pilots have mapped and leveraged a local network of stakeholders to develop on-the-ground action towards circularity and inclusion goals. The needs from the platform for this user group were identified in the workshops with pilot teams that consist of municipal partners, such as Copenhagen, Tallinn and Milan.

Lastly, each pilot cartography page may be interesting for **local community members** of each of the participating cities. To them, the Cartography can provide concrete context information about their neighbourhood and its assets, as well as raise awareness about potential allies, partners and resources. Since the pilot cartography pages can share maps and additional information on local actors that joined the CENTRINNO Network, the website can serve as a call-to-action for others to be featured on the Cartography map.

The remainder of this chapter walks through the four main pages that these four target audiences will interact with.

3.2 Landing page

The purpose of the landing page is twofold. Firstly, it aims to familiarize the visitor with the Cartography and its relevance for a circular urban system. The landing page presents the CENTRINNO Cartography as a process that can be helpful for innovation spaces, initiatives and public institutions interested in sustainable and circular urban regeneration to map and connect local resources in a networked community.
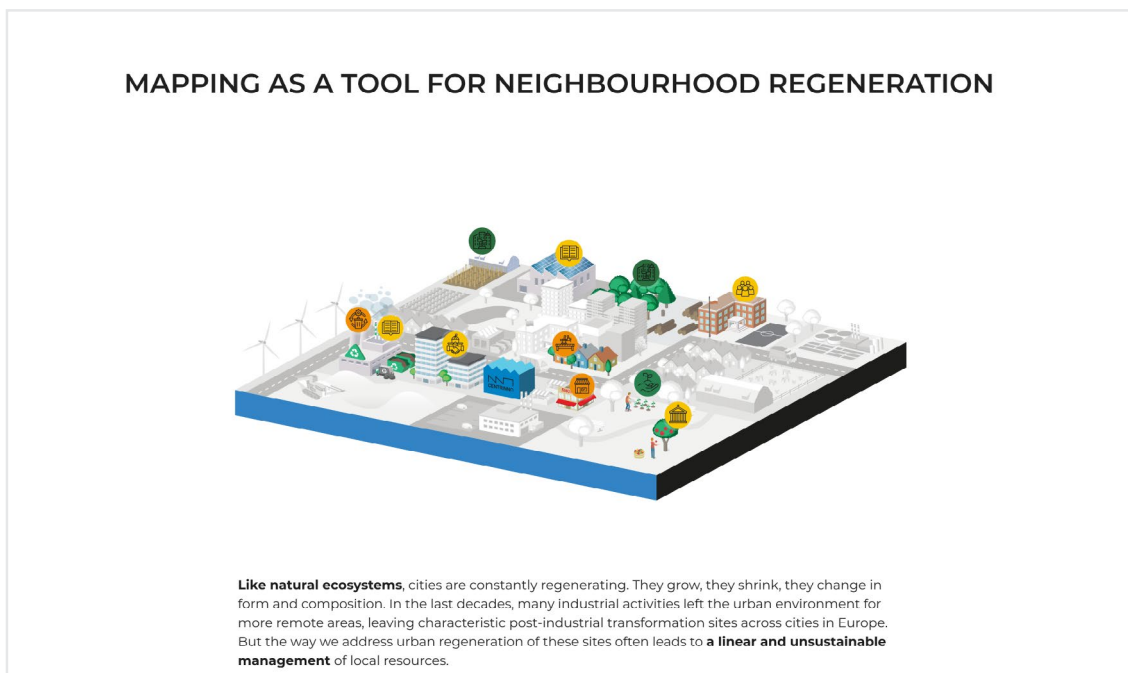

MAPPING AS A TOOL FOR NEIGHBOURHOOD REGENERATION

Like natural ecosystems, cities are constantly regenerating. They grow, they shrink, they change in form and composition. In the last decades, many industrial activities left the urban environment for more remote areas, leaving characteristic post-industrial transformation sites across cities in Europe. But the way we address urban regeneration of these sites often leads to **a linear and unsustainable management** of local resources.

Figure 5 - Screenshot of the Landing Page (Intro Copy)

Secondly, it aims to direct the visitor to the nine pilot cartography web pages to explore how cartographic methods have been adopted by CENTRINNO's pilot teams. Each button will link to the respective pilot page, where more information about each pilot's cartography can be found can be found (see Section 3.4).

CARTOGRAPHY IN ACTION

- **FIND** opportunities for local industrial symbioses
- **HIGHLIGHT** the importance of local makership for urban circularity
- **BUILD** Circular Fab City Hubs that are rooted in local resources and heritage of making
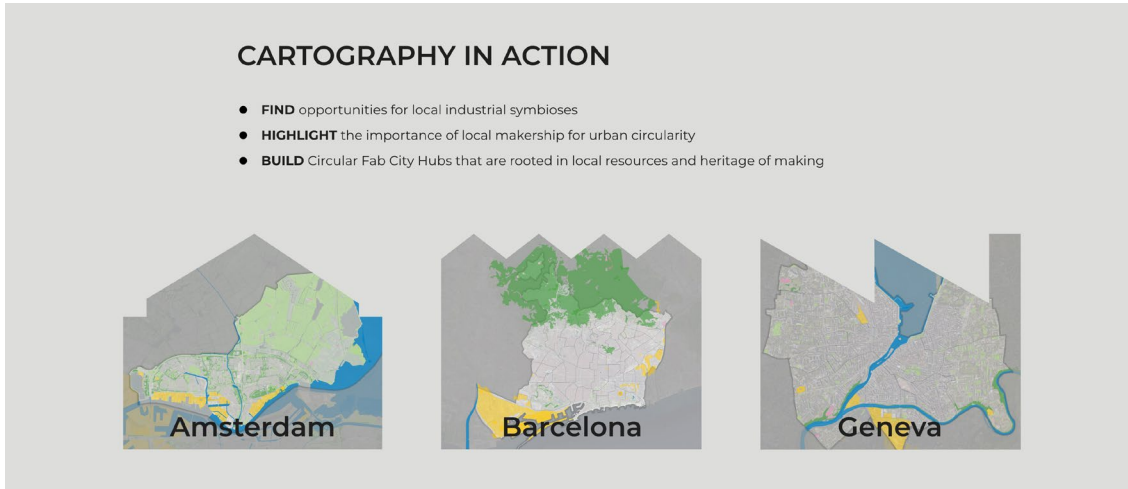
Amsterdam   Barcelona   Geneva

Figure 6 - Screenshot of the Landing Page (Links to Pilot Cartographies)

3.3 About page

The About page provides visitors of the website a general introduction into the CENTRINNO project and the role that the Cartography plays within CENTRINNO's framework.

It further introduces visitors to the vision of the Cartography to build locally productive circular ecosystems, grounded in the assets a neighbourhood brings along. Underlying this vision is the idea that communities have the assets it takes to kickstart the transition towards a circular state. This section invites visitors to concretely explore what different urban stakeholders can contribute to the transformation of urban consumption and production models towards circular value chains. It signifies the broad range of stakeholders that can and should be involved to move towards a local circular ecosystem and can guide visitors in assembling crucial partnerships.
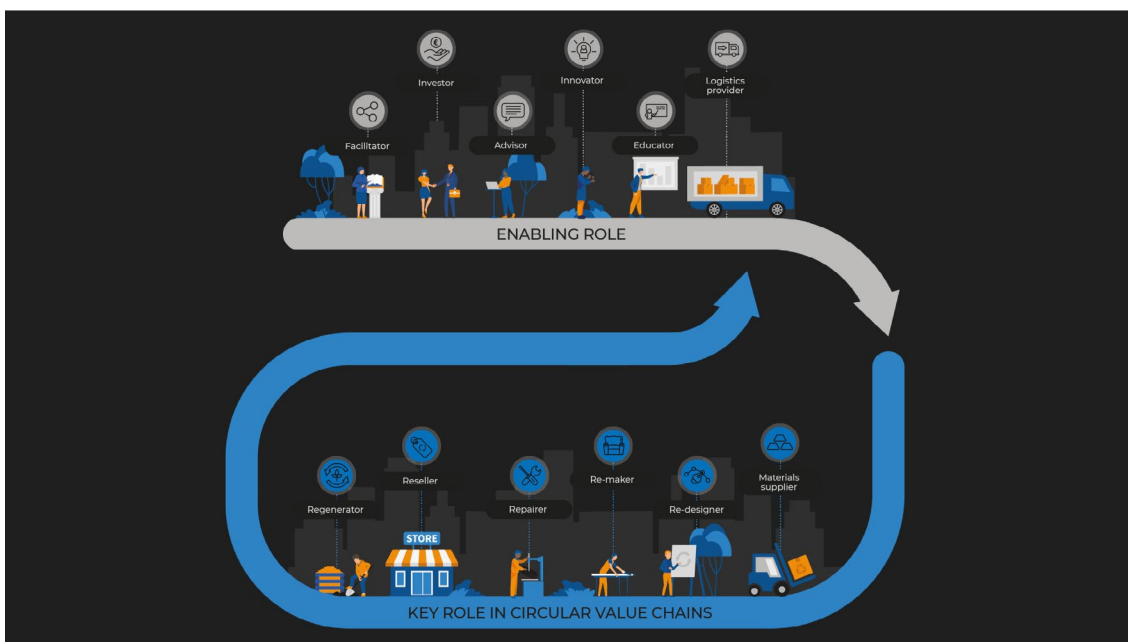

Figure 7 - Screenshot of About page (Vision)

Further, the About page also gives a high-level overview of the five key steps needed to create a cartography of local areas. These five steps make up the methodology behind the cartography, which is further explained in more detail on the website's Metholodolgy page (described in Section 3.3).
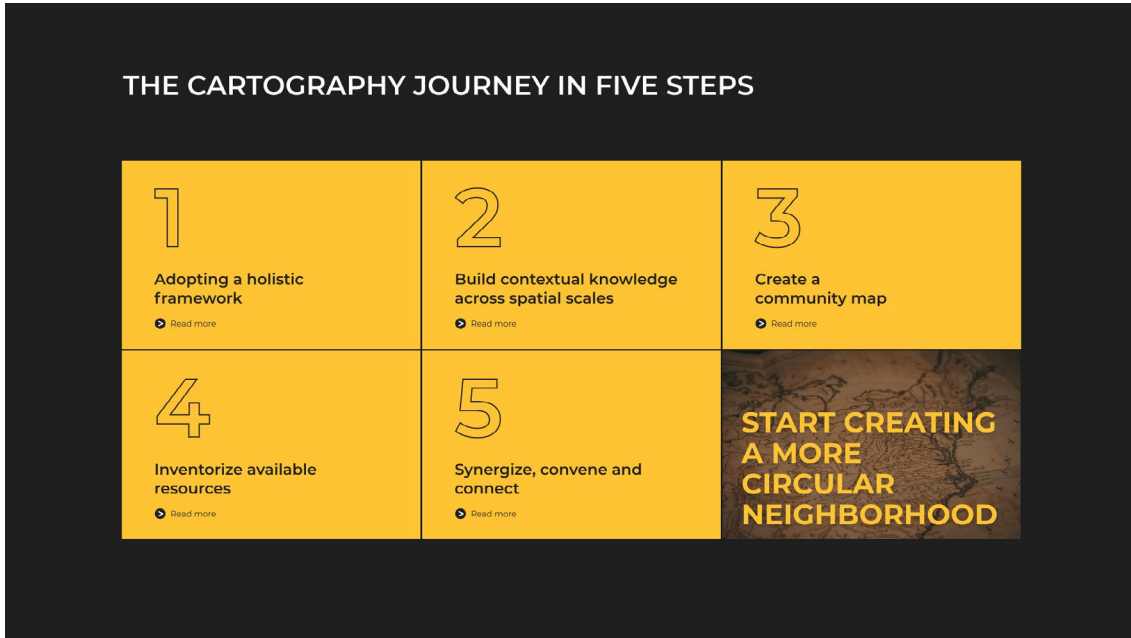

Figure 8 - Screenshot of the About Page (Overview of steps)

3.4 Methodology page – Cartography in five steps

On this page, we dive into five key elements that help us structure Urban Ecosystem Mapping activities and create a holistic and layered understanding of a project´s challenge site. These steps are synthesized from the results of the Urban Ecosystem Mapping Guidebook, presented in D2.1 [2]. Given the length and complexity of the guidebook, the purpose of this section is to provide an actionable overview, as well as key resources and examples per step.

The target audience for this methodological overview reaches beyond CENTRINNO. For now, it is aimed at any public or non-for-profit community initiative seeking to establish a locally inclusive circular economy movement that is grounded in contextual knowledge of their city and its metabolism.

