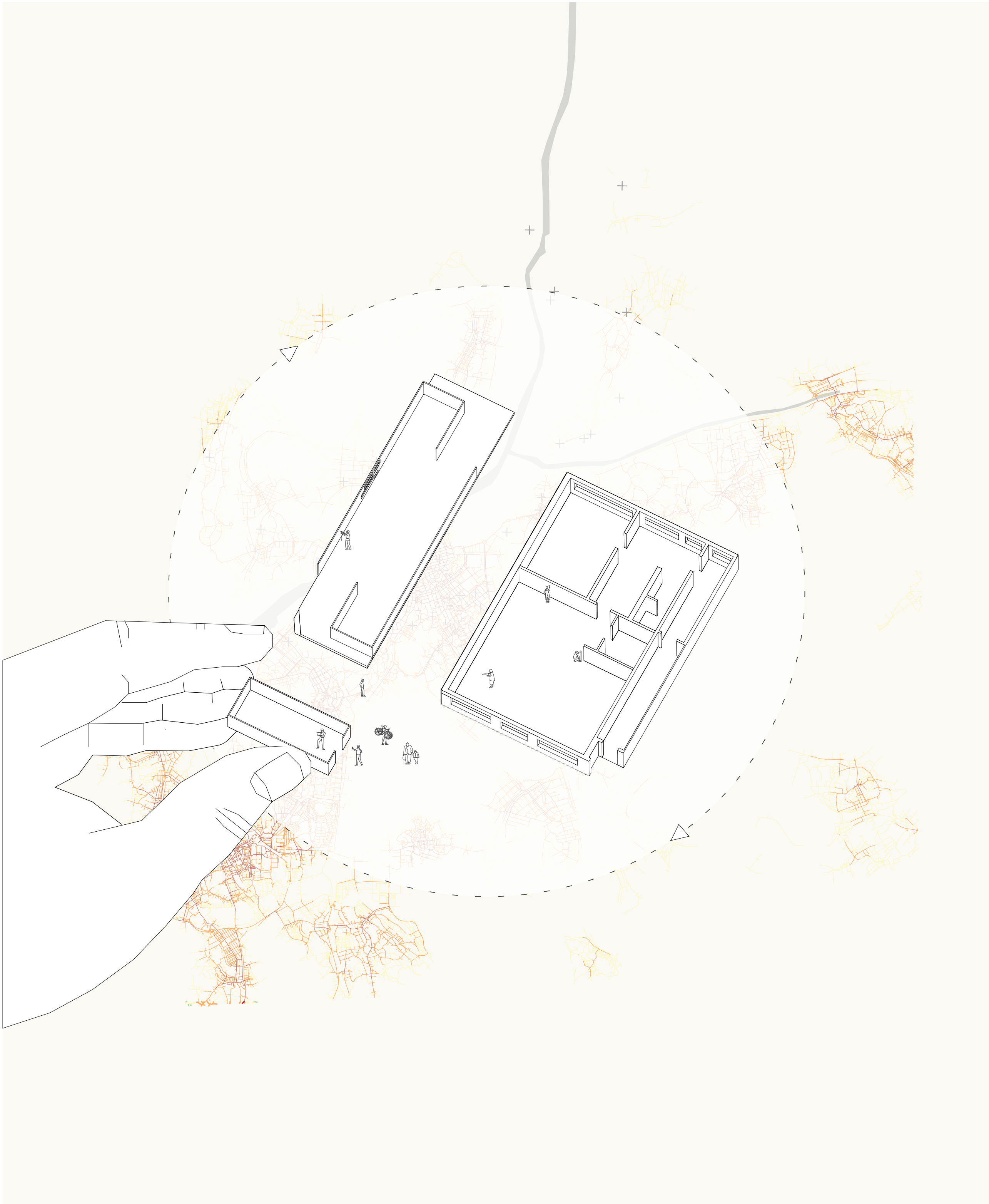
MAKING THE TRANSITION

Understanding and strengthening the urban system of circular makerspaces in Gothenburg City



Emiline Elangovan
Architecture and Planning
Beyond Sustainability

Master Thesis
Spring 2021

‘Making’ the Transition
Understanding and strengthening the urban system of circular makerspaces in Gothenburg City

Emiline Elangovan
Architecture and Planning Beyond Sustainability
Chalmers School of Architecture
Department of Architecture and Civil Engineering
Göteborg, Sweden 2016

Examiner: Meta Berghauser Pont, Associate Professor, Architecture and Civil Engineering, Urban Design and Planning, Spatial Morphology Research Group

Supervisor: Lars Marcus, Professor Urban Design and Planning, Vice Head of Department Research, Architecture and Civil Engineering, Urban Design and Planning, Spatial Morphology Research Group

CHALMERS
UNIVERSITY OF TECHNOLOGY

STUDENT BACKGROUND

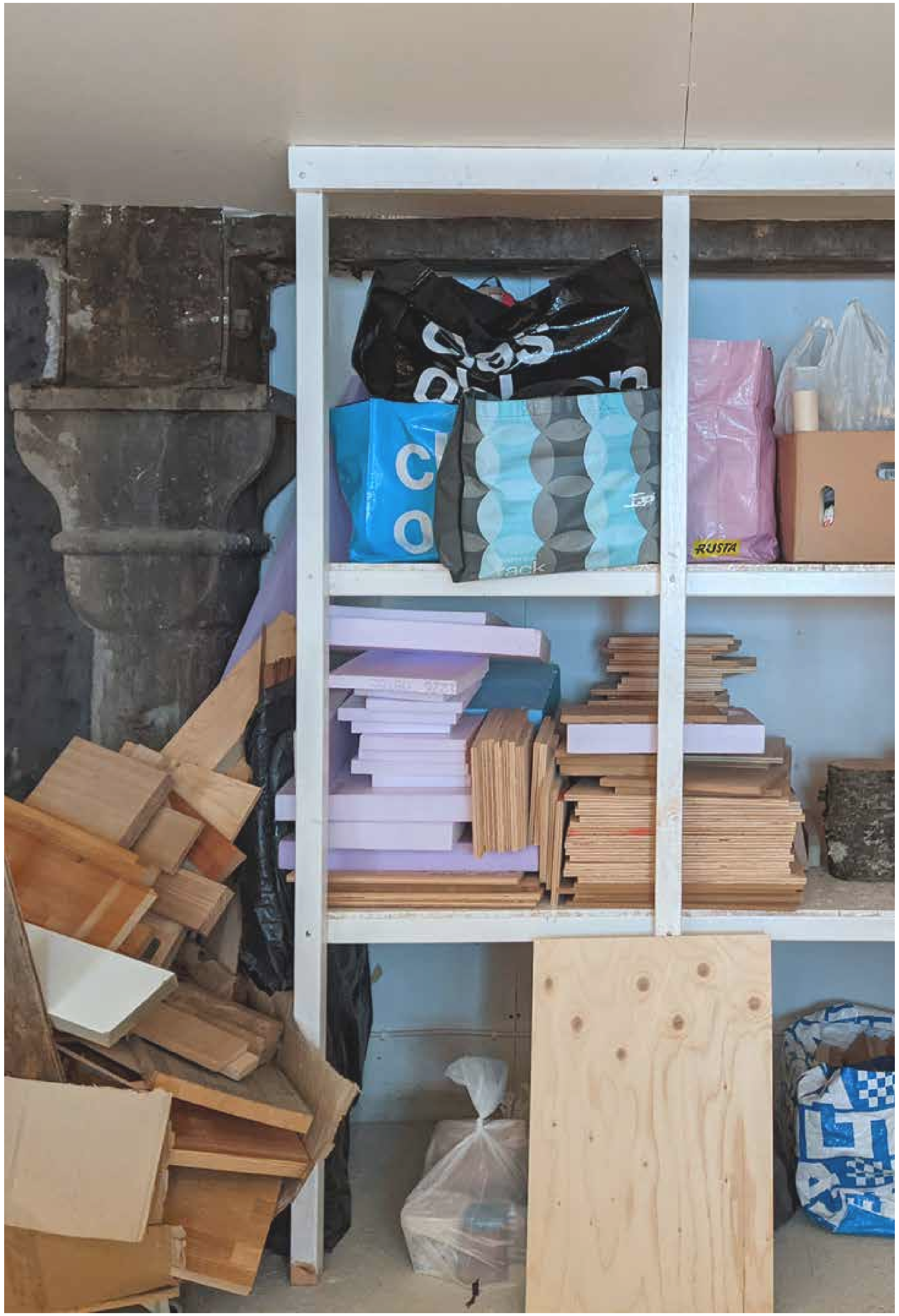
Bachelor of Design
(Architecture and Integrated Design)
University of Westerrn Australia
2014-2017

Master Studios
Design and Planning for Social Inclusion
Sustainable Architecture Design
Matter Space Structure 1
Master Thesis with Social Ecological Urbanism

I was born in Kerala, India where traditional forms of knowledge like Ayurvedic medicine and informal methods of resource management like water conservation tunnels are embraced. I then moved to Singapore which is in many ways a stark contrast to rural India. The environment in Singapore (both built and natural) is very carefully controlled by the state.

The tension between the informal communal practices of my birth place and the efficiently orchestrated processes of where I grew up has always fascinated me, influencing my design interests as well.

I am therefore interested in how urban planning, which is commonly seen as a top-down practice, and the makers' movement, which is a growing network of people and spaces blurring the line between production and consumption, can work together to help cities transition to functioning within a circular economy.



Contents

INTRODUCTION

This chapter defines the aims of the thesis, the scope of the project, and the methods used, shedding light on to what extent and in what ways the larger topics of urban planning, maker culture, and circular economy are engaged with.

Introduction

THE PROJECT AIMS TO USE ARCHITECTURAL AND URBAN ANALYSIS TOOLS TO UNDERSTAND THE SYSTEM OF MAKERSPACES IN THE CONTEXT OF GOTHENBURG'S URBAN STRUCTURE

PROPOSE SPATIAL STRATEGIES TO STRENGTHEN THIS SYSTEM, ESPECIALLY IN ITS CONTRIBUTION TO THE CIRCULAR ECONOMY.

ABSTRACT

'Making' the Transition is a master thesis which aims to use architectural and urban analysis tools to understand makerspaces in the context of Gothenburg's urban structure and propose design strategies for current and future makerspace organisers to strengthen this system, especially in its contribution to the circular economy.

Current research on the circular economy understandably focuses on larger industrial processes and material flows. However, for a complete transition to occur, closing resource life cycle loops in the supply side of the economy needs to be coupled with shifts in consumption behaviour and the physical infrastructure that supports such behaviour.

Makerspaces are informal, community-run workshops that support circular consumption and production on multiple levels. Practices of repair, reuse, and redesign can be commonly observed in such spaces although they may not be their main aim.

Informed by existing literature on makerspaces and especially Pop-Machina, an EU research project studying circular makerspaces, the research was focused on analysing the spatial factors that support the spaces and their circular activities in Gothenburg. With a multi-scalar spatial understanding of makerspaces in the city, spatial strategies were proposed at three levels to strengthen the circular processes already occurring in current spaces. These strategies, which are also guided by relevant government policy and urban development plans, include the use of vacant spaces and adaptations to existing makerspaces. They are catered to makerspace organisers and supporting institutions who wish to set up new spaces or improve current ones.

Through a process of analysis and design, the research provides a systematic and visual method of understanding makerspaces in Gothenburg as well as suggestions for future developments which can be used by those who run them.

Keywords: Maker Spaces, Circular Economy, Bottom-up Transition, Urban Spatial Analysis

Introduction

WHAT ARE THE CHARACTERISTICS OF THE CIRCULAR MAKER SYSTEM IN GOTHENBURG?

RESEARCH QUESTIONS

What are the characteristics of makerspaces in Gothenburg?

What are the different types of maker spaces that currently exist in Gothenburg?

Where are they located?

What is the spatial relationship between makerspaces and the street network?

What resources (material, human, financial, social) do makerspaces rely on to function?

What is the spatial relationship between makerspaces and their resources?

What circular strategies do the different maker spaces currently promote?

What is the spatial relationship between different maker typologies?

HOW CAN THE EXISTING URBAN FABRIC BE ADAPTED TO STRENGTHEN THE CIRCULAR MAKER SYSTEM?

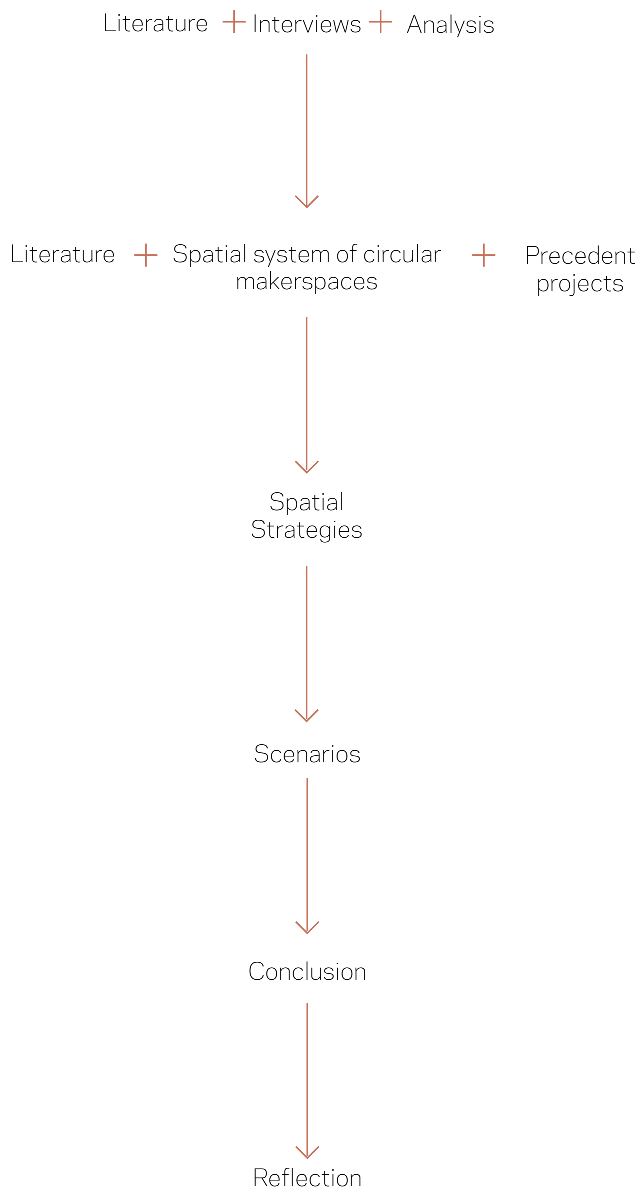
What spatial qualities need to be strengthened to promote circularity in maker spaces? (e.g. density, accessibility)

In the chosen locations, what are the opportunities and gaps in the existing built environment that maker spaces can leverage on?

What are the different strategies for incorporating the maker space typologies into the existing urban fabric?

How well do these strategies help fulfill the functional aims of each maker space typology?

How well do these strategies enhance the symbolic significance of maker spaces in the built environment?



METHODOLOGY

The project has a descriptive point of departure which is then used as a basis to formulate normative principles. To fulfil the first aim of understanding the circular maker system in the context of Gothenburg's urban structure, I first mapped and studied the characteristics of makerspaces in Gothenburg. The aspects of makerspaces I chose to focus on were highly influenced by the urban analysis methodology proposed by Pop-Machina in their paper, Circular Makerspaces and Urban Regeneration Strategies. The main stance of this methodology is that any "city planning or design decision should regard all four scales of influence and participation, even if the intervention is fixed at a nano or micro scale (the building or city block)". I used literature studies, drawing heavily from Pop-Machina, Working Cities, Foundries of Making, Space is the Machine. I conducted interviews and I used architectural visualisation tools as a form of summarising and communicating the information gathered in a spatial sense. The mapping of makerspaces was conducted on three levels of the city, neighbourhood and building.

Then, I analysed their relationship to the street network, resources, and circular system. I used place syntax to understand the relationship between makerspaces and the street network. Space syntax is both a theory and a tool which studies the street network as precisely that, a network. A deeper understanding of the configurational qualities of a street will provide insight into where makerspaces should be located to optimise the resources they depend on. This knowledge would in turn help inform how urban spaces can be adapted to support a socio-cultural shift to circularity through spatial interventions.

Place syntax tools of attraction analyses helped me understand the relationship between makerspaces and resources in the city. I employed the circular economy model as exactly that - a normative model to evaluate the circular practices enabled by the current spatial configuration of maker typologies in relation to each other.

To address the second aim of the thesis which is to propose spatial strategies to strengthen this system, I synthesised established spatial strategies for production and consumption spaces in combination with precedent projects directly relating to makerspaces. I illustrated these strategies at three different levels of urban location, neighbourhood, and building(interface).

Finally, I concluded with reflecting on the issues I had to grapple with in formulating the spatial strategies to evaluate their strengths and weaknesses

This methodology was supplemented by architectural visualisation techniques employed in projects which study makerspaces spatially such as "DIY Initiative" a master thesis project investigating and proposing makerspaces in the Polish city of Słupsk and the publication 'Makerspace' by Northeastern School of Architecture. In addition, setting up and being part of a makerspace in A Working Lab was a way of personally engaging with the topic that I hope implicitly complemented the academic tools employed in the thesis.

