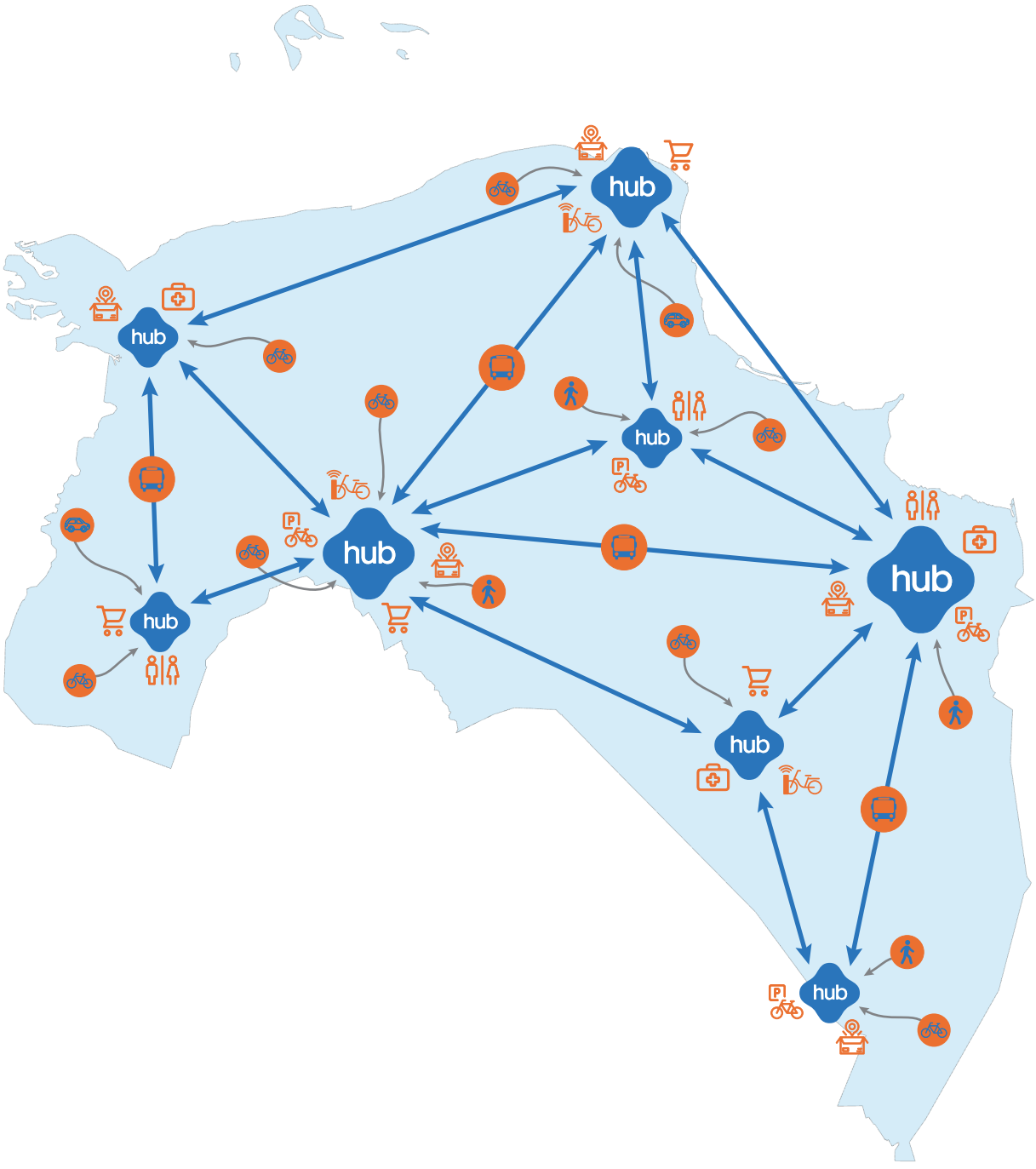
Mobility Hubs in the Province of Groningen

A Framework for Inclusive and Connected Rural-Urban Mobility Systems



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Interactive map: AC4A Hub Clustering Province of Groningen

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Summary

In the Netherlands, mobility policy is increasingly expected to support climate targets and social inclusion through accessibility of services and facilities and reduction in car dependency. Mobility hubs aim to support such goals as they are places where different sustainable modes of transport as well as facilities are placed together to increase sustainable and inclusive accessibility. This report identifies residents' desires for mobility hubs regarding their location, mode of arrival, available onward mobility services, and facility provision.

The analysis builds on a representative sample of residents (n=755) who filled in a map-based survey, and compares rural, intermediate semi-urban and urban areas of the Province of Groningen. This study is conducted in the context of the AccessCity4All research project, which aims to refine the understanding of the 15-minute city to be applicable to diverse contexts by studying accessibility across different areas in the province of Groningen.