Key methodologies that are featured on this page are the following:

1 Adopt a systems-view on cities

Figure 9 - Step 1: Adopting a systems approach to map urban ecosystems
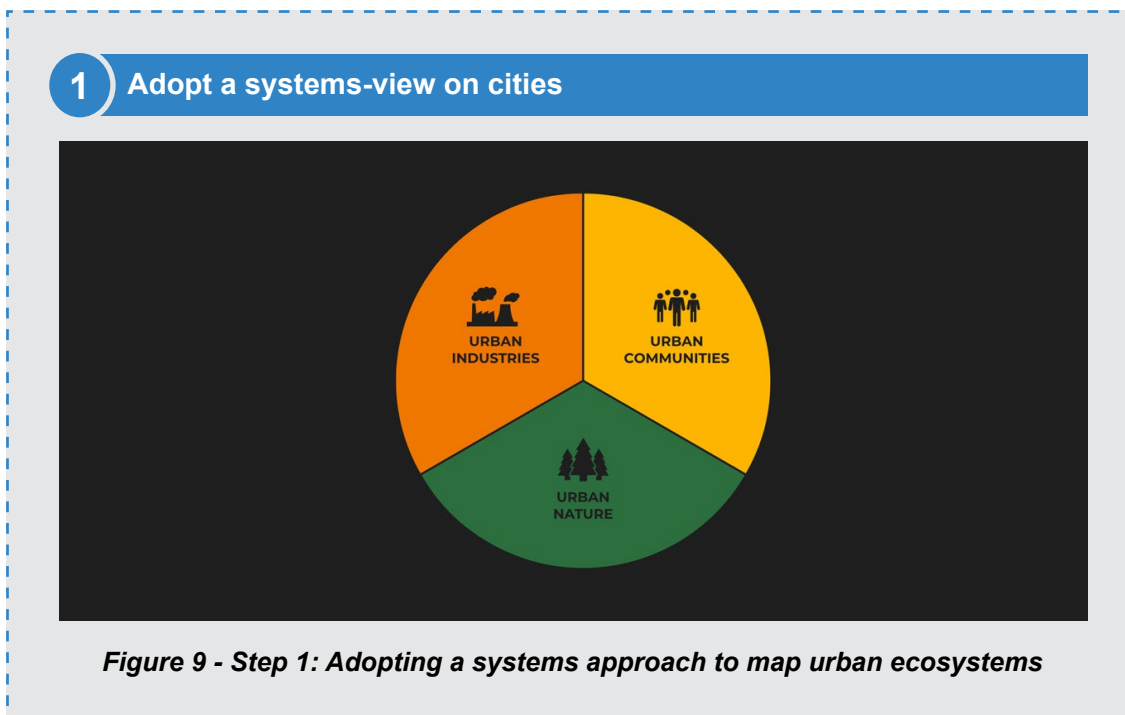
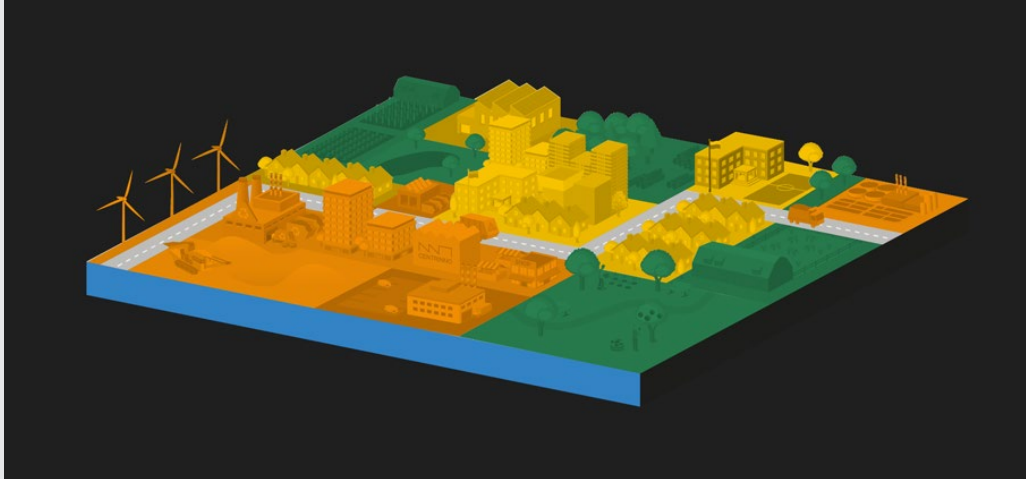**2** **Build contextual knowledge across spatial scales**

*Figure 10 - Step 2: Build contextual knowledge by
mapping city-wide geospatial indicators*

3 **Create a community map**

*Figure 11 - Step 3: Create a map of the key stakeholders within
local communities undergoing transformation*

4 **Inventory available resources**

Figure 12 - Step 4: Inventory available resources through surveys and workshops

5 **Identify opportunities and collaborate**

Figure 13 - Step 5: Identify opportunities and convene local stakeholders

3.5 Pilot Cartography pages

The Pilot Cartography pages become the online space dedicated to each of the nine pilots, showcasing their specific cartographic progress and outcomes. They function as an outwards-facing log-book that takes an external audience through the discovery journey of challenges, opportunities and assets of each pilot's post-industries area and their communities. These pages allow users to explore both bottom-up and top-down data on urban ecosystems, collected during the Urban Ecosystem mapping process. In addition, new visitors gain a clear understanding of the key mission and challenges addressed by the pilot.

For the Alpha Version of the Cartography webpage, the pilot pages will initially consist of the following four main components: (1) An **overview** of the pilots' challenges and mapping goals, (2) a **gallery of contextual maps** (top-down data), (3) an embedded interactive KUMU map showing the CENTRINNO Network, (4) a **curated, interactive slideshow** that presents how contextual maps and KUMU maps can, together, be used to identify opportunities & insights for circular action.

1. Pilot Overview

Each pilot cartography page begins with a clear introduction of the local pilot challenge, its CENTRINNO mission and a cartographic quest that each pilot is seeking to address through their mapping activities. The purpose of providing this pilot-specific information is to allow visitors unfamiliar with the CENTRINNO project to gain a basic understanding of the wider goal that CENTRINNO pilots are pursuing. A cross-linkage with the project's main website for further information will be provided.
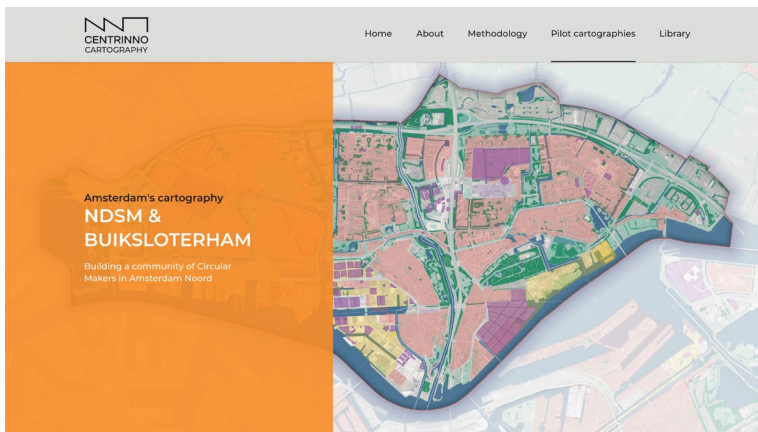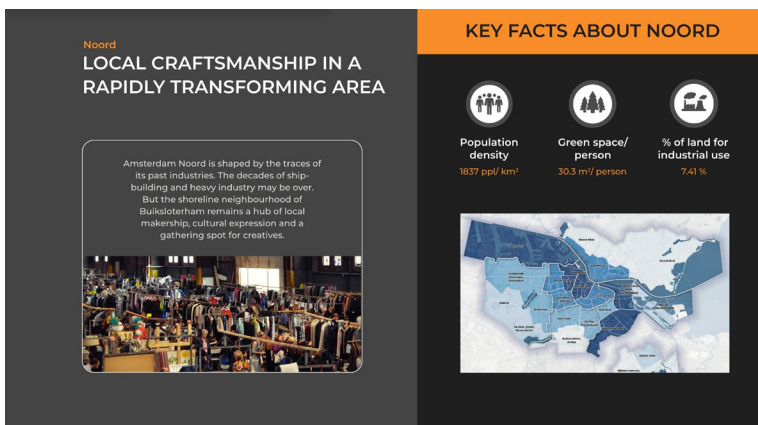

Figure 14 - Pilot Cartography Page & key indicators per neighbourhood

The pilot introduction is followed by a more detailed description of the site, supplemented with a snapshot of key geospatial indicators that describes the neighbourhood in which pilot sites are located (Figure 14). These snapshots cover main ecological, industrial and social indicators (e.g. population density, green space access, industrial land use), and are used to compare industrial neighbourhoods under transformation across all CENTRINNO pilots.

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FROM NEIGHBOURHOOD INDICATORS TO NEIGHBOURHOOD TYPOLOGY MAPS

The **Neighbourhood indicators** form the starting point to create so-called "**Neighbourhood Typologies**". By synthesizing key geospatial social, ecological and industrial indicators for each neighbourhood, urban planners and decision-makers can gain insights into the different "types" of neighbourhoods within cities. This can allow us to identify which circular interventions are most suitable per neighbourhood.

For CENTRINNO, we have adapted this approach to illustrate at the district or neighbourhood-scale how post-industrial neighbourhoods differ across Europe, as well as within other areas in the same city. While current Neighbourhood Typology maps are presented in a static format, future iterations could include an embedded interactive map that allows the user to compare CENTRINNO neighbourhoods amongst each other.
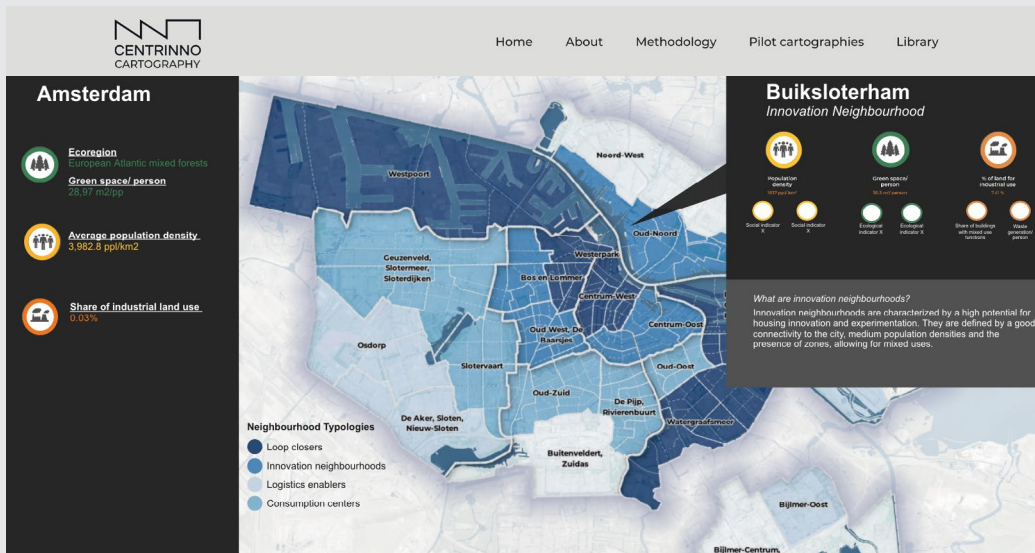

Figure 15 - Potential future neighbourhood typology map,
based on aggregate neighbourhood criteria

2. Gallery of Context Maps

To better understand how the urban spatial context functions, and to identify the challenges and opportunities that exist in relation to nature, socio-economic wellbeing and industrial activity, context maps are created for many of the pilots. The results of each pilot's geospatial context mapping will be made available to the wider audience via a gallery of maps. Here pilots can upload new maps and other forms of data collection (e.g. sankey diagrams), and share the key findings that are related to these maps. Maps will be filterable by their respective layer in urban ecosystems (Urban Communities, Urban Nature, Urban Industries).
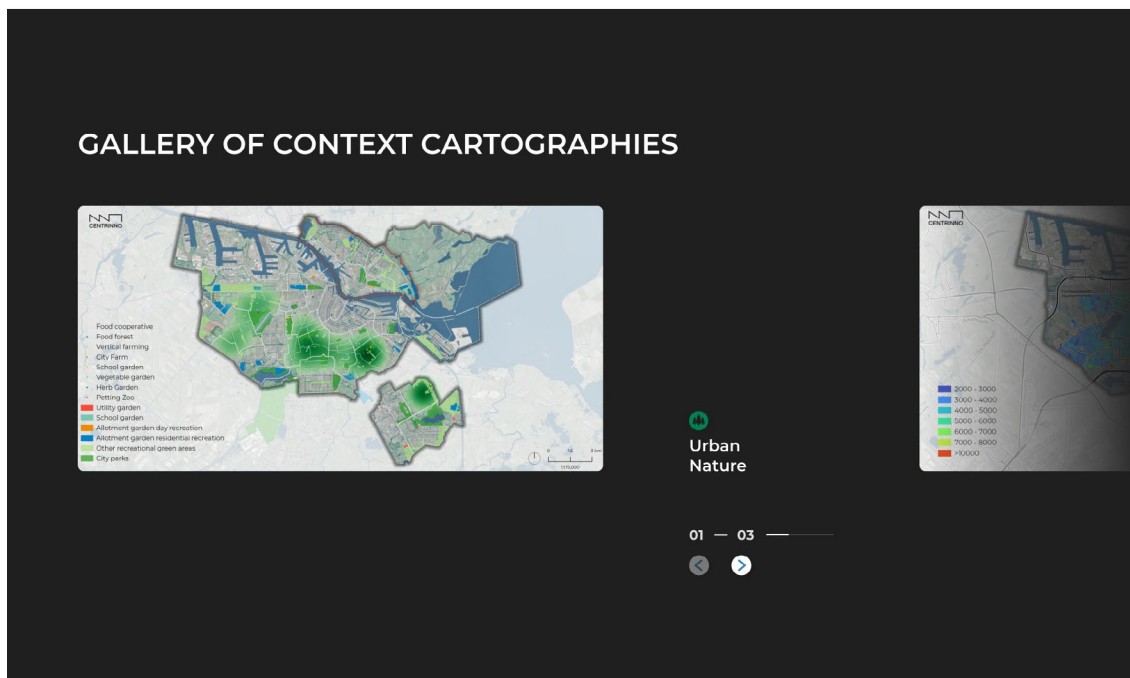