"URBAN AND SOCIAL PHENOMENON CAN BENEFIT FROM A MULTIDISCIPLINARY APPROACH GIVEN ITS MULTISCALAR AND URBAN DYNAMICS"

- University of Cambridge, Department of Architecture, 2020

Introduction

DELIMITATIONS

The phenomenon of circular makerspaces can be explored through multiple fields of study ranging from sociology to the circular economy and at varying scales from the global movement to individual spaces. Since the aim of this thesis is to understand the phenomenon from an urban analysis and design perspective, only certain areas of the conceptual, analytical, and design parameters of this phenomenon will be touched upon.

Conceptual Delimitations

As identified by Pop-Machina (Cambridge– Pop-Machina, 2020), There are six drivers that support circular makerspaces. I will only be focusing on improving he three drivers that have a strong correlation with spatial factors -namely 'city space' which refers to effective urban space, 'material access' which concerns knowledge of materials and where or how to access them, and 'networks' which deal with the clustering of urban organisations that support the functioning of makerspaces.

When discussuing the circular economy, the thesis will not focus on closing all loops of a specific material's resource life cycle. Instead, materials such as wood, electronics, and textile which are commonly used in maker spaces will be studied in the specific circular economy loops of repair, reuse, and redesign since those are the loops maker spaces specialise in.

Analytical Delimitations

The level of community engagement in makerspaces is essential in determining the impact the spaces have on changing consumption patterns. However, since 'social access' falls outside the scope of the research, ethnographic methods to study the barriers to becoming engaged in makerspaces will not be used. The study does not delve into the quantitative mapping of material used in makerspaces or the volumetric flows of material throughout the maker system. Therefore, industry relatedness and industrial ecology methods will not be used.

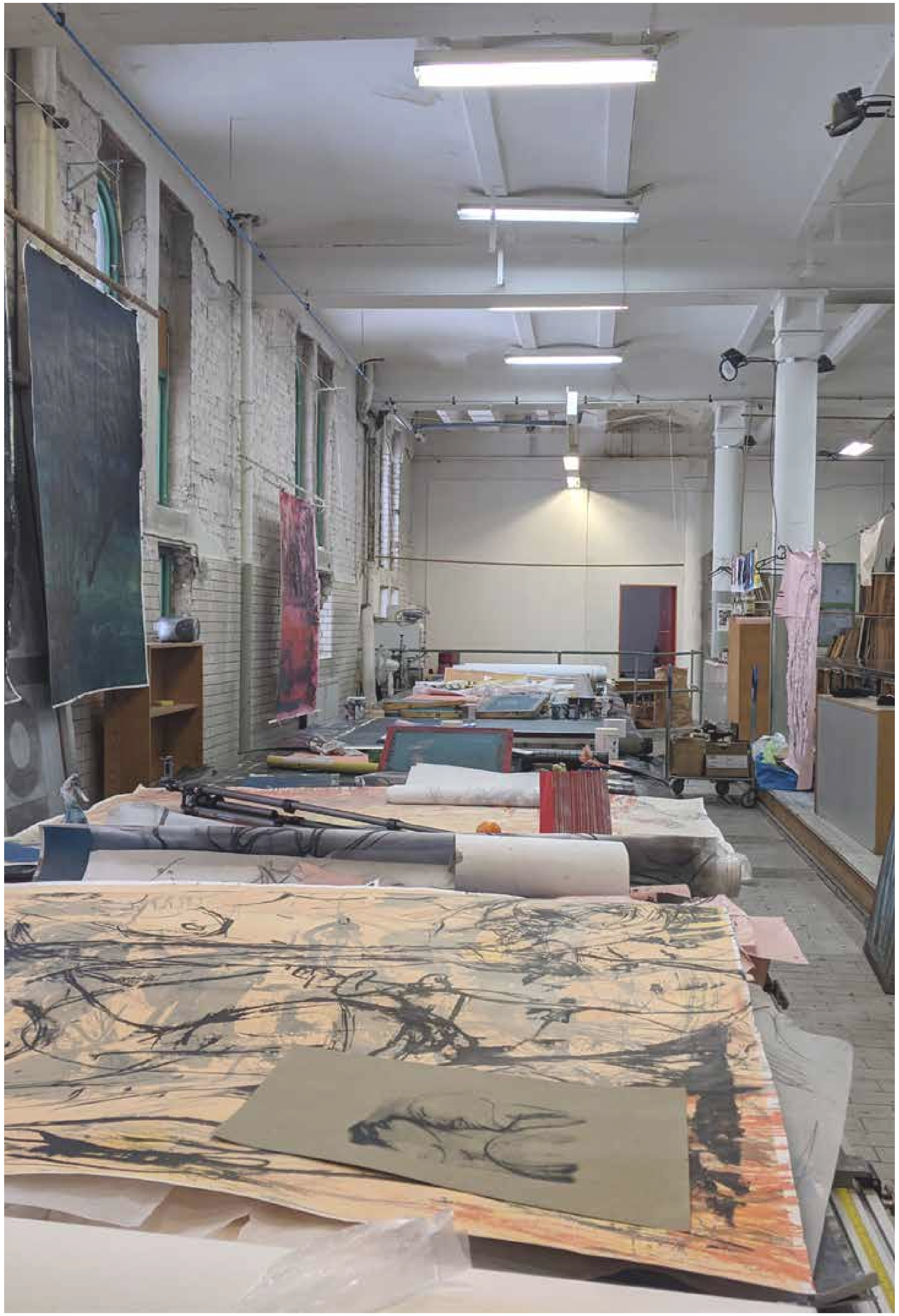
The thesis deals with Gothenburg in particular and therefore excludes analysis of national or transnational resource flows. Instead, the city's urban structure, qualities of the areas in which makerspaces are located, as well as the buildings they are part of are investigated.

Design Delimitations

A masterplan, which addresses issues purely on a neighbourhood level will not strengthen Gothenburg's maker system as a whole. Therefore, smaller scale strategies that are based on a systematic understanding of how various spaces around the city function together will be proposed. These strategies will be exemplified in specific case studies but can be applied to other spaces as well.

Circular principles will be applied in the design strategies which means that they will not involve energy-demanding new constructions but work with strategically adapting the existing urban fabric.

CONCEPTUAL FRAMEWORK		ANALYTICAL FRAMEWORK		DESIGN FRAMEWORK	
Makerspace Drivers	Circular Economy Loops	Scale of Study	Research Tools	Level of Detail	Type of Construction
Social Access	Recycle	National/ Transnational	Urban Infomatics	Masterplan	New Construction
Material Access	Redesign	City	Digital Mapping	Design Strategies	Extension
Networks	Reuse	Neighbour-hood	Urban Morphology	Individual Makerspace	Renovation
City Space	Repair	Individual Space	Space Syntax	Construction Details	Relocation
Govt. Initiative			Desk Research		
Knowledge			Urban Ethnography		
			Industry Relatedness		
			Industrial Ecology		



MAKERSPACES IN GOTHENBURG

In the next chapter, five different maker typologies are introduced and explained through case studies in Gothenburg, providing a snapshot of the spatial conditions in which they exist and the resources they need.

Makerspaces in Gothenburg

HOW DOES A MAKERSPACE FUNCTION?

The maker movement can be defined as

"a variety of stakeholders organising initiatives that are part of the supply chain of 'making'. The initiatives often aim at tackling social and environmental issues, they are often grassroots, and led by local communities." (Metta J. & Bachus K., 2020)

They often engage in the production processes of varying industries depending on the skills and interests of the stakeholders in the specific space. The materials they work with also vary accordingly as do the size of the spaces, depending on the extent to which they have access to resources (material, human, financial, intellectual).

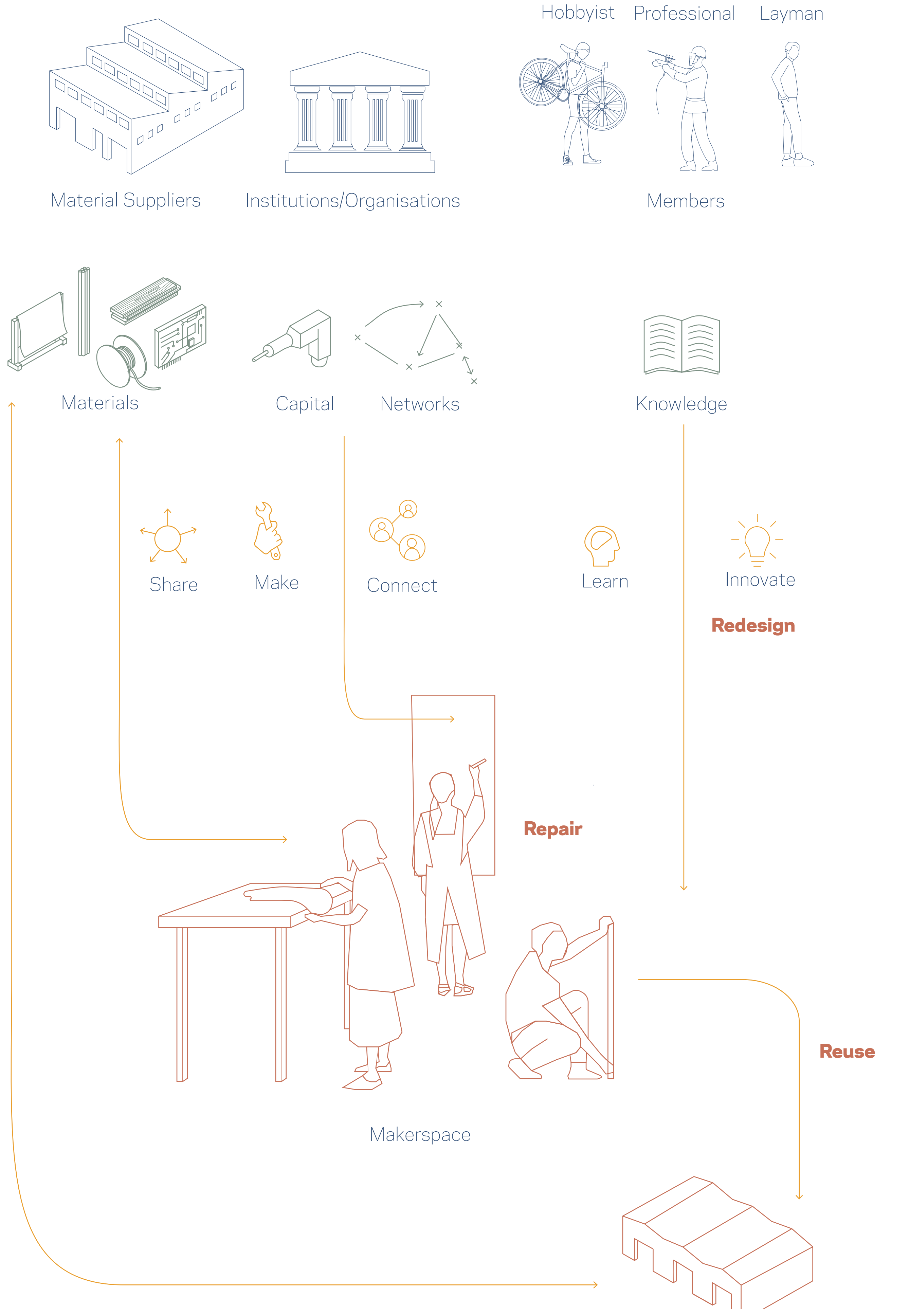
While these factors differ across various spaces, they all tend to operate with small-scale tools and generally foster an evironment of innovation, learning and sharing. Maker's movements tend to tackle environmental and social issues not addressed by current markets and regulations.

Maker spaces provide opportunities for more circular consumption patterns because they address the loss of consumer skills which prevent people from keeping products in the inner loops of repair and reuse, preventing unecessary waste.

Through the democratisation of new techologies such as 3D printing and CNC routing, the maker movement allows the shift to decentralised, local forms of production. This shift increases local employment opportunities over the long run and reduces logistic and environmental impacts of current large supply chains. Such small-scale production also allows for personalisation of products, prevents overproduction, thus allowing resources to be optimised. These attributes support the EU Circular Economy Action Plan's goal of promoting circularity in production processes. Bottom-up approaches provided by the maker movement could provide a platform to accelerate citizen acceptance towards the circular economy.

Maker spaces also have the potential to contribute to the plan's goals of designing sustainable products, and empowering customer and buyers because they allow the quick prototyping of new designs. Moreover, these spaces offer the infrastructure needed for consumer engagment in the circular economy cycles of repair and redesign as well as the sharing of product knowledge.

"THIS COMMUNITY USES THE SMALL-SCALE, COLLABORATIVE FORM OF 'MAKER' NETWORKS TO ENABLE A LOCALISED CIRCULAR ECONOMY."



Makerspaces in Gothenburg

THE FIVE CIRCULAR MAKER TYPOLOGIES

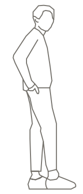
LEVEL OF SKILL NEEDED

MATERIALS USUALLY USED

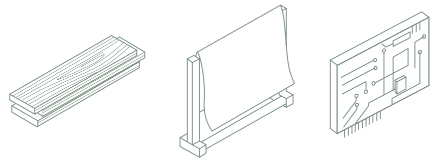
+ REUSE

Trade secondhand items

Requires little space and is therefore the most flexible function



LAYMAN

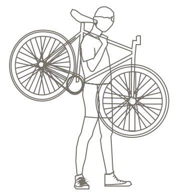


WOOD TEXTILE ELECTRONICS

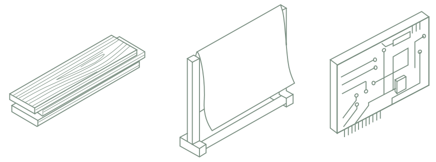
O REPAIR

Provide tools and parts for repair

Requires space for both storage and carrying out repair. Also a flexible function



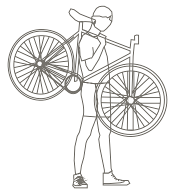
HOBBYIST



△ CRAFT

Provide tools and materials for artisinal making,

Requires specialised spaces for light and heavy work



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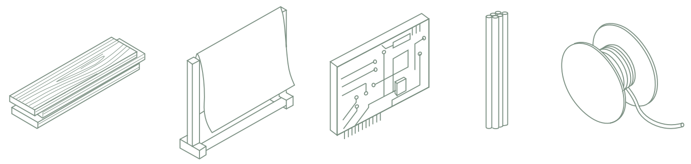


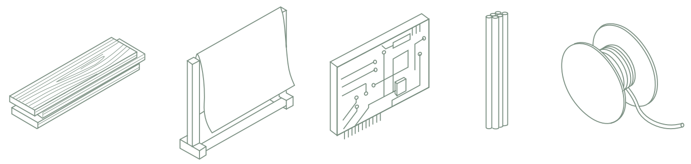
METAL PLASTIC

□ FABRICATE

Provide digital or highly specialised tools for more standardised making,

Requires space for digital machinery and computers with good access to electrical supply

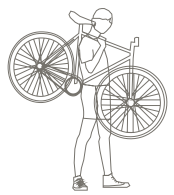
EXPERT



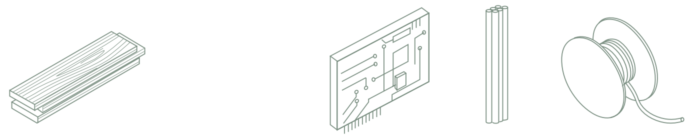
✕ DISTRIBUTE

Trade second hand materials and parts

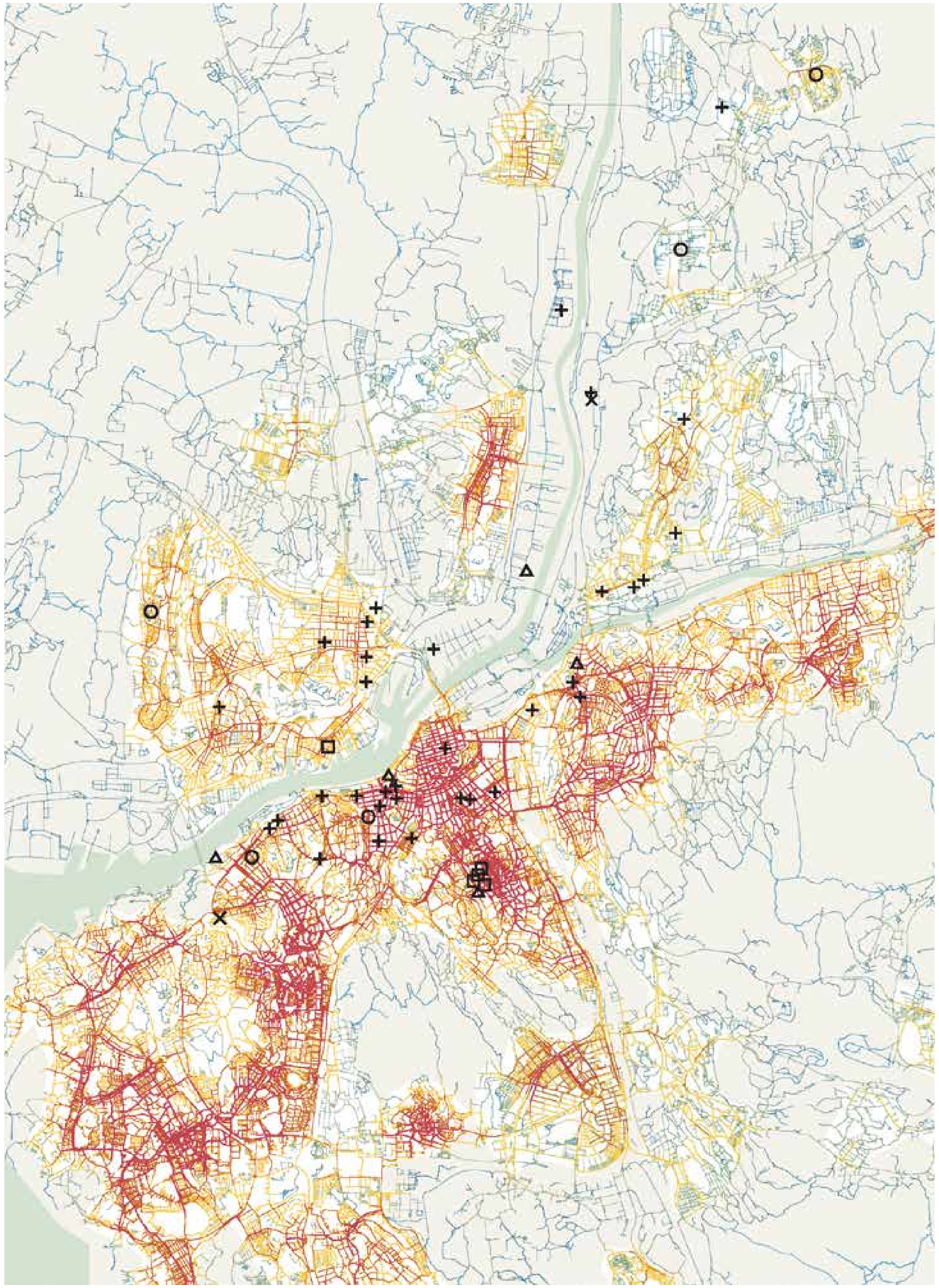
Requires plenty of space for collecting, sorting and storing materials



HOBBYIST



Makerspaces in Gothenburg



IN RELATION TO LOCAL INTEGRATION

This Angular Integration analysis shows how easy it is to get to a particular street segment from any other point on the street network within a radius of 1km

Higher integration values (shown in red and orange) usually mean more pedestrians will be found in that location

Generally, makerspaces are located in locally integrated areas

Reuse spaces are distributed across the city and are the most commonly found typology

Repair spaces are found mostly around residential areas which are relatively well integrated. The repair space or fixoteket can be considered an attraction on the neighbourhood level.