Mobility hubs are primarily perceived as nodes in longer travel chains. Across all preferred hub locations, public transport is the most desired mobility service. Practical facilities are widely valued, particularly parcel points and toilets. Grocery stores also emerge as a substantial preference, reinforcing that respondents value hubs as places where transfers can be combined with quick everyday errands.

When comparing different hub contexts, clear variations emerge in mobility service preferences. For rural hubs, there is a strong preference to combine public transport with sufficient room for car parking, showing a resemblance to a park-and-ride function, while there is also a notable preference for e-bike sharing. In semi-urban areas, shared mobility is also desired, with a strong preference for car-sharing, although bike parking and bike sharing are also highly valued. In urban areas, cycling facilities and bike sharing facilities are perceived as more important. Residential preferences for accessing hubs mirror these mobility profiles. Demand for car-sharing and parking indicates that car dependence remains prevalent in rural and semi-urban areas, whereas urban hubs are often at short distances and can be reached on foot or by bicycle.

Preferences for facilities also diverge across the different contexts. Urban hubs are more convenience-oriented, while rural hubs show stronger preferences for social functions, such as community centres and GP health services. Semi-urban hubs sit between these two, functioning primarily as efficient transfer points where facilities support quick activities during travel.

Preferred hub locations cluster most strongly in semi-urban areas in and around the city of Groningen, as well as in medium-sized towns and village centres, suggesting that desired hubs are not only seen as traditional public transport nodes but also as potential destinations to access services and amenities. In addition, the location analysis indicates that respondents generally prefer hubs in a similar urbanity setting to where they live. Semi-urban hubs can attract people from both rural and urban areas, reflecting an actual potential bridging role in the regional network.

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Chapter 1: Introduction

Throughout the Netherlands, mobility policy is increasingly expected to deliver more than just improved traffic flow. Mobility is now closely linked to climate targets, healthier and safer cities, efficient use of space and social inclusion. Within this broader agenda, mobility hubs have gained attention as a practical way to make daily travel more sustainable and contributing to accessibility for all.

A mobility hub is a physical junction where different modes of transport converge and connect seamlessly. The Netherlands Institute for Transport Policy Analysis (Kennisinstituut voor Mobiliteitsbeleid, KiM) defines a mobility hub as *"een fysieke schakel tussen vervoersmodaliteiten die naast hun mobiliteitsfunctie ook als focuspunt voor ruimtelijke ontwikkeling kan dienen. De schakelfunctie van de mobiliteitshub richt zich op het faciliteren van ketenmobiliteit, ofwel de combinatie van verschillende vervoerswijzen voor de verplaatsing van A naar B",* (KIM, 2021). In practice, this means that a traveller at a hub can, for example, switch from a bicycle to public transport (PT), or from a car to a shared car or bicycle, and continue their journey in a sustainable manner. Mobility hubs combine multiple modes of transport in one location and can offer different facilities such as shared bicycles, shared cars, bicycle parking, toilets, charging stations, parcel pickup points and even small (grocery) stores. With this broad mix of transport options and facilities, hubs can lower the threshold for switching between modes of transport and promote so-called 'trip chaining'.

Beyond just providing transport services, mobility hubs are increasingly being designed as attractive places to spend time by providing ways in which changing between modes of transport is comfortable, safe and worthwhile. This can include sheltered waiting areas, toilets, catering facilities, parcel lockers and grocery stores. Aligning with the node-place perspective, hubs function best when their role as a transport node is supported by their role as a local place with social value (Bertolini, 1999; Papa & Bertolini, 2015). When these aspects are aligned, hubs can also enhance the liveability and everyday convenience of the surrounding area.

Also, from a sustainability perspective, hubs are seen as essential for shifting away from dependence on private cars (Banister, 2008; Geels et al., 2012). Research shows that high-quality intermodal connections make it more likely that people will combine cycling or walking (active modes of transport) with public transport, particularly for longer or more complex journeys (Heinen and Mattioli, 2019). When mobility services are reliable and well-integrated into the wider public transport system, shared transport at hubs can also reduce the need for private car ownership (Shaheen and Martin, 2011; Shaheen et al., 2016). In addition to offering practical convenience, hubs can lower the psychological barriers to trying unfamiliar modes of transport by normalizing sustainable options by making them visible and easily accessible in daily routines (Gardner and Abraham, 2008).