Figure 16 - Gallery of Context Maps

3. Selected KUMU maps

Each pilot has an individual KUMU map that they use to map local stakeholders relevant to their mission, and the resources that exist in their area. This interactive and dynamic dashboard enables introspection, analysis and overview to develop insights about the needs and opportunities of their local stakeholder networks in the context of their wider urban environment. These KUMU maps are embedded into the CENTRINNO Cartography platform. The following chapter (Section 4) explores the use and functions of the KUMU maps more in-depth.
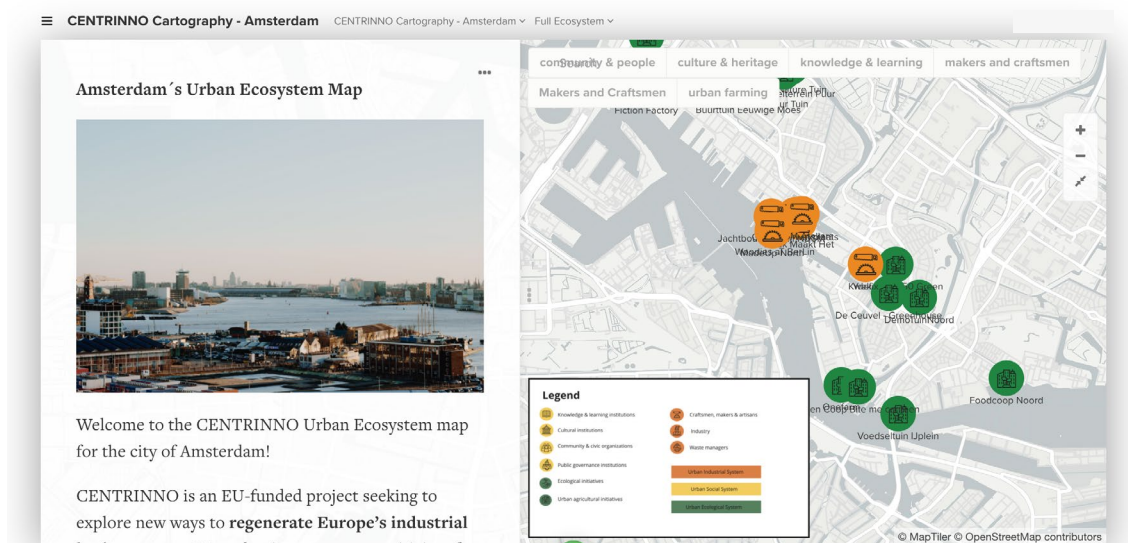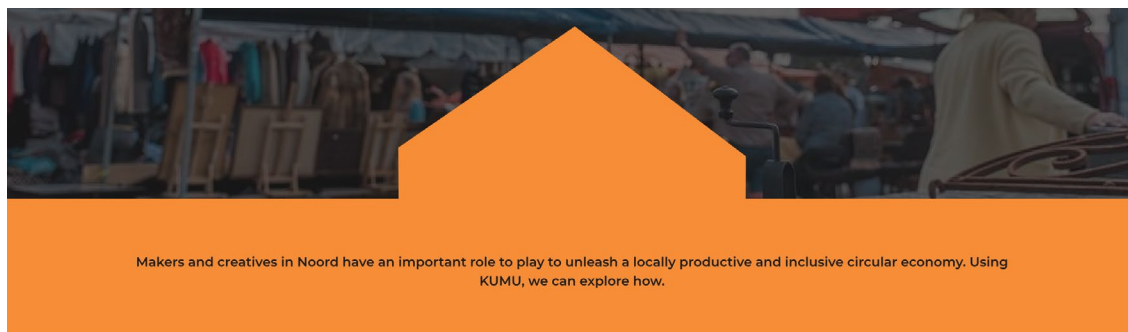
Figure 17 - Embedded interactive KUMU map.

4. An interactive cartographic journey

One of the long-term goals of the Cartography journey is to help pilots identify new synergies and opportunities for an urban circular system and network. To enable the full potential of circularity in cities, it is critical to combine top-down data on city-wide resources with the actionable and concrete bottom-up data on local resources and their owners. The power of mapping city-wide resources remains limited if the mapped information fails to be put into the realities of specific actors present within local communities.

To ensure pilots and other website visitors understand how different scales of mapping and maps are related, each pilot cartography will also built an interactive online slideshow that integrates (1) context maps, (2) KUMU maps and additional insights (e.g. MFAs) into a holistic "cartographic journey". We can think of these slide decks as curated case studies that showcase examples of how circular opportunities emerge from the combination of resource mapping across scales. These slide decks help to communicate the activities and objectives of the pilot to local stakeholders, and can serve as inspiration to other communities.

These slideshows will be created within KUMU, using the platform's function called "presentations" (see Section 4). Presentations in KUMU are a way to guide a user through their interactive maps by supplementing it with specific prompts, images, additional graphics or other information. An exemplary cartographic slide deck, as it can be embedded on the website, is found in the clickable mock-up of Amsterdam's cartography and Annex 6.

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Figure 18 - Embedded interactive slideshow. Showcasing how contextual maps in combination with bottom-up KUMU maps can generate insights into circular opportunities

5. Mapping in Action

During the three sprints, pilots are implementing a set of mapping activities that are specified in the CENTRINNO Urban Ecosystem Mapping Guidebook [2]. How these methods are adopted locally differs from pilot to pilot. Some pilots, for example, have engaged the community via neighbourhood walks along the mapped craftspeople and workshops in the area, while others have used material flow mapping workshops as a part of a wider circular economy event. The Cartography Website will become the space where pilots can share local experiences with mapping spaces, people and resources. These small blog posts that explain the mapping activities, supported by images, can become a practical inspiration for other pilots and innovation spaces.

Figure 19 - Example of a local mapping activity. Amsterdam organized a walk along locally mapped makers and craftspeople.

3.6 Library page

The fourth key element of the CENTRINNO Cartography website is the Library Page. The Library page is the repository of cresources that can be used by other projects to start their cartographic journey. Each cartographic step that CENTRINNO pilots are taking is supported by workshop templates, survey forms and data collection spreadsheets that can be either adopted directly or adjusted to the specific context. These materials will be made available to a wider audience to empower other organizations in the replication of the CENTRINNO method (Table 2). Final versions of these templates will be shared and added to the Cartography by the end of the second year (Q4, 2022).[3] Primary users of these materials can either be (1) **public departments** responsible for community development or business development, or (2) **non-for-profit organizations** that function as facilitators, networkers or intermediaries in productive communities (e.g. innovation spaces, Fab City Hubs, local incubators).

Table 2 - Overview of additional resources and materials to enable the replication of the Cartography as a method and a platform.

Cartographic Step	Type of resource	Purpose
Context Mapping	**Workshop templates** to identify geospatial indicators for geospatial context mapping	To allow urban changemakers and local residents to evaluate their surroundings from a spatial perspective.
"Resource Owner" & Community Mapping	**Spreadsheet template** to map and classify stakeholders (and their resources) for direct integration into a KUMU Cartography	To enable replication of bottom-up mapping of community networks via KUMU
	KUMU codes to easily replicate the design and functional controls of the CENTRINNO Cartography KUMU maps	To enable replication of bottom-up mapping of community networks via KUMU
	Materials to **classify local stakeholders** and their potential role in a circular transition	To build capacity in productive communities to facilitate the creation of a community of practice around the circular economy
Resource Mapping	**Workshop sheet** to facilitate an organizational-level material flow/resource flow sessions	Workshop sheet to facilitate an organizational-level material flow/resource flow sessions
	Data request template for in-depth inquiry of waste composition and volume for waste handlers	Data request template for in-depth inquiry of waste composition and volume for waste handlers

[3] Note that the Library Page is not included in the clickable mock-up of this demonstrator and the resources and materials listed in this table are due to change.

4. DEEP DIVE – KUMU AS THE CARTOGRAPHY DASHBOARD

In the previous chapter, we have demonstrated the layout and content of the CENTRINNO Cartography as an externally-facing website. Yet, the core piece of IT infrastructure that makes the Cartography a tool for collection, storage and visualization of mapped information is hosted outside of the website itself.

Instead, pilots will have a dedicated workspace on the mapping platform KUMU. Selected elements of KUMU maps can be embedded on the Cartography website, depending on pilot's individual focusses and privacy demands of mapped stakeholders. Prior to publishing maps on the website, pilots are requesting consent from mapped stakeholders on the information that can or cannot be made public. The role of KUMU in CENTRINNO is two-fold. First, it plays an internal role for pilots in analysing their local communities to identify existing and potential opportunities for circular local value chains. Second, a master dataset on collected information on local actors can be used by pilots to selectively create interactive maps for the outwards-facing CENTRINNO Cartography Website. Both pilots themselves and Metabolic have access to these datasets, and can update them as new information is generated throughout the CENTRINNO process and beyond.
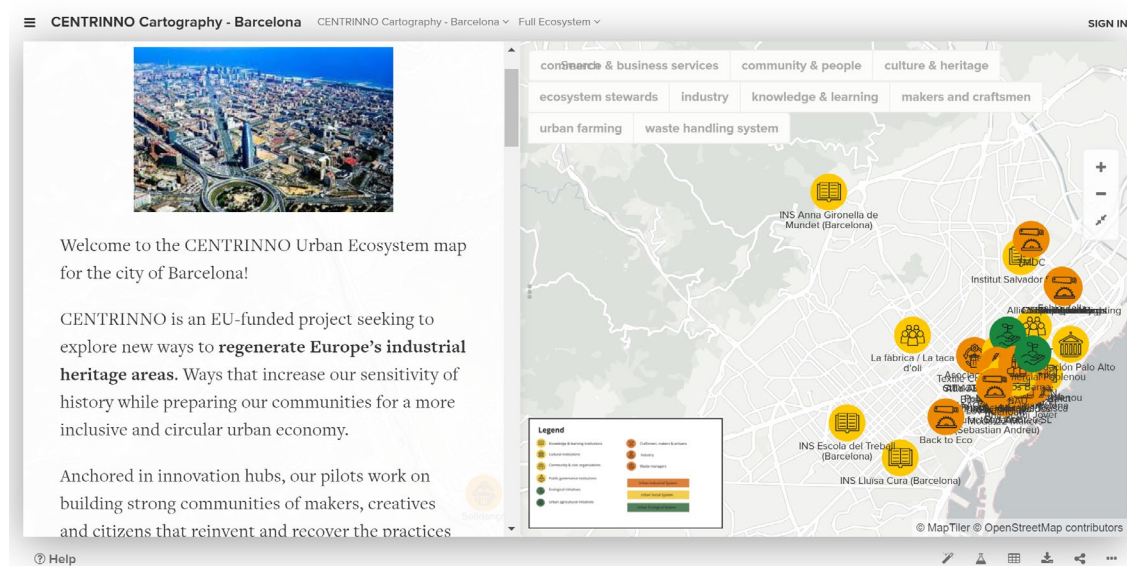

Figure 20 - KUMU Start Page. Left-side panel describes the purpose and functionalities of this map

4.1 Why KUMU?

The interactive heart of each pilot's cartography is built on the open-source mapping platform KUMU. Designed for the visualization and analysis of complex systems and networks, KUMU enables CENTRINNO pilots to store and make sense of data collected on multi-stakeholder networks. Building the functional core of the Cartography in KUMU has four main benefits for the CENTRINNO project:

1. **Open-source:** Being an open-source platform, KUMU is a time and energy-efficient option for CENTRINNO partners that does not require the development of other proprietary tools.

2. **Collaboration:** KUMU maps can have several contributors, allowing pilots and WP2 partners to collaboratively feed initial maps with new entries on stakeholders and their resources.

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3. **Legacy: KUMU** maps can be handed over to any other party with a KUMU account, remaining free of charge for public projects. After three years of training in the use of this tool, each pilot can take ownership of their own maps beyond the project's timespan.

4. **Adjustability:** All pilots are different in their mission, priorities and their resulting order of activities in CENTRINNO. To respond to these differences in entry points into the CENTRINNO Framework, Cartography shall become a useful tool for all pilots, whether they have started with a high-level material flow analysis or with the hyperlocal mapping of stakeholders around their immediate sites. KUMU allows us to build a common cartography template that pre-defines certain "views" of the stakeholder data uploaded into the platform. Additional views can be flexibly created by pilots.

4.2 Cartography "Views"

The KUMU Cartography template for all pilots consists of a set of suggested map visualizations called "views". To explain what a "view" is, it is important to understand how data is uploaded into the platform to create network maps. KUMU functions by visualizing data stored in tables (csv-format) that follow a specific labelling of columns (Table 3). Each entry in the table is imported as a point on the KUMU map. Via an internal editor in KUMU, users can cluster, hide, color, connect and analyse their data.

Table 3 - Set-up of spreadsheet template for data entry into KUMU [4].