Craft spaces are also located in locally integrated streets segments with exception of Mikrofabriken

ANGULAR INTEGRATION 1KM
(LOCAL CENTRALITY)

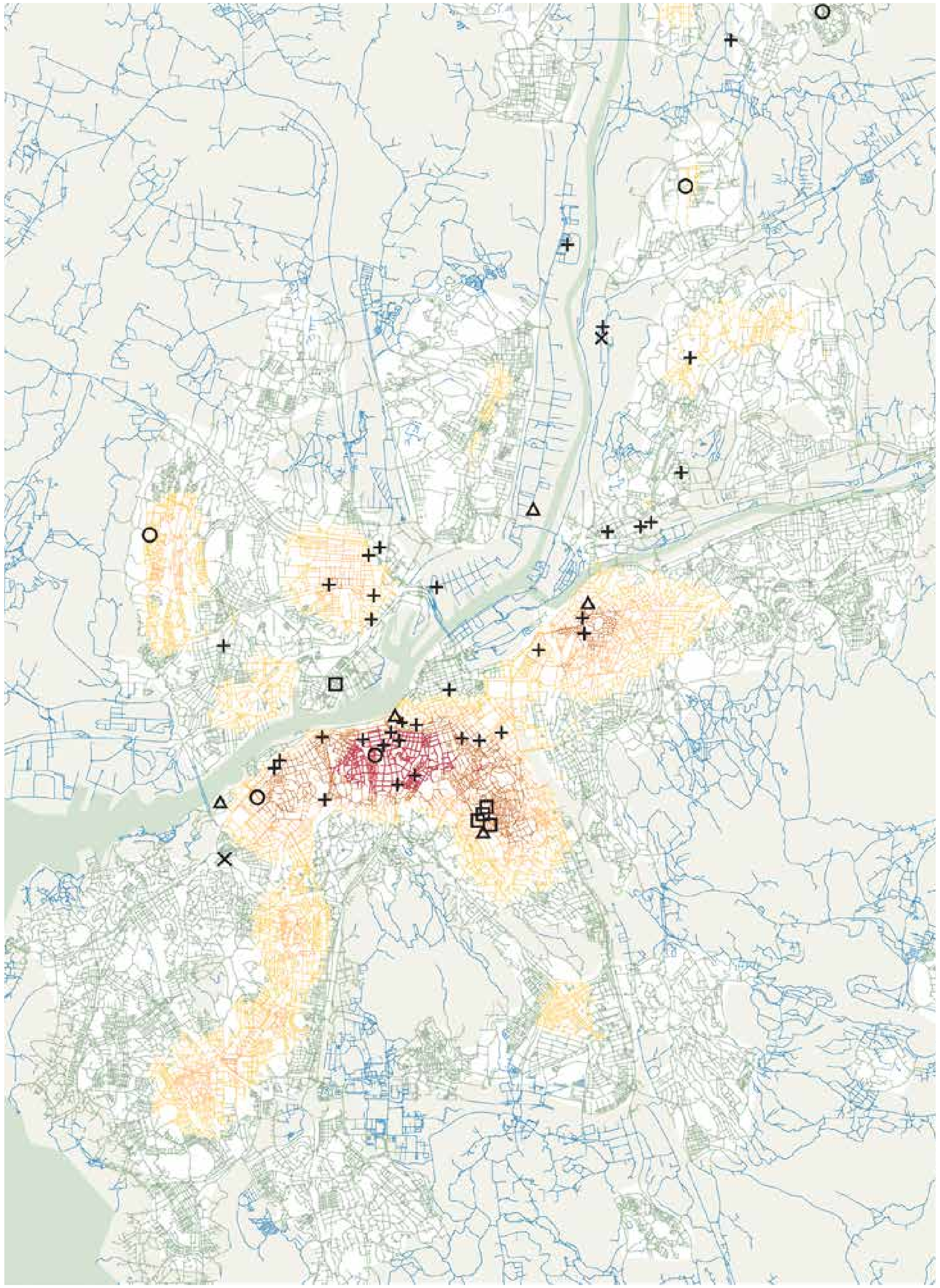
	370-724	+	REUSE
	257-370	○	REPAIR
	169-257	△	CRAFT
	89-169	□	FABRICATE
	1-89	×	DISTRIBUTE

Fabricate spaces are clustered around the Chalmers campus

Of the two distribute spaces, one is located in a segregated area while the other is located in a well integrated area

It is hard to understand how these spaces function based on this analysis alonev

Makerspaces in Gothenburg



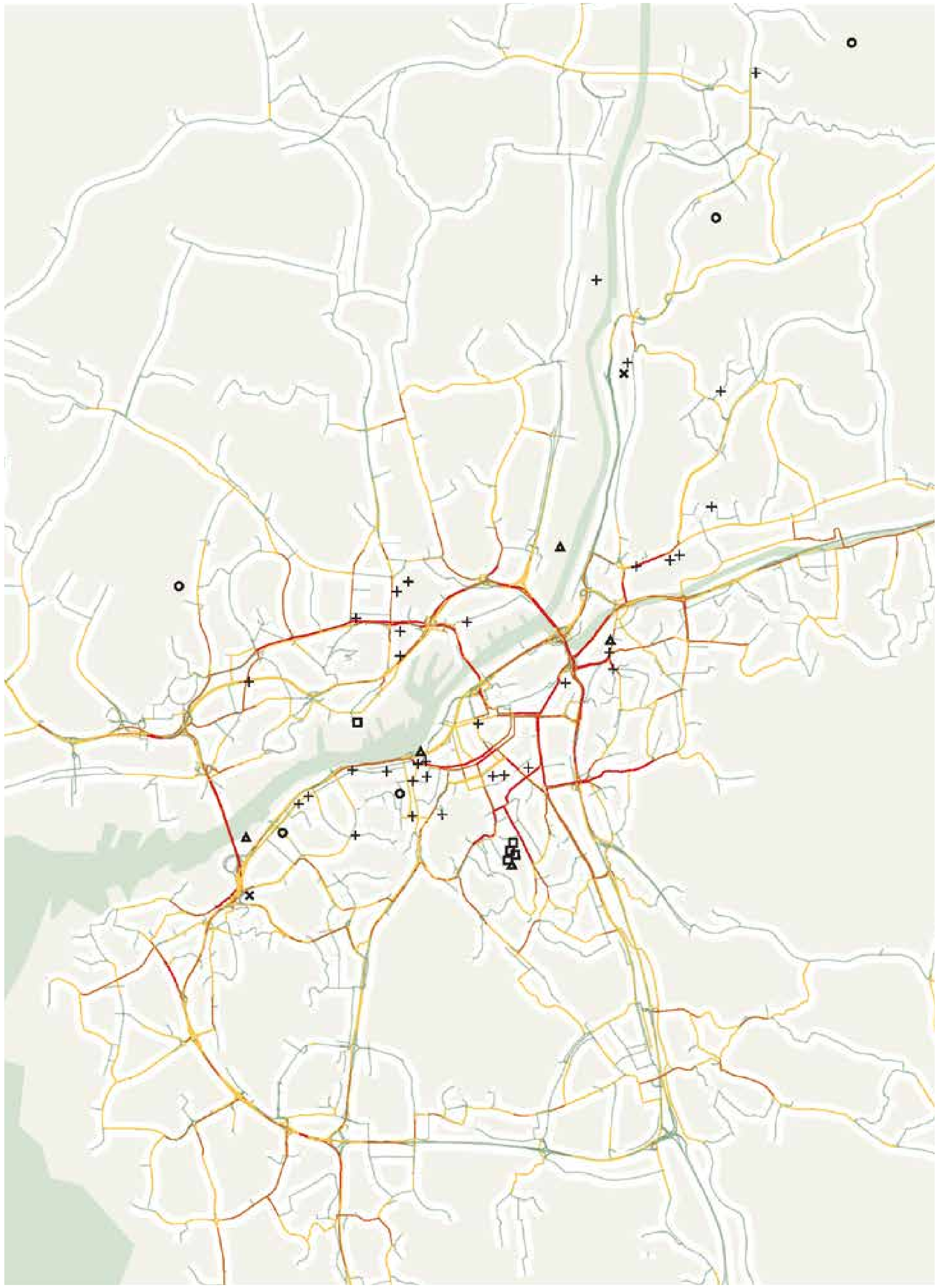
IN RELATION TO WHERE PEOPLE LIVE

Makerspaces are generally located close to where people live.

ATTRACTION REACH OF 1KM
(TO RESIDENTIAL POPULATION)

	18303-30604	+	REUSE
	10842-18303	○	REPAIR
	5688-10842	△	CRAFT
	2052-5688	□	FABRICATE
	1-2052	×	DISTRIBUTE

Makerspaces in Gothenburg



IN RELATION TO VEHICULAR MOVEMENT

This Network Betweenness analysis shows how often a particular street segment is passed through on the way to any other street segment in the network within a radius of 5km.

This analysis has been carried out on the motorised street network of Gothenburg and helps us see if a makerspace is easy to reach by car from other parts of the city.

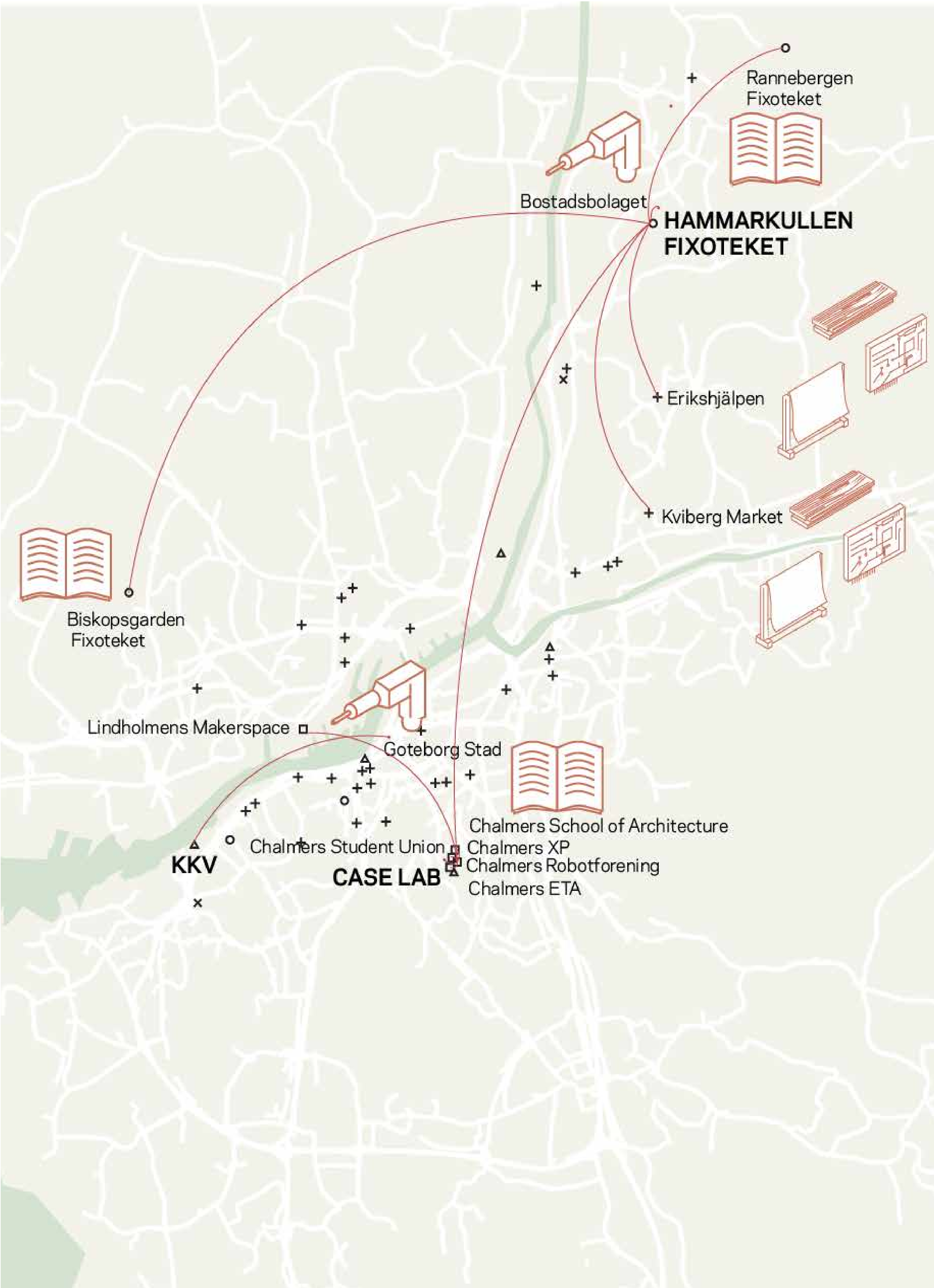
Most makerspaces are not located directly on streets with high betweenness centrality on a global level. The maker typology that has least through movement on the motorised network are repair spaces.

NETWORK BETWEENESS 5KM
(MOTORISED STREET NETWORK)

3014885-8244944
1578817-3014885
784567-1578817
250715-784567
0-250715

REUSE
REPAIR
CRAFT
FABRICATE
DISTRIBUTE

Makerspaces in Gothenburg



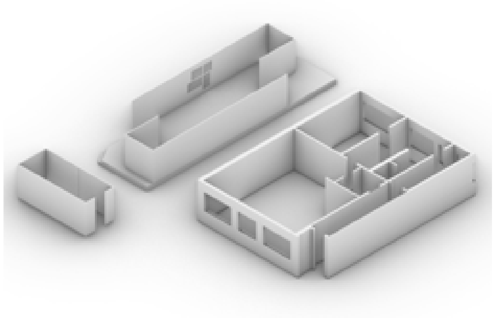
CASE STUDIES

Three case studies were chosen to investigate in further detail. Each of these case studies, Hammarkullen Fixoteket, KKV, and Case Lab represent the three maker typologies that actually host the act of making.

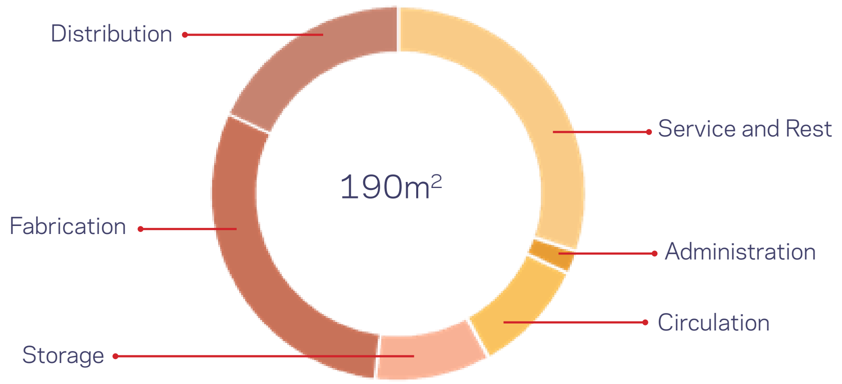
NETWORKS, KNOWLEDGE, MATERIALS

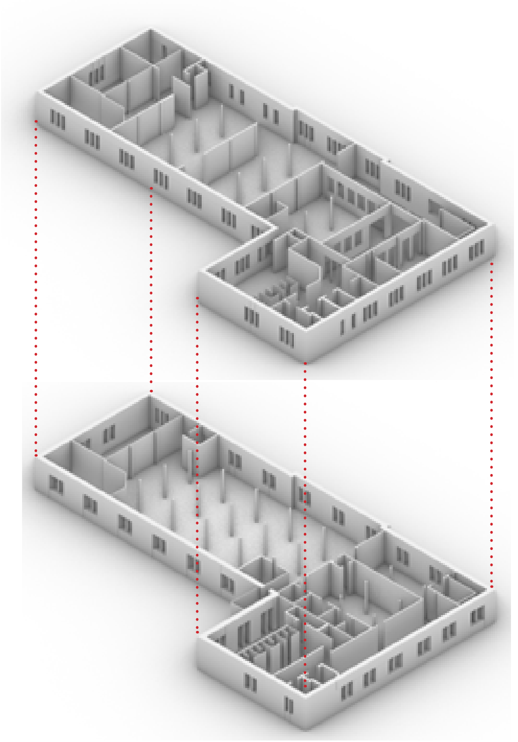
The relationship makerspaces have with other groups involves the exchange of materials, knowledge, and operational space or tools. The flow of these resources is not well documented and is not regular or consistent but more based on community events, relationships and informal arrangements.