Although mobility hubs are often associated with densely populated urban areas, they can be relevant in supporting sustainable and inclusive accessibility in suburban and rural contexts. In these areas, travel distances tend to be greater, and conventional public transport systems often struggle to offer an adequate level of accessibility. Mobility hubs can help to bridge this gap by connecting dispersed settlements to major transport routes, enabling residents to reach employment, amenities, and education without having to rely on private cars (Miramontes et al., 2017; Eckhardt et al., 2018). Additionally, hubs can facilitate trip chaining, where travellers link two or more activity locations within a single journey, by providing convenient and reliable interchange between modes and

services (Primerano et al., 2008; Schneider et al., 2021). This is particularly relevant in the province of Groningen, where the large city of Groningen (Stad) is surrounded by smaller villages (Ommeland).

However, the sustainability and accessibility benefits of hubs do not arise automatically. Accessibility encompasses more than just the ability to be mobile. It also considers people's ability to reach essential daily activities (Geurs and van Wee, 2004; Lucas, 2012). If hubs are poorly located or designed primarily for those who are already mobile, they can reinforce inequality rather than reduce it (Lucas, Van Wee and Maat, 2015). This makes understanding of local preferences, daily routines, and perceived usability crucial factors in the planning process.

1.1. Objective

The aim of this rapport is to identify residents' desires regarding mobility services, facilities, preferred mode of accessing the hub, and their preferred locations for mobility hubs, in rural, semi-urban and urban areas of the Province of Groningen.

By explicitly focusing on residents' perspectives, the study seeks to contribute to the broader objectives of mobility hubs, by providing user-centred evidence. Understanding these preferences is essential to ensure that mobility hubs are aligned with local needs and contexts, thereby increasing their effectiveness, usability, and societal impact.

1.2. Context of the research: AccessCity4All and the 15-minute city

This study on mobility hubs is conducted within the context of AccessCity4All project, an international research programme (2024-2027) under the European Driving Urban Transitions (DUT) initiative and co-funded by NWO and the EU. AccessCity4All seeks to refine the understanding of 15-minute city concept by focusing on its challenges and inclusivity across different urban contexts.

The 15-minute city is a recent urban planning concept which proposes that all residents should have access to essential amenities (workplaces, shops, educational, healthcare and recreational) within a 15-minute walk or cycle from homes. It promises more sustainable, healthy and social urban living by promoting proximity and reducing car dependence. However, the concept does not automatically work for all contexts or population groups. Current applications mainly focus on dense (inner) cities and new developments, often overlooking suburbs, rural centres and people with limited physical ability. Although adaptations such as the 30-min territory have been suggested for suburban and rural settings, there is still a risk that a one-size-fits-all approach to the 15-/30-minute city could increase rather than reduce accessibility disparities.

The AccessCity4All project aims to make the 15-minute city concept more applicable and equitable for different types of areas and residents. Rather than focusing on a single ideal 15-minute city, the project considers a variety of neighbourhoods depending on their context, and the characteristics of its population. The central question is how to promote active mobility and proximity for everyone, including those living outside the city centre. The research considers not only calculated accessibility, measured by distance or travel time to facilities, but also the perceived accessibility as experienced by residents themselves as well as their actual behaviour (i.e. actualised accessibility). This allows identifying discrepancies between what planners consider 'accessible' and what residents experience in their daily lives.

The project takes a transdisciplinary approach and is organized as an international consortium led by the Austrian Academy of Sciences. Partners include the University of Groningen, the Technical University of Dortmund, the University of Lisbon and Gazi University in Ankara. Together, they conduct case studies in five European Urban Living Labs using methods such as spatial analysis,

participatory workshops, walk-along interviews and large-scale public participatory map-based surveys (PPGIS).

Within this framework, the Groningen sub-study focuses on accessibility and mobility in the city (Stad) and its surrounding region (Ommeland). This report presents the results of part of the large-scale map-based public participation survey. It focuses on residents' preferences for mobility hub locations and services to support active and inclusive mobility and accessibility in areas outside the urban core. The goal is to strengthen regional connections and increase proximity. This research therefore contributes to AccessCity4All's overarching objective of adapting the 15-minute city approach to various contexts and making it applicable 'for everyone'.

Chapter 2: Data and methodology

2.1. Research design

The data used in this report comes from a map-based survey through the Maptionnaire platform. Respondents were asked a variety of questions on accessibility and travel behaviour in this online questionnaire while linking their answers to actual locations on the map. This report is based on the survey section that explicitly focuses on mobility hubs.

Hub-specific survey section

The hub section of the questionnaire was designed as a map-based question. Respondents indicated their preferred location for a mobility hub by placing a dot on the map. They were then asked a series of follow-up questions relating to that location:

- Desired mobility services: what forms of mobility people consider important to be available at the hub (e.g. bike parking, shared cars, shared bicycles, etc.).
- Desired facility services at the hub: what amenities people would like to see at this location (e.g. toilets, parcel pickup points, ATMs, etc.).
- Mode of transport to access the hub: which mode of transport people expect to use to travel to this hub (e.g. on foot, by bicycle, by car, by public transport, etc.).

