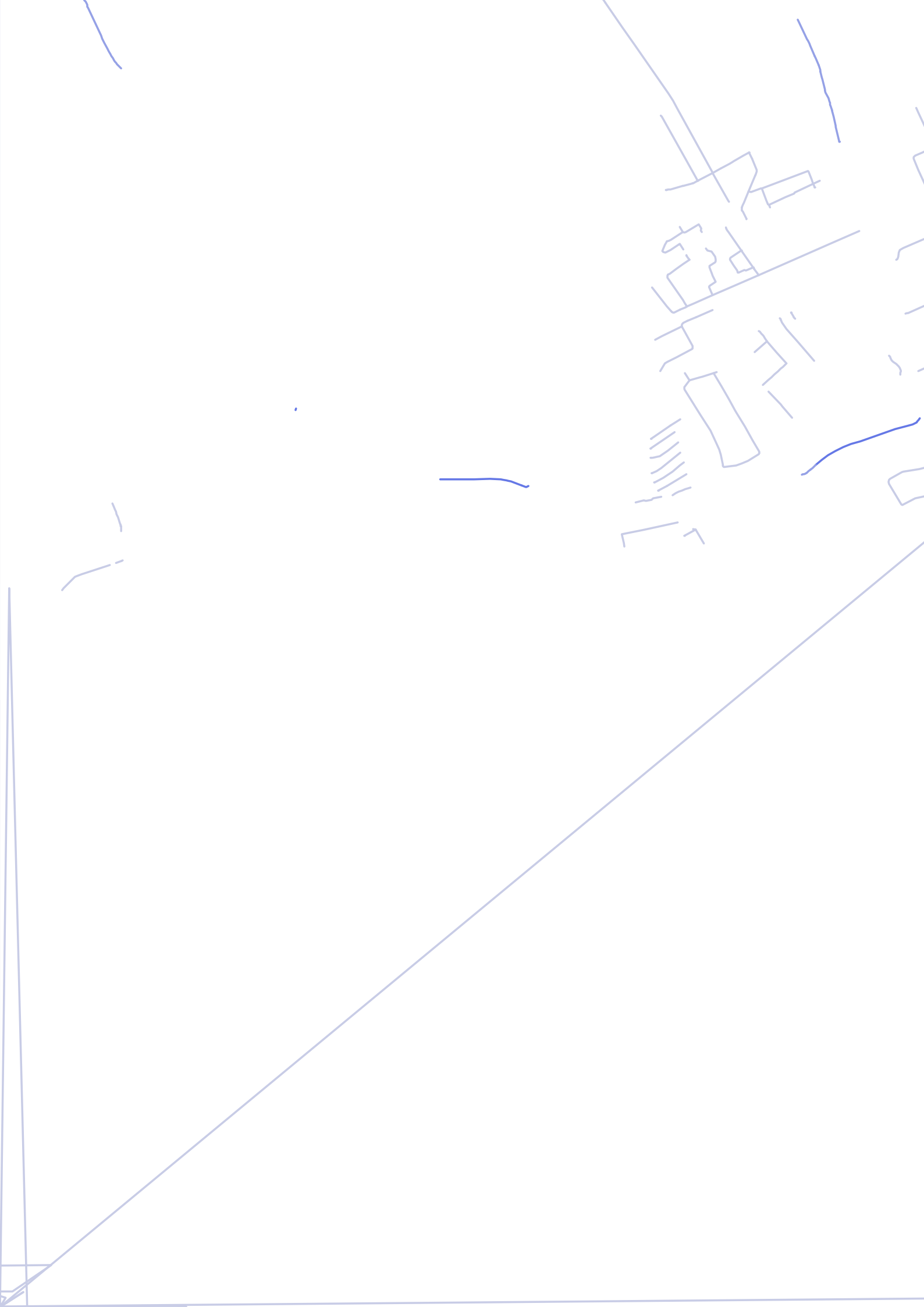

EXECUTIVE SUMMARY

Like many innovations, parcel lockers took cities by surprise, developing much more rapidly than associated policies and regulations. Some public authorities are trying to find a middle ground between allowing such services to spread freely on streets, while managing the additional pressure they might bring to public spaces, traffic, and overall quality of life.