Makerspaces in Gothenburg

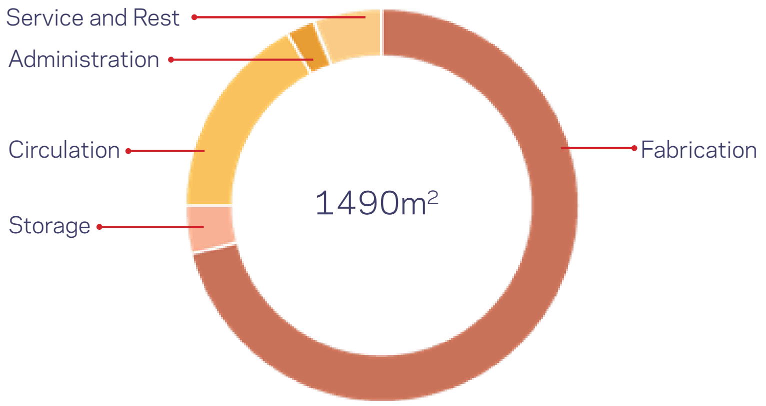


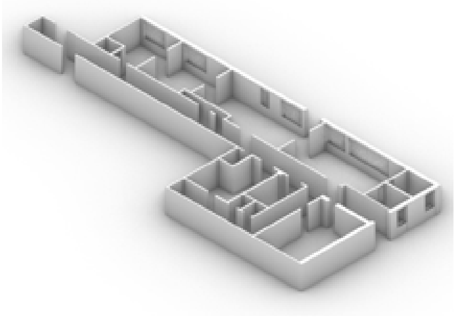
Hammarkullen
Fixoteket



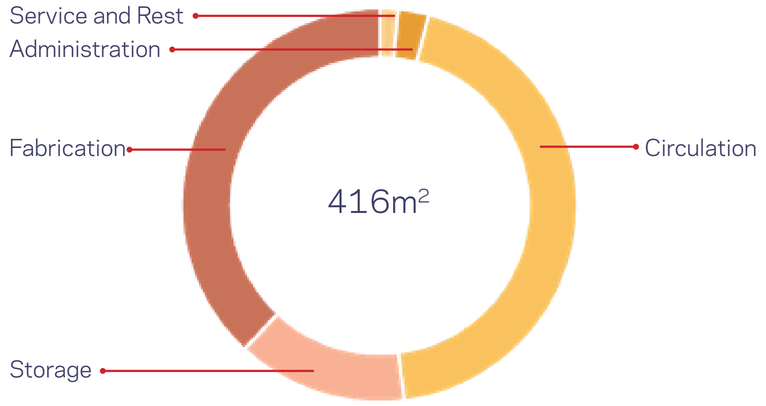


KKV





Case Lab



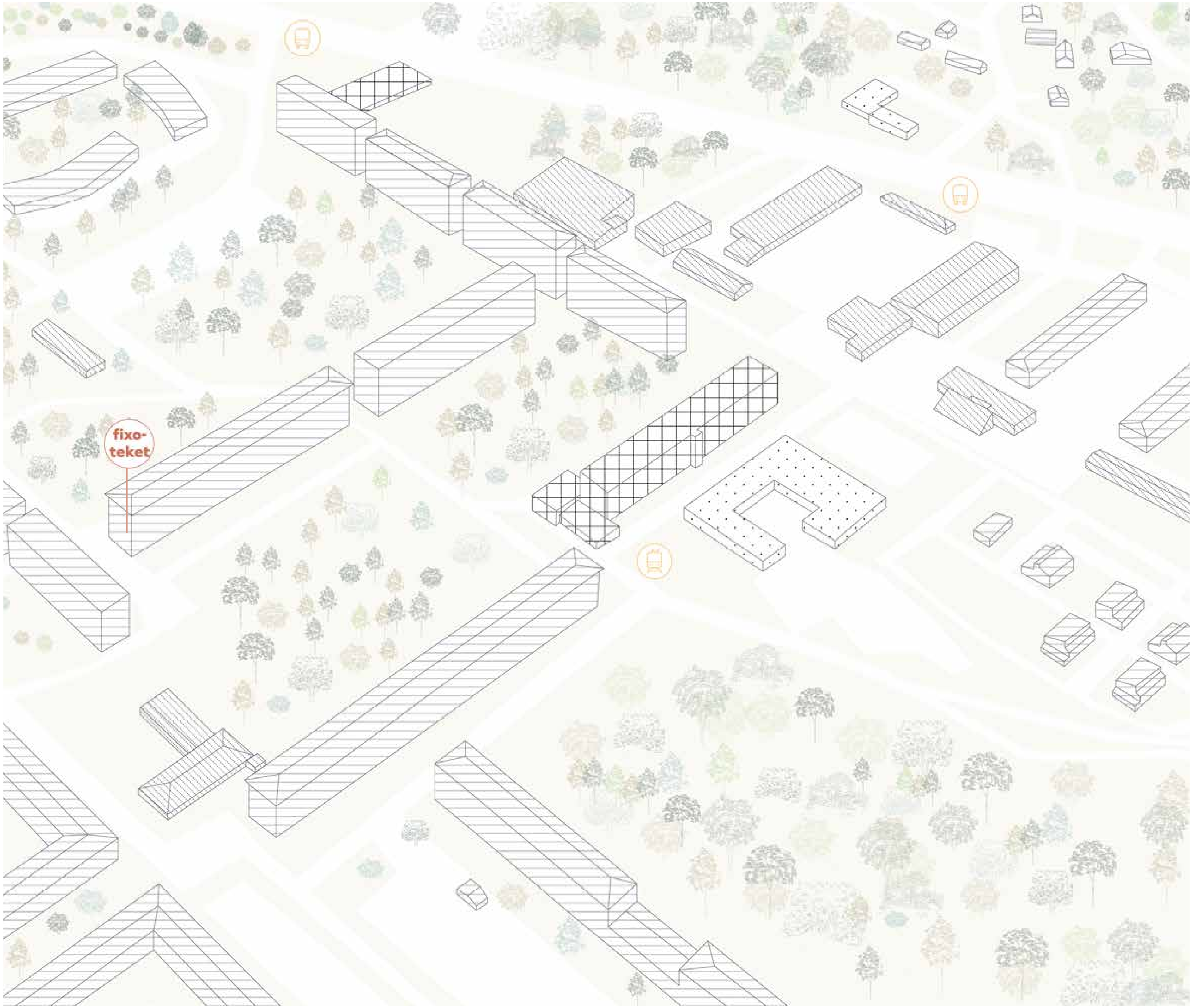
CAPITAL

Capital in the context of makerspaces refer to the operational space as well as the tools and machinery available.

In the fixoteket, which is as much of a community space as a space for repair, service and rest occupy almost the same amount of space. In the craft typology (KKV), fabrication is clearly the main focus, followed by sufficient space for movement between various fabrictaion spaces.

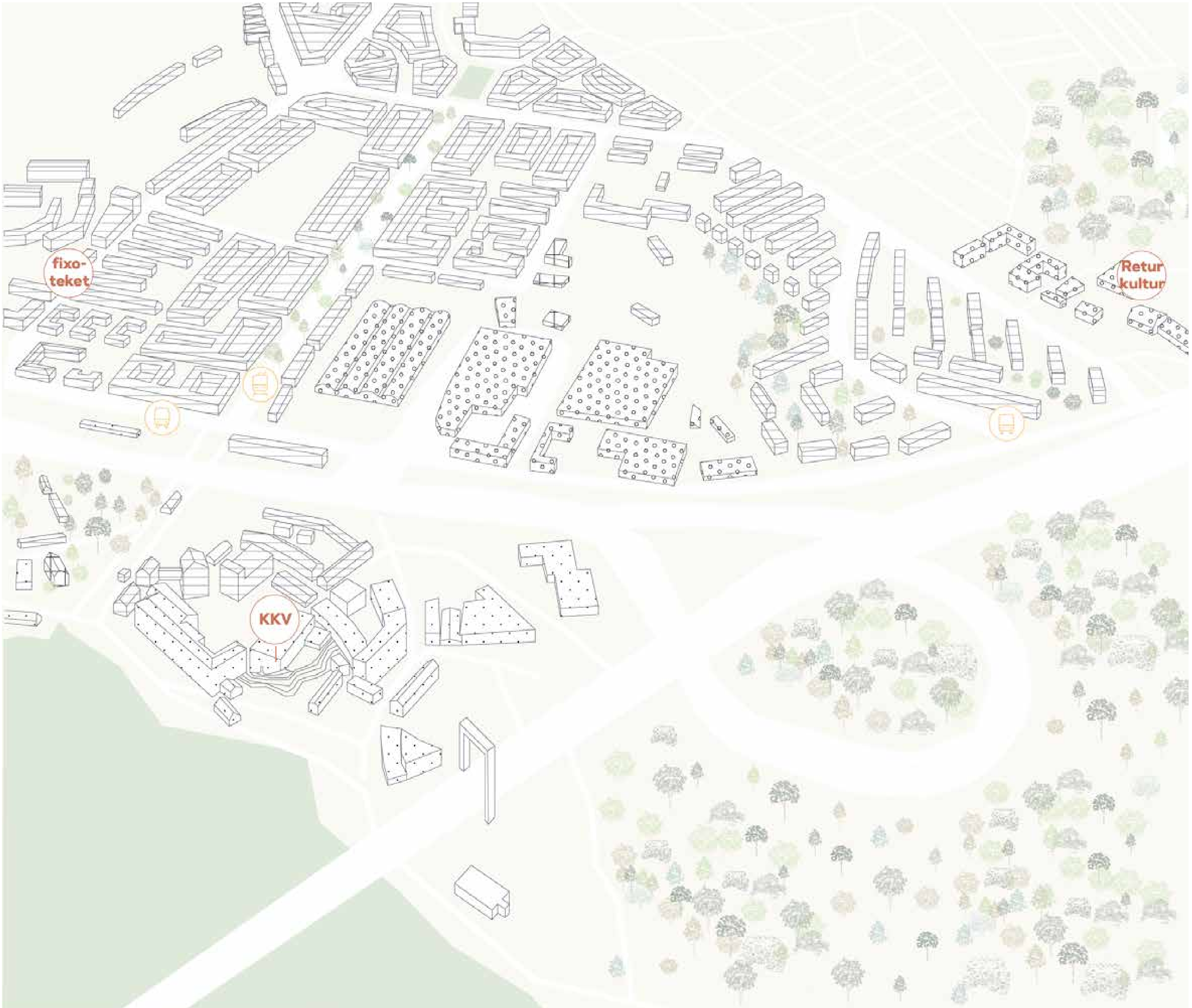
In Case Lab, which falls under the fabrication typology, fabrication and circulation are the main functions as well. The significantly higher proportion of circulation space in case lab can be explained by the fact that the lab is part of a larger set of rooms in the Chalmer electrical engineering building.