In this way, the survey links preferences for services and facilities directly to a specific location chosen by the respondent.

2.2. Analytical approach: urbanity as a frame of reference

This report categorizes findings within three contexts based on urbanity levels: rural, semi-urban, and urban. This classification makes it possible to systematically compare whether and how preferences differ between contexts. Respondents' locations of residence and their preferred hub locations were linked to the 2023 neighbourhood dataset from Statistics Netherlands (CBS, 2026) and classified using the average address density indicator (omgevingsadressendichtheid), resulting in the following three categories:

- rural: less than 500 addresses per km2;
- semi-urban: 500 to 2.500 addresses per km2; and
- urban: 2.500 or more addresses per km2.

In addition, the following neighbourhoods were manually adjusted from an urbanity context of rural to semi-urban, due to their adjacency to the city of Groningen: in Meerstad (Tersluis, Groenewei and Meeroevers) and in Stadspark (De Buitenhof and Piccardthof). Figure 1 shows all neighbourhoods in the province of Groningen with its urbanity score.

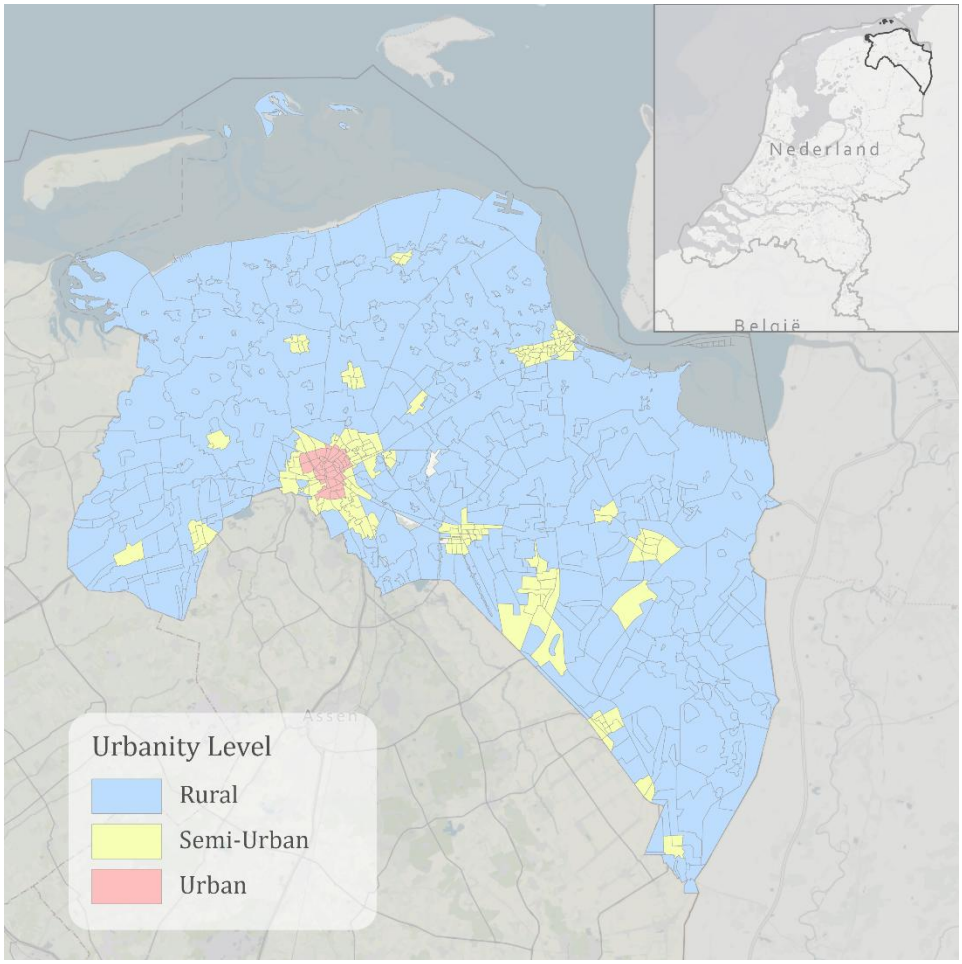

Figure 1: Urbanity levels assigned to each Neighbourhood (data: CBS, 2026)

2.3. Sample and recruitment strategy

In total, the survey yielded 1,713 responses. However, some responses were excluded when no preferred hub location was indicated or when the indicated hub location was the study area (Province of Groningen). Partially completed questionnaires were retained where possible, as they still provide relevant information.