The City of Groningen, in collaboration with the University of Groningen and Bax & Company, is one of the few public authorities to have developed a framework for an open parcel locker system. The extensive development process included:

- **Interdepartmental collaboration within the city**
- **Stakeholder engagement via logistics fora within the ULaaDS project**
- **Academic studies led by the University of Groningen**
- **A benchmarking of other international practices**
- **A spatial analysis for the potential placement of parcel lockers**

The following pages summarise the benchmarking exercise, as well as the process and results of the spatial analysis conducted by Bax & Company. Despite a very limited number of good practices, we have analysed and compared other parcel locker frameworks and approaches from Austria, Norway, the UK, the US, and Singapore. The search for other examples and best practices from around the world led us to conclude that work in this direction is still emerging. When led by public authorities, most parcel locker programmes are rather experimental in nature, and only some of the existing guidelines (e.g., from Austria) provide a thorough overview of aspects to consider for implementation.

The spatial analysis followed different stages in continuous consultation with the city's employees, helping Groningen find the most suitable spots for parcel lockers. The aim was threefold:

1. **To ensure accessibility for active travel, avoiding car travel for parcel pick-ups**
2. **To complement the existing private parcel locker networks, adding facilities in underserved areas**
3. **To develop an integrated approach which embeds logistics services in the city's mobility hubs strategy**

The following insights can serve as a guide for public authorities looking to develop a well-thought, coordinated approach. They are also beneficial for parcel locker providers interested in improving their services and adapting to different city requirements, including accessibility and aesthetics. Although complex, Groningen's approach is replicable in other contexts, too, allowing public and private stakeholders to work together in the transition towards sustainable urban logistics. This way, municipalities can ensure that their ambitious zero-emission policies can be implemented with less pushback from the local community. This is bolstered by tangible support for businesses and citizens, ensuring sustained economic activity within the city.

1. A BENCHMARKING OF CURRENT PRACTICES

THE NEED FOR A PARCEL LOCKER FRAMEWORK

Parcel lockers are rapidly becoming as ubiquitous as ATMs in our daily lives. Much like ATMs revolutionised banking accessibility, parcel lockers can be a game-changer in the realm of package deliveries. While this transformation should be benefitting inhabitants equitably, regardless of their location or circumstances, accessible parcel locker networks carry certain environmental implications.

The impact is neither inherently positive,

Public authorities often have more control over **parcel locker placement** on public grounds, bringing municipalities, landowners, and suppliers into the decision-making process. In Austria and the UK, public land use requires approvals and has the potential to generate rental income. To bypass planning permissions and encourage trip chaining, providers often opt for private areas, like shopping centres, transport hubs or gas stations. In Austria, restricted-access sites like residential complexes and company buildings are also utilised for parcel locker placement. This approach enhances flexibility and minimises bureaucratic hurdles.

In terms of **infrastructure** requirements, the Norwegian VIV network emphasises the need for power-independent operation, neutral design, and the removal of advertising.

Oslo suggests colour coordination, placement against a wall, and alignment with municipal aesthetics requirements. Austria lists essential features such as stable internet and power, levelled floors, and space for expansion. New York's security measures include cameras and anti-theft mechanisms. Installation sites should prioritise circulation space, avoid street furniture conflicts, maintain pedestrian flow, and not obstruct windows, fire escapes, or public art. Generally, all guidelines aim to ensure efficient and harmonious parcel locker deployment.

Centre for London offers some examples of **place-based integration** aiming to blend parcel lockers with existing elements, thereby providing a more pleasant urban environment and boosting their overall acceptance (Figure 1).