Makerspaces in Gothenburg



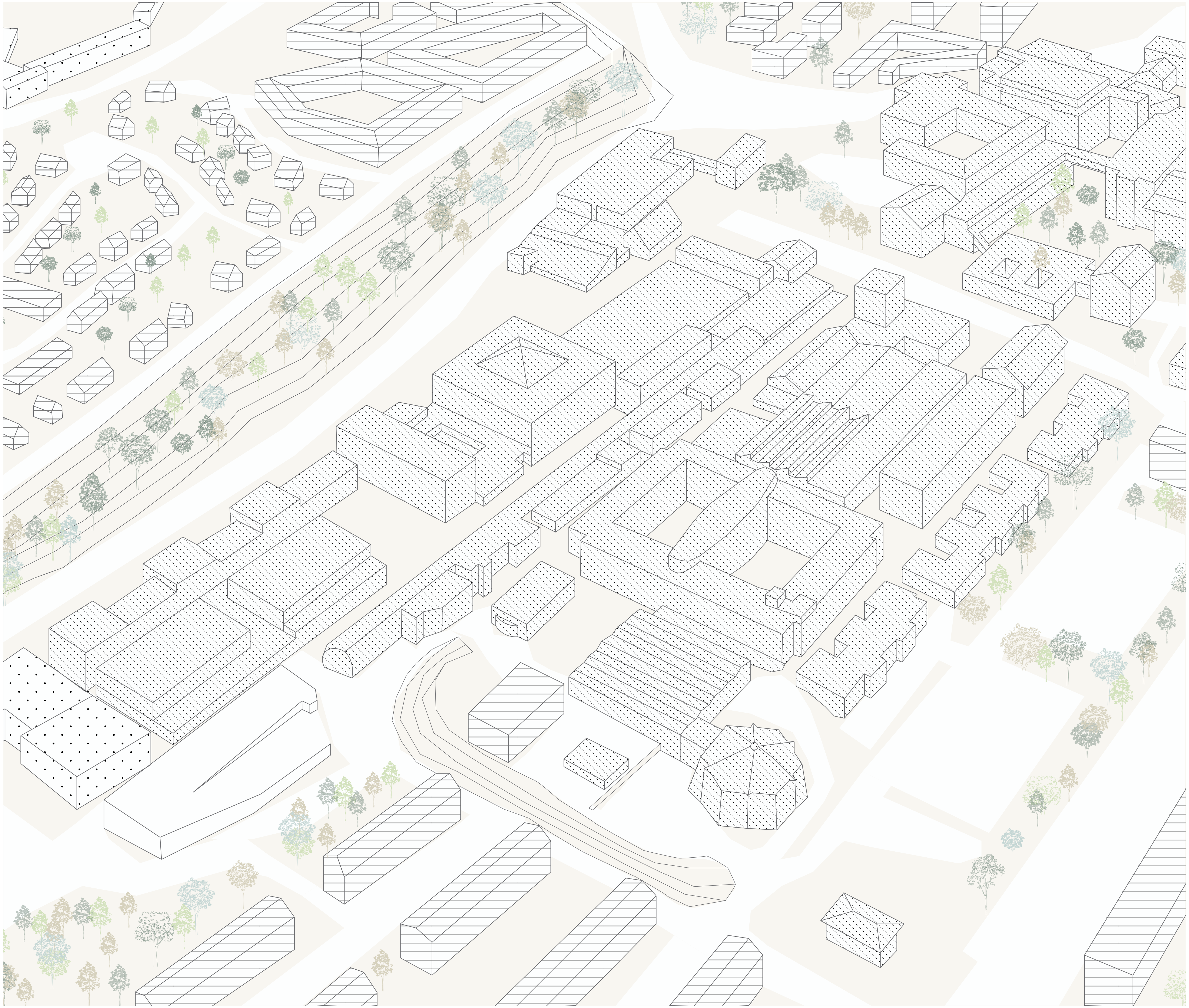
HAMMARKULLEN FIXOTEKET URBAN TEXTURE

Makerspaces in Gothenburg



KKV URBAN TEXTURE

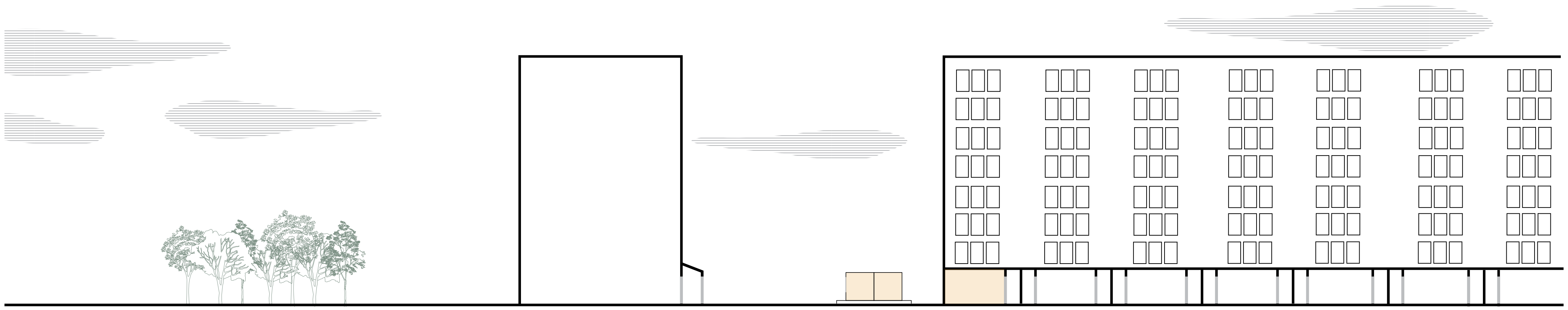
Makerspaces in Gothenburg

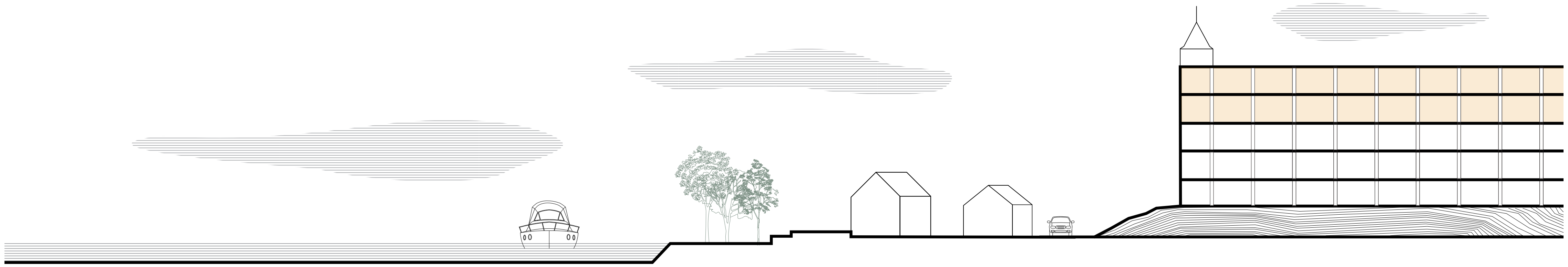


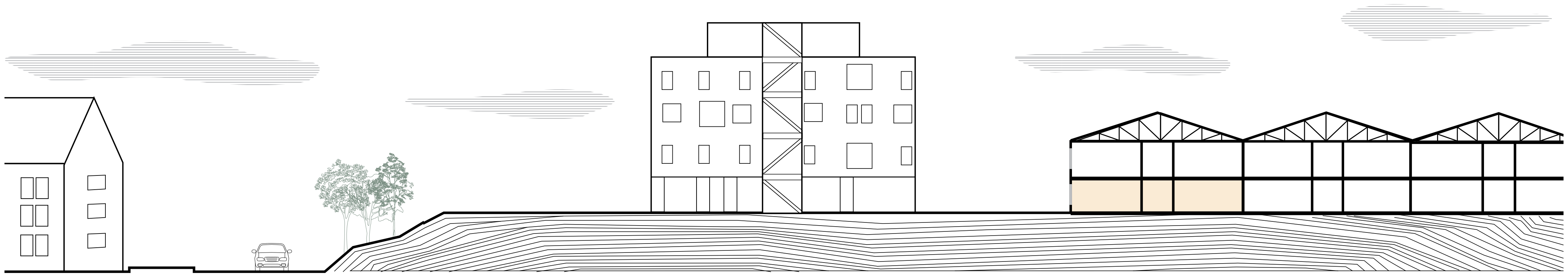
CASE LAB URBAN TEXTURE

Makerspaces in Gothenburg

RELATIONSHIP TO STREET







SYSTEM OF CIRCULAR MAKERSPACES

This chapter proposes a framework for understanding makerspaces in relation to the urban street network, required resources, and the circular economy, based on which four steps to planning for makerspaces are derived.

System of circular makerspaces

Global Centre

Local Centre

Production **Consumption**

Distribute Fabricate Make Repair Reuse

Low influence on location **High influence on location**

Materials Networks Knowledge Capital

THE NEED FOR A MAKER SYSTEM

Analysing where current makerpsaces are located has shed some light on their relationship to the street network, to the resources they depend on and in relation to each other. What is even more clear, however, is that these relationships are not consistently applied across all the spaces and amongst all areas of the city. It may seem redundant to systematise these informal spaces which are so tied to the particular qualities of the communities that run them but if we are to transition to a circular economy, we need to establish more formal and systematic relationships between spaces of local consumption and production. In addition to making the knowledge and facilities for circular practices more available to those who live in all areas of Gothenburg, a systematic spatial relationship between the different maker typologies would help makerspaces become more circular by allowing them to gain reliable access to second hand materials as well as direct used materials to other spaces that need them.

SPECTRUM OF CENTRALITY

The five maker typologies are similar in their basic function as spaces for repair, reuse, and redesign but differ slightly in terms of materials, tools, members, networks, scale and the circular practices they support. These differences are largely determined by whether they focus on production-centred activities or consumption-centred activities. However, since makerspaces are informal community-based spaces, they cannot be neatly categorized into the two groups. It is more accurate to understand the spaces on a spectrum with production activities on one end and consumption activities on the other.

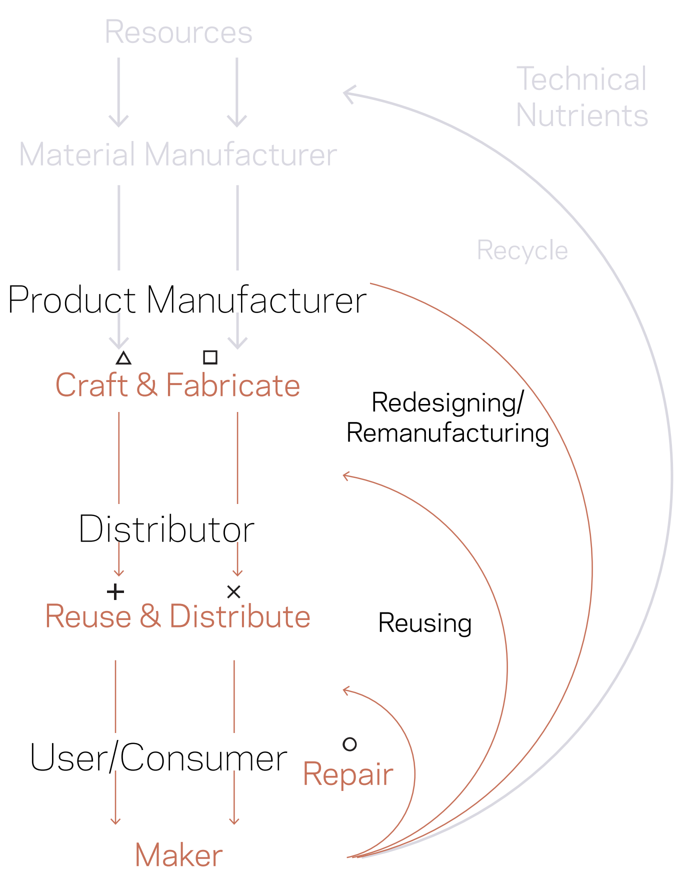
The conceptual proximities of the maker typologies when placed on the spectrum of production and consumption related activities is parallel to the spatial proximities they can be arranged in. This is because the level of skill required to participate in these spaces is directly related to the resources they depend on which are in turn closely linked to the centrality of streets in the urban network. In addition to Co-location of production activities which used similar resources is a trait of early cities. For example, metal smiths performing similar but complementary tasks may have been located near a canal to access heavy raw materials and fuel (Hill, Adrian V ed. 2020).

'Fabricate' spaces which are next on the spectrum stand to benefit the most from a closer proximity to 'Distribute' 'spaces since they deal with standardised materials like 3D printing filament or plywood and already coordinate amongst members to bulk order materials. Being strategically located in relation to warehouses where second hand materials are collected and sorted means that they would get access to used materials in bulk which is one of the main reasons it is hard to work with reused material in more standardised operations. On the other hand, locating fabricate spaces close to repair spaces is not beneficial since they do not share the same resources or similar level of skills.

RELATIONSHIP TO RESOURCES

This spectrum helps us to understand whether a particular makerspace should work on a local or global level and what other maker spaces it should be located close to. As mentioned earlier, to function well, makerspaces should also be located strategically in relation to the resources that support their activities. These resources are materials, networks, knowledge and capital. However, not all these resources need to be positioned close to the makerspace. Materials, especially for small scale production, are generally easy to transport throughout a city. On the other hand, capital which determines what sort of facility a particular maker community can access has a huge influence on where the makerspace can be located. At the level of the city, networks are dispersed even those of spaces like Hammarkullen Fixoteket which works on a local level. It can therefore be assumed that the location of a makerspace's networks are not as relevant as the capital available to the space when deciding where to locate the space in the city.

System of circular makerspaces



CIRCULAR SYSTEM

Those who study urban metabolism and industrial ecology conduct extensive studies on the flow of energy and materials in the city. They conduct life cycle assessments which inform us of how much carbon is emitted in the supply chain processes of any given material. Makerspaces engage in circular practices but because they are a largely informal and nascent movement, crucial details like the volume of the materials they use, the type, and the stage of the material life cycle they are in are not available for analysis. Given this severe lack of information that would allow researchers to conduct quantitative analyses, how can urban planners and designers take into account circular economy flows in the context of makerspaces?

The circular economy model essentially recommends loops of material flow between various actors in the supply chain of products. Since the five maker typologies host a range of production and consumption activities they can be considered as agents in the supply chain of products. Craft and Fabricate typologies can be considered product manufacturers since that is the primary activity that they host. The Reuse and Distribute typologies are clearly the distributors. The Repair typology occupies the inner most loop of the supply chain. In this context, the consumer or user becomes the maker.

A flow of materials and people between these maker typologies will help strengthen a culture of keeping materials in a local, consumer level without necessarily needing to distribute to larger, more geographically dispersed industy players. If these spaces are located on streets that have good through movement either vehicular or pedestrian (depending on if it is the flow of people or materials that is desired), we can facilitate circular practices. Attraction betweenness analysis in space syntax will help determine through movement specifically between the various maker typologies.

STEP 1

Identify clusters of where people live

(attraction reach of population)

STEP 2

Identify streets with centrality appropriate to the maker typology

(angular integration on non-motorised or network betweenness on motorised network)

STEP 3

Identify streets with good through movement between maker typologies

(attraction betweenness on non-motorised or motorised network)

STEP 4

Identify resources in selected areas that can support maker typologies

(operation space, knowledge hubs, social networks)

STEP 5

Apply spatial strategies to support effective location

(levels of location, area or building)

METHOD OF APPLYING SYSTEMATIC UNDERSTANDING

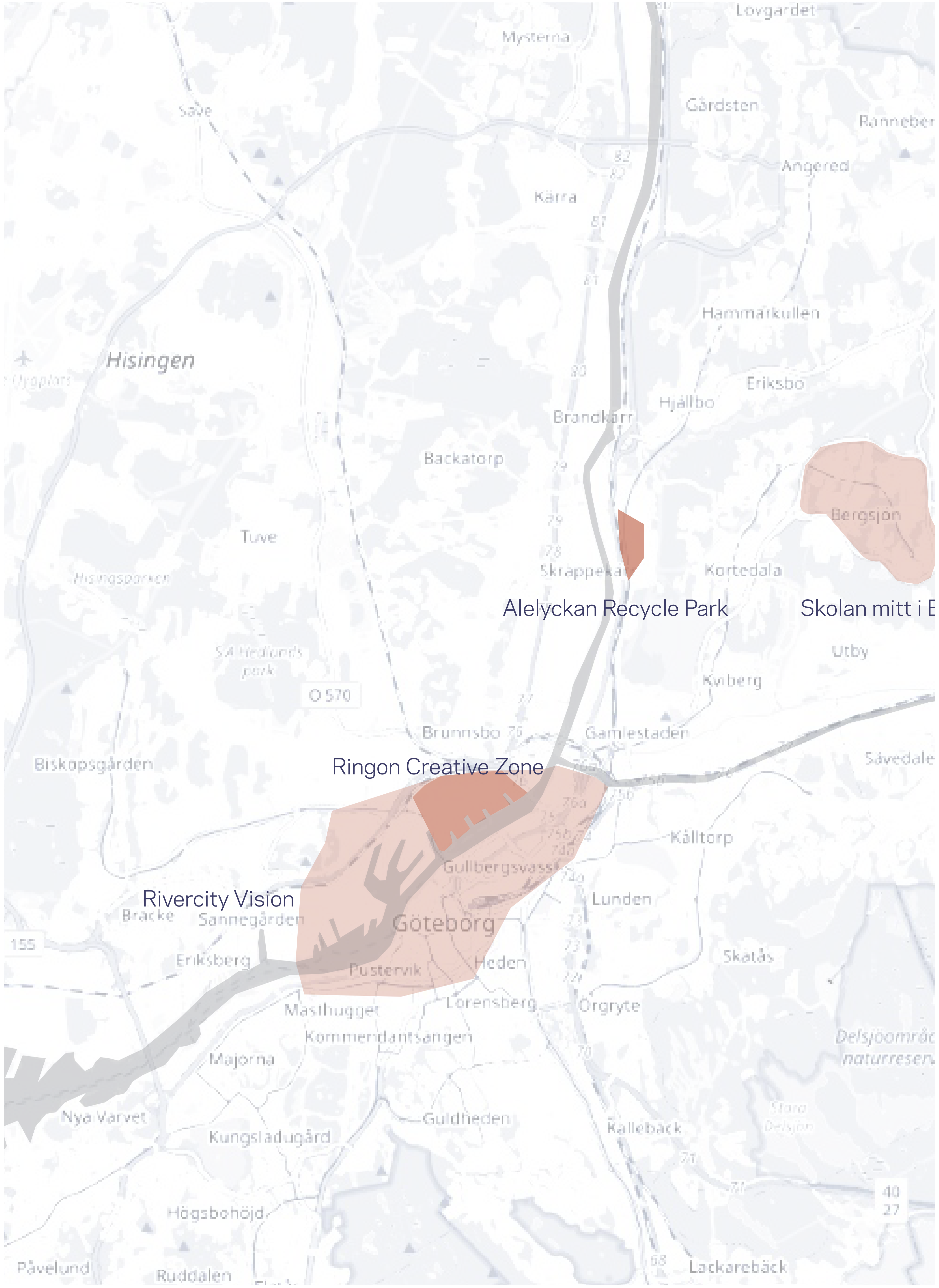
Based on the systematic understanding of spatial relationships between maker typologies, the street network, resources they need and their relationship to each other, a five step process of identifying effective locations for makerspaces are outlined.

Ideally, a makerspace should be in a location that fulfills the requirements in the first four steps. Actually locating them in such places can be a great challenge since makerspaces are niche spaces that do not have many resources or power. The spatial strategies proposed in the next chapter can both help compensate for the shortcomings of a less than ideal location as well as supoort an effective location.

SPATIAL STRATEGIES

This chapter delves into the spatial strategies that can strengthen circular practices in makerspaces at the level of location, urban area, and building interface. They enhance the benefits created by an effective location on the urban street network.

Spatial strategies



URBAN DEVELOPMENT PLANS

The spatial interventions can be implemented by two types of stakeholders -larger institutions who wish to support the maker movement or grassroots initiatives running maker communities. This distinction is made because the resources and power available to the respective stakeholders differs greatly, affecting to what extent they can impact the built environment

Municipilaties and other institutions are abe to operate at a larger scale, providing necessary infrastructure to support circular practices. However, these changes usually take time to be implemented. Community organisers of makerspaces on the other hand, do not have the power to enact large-scale spatial changes.

Therefore, it would be useful to both types of stakeholders to identify relevant urban development plans that align with their spatial needs as a way of either expediting the implementation process in the case of larger organisations or getting support for their particular needs in the case of community organisers. Below are some urban development plans that could potentially support circularity in Makerspaces.

RIVER CITY VISION

- Connect the city across the river
- Create a city at eye level
- Start with temporary measures
- Create a living river space. Create meeting spaces along the river
- Make it easy to live sustainable. Make sustainable systems visible

RINGON CREATIVE ZONE

- Develop into a mix of small industry and various creative businesses

ALELYCKAN RECYCLE PARK

- Reuse, Recyle Park/Programme with redesign initiatives
- Interesting Initiative: Recycle Barge, a boat that collects recyle items at strategic points along the river.

Spatial strategies

LEVEL	city location		area		building
PRINCIPLES	centrality	proximity	accessibility	visibility	functionality
VARIABLES	global	resources	motorway		production activities
	local	other maker typologies	public transport		consumption activities
TIME FRAME	temporary	short term		long term	
STAKEHOLDER		citizens		institutions	

The following strategies have been identified based on those proposed by reference projects. Foundries of the Future, DIY Initiative, and Pop-Machina.

These general strategies have been modified based on the opportunities and weaknesses provided by the physical, political and social context of Gothenburg.

Using existing production or community spaces as a proxy for operation depending on where the makerspace falls on the production-consumption spectrum (e.g. Bergsjöskolan after hours)

Adapting typically vacant spaces in a city like carparks and buildings slated for future developments with the use of temporary structures (e.g. svarte mosse car park and Backa Folkethus)

Designing urban wayfinding interventions to improve accessibility and visibility (KKV link path to ferry and roda sten)

Adding shared facilities in streets with good through movement between a particular cluster of maker typologies (e.g. storage facility at chalmers)

working with landscapes

Activating building interfaces (facade and entrance)

Adding hybrid functions not usually found in the maker typology

Making use of courtyards as centres of communal making.