Label	Type	Tags	Location	Potential role in circular economy	Available Resources
Name of resource owner	Ecosystem taxonomy	Detailed type of resource owner	GPS coordinates	Definition of potential role in circular value chains	Listing of mapped resources (know-ledge, materials, waste, tools, infra-structure, heritage)
e.g. Fiction Factory	*Makers and craftsmen*	*innovation space, maker space, production*		*re-maker, logistics provider, educator*	*Materials:, Tools & equipment: Knowledge & skills: Cultural resources: Infrastructure:*

Based on the complexity of data analysis required by the users, KUMU provides either an easy-to-use basic editor, or an advanced editor dashboard that uses code language.[5] Via these editors, users can create so-called "views". Views in KUMU are saved via sets of code that determine what is shown on the map, and how visitors can interact with the map.

In the first iteration of the CENTRINNO Cartography, each pilot will be equipped with a basic set of views that depict data collected on local community agents ("resource owners") already collected by pilots during Sprint 1. Functionalities and descriptions of these pre-set views are explained in the following section.

[4] For a full table with an overview of data entries possible per column, see Annex 2
[5] One shareable outcome of the CENTRINNO project will be to make the codes for KUMU Cartographies available on the CENTRINNO project's GitHub Guidebook.

4.2.1 Full Ecosystem View

The "**Full Ecosystem View**" is the foundational and most exhaustive visualization of each pilot's ecosystem. In this view, all local resource owners are spatially mapped and classified by a taxonomy that was co-developed with partners of WP2, WP1 and pilots during Sprint 1[6] (Figure 21). Pilots can use this view as the **home dashboard** to organize their collected data on the entire ecosystem of stakeholders.
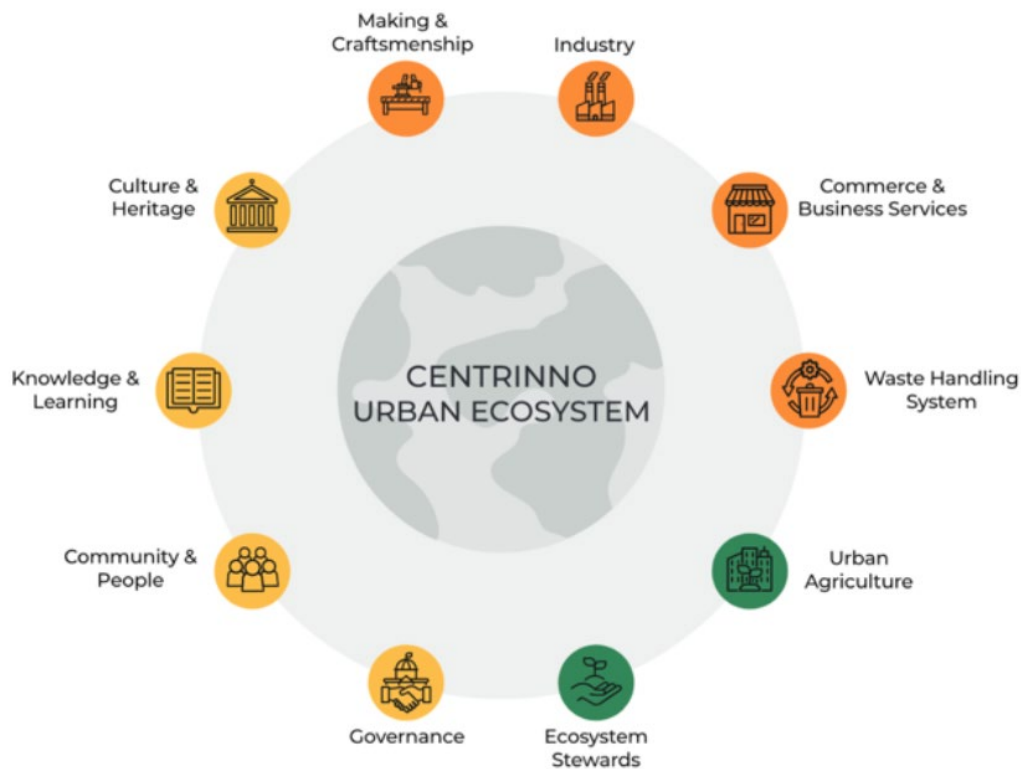

Figure 21 - Classification of stakeholders in urban ecosystems

Interactive functionalities:

• Pilots can add stakeholders to the map and augment each mapped stakeholder with metadata about their activities, resources and other selected information gathered throughout the project (Figure 22)

• Pilots can **add connections** between stakeholders to show either already shared resources, or to highlight future opportunities (Figure 23). These connections can be tagged by their type as "material" connections, partnerships or other.

• Pilots can **build and separately save customized maps** that highlight specific stakeholders, their connections or types of available resources, using the internal editor interface in KUMU. Based on these filter functionalities, pilots can create maps for the purpose of sharing on the Cartography website in which they flexibly define which data should be publicly represented, and which should be hidden for internal purposes only. Figure 23 shows Iceland's KUMU project, filtered by industry and makers to highlight the productive ecosystem around wool value chains.

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[6] *This taxonomy is a high-level classification to attribute different "ecosystems" of stakeholders. Additional tags are used to give more specificity. Recurring WP1 "CENTRINNO Infrastructure" alignment meetings were used to present drafts of a common taxonomy of stakeholders. Further, input from pilots on the suitability of these categories was gathered by trial runs to classify their already known network. The categories will be iteratively improved upon.*
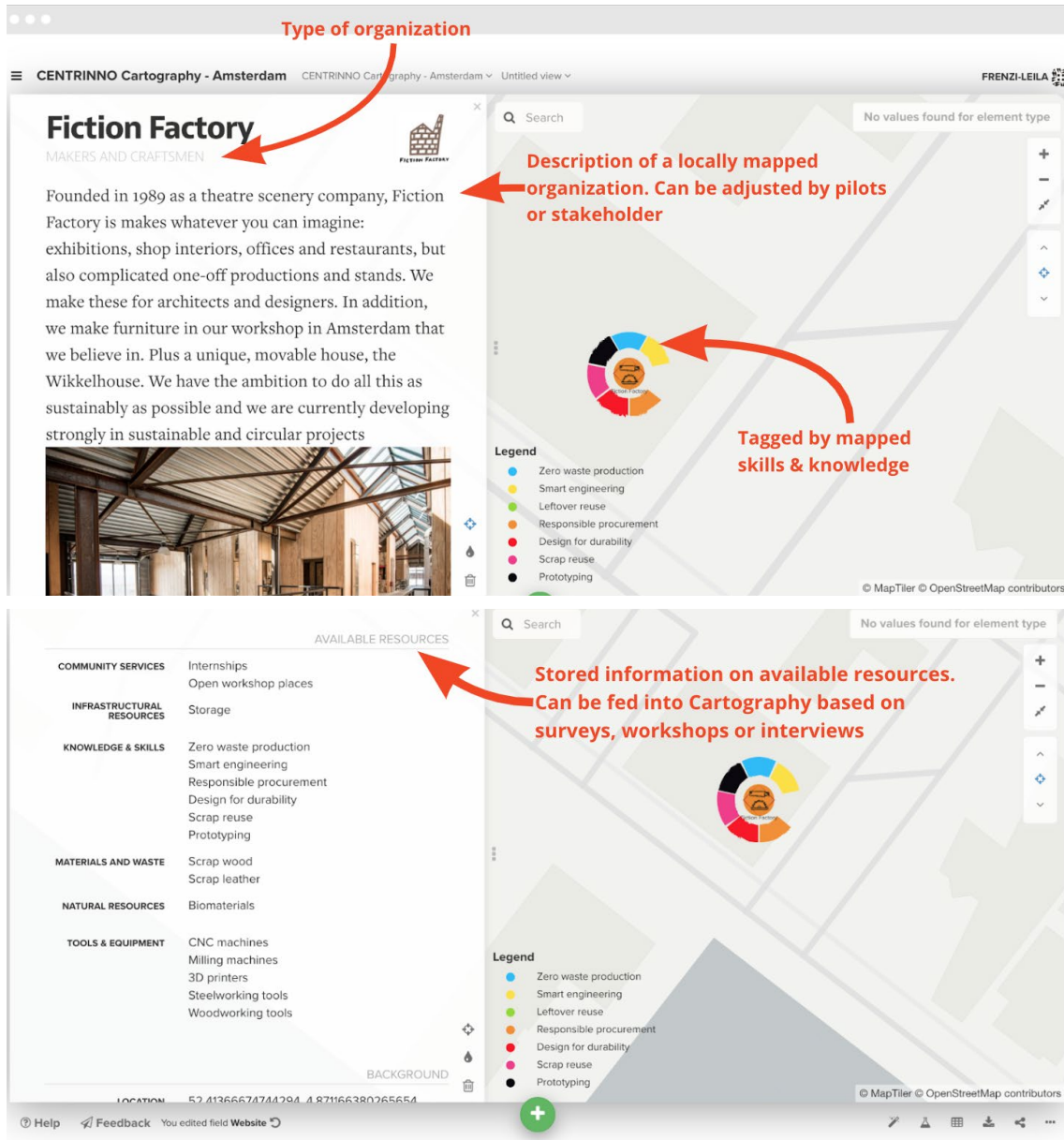
Figure 22 - Example of a filled "resource owner" card. *These cards can store any type of background data collected about stakeholders, including qualitative and quantitative data. For each data field, pilots can set the visibility to "private" or "public".*
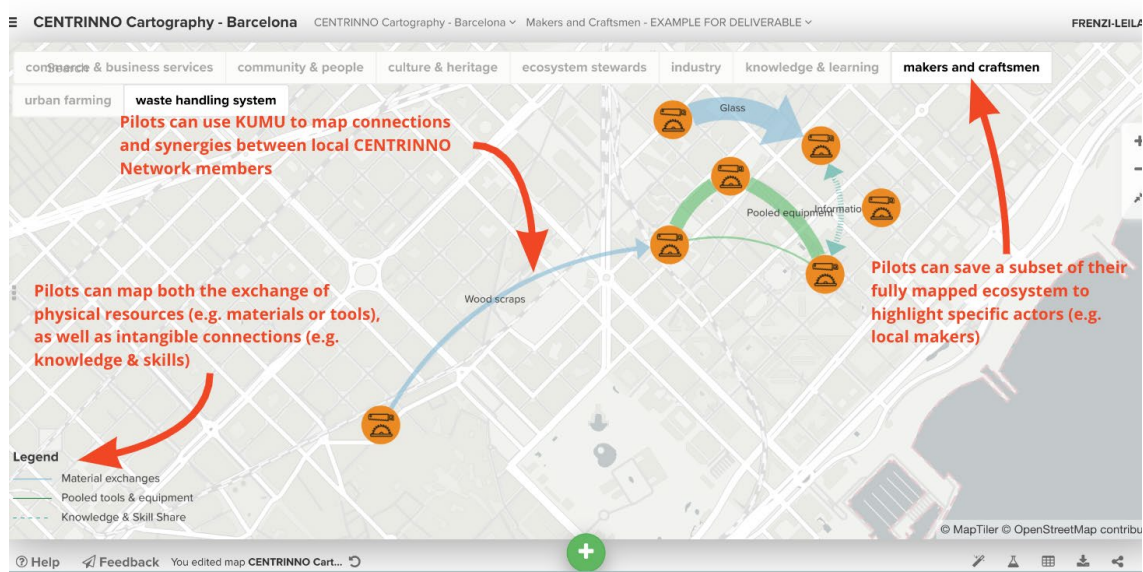
4. DEEP DIVE – KUMU AS THE CARTOGRAPHY DASHBOARD
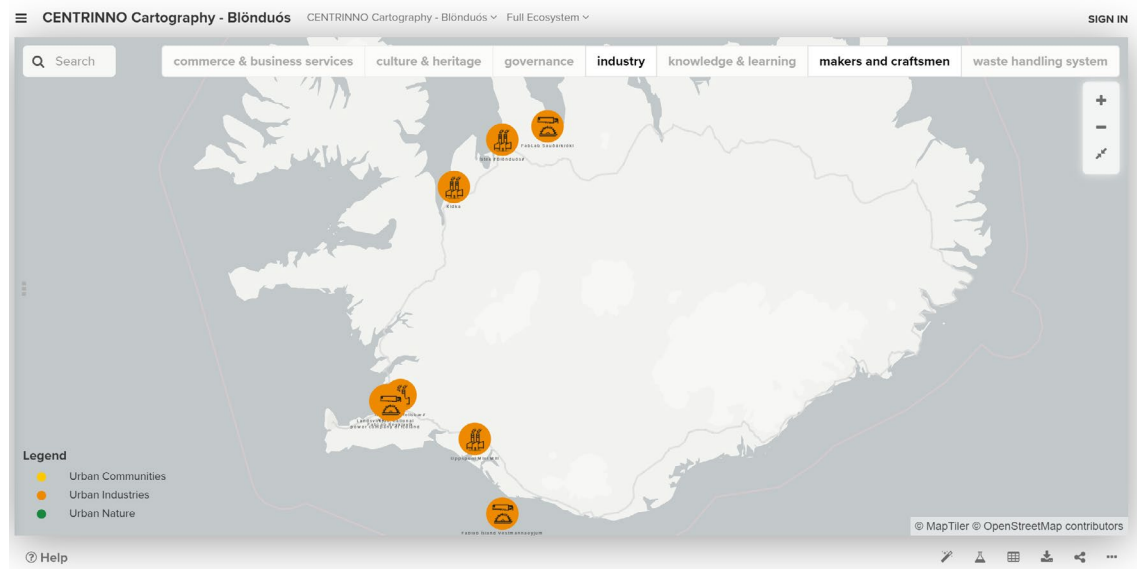
Figure 23 - Example of connection mapping in KUMU

*Figure 24 - Full Ecosystem view for the Blöndoús pilot,
filtered by industry and small-scale makers*

4.2.2 Waste Flow View

The "**Waste Flow View**" is the result of mapping city-wide waste systems and flows. In KUMU, waste streams are spatialized by mapping the location of waste handlers, recycling sites, landfills, incineration plants and composting facilities. Depending on data availability, the waste flow map is augmented with (1) the **volume** of waste received at different waste stations, (2) the **source** of waste flows, (3) the **destination** of waste flows and (4) the **characterization** of waste. The main advantage of this approach is that pilots can map and store information on waste systems as they go, adding layers of information over time.