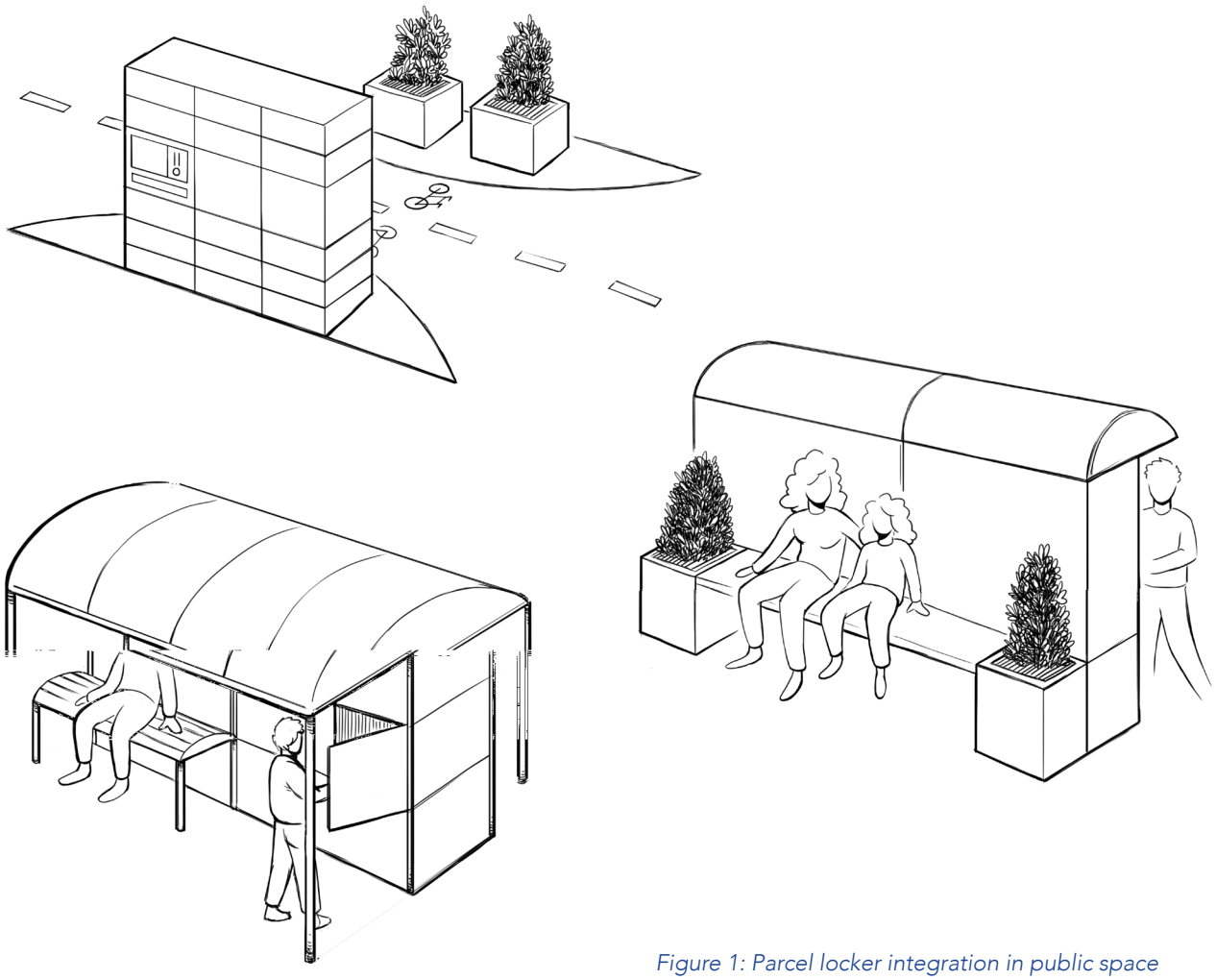

Figure 1: Parcel locker integration in public space (Visual inspired by Millie Mitchell / Centre for London)

To ensure a universally accessible service, public authorities also include certain **accessibility** requirements.

The Austrian Guidelines provide some useful illustrative examples that align with European standards and regulations (Figure 2).

Besides the physical design, users should have the option to choose accessible delivery to ensure their parcels are stored at a reachable height.