After data cleaning, 755 unique participants indicated one or more preferred locations for mobility hubs (Table 1). The sample was established using three recruitment strategies. Stratified random recruitment by post in selected neighbourhoods resulted in the most respondents (658). This was supplemented by a social media campaign (66 respondents) and flyers in and around the University of Groningen (51 respondents). See Appendix iii for the number of responses per neighbourhood and the randomly selected neighbourhoods to which a questionnaire invitation was sent by post.

A total of 1,010 preferred hub locations were recorded. Of these, 316 hubs are located in urban areas, 390 in semi-urban areas, and 304 in rural areas. The total number of respondents living in rural areas is 244, living in semi-urban areas is 274, and living in urban areas is 257.

Table 1: Overview of the number of respondents, the urbanity of their home locations and the number of hubs in each context

Type	Number
Unique respondents home urbanity: rural	244
Unique respondents home urbanity: semi-Urban	274
Unique respondents home urbanity: urban	257
Total Unique respondents	775
Number of hubs: rural	304
Number of hubs: semi-urban	390
Number of hubs: urban	316
Total number of hubs	1010

2.4. Representativeness and interpretation of the results

The sample can generally be considered representative for the entire province. This representativeness is supported by a demographic distribution that largely corresponds to the provincial average, as well as a balanced geographical distribution of respondents across the various neighbourhoods (Figure 2). An overview of the demographic composition of the respondents is provided in Table 2. The dataset provides a solid basis for understanding preferences for mobility hubs in the province of Groningen, as respondents come from a wide range of neighbourhoods spread across almost the entire province.

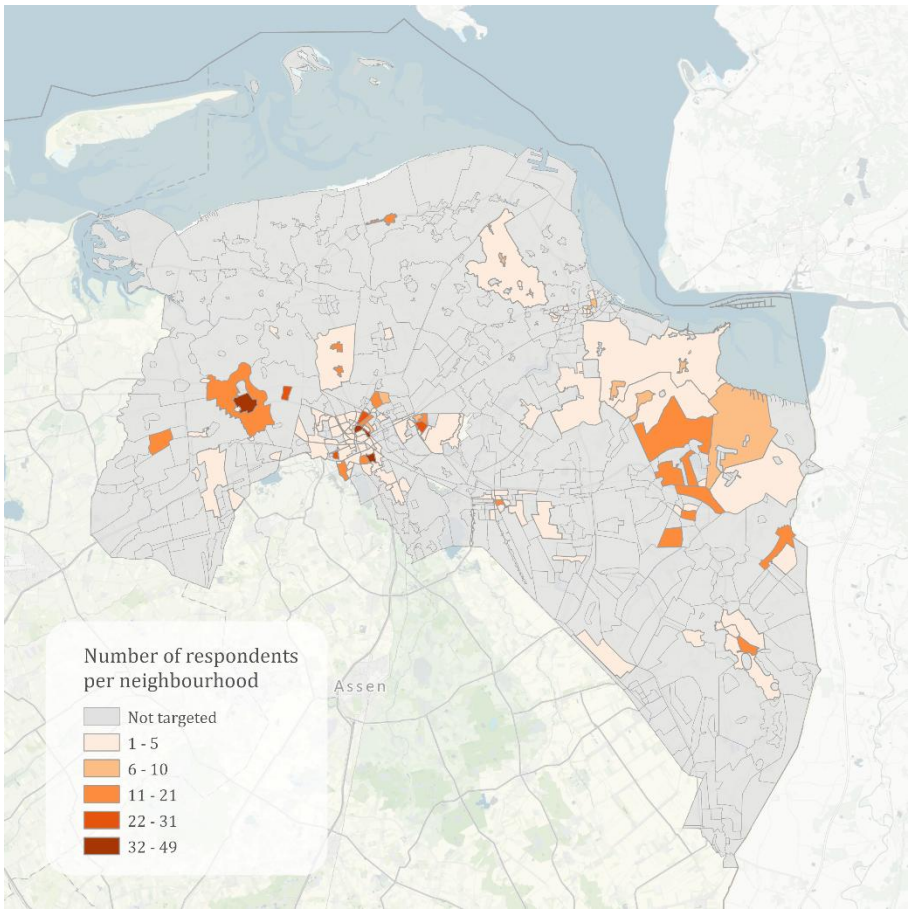

Figure 2: Overview of Number of respondents per Neighbourhood

This broad geographical spread, combined with a good distribution across urban, semi-urban and rural contexts, makes it possible to provide a picture of which location characteristics, facilities and mobility services respondents find attractive, and how these preferences differ across urbanity levels. The marked hub locations are used to reveal broader patterns in what people value in a hub location and to analyse how desired amenities, services and location characteristics vary between more rural and more semi-urban or urban environments. At the same time, results linked to specific preferred locations (Chapter 4) should be interpreted with caution. This is because the largest group of respondents was recruited via the postal sampling method, which was based on a neighbourhood basis. This can lead to a relatively high degree of clustering in the data. Location specific outcomes in this report should therefore not be interpreted as the 'best' or most wanted locations for mobility hubs in Groningen. They show the preferred locations of respondents from certain (targeted) areas and should be read with that nuance in mind.