Interactive functions:

• Pilots can use this view to communicate and visualize their current baseline of linear urban production systems, and to identify resources that could be locally reused, remanufactured or recycled within FabCity Hubs and their networks;

• Pilots can filter and search for waste types and recall supplementary information on specific points in the waste system;

• WP2 partners can also use this view to analyze opportunities for a local circular economy, find leverage points and evaluate the performance impact of pilot activities on the overarching waste system.
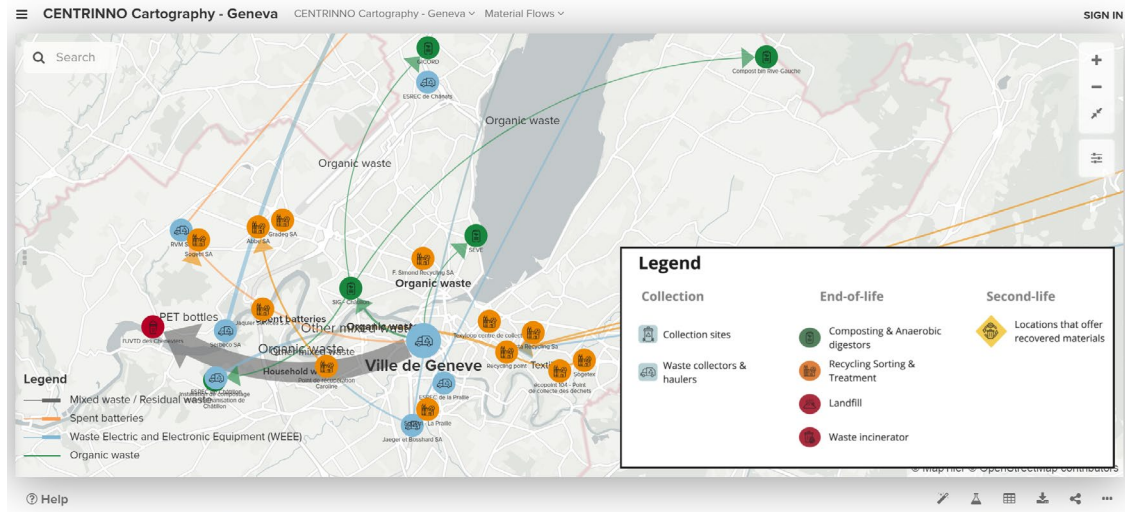

Figure 25 - Example of Geneva's waste flows, based on municipal waste collection information

4.2.3 Circular Economy Roles View

The third suggested view in KUMU is a classification of local stakeholders by their potential roles in a locally productive and circular urban economy. During the first sprint phase, a preliminary list of these potential circular economy roles has been developed by Metabolic. This list can be used by pilots to create a first classification of their stakeholders, or discuss these roles together with their stakeholders. By assigning circular economy roles to local stakeholders, pilots can build the foundation for a shared and inclusive vision of a circular economy. During the second and third sprint, this list will be iterated upon, based on feedback from pilots and their stakeholders.

Interactive functionalities and potential uses:

• Filter and cluster stakeholders by similar roles in the circular economy. (For example, filtering for all potential local craftspeople in the area who could close material loops by re-manufacturing them into new goods);

• Filter by shared value chains (for example, we can filter all stakeholders dealing with wood to explore which roles may be missing to establish circular wood value chains.
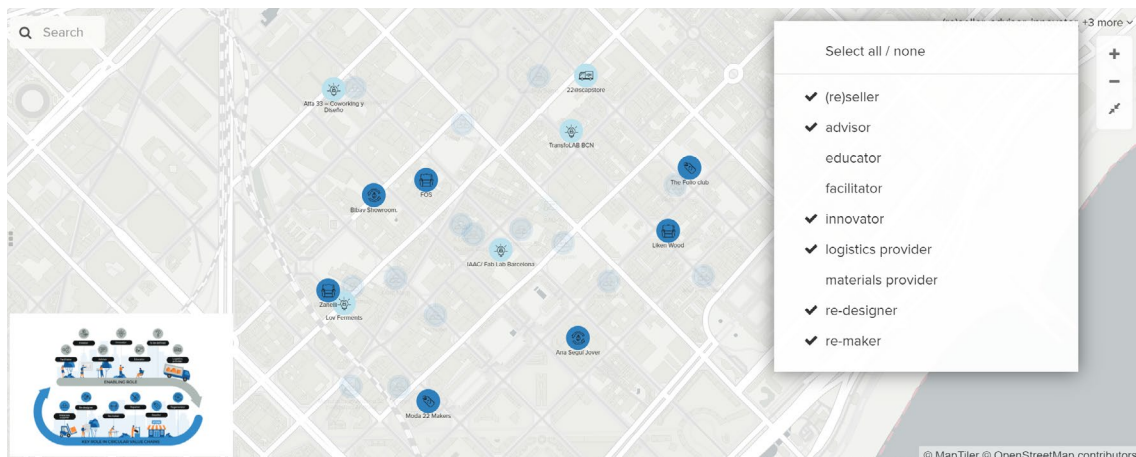

Figure 26 - Example of Barcelona's mapped resource owners, classified by roles in the circular economy. *The first image is a spatial map of stakeholders, classified by circular economy roles. The second map is a non-spatial visualization of the same data set to illustrate more clearly which roles have (or have not) been mapped.*

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4.2.4 Exploration Dashboard

The exploration dashboard is a non-spatial map of each pilots' urban ecosystem that can be used to cluster and analyse local stakeholder networks. This space allows pilots to build out customized views and visualizations of their networks which show relationships of non-spatial character (e.g. clustering of all mapped elements based on available materials, connecting elements based on their potential role in a circular economy).

Interactive functionalities:

• **Network analyses:** Using the non-spatial representation of existing connections between local resource owners allows pilots to conduct a range of network analyses operations (e.g. degree centrality, betweenness and closeness). While these advanced network indicators require a larger set of entries into the KUMU map, they can enable pilots to identify the most abundant resources used and shared or critical well-connected stakeholders).

• **Flipped views:** While the previously mentioned views are based on the geolocation of **organizations**, they do not visualize resources directly. In the non-spatial dashboard, pilots can visualize **resources** as points on the map and connect these to stakeholders who have access to them.
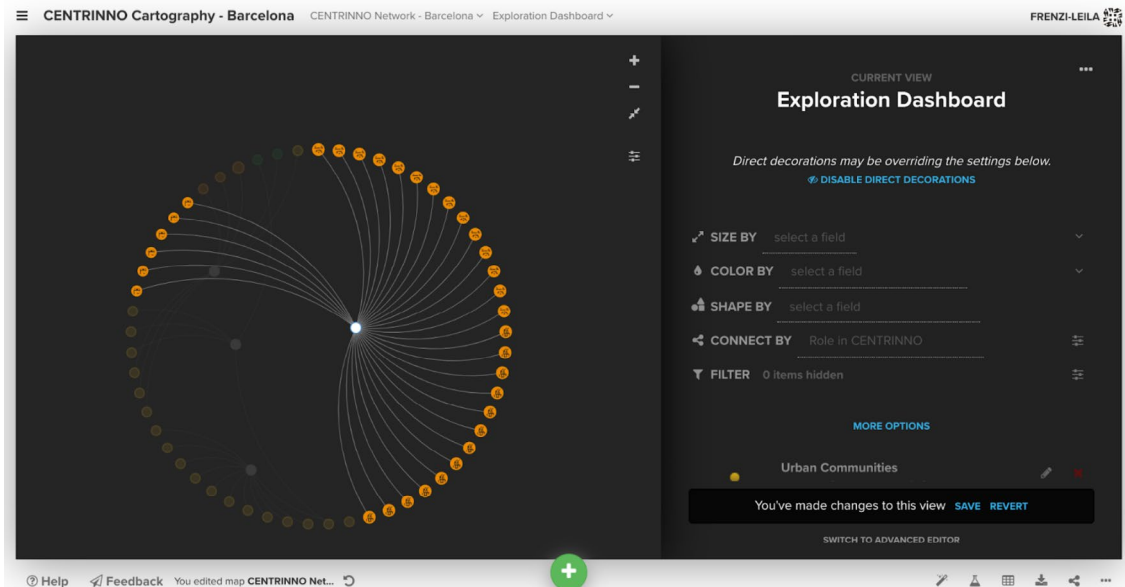

Figure 27 - Exploration dashboard. Example of Barcelona's mapped ecosystem, clustered by the different roles in the CENTRINNO project. Other functionalities could be to cluster by sector, resources, circular economy roles or pilot-specific fields.

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FUTURE ITERATIONS FOR THE EXPLORATION VIEW

Resource-centered view: Current KUMU visualizations show stakeholders and what assets they use and have. In future iterations, however, we could further explore visualizations that show locally used resources in relation to those resources that are inherent to a local bioregion. The goal of such a resource-centred view is to both understand and communicate potential mismatches and opportunities for embedding local production activities within a region's biological systems.

While these future iterations are still under development, other mapping projects can serve as a source of inspiration. The UNESCO Intangible Heritage Section, for example, has created a non-spatial map to connect the 500 intangible heritage items on the UNESCO Lists of 2003 Convention to biomes and their natural resources [10]. CENTRINNO's exploration dashboard can help us to build out a similar relational map that links locally available resources to their uses (or opportunities) across the urban ecosystem.
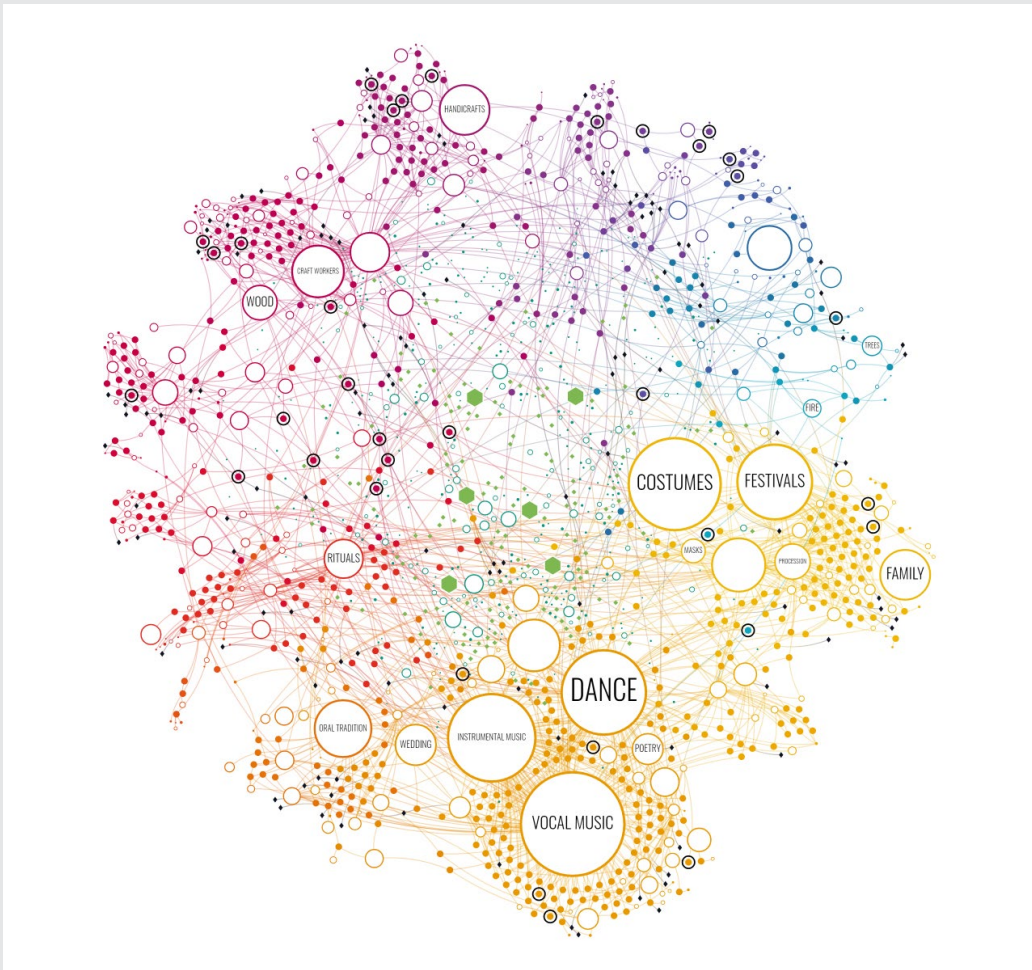

Figure 28 - UNESCO visualization of intangible cultural heritage. UNESCO, 2018 [8]

5. PILOTS & THE CARTOGRAPHY

This section outlines how pilots have been and will be involved in the development and use of the CENTRINNO Cartography infrastructure during the project. While the first and second touchpoints of pilots and the cartography have already been completed (Section 5.1), the third to fifth steps listed below will occur during the upcoming sprints (Section 5.2).