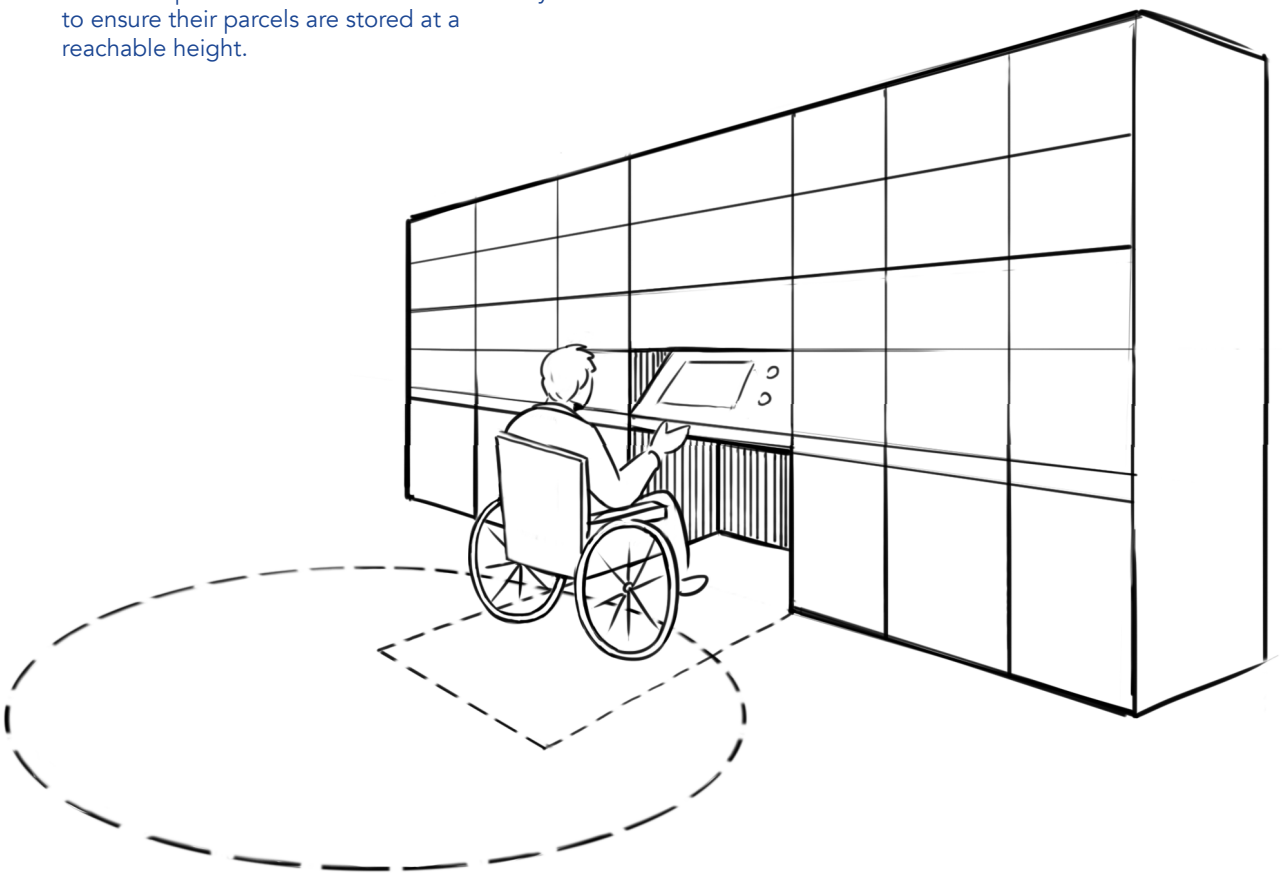

Figure 2: Barrier-free design of the installation site (Visual inspired by Bernhard Hruska / Architektur B4)

2. WHERE SHOULD PARCEL LOCKERS BE PLACED IN GRONING PUBLIC SPACES?

WHY AND HOW WE STUDIED THIS

Taking a proactive approach, the City of Groningen wanted to ensure that parcel lockers are available and accessible for most, if not all, of their inhabitants. Given that the location and density of lockers can impact the recipients' choice of transport, we conducted a series of spatial analyses to identify the most suitable locations for an open network of parcel lockers.

The analyses followed

1. Understanding the
   - Demand: where
   - Infrastructure: wh
     likely to walk and
   - Priorities: where
     to locate parcel l
2. Finding the ten mo
   spots
3. Filling the gaps in e
   networks

WHAT WE FOUND

1. UNDERSTANDING THE CITY CONTEXT

Figure 3 illustrates the city's neighbourhoods and their respective population distributions. The darker shades reflect the denser areas, pointing towards potential higher demand for logistics services.