Spatial strategies

Level:
City
Strategy:
Using proxy spaces
Principles achieved:
Centrality, Proximity
Problem addressed:
Insufficient capital
Stakeholder:
Citizens
Timeframe:
Temporary

Using existing production or community spaces as a proxy for operation depending on where the makerspace falls on the production-consumption spectrum. This strategy has been mentioned in Pop-Machina as a potential opportunity for location. The principles or variables achieved are centrality and proximity. The strategy applies to both production side activities as well as consumption oriented activities. As mentioned several times in the thesis, makerspaces are generally not profitable spaces. Sustained operation of these spaces requires a certain resourcefulness and strategic decision making, not least in procuring a suitable space to function in. This is especially the case in Gothenburg, where access to strategic locations is becoming increasingly unaffordable. For instance, 'Collaboratory' is a maker community that used to have access to a physical space in Lindholmen but had to let go of their space due to rent and become a more virtual community. This strategy is especially useful for citizens or informal maker communities who wish to start a makerspace since they do not usually have the resources to run a full operation independently. The use of proxy spaces is often a temporary strategy whereby the maker community operates in or repurposes a particular space for certain hours of a day or week. One example is the lindholmen makerspace which operates from 5pm onwards in the SII lab at Patricia building.

Level:
City
Strategy:
Appropriating vacant spaces
Principles achieved:
Centrality, Proximity
Problem addressed:
Insufficient capital
Stakeholder:
Citizens, Institutions
Timeframe:
Short-term
Example:

This strategy refers to appropriating spaces that are typically vacant or suited to flexible use in Gothenburg, such as parking spaces, old industrial spaces, courtyards, ground floor rooms of million homes areas and buildings slated for development in the long run but temporarily available like Backa Folkethus. Like the strategy of using proxies, appropriating vacant spaces allows makerspaces to access strategic locations without having the necessary resources to permanently locate there. Again, this addresses the same problem of makers not having the right resources to access locations that they really need to function well.The use of vacant space usually needs to be arranged through a partnership between institutions and informal maker communities. This is a short-term intervention that could later become permanent.

Level:
Area
Strategy:
Wayfinding intervention
Principles achieved:
Accessibility
Problem addressed:
Lack of navigational cues
Stakeholder:
Institutions
Timeframe:
Long-term

Strategy: Wayfinding Intervention (How)
Principles/Variables Achieved: Accessibility(What)
This strategy makes the space easier to navigate to.
Problem addressed: Despite being located close to the right amenities, makerspaces may still seem hidden in the urban fabric if there is no easy way to navigate to the space. Barriers in the area may include an unclear path for pedestrians with too many options, a lack of cultural markers, especially at eye level. This is intervention has to be undertaken by the municipality since it covers an area outside of individual spaces. Since these changes also create urban regeneration in the area, they can be a long term feature.

Level:
Area
Strategy:
Collection places
Principles achieved:
Visibility, Functionality
Problem addressed:
Hidden circular process, lack of storage
Stakeholder:
Institutions
Timeframe:
Long-term

This strategy involves creating more distributed places for material collection that are not just points to dispose of material but also a place to stay and procure material and interact with community members.The principles achieved are visibility and functionality.By reducing and making the collection points into places, larger city-wide collection and sorting processes become even more localised, efficient, and visible. This sort of distributed process also benefits from being connected to larger city-wide collection processes and therefore should be implemented by institutions. This can be a long term implementation.

Level:
Area
Strategy:
Shared functions (de-centralised functions)
Principles achieved:
Functionality, Proximity
Problem addressed:
Lack of suitable work space,
lack of common space between makers
Stakeholder:
Citizens
Timeframe:
Long-term

This strategy involves using the periphery of the building to add functions to the existing makerspace to allow for hybridity when the space cannot be located close to other maker typologies. Makerspaces benefit from being clustered. For instance, it was noted in Pop-Machina's studies of pilot cities that repair and make go together and that fabricate and distribute go together. Allows people to engage across skill levels and also in the specific case of hybrid 'distribute' spaces, helps make the circular practice of redesigning more efficient. This can be implemented by organisers of existing spaces as it uses with support from institutions if necessary. This can be a long-term intervention

Level:
Building
Strategy:
Display cabinets
Principles achieved:
Visibility
Problem addressed:
lack of large facade openings
Stakeholder:
Citizens
Timeframe:
Long-term

Adding structures that either show or carefully frame processes and artefacts of making pique the curiosity of pedestrians. E.g. Hammarkullen fixoteket.The act of making has been pushed out of sight in cities of the industrial age. Products are of course always on display but usually in commercial establishments and not in community spaces. This quick, small scale intervention is ideal for informal community groups.This can be a long term addition to makerspaces and it does not require structural changes

Level:
Building
Strategy:
Extension (adding functions)
Principles/Variables Achieved:
Functionality, Proximity
Problem addressed:
lack of suitable location
Stakeholder:
Citizens, Institutions
Timeframe:
Long-term

This strategy involves sharing particular functions that clusters of makerspaces require but do not have individual space or manpower to run can be shared amongst them. This achieves the principle of functionality. Individual makerspaces can be too small to host certain functions like educational spaces or storage spaces that are especially useful in promoting circular practices. These can be shared amongst existing clusters of makerspaces and can be a long term implementation.

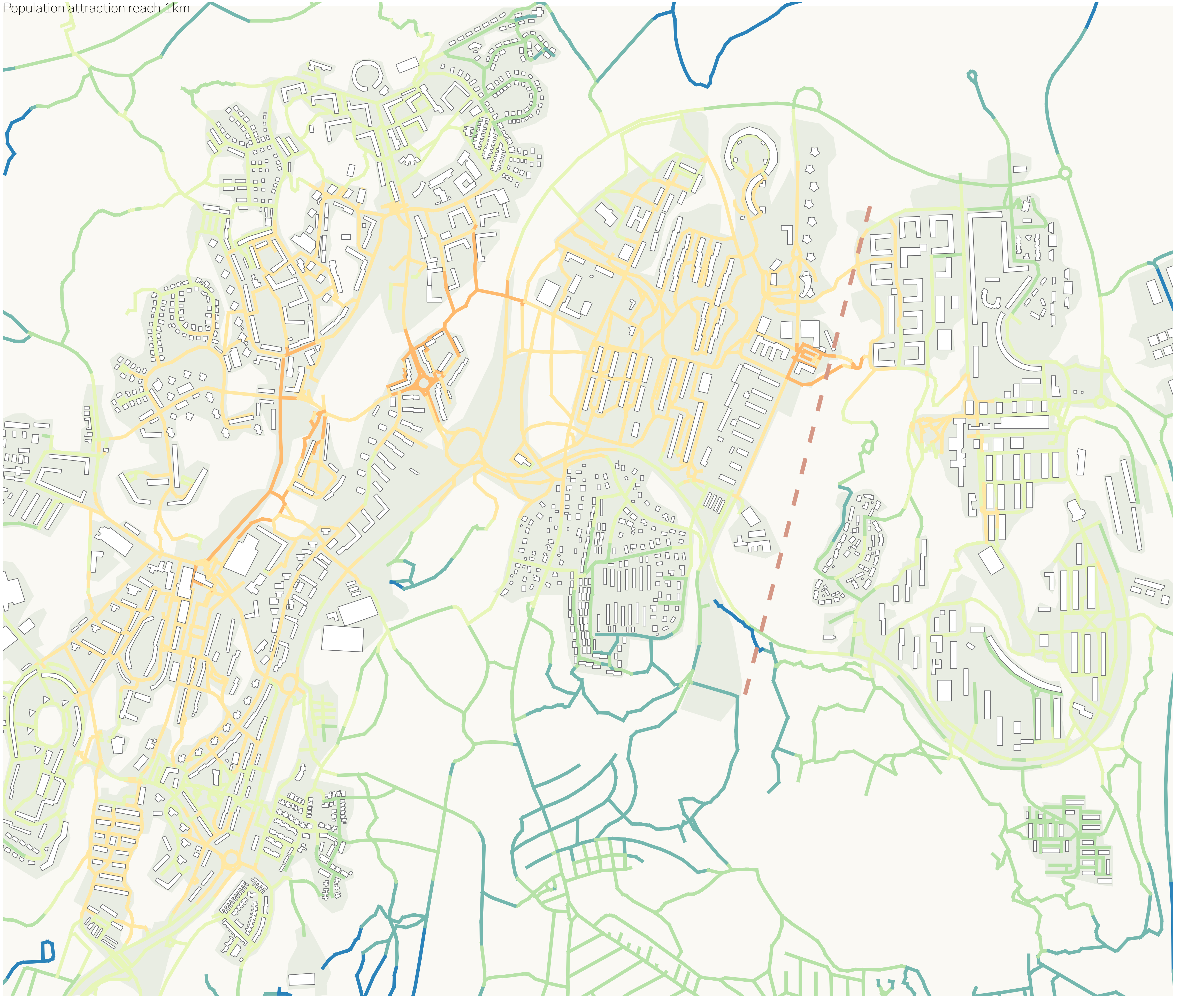
Level:
Building
Strategy:
Transition zones between production and consumption
Principles achieved:
Functionality
Problem addressed:
appropriate type of operational space
Stakeholder:
Citizens
Timeframe:
Long-term

This strategy is applied at the building level. It involves providing areas of leisure or partitions between street or more consumer friendly uses. This strategy helps the space function well and engage the right people for the appropriate level of activity in addition to providing chance for these flows to mix. Visibility of makerspaces is desirable. However, there are two issues that may rise from this. Making expensive machinery too accessible may cause a potential risk of threat. Furthermore, the act of making can often be a messy process, especially in less standardised operations. This may not have the desired effect of inviting people to engage with the space. This can be undertaken by makerspace organisers who have the capacity to make quick changes to their interior spaces. Longterm implementation is possible for this strategy.