5.1 Pilots & the Cartography - M08-M12

As explained above, the Cartography consists of two main infrastructural components: A website and a data visualization platform developed in KUMU. The decision to split the Cartography into these two elements is justified by the project's internal and external requirements from the Cartography. Internal needs of the Cartography are those functionalities that support the pilots in preparing and setting up their activities during the project's sprints. Consultations within one-to-one sessions with pilots and Metabolic also highlighted that pilots need to develop their internal capacity to integrate circularity into their pilot action planning.

Step 1: Co-creating the Cartography (completed)
During the first sprint (M08-M12), Metabolic held nine individual workshops with each pilot to identify the most important needs that the CENTRINNO Cartography as a platform and tool should fulfil. To gather feedback on the proposed core functions of the CENTRINNO Cartography, four potential thematic purposes were identified:

1. Awareness-raising:
  • Provide functionalities to showcase what important assets and resources industrial sites and their communities possess;
  • Raise awareness in communities how local resources can be shared, exchanged and synergized;

2. Networking and connecting:
  • Actively enable match-making and networking between local producers and makers;

3. Analysis and insights gathering:
  • Provide functionalities to gather, store and analyse high-level information about the site's/ neighbourhood's and community's resources, challenges and opportunities;
  • Enable pilots to use this information to inform pilot activities;

4. Facilitation of bottom-up participation:
  • Allow the local community and CENTRINNO Network members to participate in feeding in data on their resources into the Cartography.

After each pilot and their members ranked the importance of these functionalities from "nice-to-have" to "must-have" functions, Metabolic synthesized the outcomes and proposed the resulting key functions at the consortium meeting in May 2021. For the first iteration, the most important purpose of the cartography as a platform was to create an outwards-facing outlet in which pilots could communicate the potential opportunities that local communities and their neighbourhood possess. The second most-voted for functionality stressed an internal analysis purpose to help pilots identify potential opportunities for circularity as well as needs for additional resources.

To respond to these two needs, Metabolic proposed to use KUMU to fulfill the raised needs for a flexible platform that can both be used for internal analysis, as well as for external purposes, such as awareness-raising and education.

Figure 29 - Screenshot of co-development activity with pilots to collect feedback on core functionalities of the Cartography

Step 2: Setting up the Cartography's infrastructure (in progress)

The remainder of the **first sprint** was used to develop the backbone infrastructure for the Cartography. Metabolic created a KUMU project for each pilot and provided the needed templates and stakeholder taxonomies used by pilots to map their stakeholder networks. By the end of Sprint 1, each pilot created one spreadsheet with between 15 and 50 entries of relevant "resource owners" in their communities that form the basis for their KUMU maps. Metabolic uploaded this content into KUMU maps and had nine individual review sessions with pilots to explain the functionalities of KUMU as a cartographic tool.

5.2 Pilots & the Cartography - Next Steps

During the upcoming months (M19-M25, second sprint), pilots will start to actively engage with the Cartography Infrastructure, including the KUMUs and the Website. Since the internal KUMUs will be operational before the development of the website is completed, the second sprint will predominantly focus on Feeding the Cartography (**Step 3**) and gaining insights for other CENTRINNO activities (**Step 4**). Curated maps and insights will then be shared on the website (**Step 5**).

Step 3: Feeding the Cartography (upcoming)

Pilots will continuously work on feeding the KUMU-based maps in two ways:

(1) They will **grow their maps** by finding and adding stakeholders that are yet not present on their cartographies. (2) They will **deepen their maps** by adding **resource data** to their stakeholders. This resource data (including data on used materials, waste streams, skills, and knowledge) is collected via surveys, workshops and interviews. Within **Sprint 2** (M19-M25), thus, the KUMU maps will become built out significantly. Metabolic provides training materials and capacity-building opportunities to pilots to support them in feeding "resource owner profiles" with data.

In **Sprint 3** (M30-M36), pilots will further build out their KUMUs by **adding existing and potential flows** between local businesses, industries and makers. We will also prepare for the legacy of KUMU and the Cartography website by handing over ownership of KUMU to each pilot and supporting pilots in adjusting the content, settings and branding of their projects.

Step 4: Extracting insights to build an agenda for pilot activities (upcoming)

The iterative analysis of locally mapped ecosystems and their agents via KUMU, supports pilots to generate outputs & insights that feed their activities in CENTRINNO Schools and

innovation spaces. These moments of reflection will happen as a collaborative workshop at the beginning of **Sprint 2** (M19-M25) and **Sprint 3** (M30-M36).

Supported by Metabolic, pilots will use KUMU's clustering and filtering functionalities in combination with contextual geospatial maps and MFAs to gain insights on the following questions and themes:

Table 4 – Guiding analysis questions for mapping outcomes

Label	Type	Tags
Resource Owners	Looking at our mapped resource owners, can we identify certain gaps in our coverage?	Target future research of stakeholders to fill these gaps: For example, pilots may notice a lack of mapped initiatives/ businesses working with and in ecological systems.
	How are our resource owners connected? Who may know whom? Who already shares information/ resources/ materials?	Organization of "connection mapping" events with resource owners, supported by KUMU maps.
Materials & Waste	Do we have a lot of unused materials and unrecycled of one kind?	Invitation of local community and successful business models that reused/ reutilized/ reduced waste stream.
	Are there trends in material needs of our mapped makers, businesses, industries?	Exploration of top-down context maps for potential urban and regional alternatives (e.g. wood from urban tree maintenance & deconstruction).
Tools & equipment	Which tools and equipment are lacking/ not present in our local production system?	Provision of selected tools and equipment in pooled Fab City Hubs to fill gaps of locally lacking tools and equipment.
	Does our local production system have expertise in using tools and equipment that enable circular and sustainable production?	Outreach to specific stakeholders to inquire about interest in (1) sharing expertise on equipment usage or (2) pooling their equipment (similar to Make Works[7]).
Skills & Knowledge	Have we mapped any interesting skill sets that could be useful for other community members (in transitioning to a local Circular Economy)?	Outreach to specific stakeholders and potential organization of peer learning / teaching events via CENTRINNO School; Creation of blog posts for the CENTRINNO website about identified local skills and their contribution to a circular economy that are often undervalued (e.g. car rentals may have skills and knowledge to share on leasing business models).
	Do we recognize a specific lack of CE-related skills in our stakeholders? (e.g. lack of knowledge on CE business models)	Targeted search for city-wide actors who can provide training via CENTRINNO Schools.
Cultural heritage	Have our mapped resource owners highlighted intangible and tangible heritage?	Targeted outreach to stakeholders for potential interested in contributing to the CENTRINNO Living Archive.
Infrastructural resources	Which infrastructure (space, storage) is needed by local makers, industries to enable a CE?	Organization of showcasing event how to utilize empty spaces for CE logistics (e.g. show-casing of case studies on staging areas and intermediate storage places for reusable materials).

[7] *Make Works is a global open source library for local manufacturing, connecting people who want to make with skilled manufacturers, tools and materials.*

Step 5: Selecting curated maps for the website

Based on the combined analysis of top-down maps and bottom-up KUMUs, pilots will create an interactive "cartographic journey" slideshow (Annex 6) that make the KUMU maps and geospatial maps accessible and readable to an external audience. This curated content will then be embedded on their website. To raise awareness about their local ecosystem, pilots can select a "subset" of their KUMU projects and decide how users can interact with the mapped information.

A few examples are:

Makers and Craftspeople Map: Consultations with pilots have highlighted the importance of communicating the diversity and potential of local producers and small-scale creative businesses currently inhabiting post-industrial neighbourhoods. Pilots can build out website content that focuses on these stakeholders to raise awareness about local (traditional and digital) skills, heritage and craftsmanship, and their roles in circular neighbourhood development (see Example 1 below).

Urban Waste interactive slideshow: Pilots can further use KUMU to create interactive slideshows that stitch together data collected from material flow analyses with bottom-up mapping of local materials, used by the local productive ecosystem. As an example, they can embed a waste flow interactive map in a slideshow that provides additional information on potential reuse business opportunities for mapped waste streams. These slideshows can be embedded on the website of the Cartography (see Example 2 below).

Case study

EXAMPLE 1: SHOWCASING INNOVATIVE RESPONSES TO ECOLOGICAL POLLUTION

The Amsterdam pilot has started to map creative organizations and maker communities around the neighbourhoods of Amsterdam Noord - many of which are threatened by rapid urban transformation, building projects and social demographic change of the area. Sharing stories about the value that stakeholders present to circular and socially inclusive development help the pilot to highlight the importance of safeguarding them against urban transformation. As an example, mapping soil quality zones around Amsterdam showed that soil pollution limits the options for the neighbourhood to employ traditional urban farming projects. However, innovation spaces, such as De Ceuvel are developing the technical expertise on how to grow food and remediate local soils in the presence of heavy metal pollution. This know-how can be harnessed in the regeneration of post-industrial landscapes towards cleaner soils and food production.

KUMU maps, embedded on the pilots' Cartography pages, can highlight these case studies of local stakeholders and share their knowledge with website visitors,
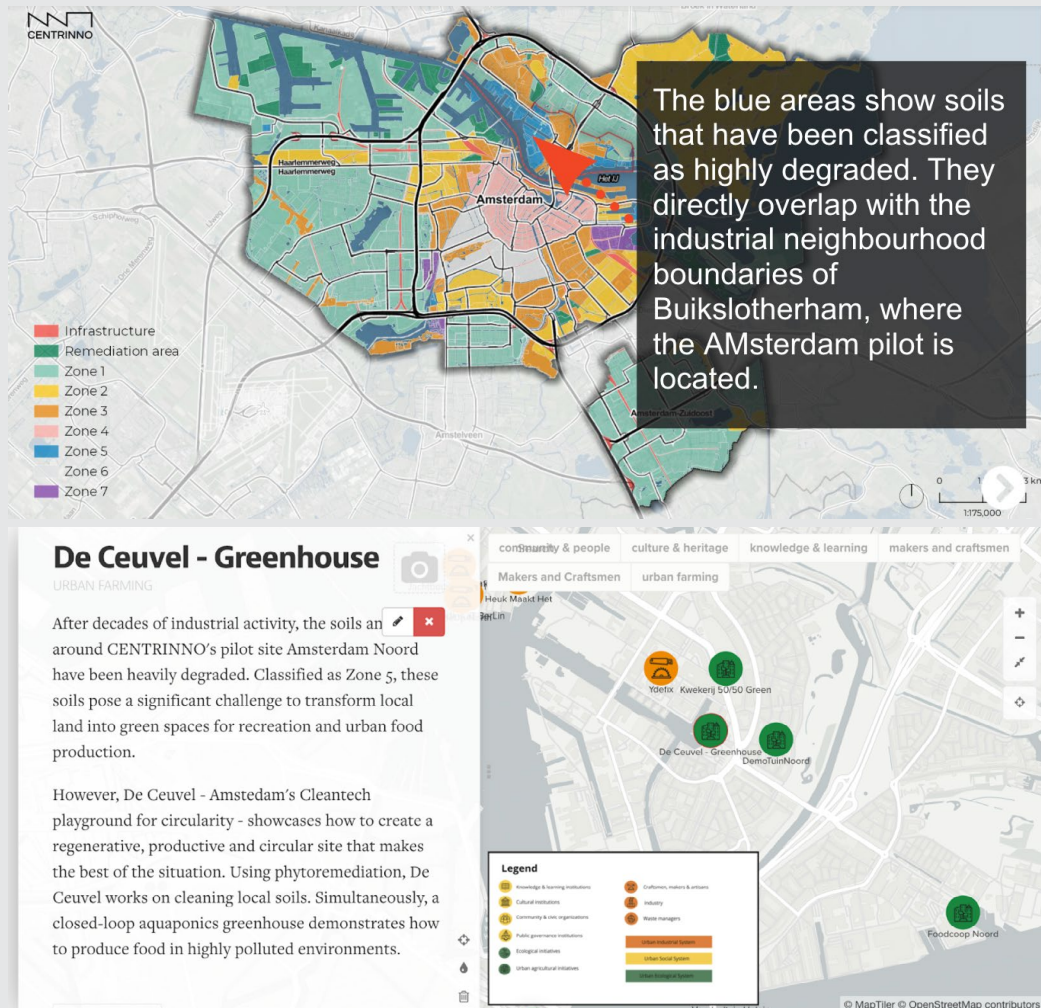

Figure 30 - Turning soil pollution into a resource. Example KUMU content to showcase the value of specific actors in responding to city-wide geospatial context information (here: soil map of Amsterdam).