To identify areas where people are most likely to use active transport, we used the **Space Syntax betweenness centrality analysis**. Figure 4 illustrates the network segments most used by bicycles. Centrally located streets and streets that connect different neighbourhoods tend to have high centrality values, meaning that they carry a higher flux of users, swiftly connecting different origins and destinations within a given radius (in this case, 10 km).

The **kernel density** of the betweenness centrality (Figure 5) highlights areas in the city with the densest usage of network segments. The highest values cover the central region of the city and areas adjacent to the canals. In these canal areas, traffic tends to be funnelled onto fewer roads, particularly around bridges.

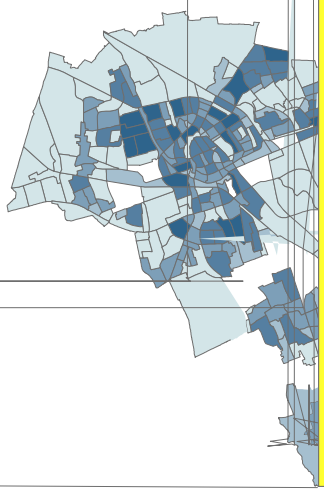

Figure 3: Neighbourhoods and population density in Groningen

2. FINDING THE TEN MOST ACCESSIBLE PUBLIC SPOTS FOR PARCEL LOCKERS

As a second step, we used **location-allocation models** to assess the top ten locations that could cater to a majority of the city's population. This analysis was carried out in two phases: first we considered all possible locations where parcel lockers could be placed, including neighbourhood hubs, and then we selected only large hubs, stations, and P&R, which the city might choose to prioritise (Figure 7).

Figure 8 shows the coverage of these ten selected lockers at five, ten, and fifteen minute **cycling intervals**. Figure 9 is a visualisation of this coverage, with an overlay of the population density distribution, showing how the most densely populated neighbourhoods would be covered by these optimal locations.

It's noteworthy that in both scenarios, the locations derived from our analysis coincide with those of the two main providers, indicating their strategic site selection. These results guided us in analysing the potential gaps in the existing private offer for parcel lockers and other pick-up and drop-off points (PUDOs)[2].

[2] PUDOs is a wider term, encompassing parcel lockers and other collection and delivery points, such as partnering shops and individuals collaborating with Logistics Service Providers (typical mostly in the Dutch context).

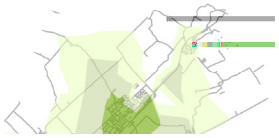

Figure 8: Area coverage for 10 optimally-located lockers at five minute intervals for cyclists

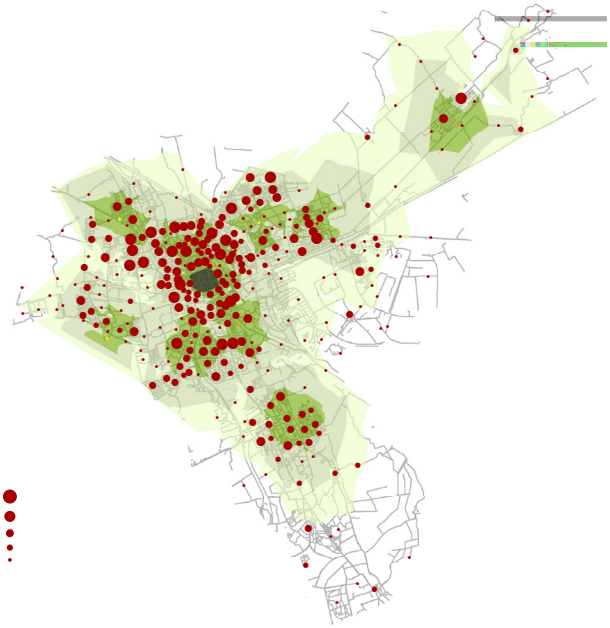

Figure 9: Area coverage for lockers at five minute intervals for cyclists and population density