Spatial strategies

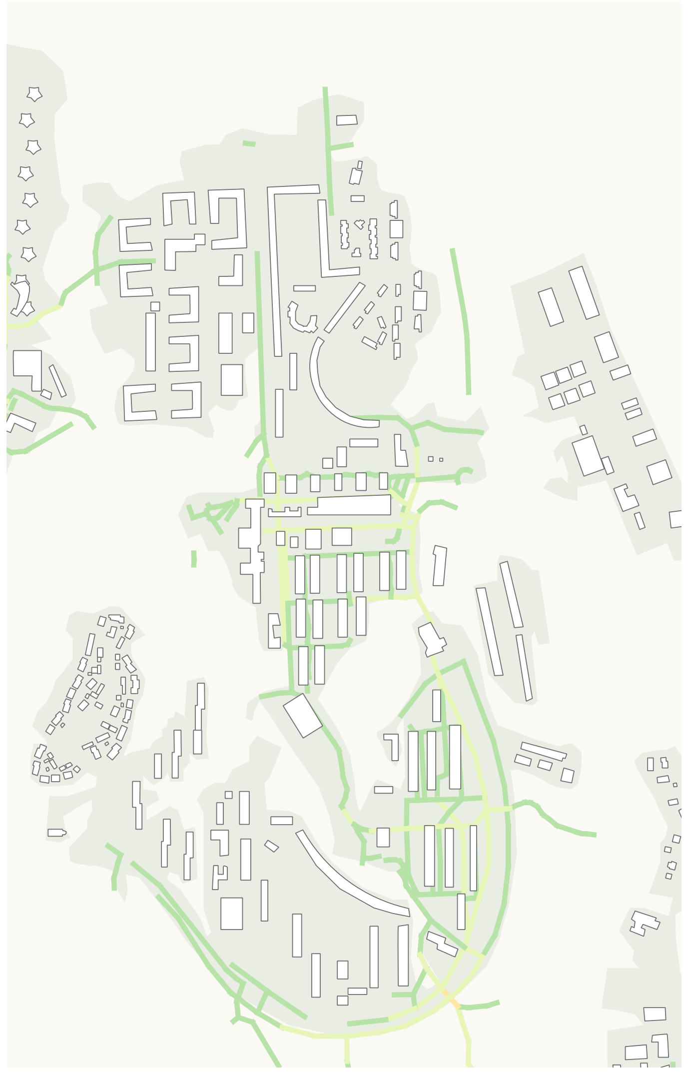
A NEW MAKER SYSTEM FOR EAST BERGSJÖN

Population attraction reach 1km



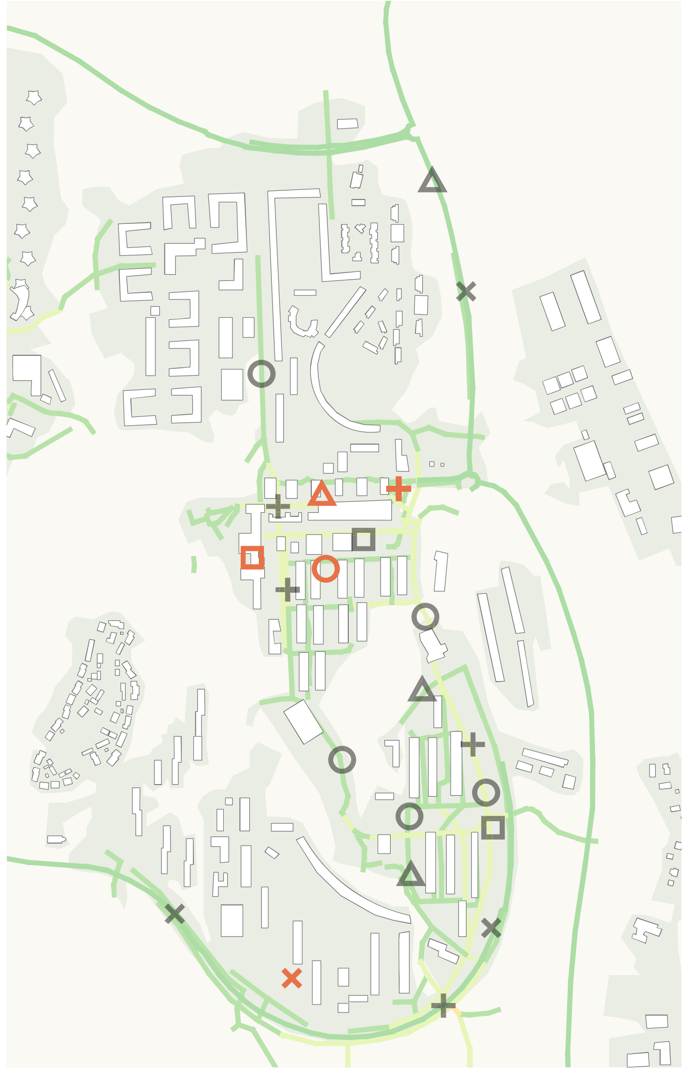
Spatial strategies

GLOBALLY INTEGRATED STREETS



LOCALLY INTEGRATED STREETS

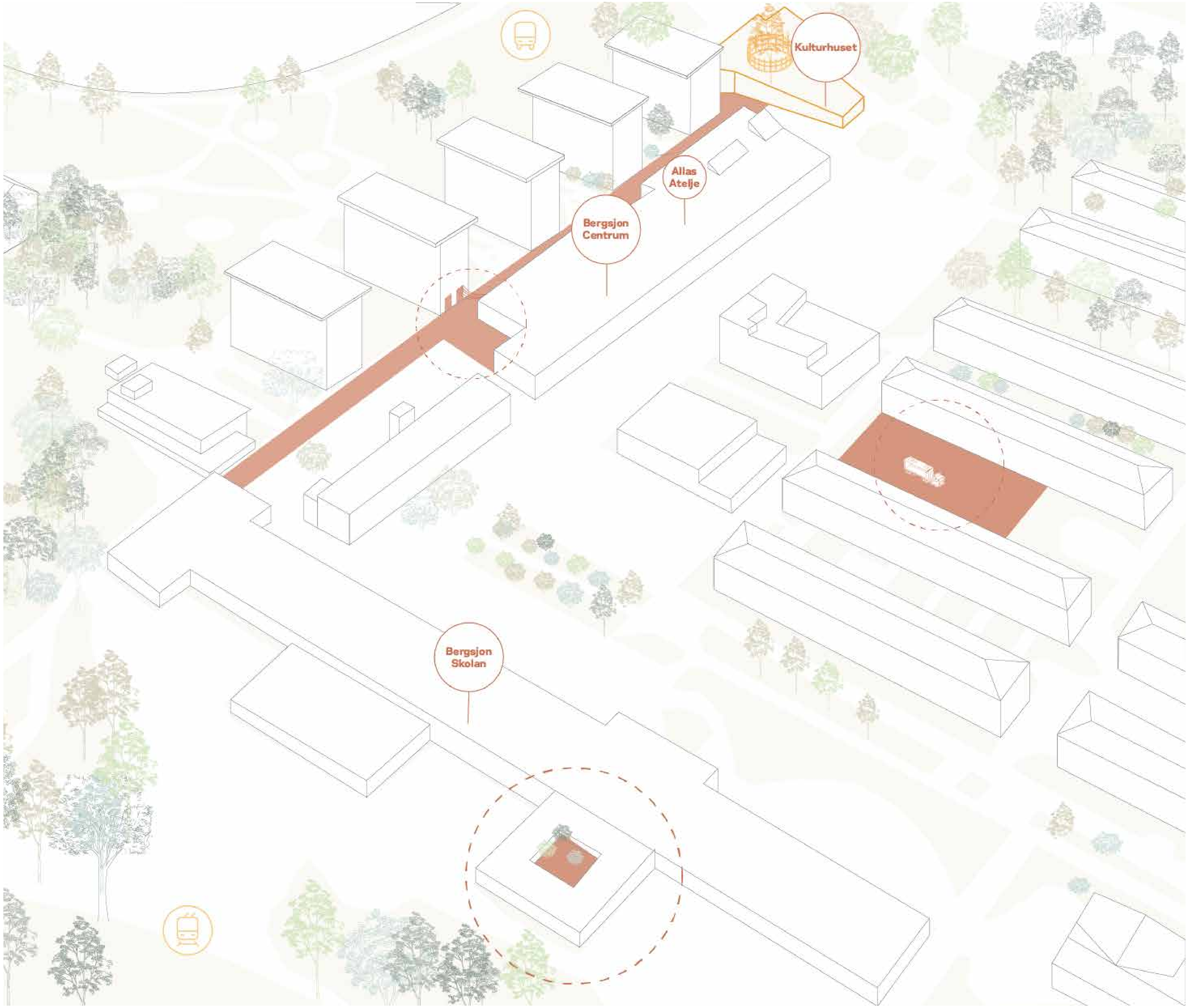
POSSIBLE LOCATIONS



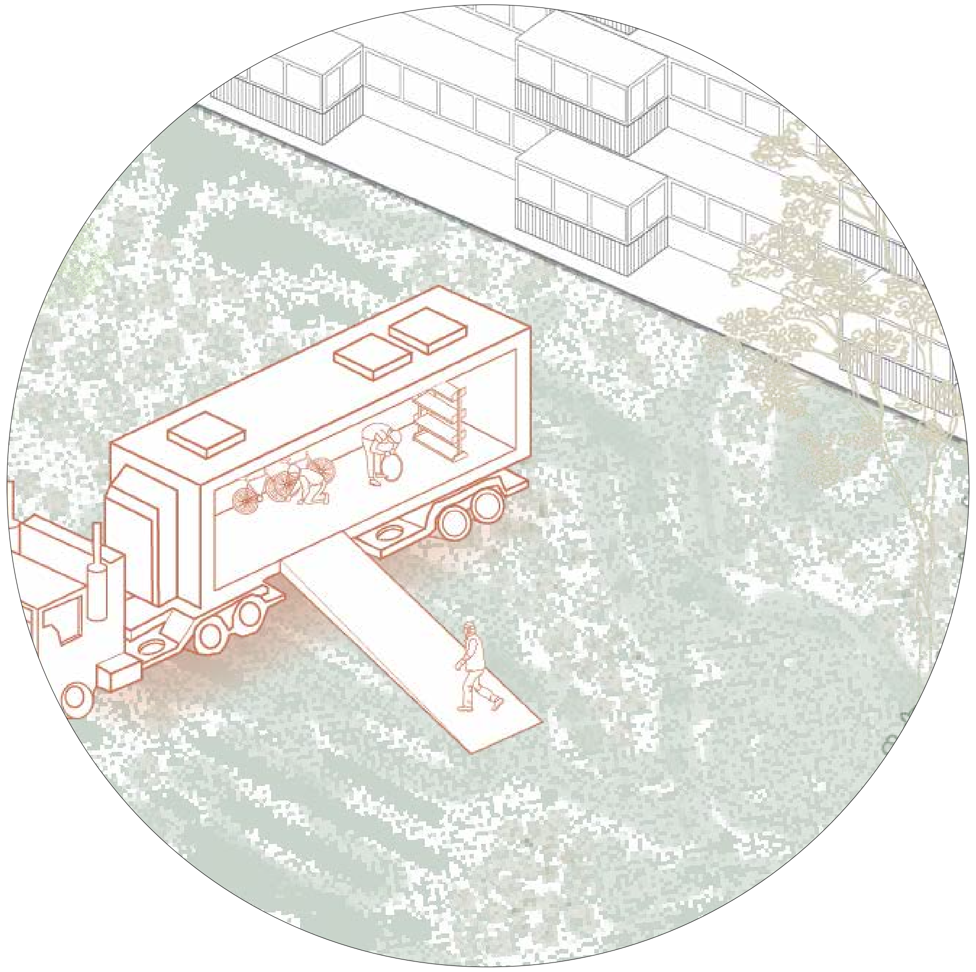
CHOSEN LOCATIONS BASED ON RESOURCES

Spatial strategies

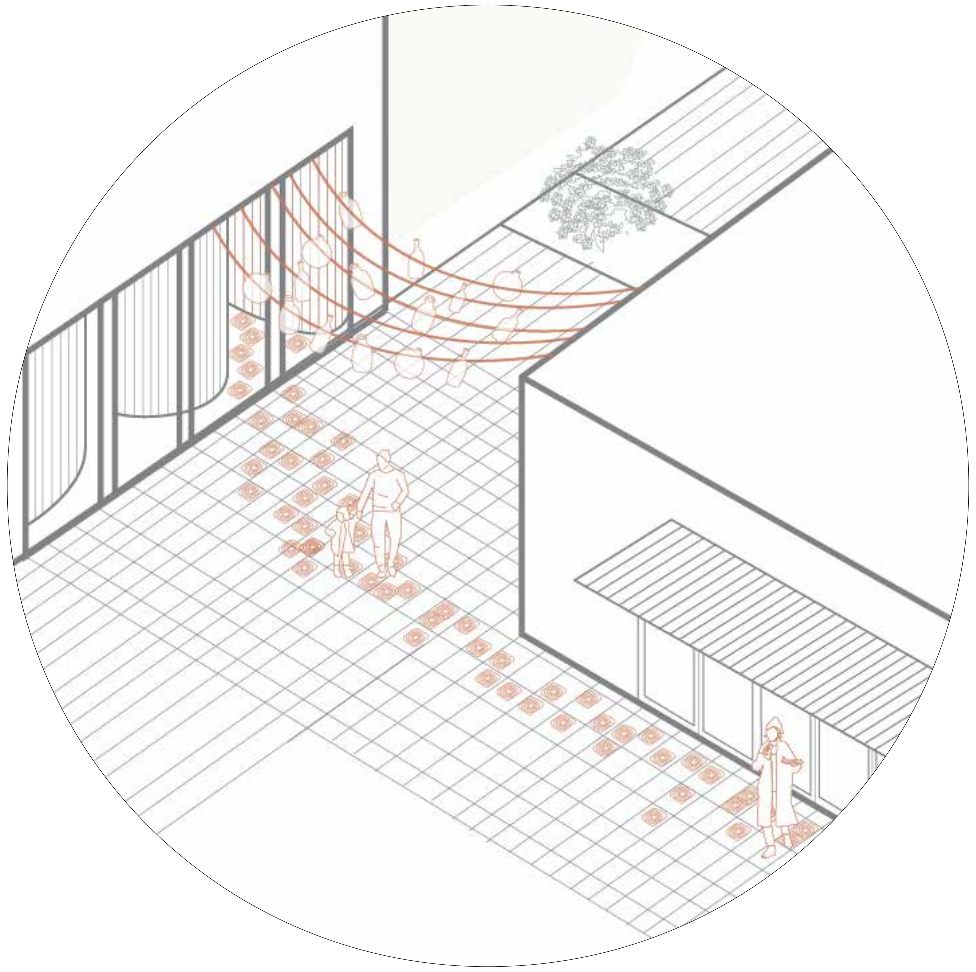
DESIGN INTERVENTIONS TO SUPPORT LOCATION



Spatial strategies

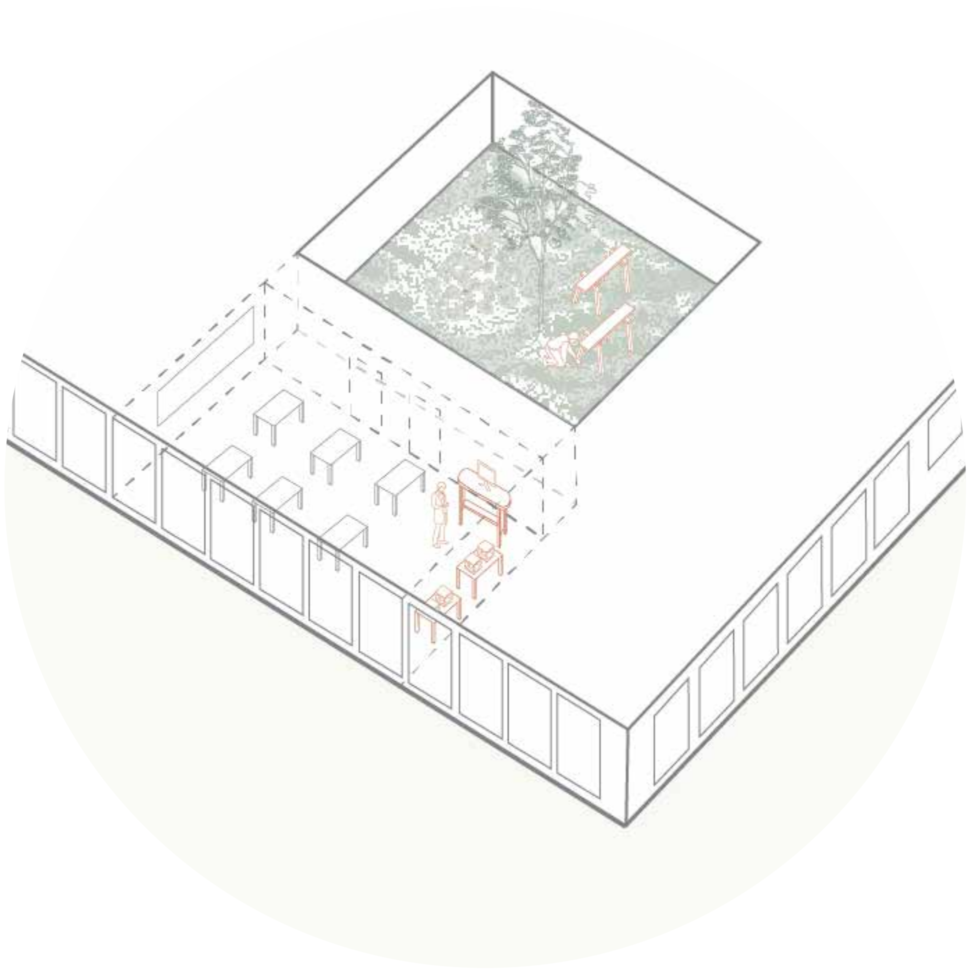


Level:
City
Strategy:
Appropriating vacant spaces
Principles achieved:
Centrality, Proximity
Problem addressed:
Insufficient capital
Stakeholder:
Citizens, Institutions
Timeframe:
Short-term



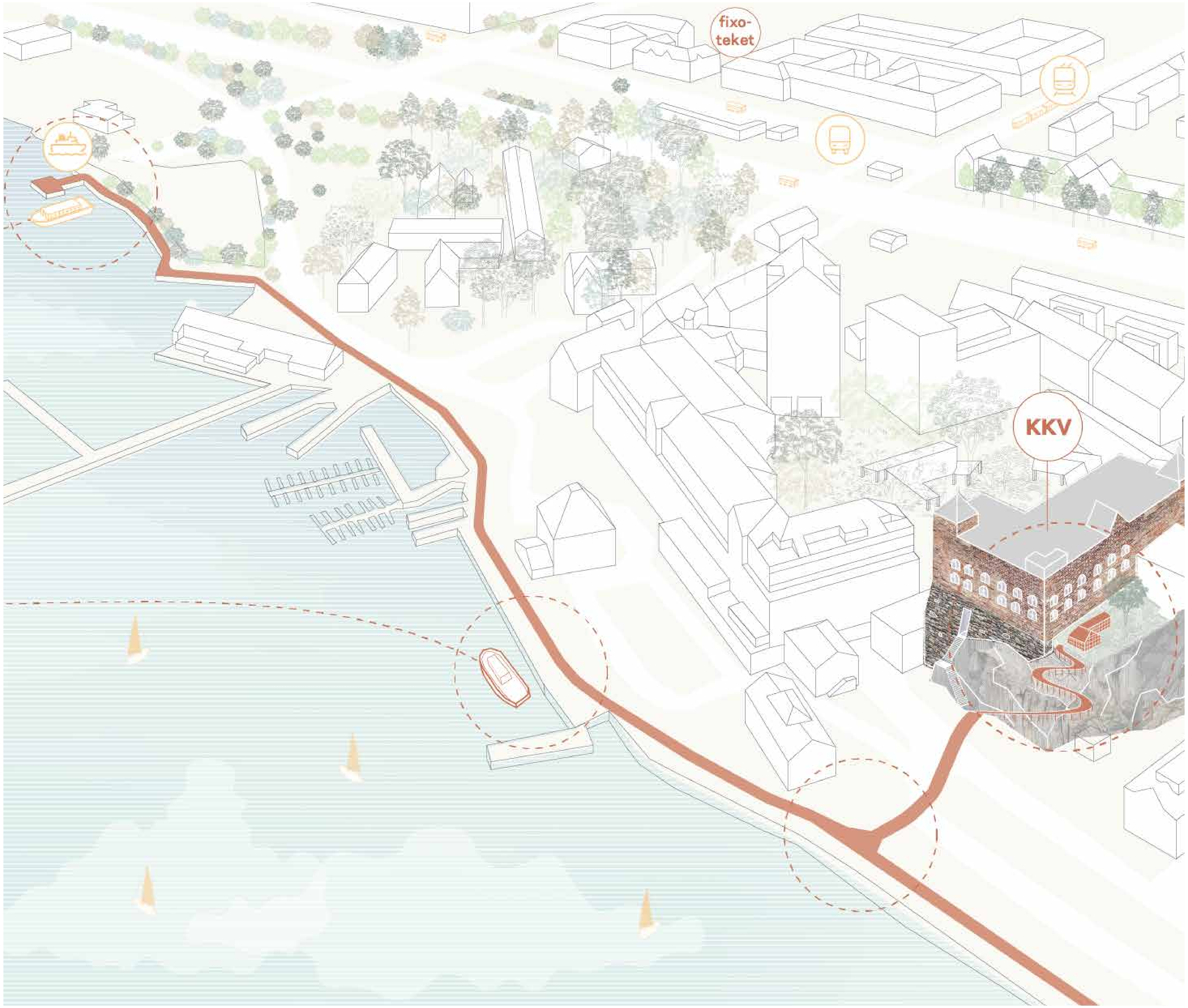
Level:
Area
Strategy:
Wayfinding intervention
Principles achieved:
Accessibility
Problem addressed:
Lack of navigational cues
Stakeholder:
Institutions
Timeframe:
Long-term

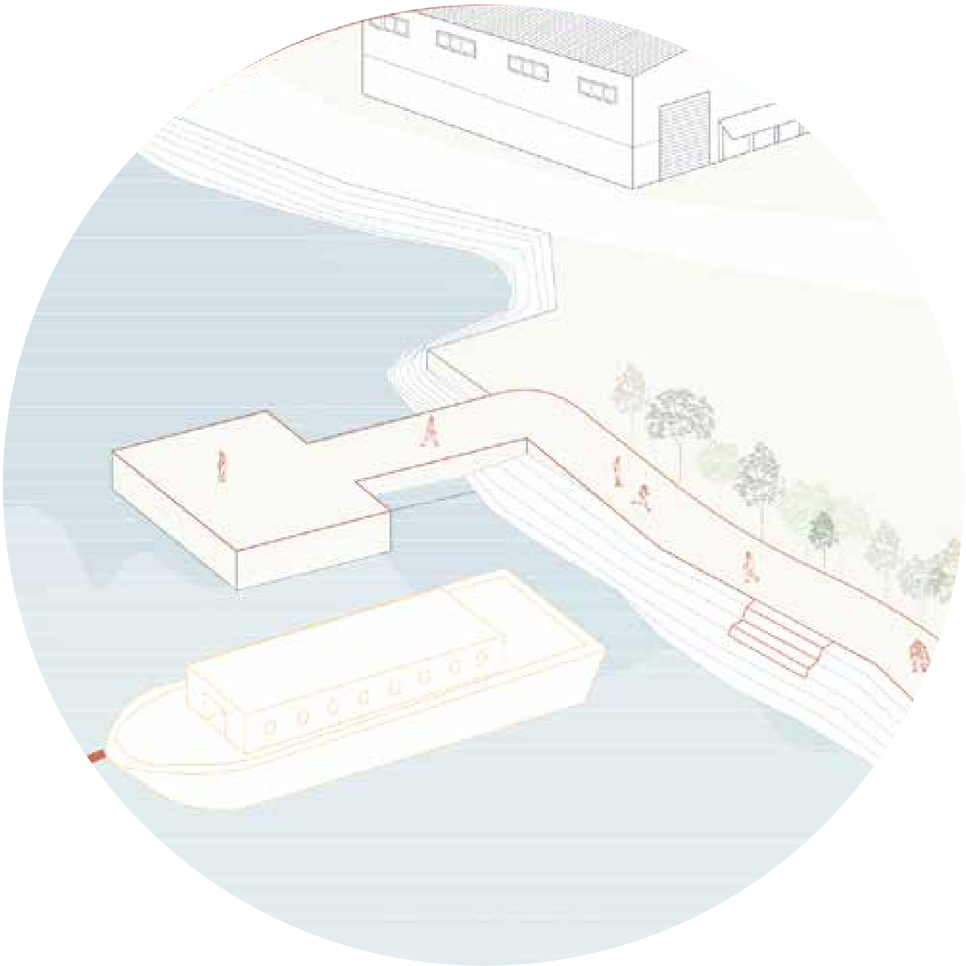
Level:
Building
Strategy:
Display cabinets
Principles achieved:
Visibility
Problem addressed:
lack of large facade openings
Stakeholder:
Citizens
Timeframe:
Long-term



Level:
City
Strategy:
Using proxy spaces
Principles achieved:
Centrality, Proximity
Problem addressed:
Insufficient capital
Stakeholder:
Citizens
Timeframe:
Temporary