In terms of gender distribution, the sample broadly corresponds to the provincial population. A slight deviation is visible in the semi-urban areas. At 52.3%, men are slightly more strongly represented than in the provincial figures for comparable areas (49.2%).

Table 2: Sample descriptives compared to the province of Groningen. Numbers of province of Groningen from CBS, 2026

		Sample				**Province of Groningen**			
		Total	Rural	Semi Urban	Urban	Total	Rural	Semi Urban	Urban
Age	15-24	8,2%	3,1%	3,8%	17,2%	14,17%	12,64%	13,27%	29,10%
	25-44	33,9%	27,5%	28,5%	45,3%	24,82%	22,92%	24,69%	39,85%
	45-64	36,8%	44,2%	40,4%	25,6%	33,75%	36,83%	31,42%	18,73%
	65+	21,1%	25,2%	27,3%	11,9%	27,31%	27,61%	30,62%	12,32%
	Sum	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Gender	Female	47,9%	48,2%	46,6%	48,4%	50,04%	48,73%	50,77%	50,38%
	Male	49,7%	50,0%	52,3%	47,3%	49,96%	51,27%	49,23%	49,62%
	Other	2,2%	1,8%	0,4%	4,0%	N/A	N/A	N/A	N/A
	Sum	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

With regard to age distribution, the data show a deviation from the provincial population statistics. The age groups 15-24 years (8.2% in the sample compared to 14.2% in the province) and 65+ (21.1% compared to 27.3%) are underrepresented. On the other hand, the middle age groups are overrepresented: respondents between 25 and 64 years of age together make up 70.7% of the sample, compared to 58.5% of the total provincial population. Appendix i contains an overview of the sociodemographic characteristics of the sample.

2.5. Interpretation and possible misunderstandings in the survey

Respondents may have interpreted some questions and key concepts differently than intended by the researchers. This is a common challenge with map-based surveys, where the quality of the responses depends partly on how respondents interpret the instructions and concepts and translate them into a specific location on the map (Czepkiewicz et al., 2018). In this study, some respondents may have interpreted the concept of a 'mobility hub' based on recognisable, existing references. Rather than envisaging a multifunctional, intermodal hub with a broader set of services and facilities. Consequently, their responses may align more closely with existing, limited mobility hub locations than with the broader hub concept often envisaged in policy and research. Although attempts were made to limit this effect in the design and explanation of the questionnaire (see Section 2.1), differences in interpretation and the resulting uncertainty in the spatial and substantive interpretation of responses cannot be completely ruled out.

Chapter 3: Preferences per hub location: from functional hub to context-specific design

This chapter describes which mobility services, facilities services and transport modes respondents want at hubs in rural, semi-urban and urban settings. The categories refer to the urbanity of the preferred hub location and not to the respondents' place of residence. Thus, the results show what people consider desirable for mobility hubs in different spatial contexts.

3.1. Mobility services: park-and-ride in rural areas, shared mobility in the city

This paragraph discusses the preferred mobility services in each context. It describes the key characteristics of each context and the differences between them. Figure 3 and Table 3 show the percentages of each indicated service out of all the possible mobility services indicated by respondents. An overview of the top five services is provided for each context.