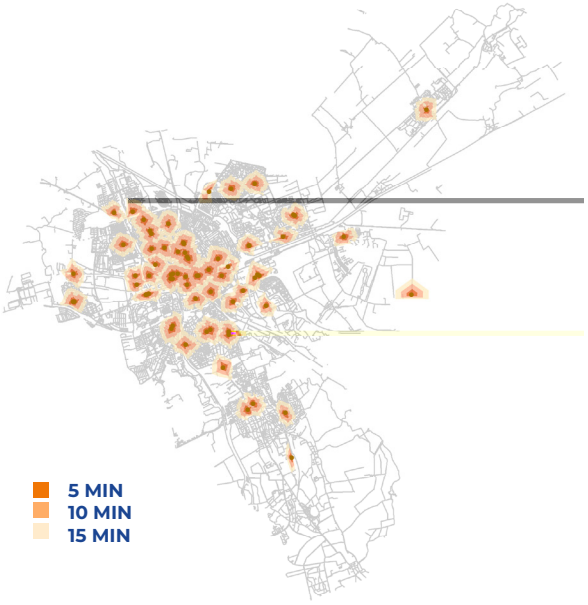

Figure 10: Area covered by PostNL lockers at five minute intervals for pedestrians

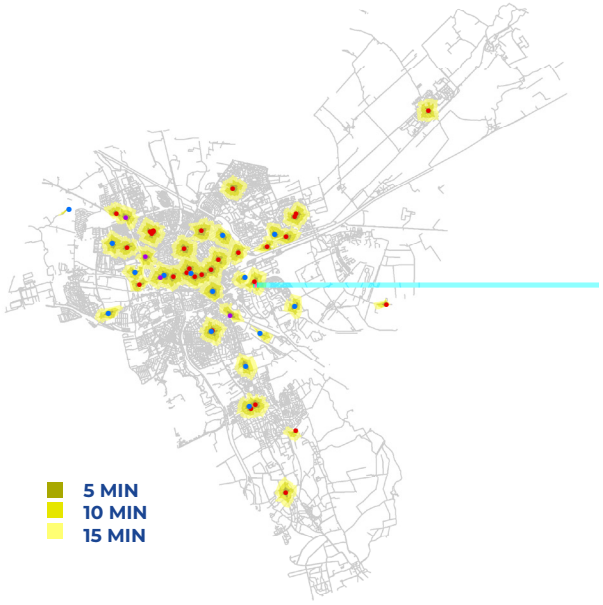

Figure 11: Area covered by DHL lockers at five minute intervals for pedestrians

Given that the PUDO networks of some of the biggest logistics service providers, such as PostNL and DHL, are within a **ten-minute bike ride** for the majority of the population, we tried to pinpoint any potential gaps. Our results show a disparity for parcel lockers, with areas such as Ten Boer and Haren being underserved.

Furthermore, **pedestrian accessibility** to both PostNL (Figure 10) and DHL (Figure 11) PUDOs is quite restricted, highlighting areas the city should prioritise to enhance pedestrian reach. By superimposing the coverage of the two main brands for pedestrians (Figures 10 and 11) onto all potential new locations (in planned hubs) suggested by the city of Groningen (Figure 12), the following three spots could help fill the gaps, as illustrated by Figure 13 on the following page:

1. Meerstad
2. S.O.J. Palmelaan
3. Martiniplaza
This location does not coincide with any existing PUDO. Although it would not cover an area of high population density, it's strategically positioned to cater to areas that are lacking adequate service.

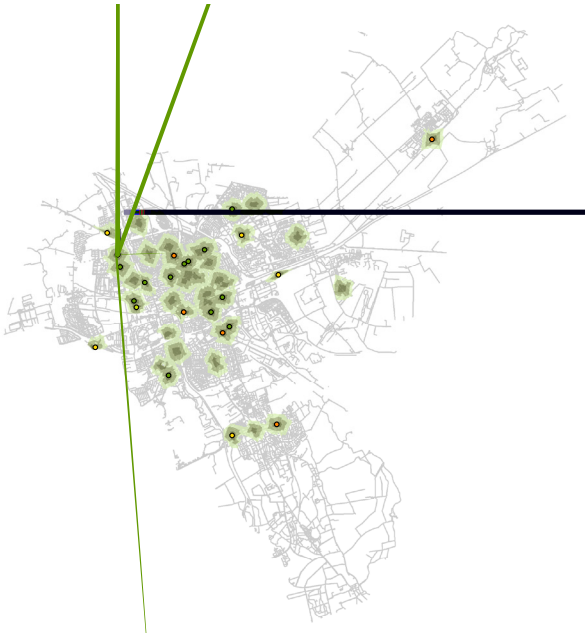

Figure 12: Area covered by mobility hubs at five minute intervals for pedestrians