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Case study

EXAMPLE 2: USING KUMU TO EXPLORE LEVERAGE POINTS TOWARDS A CIRCULAR URBAN METABOLISM

The mapping of urban waste flows is the first step to understanding the urban metabolism and its potential hidden resources for a circular local production model. But material flow analyses run the risk to remain a theoretical exercise if leverage points are not directly linked to local changemakers. These are agents that can either reduce the volume of generated waste; reuse, recycle or upgrade locally available waste streams, or support others in applying circular strategies. KUMU can help pilots to stitch together material flow analyses with bottom-up data collected by local stakeholders.
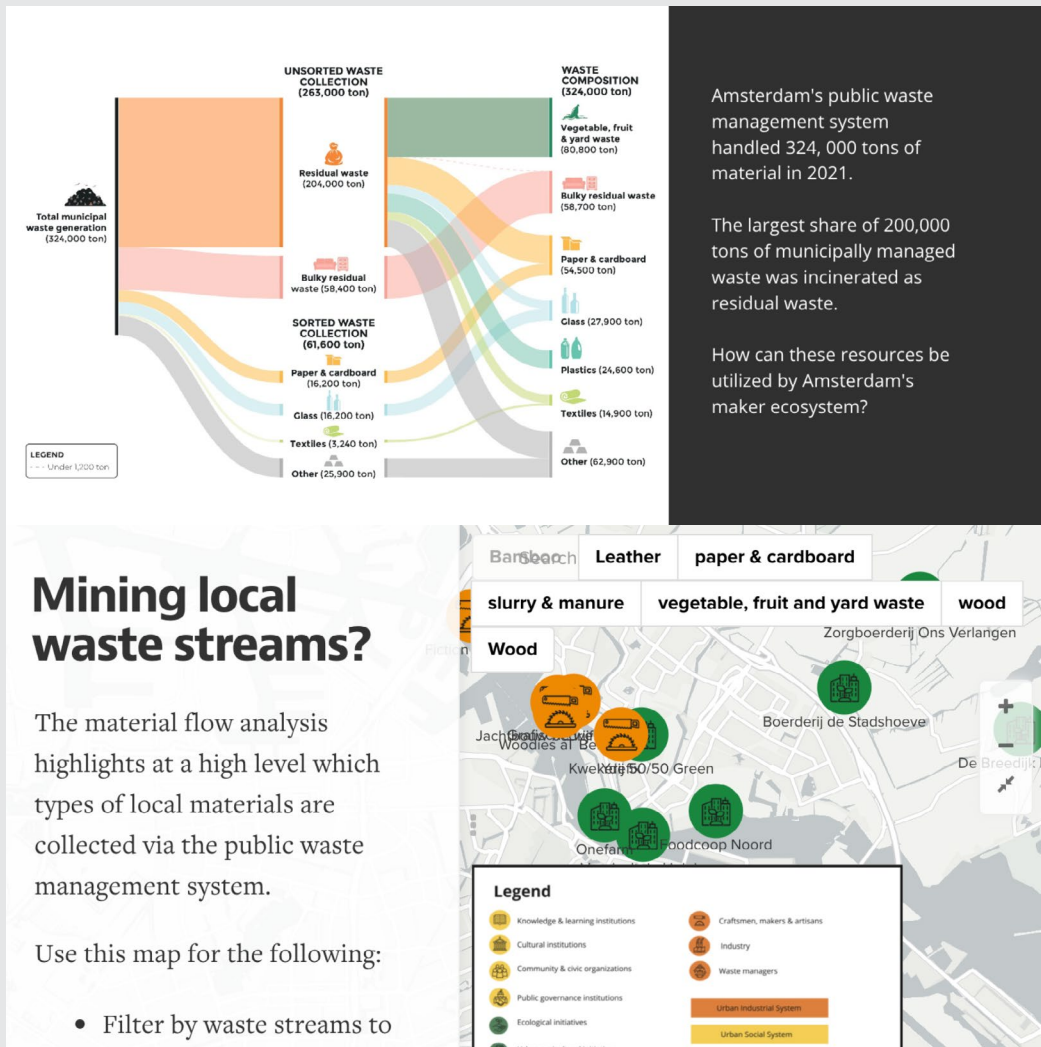

Figure 31 - Extracts of the embedded cartography slideshow - Amsterdam. For the full slideshow demonstration, see Annex 6.

CONCLUSIONS AND FINAL REMARKS

Gaining a clearer understanding of the way our cities are currently functioning provides a valuable starting point for building socially and ecologically sustainable cities of the future. The CENTRINNO Cartography lowers the threshold for urban changemakers to engage in urban resource mapping. In addition, the dynamic platform helps to position the city as a playground of opportunities for identifying and valorizing local resources.

With the design of the CENTRINNO Cartography complete, we stand at the beginning of the process of urban resource mapping. As a first step, the design will be translated into a functional platform throughout the first months of Sprint 2. What follows is a process of learning, exploring and reiterating: both the functionality of the platform itself and the way that stakeholders will engage with it, will be subject to a process of trial and error. Therefore, apart from developing and launching the CENTRINNO Cartography platform, a crucial component of the following sprint will be to build capacity among the pilot teams to engage with the platform in a way that contributes most effectively to their local ambitions and goals.
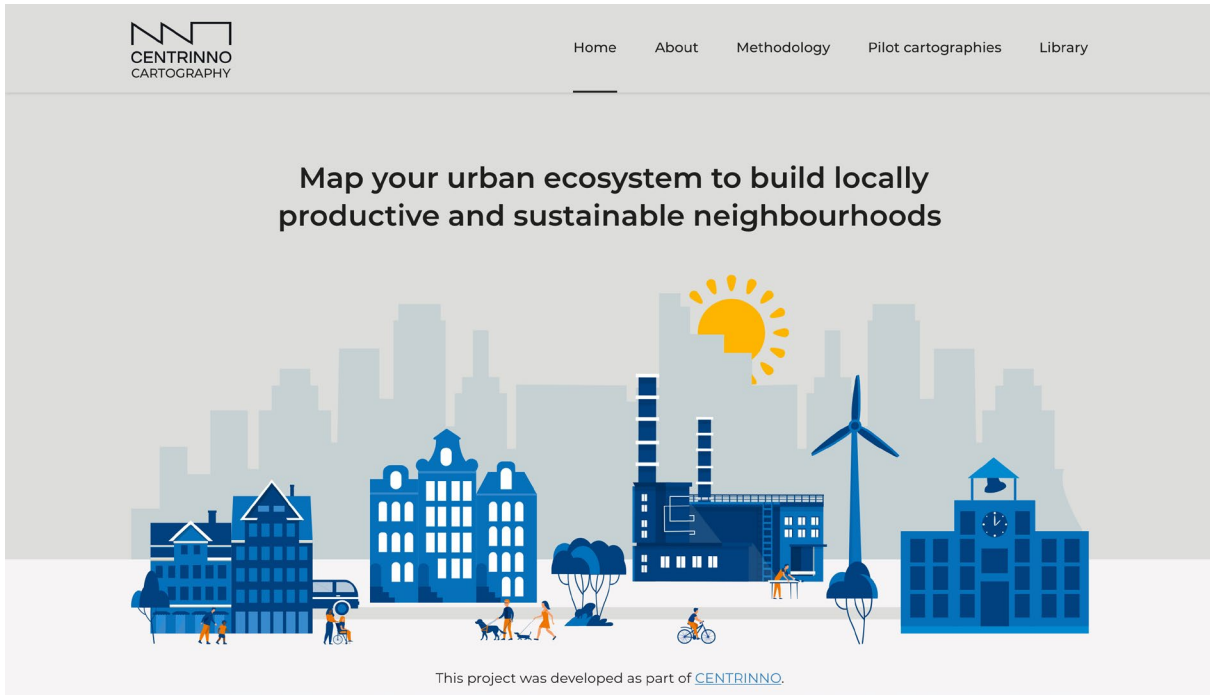
Even though the exact outcome is still subject to change, the creation of the CENTRINNO Cartography provides a solid foundation to engage in the process of dynamic urban ecosystem mapping that can only lead to an increased understanding of cities and their potential for development.

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ANNEX 1	ANNEX 2	ANNEX 3	ANNEX 4	ANNEX 5	ANNEX 6

ANNEX 1: WEBSITE DEMONSTRATOR

Link: https://xd.adobe.com/view/44b35f12-8db8-42dc-8c77-8b852f738aee-11e0/?fullscreen

ANNEX 2: KUMU TEMPLATE & TAXONOMY

Label
• Name of resource owner

Type
• makers and craftspeople
• industry
• waste handling system
• commerce & businesses
• community & people
• knowledge & learning
• urban agriculture
• ecosystem stewards
• governance
• nature as a stakeholder

Description
•

Location
• GPS coordinates

Potential role in circular economy
• facilitator
• re-maker
• logistics provider
• (re)seller
• regenerator
• innovator
• educator
• investor
• advisor
• re-designer
• yet to be defined
• materials provider
• repairer

Ownership
• non-for-profit
• private
• public
• community

Sector/ Application
• built environment
• arts & crafts
• tech & electronics
• other
• waste
• consumer goods
• food & feed
• events & entertainment
• lifestyle
• textile & fashion
• health & wellness
• chemicals
• machinery & equipment
• furniture
• energy

Tags
• university
• vocational school
• primary and secondary school
• research institute
• other knowledge facility
• innovation hub
• museum
• art gallery
• event venue
• cultural center
• other cultural facility
• community center

• social media community
• activists
• NGO
• public administration
• public service provider
• other public institution
• accelerator
• incubator
• recycling site
• landfill
• incinerator
• composting facility
• waste collector
• sorting facility
• treatment facility
• craftsmen
• artists
• designers
• maker space
• fab lab
• other creative agent
• retail
• second-hand retail
• repair services
• other services/ business
• logistics & transport provider
• mining company
• manufacturer
• construction company
• pilot hub
• community garden
• commercial farmer
• urban forester
• environmental agency
• other ecosystem stewards

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ANNEX 2: KUMU TEMPLATE & TAXONOMY

Resource Inventory

Materials & waste resources
- Chemical wastes
- Metallic wastes
- Non-metallic wastes
- Discarded equipment
- Animal and vegetal wastes
- Mixed wastes
- Sludge
- Mineral wastes

Cultural resources
- Traditional craftsmanship
- Oral traditions and expressions
- Performing arts
- Knowledge and practices on nature & the universe
- Social practices, rituals and festive events
- Sites of built heritage
- Sites of natural heritage

Skills & knowledge
- Use Waste as a Resource
- Rethink Business Models
- Design for the Future
- Prioritize Regenerative Resources
- Collaborate to Create Joint Ventures
- Preserve and Extend What is There

Tools & equipment
- Mineral & ceramics equipment
- Woodworking equipment
- Glass working equipment
- Metal working equipment
- Textile processing equipment
- Paper & cardboard processing equipment
- Plastic processing equipment
- Digital manufacturing equipment
- Basic hand tools

Services
- Learning & Training
- Research & Consultancy Services
- Exhibition & Venue Hire
- Fabrication Services
- Open Access Workshop
- Storage Areas
- Studio Space Rental
- Logistics & Transportation
- Technology Services

Natural resources
- Provisioning Services
- Regulating Services
- Supporting Services
- Cultural Servic

ANNEX 3: KUMU DEMONSTRATOR – FULL ECOSYSTEM VIEW & FUNCTIONALITIES

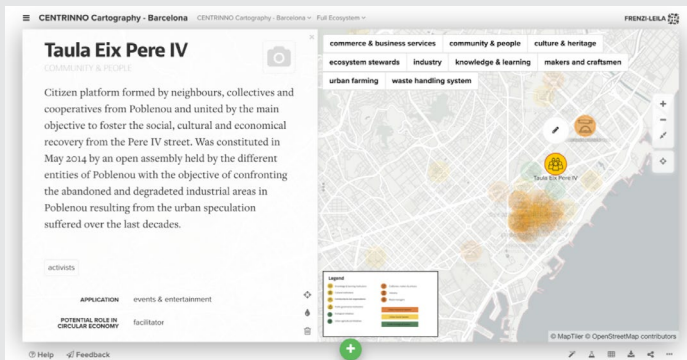## A deep dive into neighborhood typologies
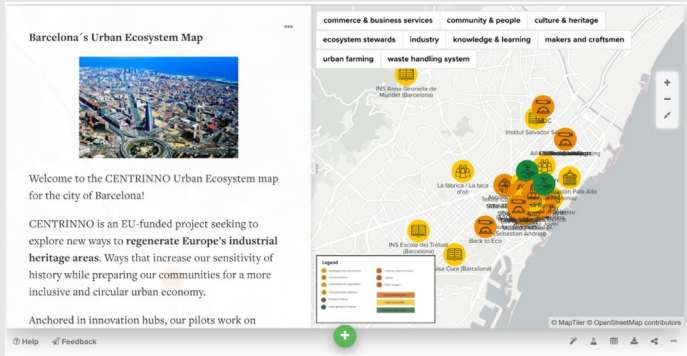
Description

Left-side panel introduces KUMU map and its role in CENTRINNO.

Controls on map allow users to filter by type of mapped elements.
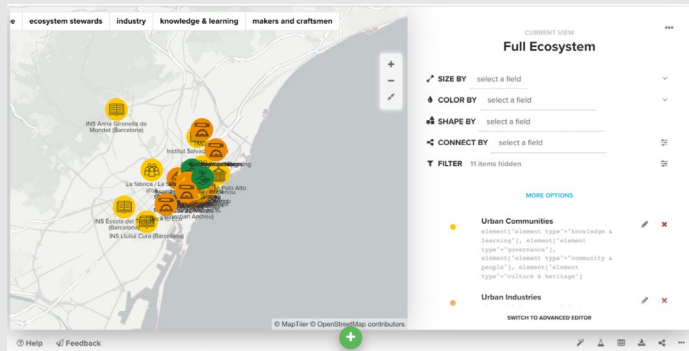
"Resource Owner" Cards

Description

A resource owner is defined as any mapped organization, stakeholder or CENTRINNO Network member that has been identified by the CENTRINNO pilots.