Level:
Building
Strategy:
Transition zones between production and consumption
Principles achieved:
Functionality
Problem addressed:
appropriate type of operational space
Stakeholder:
Citizens
Timeframe:
Long-term


fixo-
teket
KKV



Level:
Area
Strategy:
Shared functions (decentralised functions)
Principles achieved:
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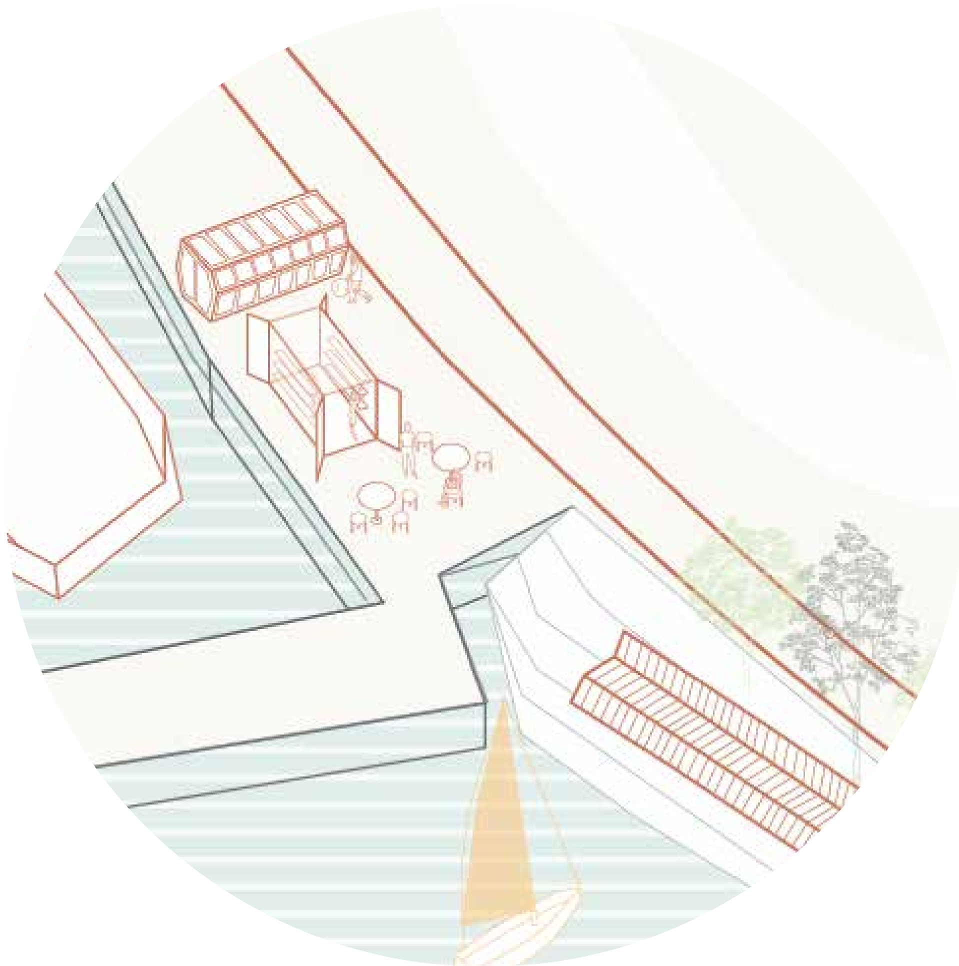
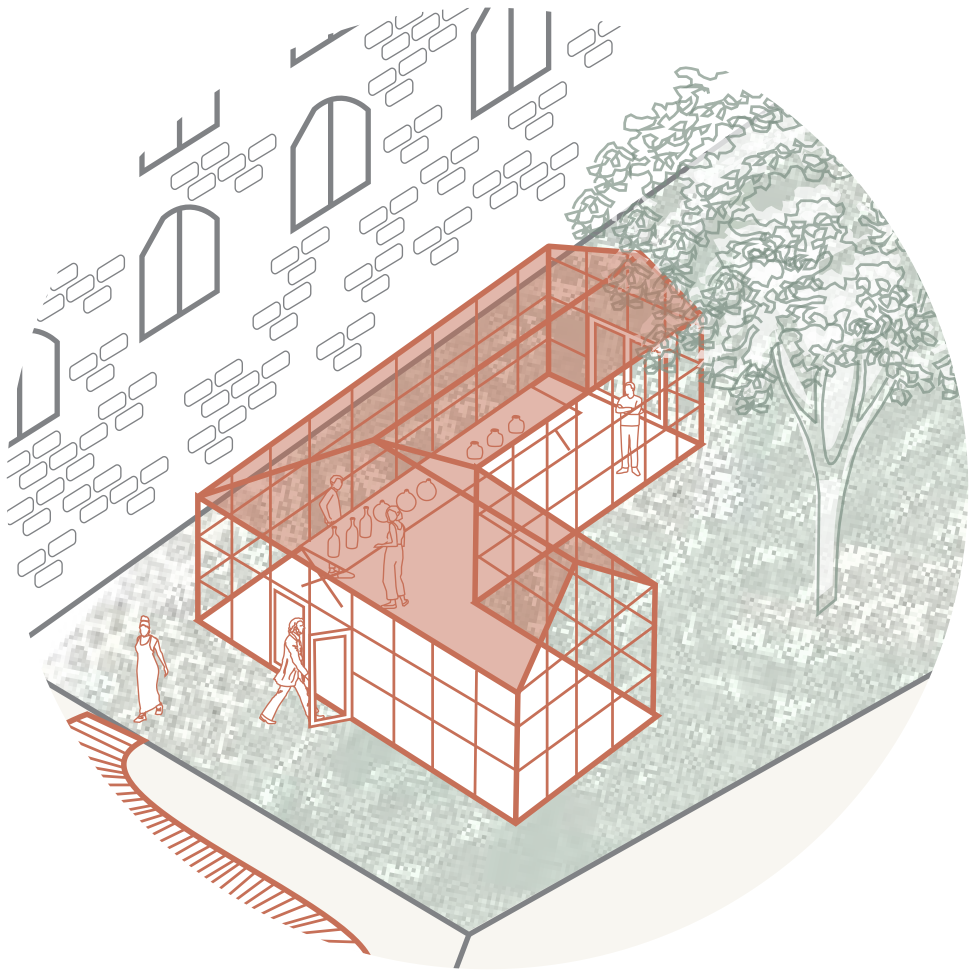
Problem addressed:
Lack of suitable work space, lack of common space between makers
Stakeholder:
Citizens
Timeframe:
Long-term

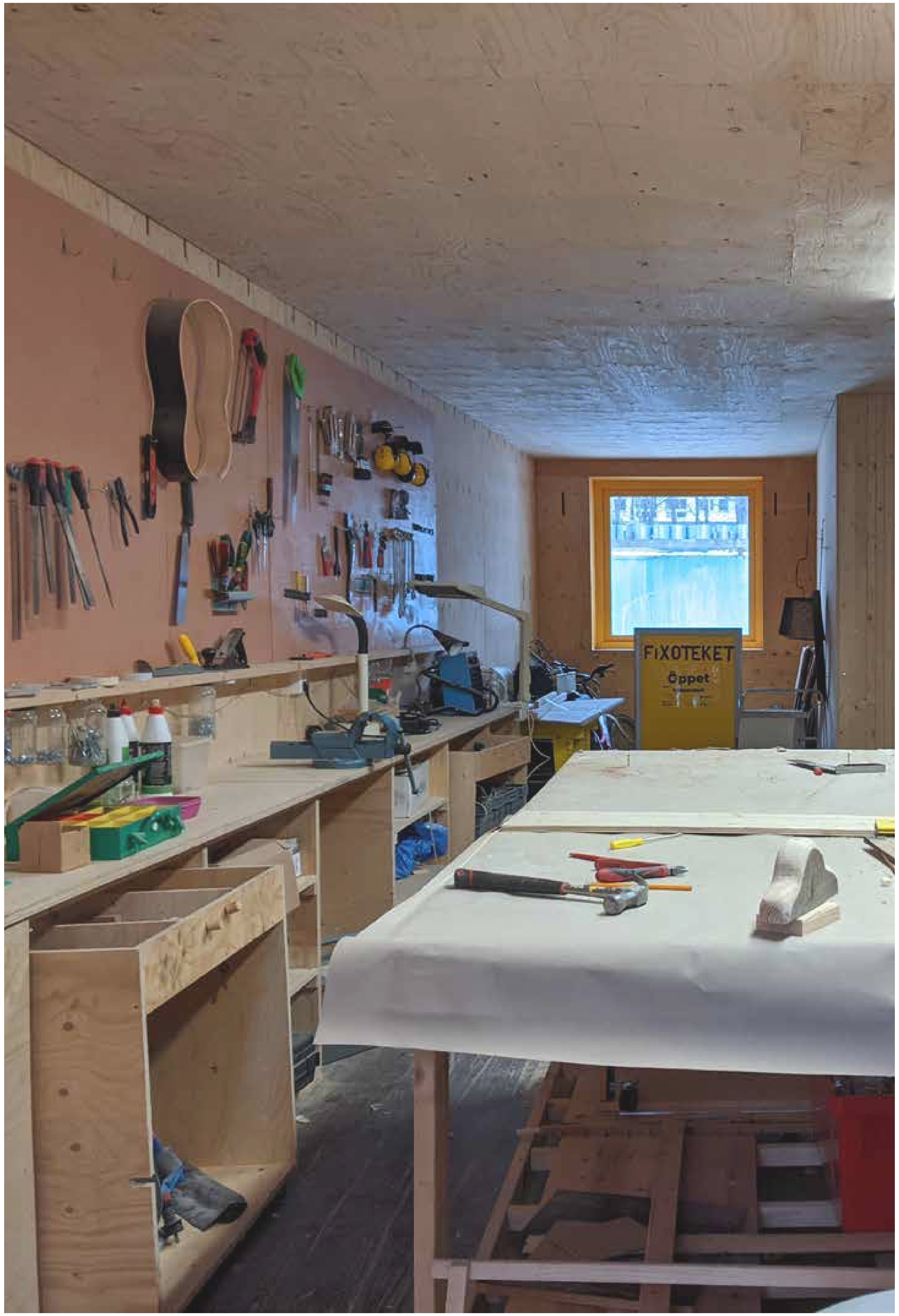


Level:
Area
Strategy:
Collection places
Principles achieved:
Visibility, Functionality
Problem addressed:
Hidden circular process, lack of storage
Stakeholder:
Institutions
Timeframe:
Long-term



Level:
Building
Strategy:
Extension (adding functions)
Principles/Variables Achieved:
Functionality, Proximity
Problem addressed:
lack of suitable location
Stakeholder:
Citizens, Institutions
Timeframe:
Long-term

Level:
Building
Strategy:
Display cabinets
Principles achieved:
Visibility
Problem addressed:
lack of large facade openings
Stakeholder:
Citizens
Timeframe:
Long-term



CONCLUSION

The concluding chapter provides a quick recap of how makerspaces can be located and designed in a manner respectful to their spatial needs and reflects upon the points that posed problems in the analytical process.

Conclusion

In summary, To be able to locate makerspaces strategically and design them to support circular practices, we should understand urban space not as isolated or purely local spaces but as agents in a system governed largely by spatial and economic forces. This requires studying their spatial relationship to the entire street network and other spaces in the circular economic system. To understand their relationship to the urban street network, we can use space/place syntax. To understand their relationship to other spaces in the system we should study how they differ in terms of the resources they rely on. To understand their relationship to the circular economic system we should study their relationship to other agents in the loops of repair, reuse, and redesign.

From this study we can identify two basic systems that of to what extent a particular maker typology engages with production or consumption activities and to what extent the resources they rely on, exert influence over their location. These conceptual systems should be tailored to the urban structure of Gothenburg city instead of being geometrically superimposed onto the city. We can break the city into clusters of residential populations that help us identify the boundaries within which the spatial system should be applied. Within each cluster, the local and global centres should be identified. Then within these areas a location that leverages on spatial relationships with resources should be chosen.

design interventions on the building and neighbourhood level like temporary structures which host new functions and wayfinding interventions should be implemented to support a strategic location. This is because a great location only creates potential opportunities for a makerspace to function well. Whether the space functions well, is also affected by localised spatial factors like visibility and accessibility from the street.

REFLECTION

Top-down vs Bottom-up initiatives

The maker movement is generally considered a bottom-up socio-spatial phenomenon that addresses a lack of consumer skills and knowledge about the products we use. Grassroots movements like this can be a good indicator of what a city is lacking in terms of services or facilities. It then almost becomes the duty of government agencies to fill the gaps highlighted by such bottom-up initiatives. Sweden has a long tradition of co-opting such movements and institutionalising them like in the case of hyresgästföreningen or folkuniversitetet which started as informal unions but are now nationwide institutions.

Such strategies of co-opting are beneficial in terms of directing resources and support to citizen needs that were previously not catered to. However, makerspaces offer an interesting opportunity for large scale transition precisely because their informal nature allows them to be ideal test beds for the innovative design strategies, modes of learning and production that need to be developed to transition to a circular economy.

However, the bureaucratic nature of institutions robs the informal initiatives from their experimental nature and their ability to adapt operations quickly in response to changes in society. Urban planning as a process is especially notorious for how slow it is to respond to rapidly changing paradigms which means that changes in the urban built form tend to take years to implement. It is widely accepted by those who work with community-led urban development that it is more effective to collaborate with actors who are already engaged in an initiative than to wait for widespread support to carry it forward (Hamdi, 2004). This is why the spatial strategies proposed rely heavily on existing spaces and existing stakeholders as opposed to being catered to municipalities which have the power to make larger more comprehensive changes but need more time and political will to actually implement those changes to the built environment.

Production versus Consumption spaces in the era of the Circular Economy

Traditionally during the era of the home economy, spaces of production and consumption were not as distinct as they are in the current era of the service or knowledge economy. As Howard Davis identifies in "Working Cities", european cities are very consumption centric. In the era of the circular economy, the lines between production and consumption, producer and consumer become blurred as products or materials are processed in iterative loops. Makerspaces in particular, are an example of how consumption and production could converge. In this thesis, the optimal location for a particular maker typology has been proposed based on an understanding that the spatial needs of a production centred space are diametrically opposed to consumption-focused space. How will this change as we progress further in the transition to the CE? Will production spaces find their way back to high streets as urban manufacturing is embraced? Or will there be districts of production like in ringon? How will the spatial system adapt to this future scenario?

DESCRIPTIVE OR NORMATIVE?

As mentioned in the methodology section, formulating design strategies which are normative based on a descriptive analysis of the current urban situation is a well-established approach in space syntax research. This can be considered a relevant method to understanding makerspaces since current makerspaces have urban and spatial characteristics that already support a certain level of circular practices which is the goal of any normative principle in this thesis.

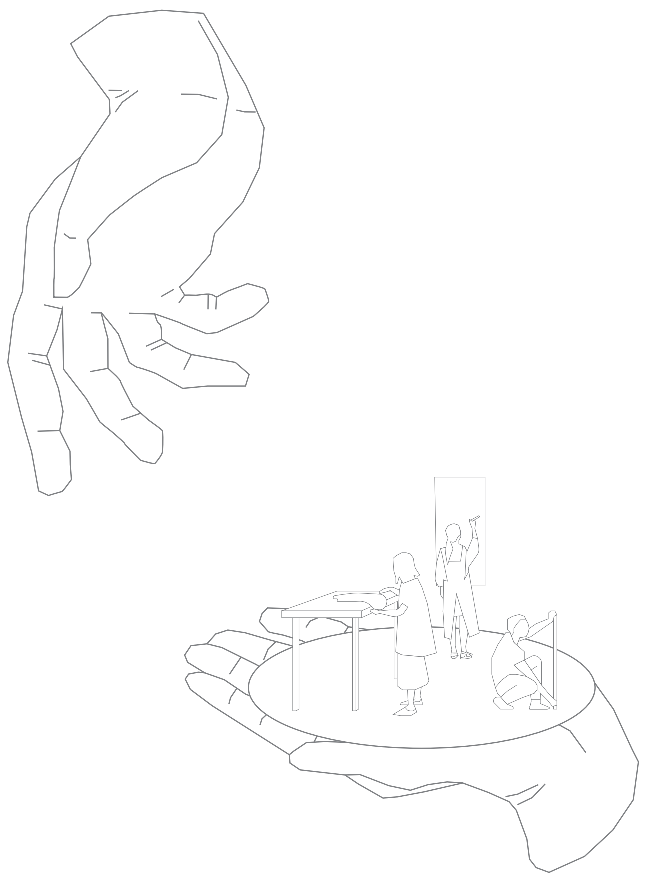
However, such an approach is probably better suited to more widely observable phenomena. Makerspaces are not systematically well-researched spaces in an urban design context. Moreover, the spaces, how they function and who they cater to are still evolving. More importantly, the spatial patterns were drawn from a study of only fifteen spaces. A wider study of spaces in other cities may result in a more accurate spatial system to model the way makerspaces function within an urban environment. The configurational relationships between makerspaces proposed in this thesis, therefore, requires further testing.

LIMITATIONS OF STUDY

The study draws on anecdotal observations and analyses data specific to Gothenburg.

A broader study of various cities was only reviewed in literature.

Given the small number of makerspaces and maker related activities occuring in Gothenburg, broad trends on how makerspaces function cannot necessarily be gleaned. This study, however, does contribute to the body of work which with further input allow generalisations to be made about how makerspaces.



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