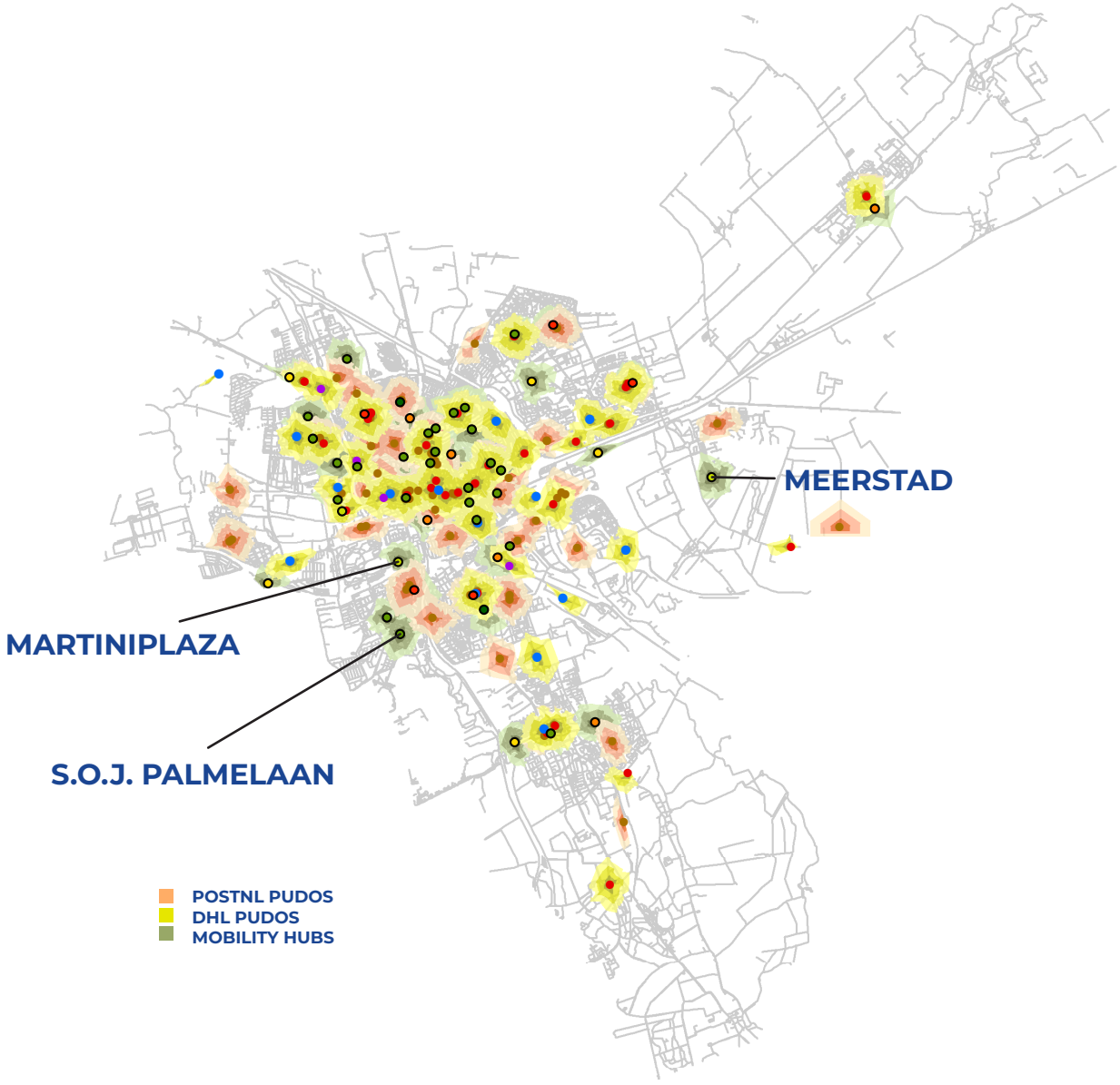

Figure 13: Priority locations for parcel lockers to complement the existing private offer