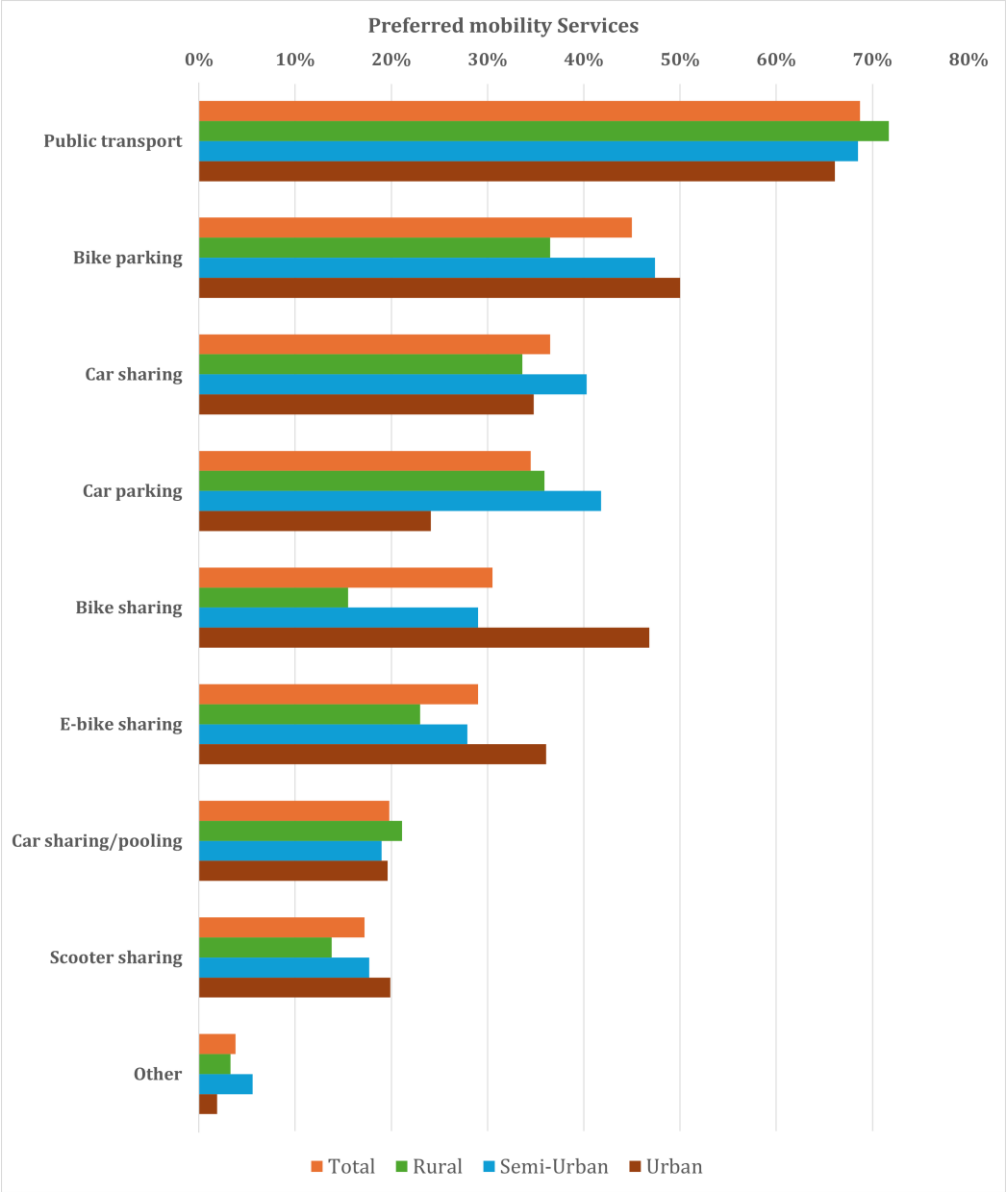

Figure 3: Percentages of preferred mobility services

The most important takeaways from the preferred facility services are:

- **Public transport forms the core basis for all mobility hubs, but the required combination of supporting mobility services depends heavily on the specific regional context.**
- **Rural hubs serve a vital function that extends beyond traditional park and ride, combining public transport with active mobility and shared services.**
- **Semi-urban hubs operate as efficient transfer points that require a mix of car sharing, car parking, and bicycle parking.**
- **Urban hubs display a highly singular active mobility profile, driven by intense demand for bicycle parking and shared bicycles.**

Rural: public transport with car parking as a condition for access

The defining characteristic of the rural hub is the provision of both public transport and car parking in one place. Rural hubs appear mostly interpreted as transfer points where people travel by car and then continue their journey by public transport. The desire for public transport is highest here, at 71.7%, compared to 68.5% for semi-urban hubs and 66.1% for urban hubs. At the same time, the demand for car parking is relatively high (35.9%). Reinforcing the importance of this combined park-and-ride function. Hence, respondents largely view the rural hub as a more traditional park-and-ride location.

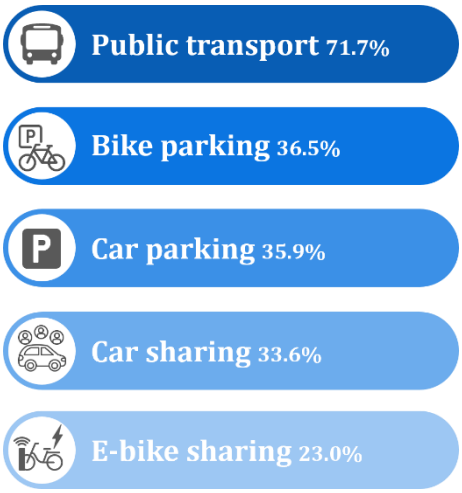

Figure 4: Top 5 mobility services rural hubs

Cycling facilities are also perceived relevant, however less prominently than in urban areas. 36.5% of people desire cycling parking, which indicates a role for cycling in transport to the hub, although this is lower than at semi-urban (47.4%) and urban (50.0%) hubs. Shared bicycle concepts are clearly less popular in rural contexts. Only 15.5% mention shared bicycles and 23.0% e-bike sharing, compared to 46.8% and 36.1% respectively at urban hubs. This suggests that shared bicycle and e-bike concepts are considered less obvious in rural areas, which is understandable given the lower population density and greater distances between destinations, all of which make shared active mobility possibly less efficient. The unpopularity of shared mobility also holds for cars, with 33.6% of people indicating shared cars as a preferred service at rural hubs, the lowest proportion across spatial contexts.