By clicking on an element on the map, users can access the background information about each element.
This includes a description of the organization, sector information, images as well as an "inventory of resources".

Cards can be customized or adjusted by pilots and their stakeholders in workshops. For example, pilots can add a specific tagging system to supplement project-wide tags.

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ANNEX 3: KUMU DEMONSTRATOR – FULL ECOSYSTEM VIEW & FUNCTIONALITIES

Basic Editor

Description

The basic editor in KUMU is the easy-to-use internal tool for pilots to visualize the attributes stored within each "resource owner card".

This includes:

- filtering by any defined field (e.g. by type of stakeholder, type of material uses, type of skills),
- create views & save these separately,
- scale elements by e.g. available waste streams, number of employees, degree of connectedness,
- change design of the map.

Advanced Editor
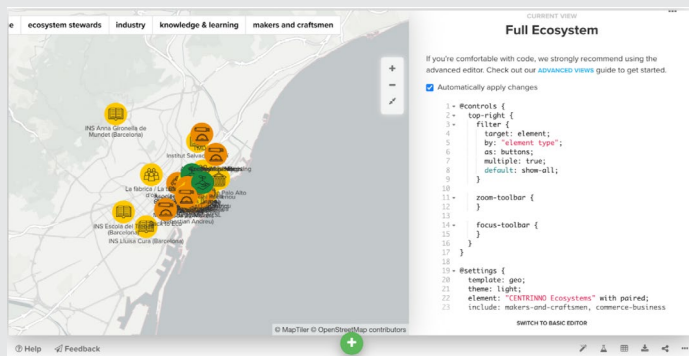
Description

The advanced editor is only going to be used by pilots interested in advanced techniques of data analysis and visualization.

It allows users to build custom controls that determine how an outside visitor interacts with their KUMU maps.

## Sketch functionality
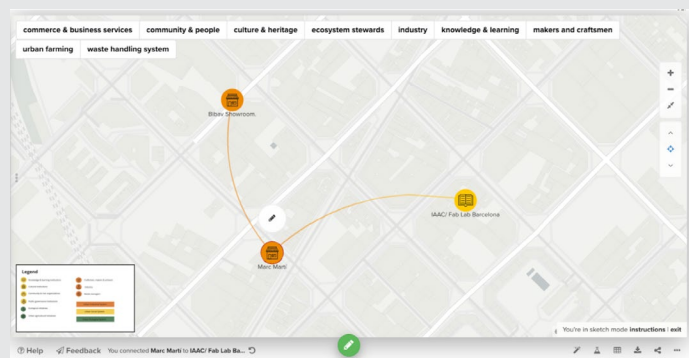
Description

- Pilots will also be able to add new stakeholders and connections between them directly in KUMU, using the platform's sketch function.

This enables pilots to:
- add new elements ("resource owners") directly to the map,
- add existing connections (material flows, information flows) between stakeholders,
- use KUMU in stakeholder workshops to map future opportunities for circular synergies.

ANNEX 4: KUMU DEMONSTRATOR - WASTE VIEW

Level 1 - Waste handling system without flows
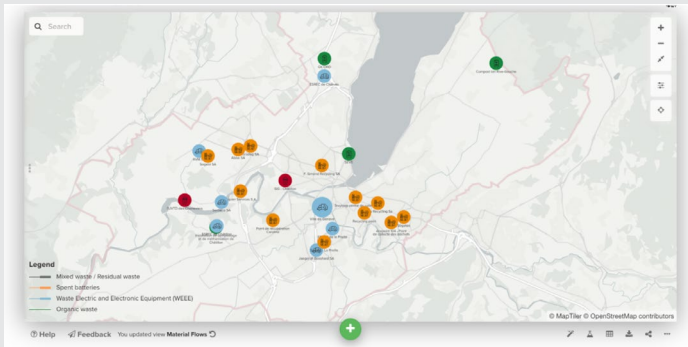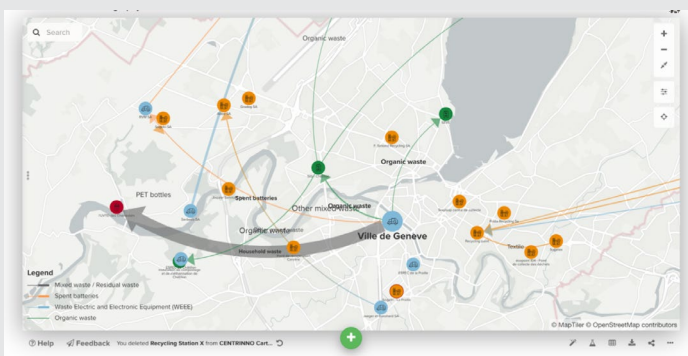

Description

Each pilot builds out a spatial urban metabolism map in KUMU that visualizes waste streams generated and managed by urban waste systems.

It is not always possible to gain insights into the destination of flows of collected waste between agents in urban waste systems. Therefore, the most basic visualization of urban waste systems will show (1) the stakeholders responsible for waste collection, handling, treatment and recovery, and (2) "waste snapshots" of waste handled at individual locations.

Level 2 - Waste handling system with flows
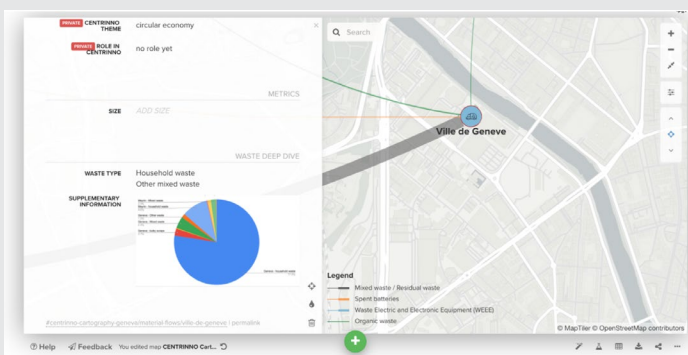

Description

If data allows it, KUMU will be used to visualize the size and kind of waste flows between stakeholders in a spatial format.

For this visualization, data of (1) source and (2) destination is needed.

If volumes are present, pilots can scale flows by volume to visualize most abundant waste streams.

Waste flow maps will be used to identify opportunities within local productive ecosystems (industry & makers) to mine for secondary materials.

## Level 3 - Supplementary waste composition data

Description

If waste composition data is available for specific locations (e.g. composition of recyclables received at recycling centers), this data can be further made available to pilots and KUMU users via the "resource owner" card.

This information can be used by pilots to gain more detailed insights on locally available waste streams. The goal is that this information is used by pilots to identify opportunities within their networks that can help divert urban waste streams from low-value treatment pathways.

ANNEX 5: KUMU DEMONSTRATOR CIRCULAR ECONOMY ROLES VIEW

Circular Economy Roles (Spatial Visualization)
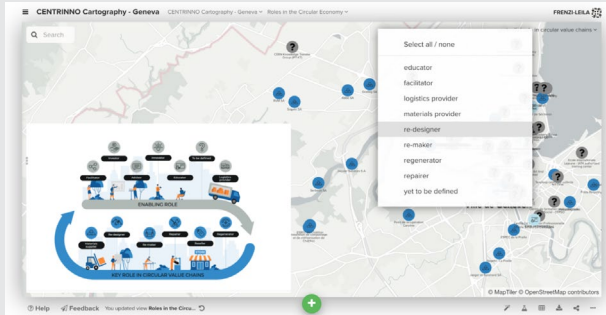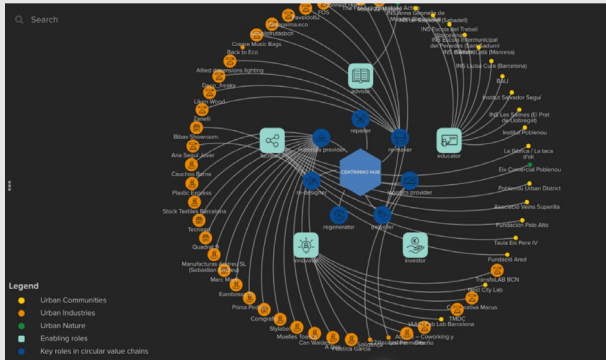

Description

With the Circular Economy Roles view, pilots are visualizing their local community through the lens of each stakeholder's potential role in a circular transition.

The Circular Economy Roles view has two purposes: One, pilots can use this map in direct interaction with their local network to help stakeholders identify what role they could play within a circular economy, thereby building a joint vision of what a circular and inclusive future may look like.

Second, this view also highlights which essential roles are currently not covered within the CENTRINNO Network. By identifying gaps in key stakeholders needed to leverage a circular economy, pilots will be able to target their networking activities.

Circular Economy Roles (Non-spatial Visualization)

Description

Using a non-spatial visualization of the circular economy roles provides more opportunities for pilots to understand the strengths and weaknesses of their local network.
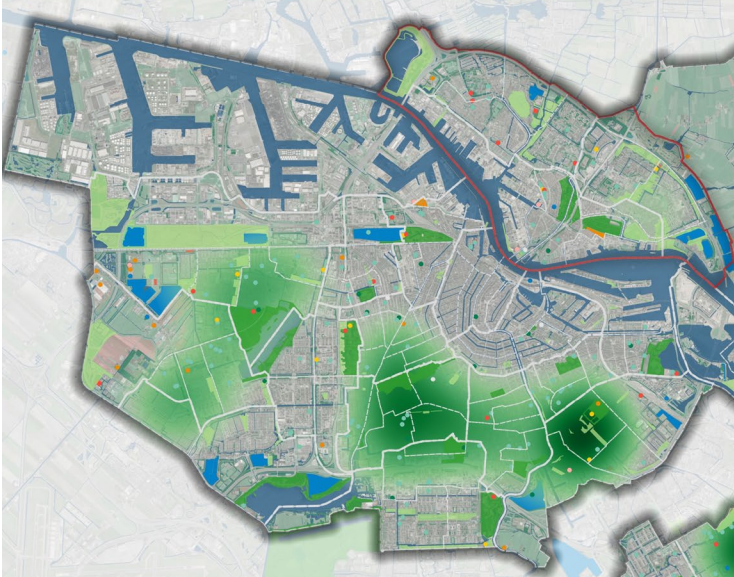
As an example, Barcelona's ecosystem on the left exhibits that mapped agents either act as educators and facilitators for a circular economy, while potential investors and expert advisors are missing.

Amongst the key roles in circular value chains, it is also noticeable that many organizations have been identified to provide secondary materials (waste), while few stakeholders have been mapped that could potentially enact higher-value circular strategies, such as the repair, remanufacture or redesign of products.

| ANNEX 1 | ANNEX 2 | ANNEX 3 | ANNEX 4 | ANNEX 5 | ANNEX 6 |

ANNEX 6: INTERACTIVE SLIDEDECK, EMBEDDED ON WEBSITE

Link: https://xd.adobe.com/view/44b35f12-8db8-42dc-8c77-8b852f738aee-11e0/screen/b161f2e7-35df-4413-9e59-227c694fd3e5?fullscreen

Mapping insights#3:
An urban wood economy?

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Opportunities for a local wood economy?

Amsterdam's tree maintenance generates a lot of woody waste.

In 2020, around **2,900 trees** have been cut and another 600 pruned due to "unsafe situations". Due to a long backlog of planned replacements, until 2023 additional **8000 to 10,000 trees will be felled.** A unique opportunity to test how a local wood economy could be realized!

Amsterdam's ecosystem of wood-processing makers and industries could play a crucial role in collecting, reprocessing and reusing locally harvested wood. **Explore local wood users in KUMU**
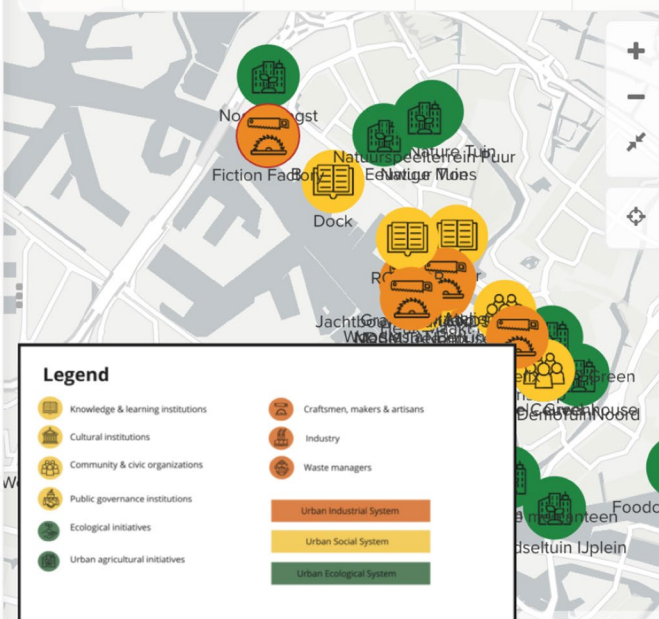
Download high-resolution map

Can makers in Noord support a local wood economy?

Amsterdam Noord has many businesses and craftsmen that utilize wood as a primary resource for their activities.

Future research questions to explore:

Search bamboo   Scrap leather   Scrap wood   wood

Legend

Knowledge & learning institutions
Cultural institutions
Community & civic organizations
Public governance institutions
Ecological initiatives
Urban agricultural initiatives

Craftsmen, makers & artisans
Industry
Waste managers

Urban Industrial System
Urban Social System
Urban Ecological System

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