Semi-urban: the hub where cars and bicycles meet

The preferences for semi-urban hubs point at a hybrid mobility profile. The preference for car parking is highest here of all settings at 41.8%, higher than in rural (35.9%) and urban (24.1%) contexts. Car sharing preferences also peak in semi-urban areas at 40.3%, compared to 33.6% in rural and 34.8% in urban settings. At the same time, semi-urban hubs are not solely car oriented. Bicycle parking is very high here (47.4%), almost on the same level with urban hubs (50.0%). This indicates that in a semi-urban context, often within or close to regional centres, bicycles can account for a substantial proportion of the access to the hub. The demand for biking facilities do not extend to shared service, as the desire for shared bicycles (29.0%) and e-bike sharing (27.9%) is not high and lies in the middle between rural and urban. This fits in with the semi-urban environment in which distances are large in surrounding rural areas but their location close to activity and population centres make cycling a viable alternative for the first or last part of the trip. In this setting, hubs should be places where car and bicycle facilities are combined.

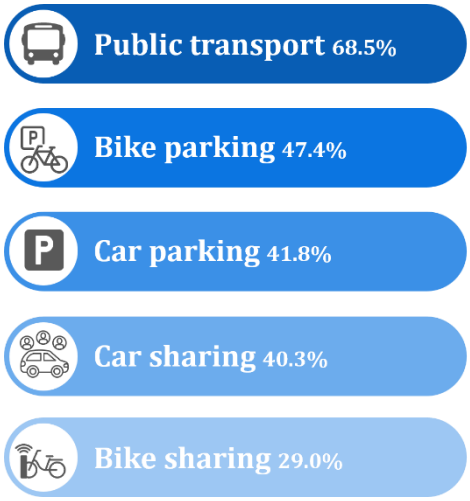

Figure 5: Top 5 mobility services semi-urban hubs

Urban: bicycle parking and shared mobility as dominant building blocks

Urban hubs can be clearly distinguished by a strong desire for bicycle facilities and shared bicycle modalities. Bicycle parking preferences are highest here at 50.0%. Shared bicycles stand out even more strongly: 46.8% in urban hubs, compared to 29.0% in semi-urban and 15.5% in rural contexts. E-bike sharing is also significantly higher at 36.1% than in semi-urban (27.9%) and rural (23.0%) areas. This profile suggests that respondents see urban hubs as places where shared (e-)bikes are logical and effective for travel, partly due to high density, short distances, and the presence of cycling infrastructure. In urban environments, space for car parking is limited, making (high-quality) bicycle parking facilities and shared alternatives particularly valuable.

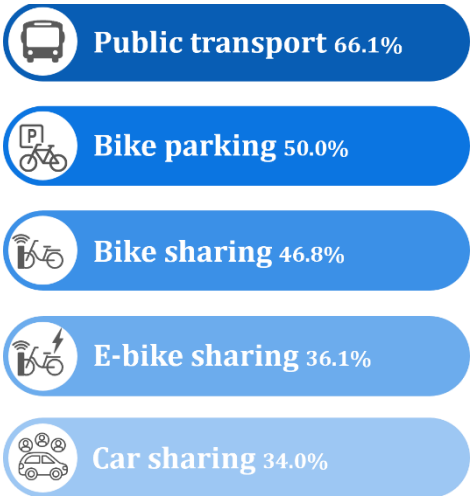

Figure 6: Top 5 mobility services urban hubs

Car parking demand is relatively low in the urban context (24.1%), in line with space constraints and alternatives in the city. At the same time, there remains some demand for car sharing (34.8%) and parking. Whereas the car is often the dominant mode of transport in semi-urban and rural settings, in an urban context it seems to be more of a supplementary or shared option for specific journeys, target groups or circumstances

Summary

Across all hubs, public transport is perceived to form the basis, but the desired combination of mobility services varies depending on the context. Rural hubs combine the highest public transport demand with relatively high car parking demand indicating a closer resemblance to more traditional park-and-ride function, remaining crucial mobility gateways that are primarily oriented towards cars and public transport, although electric bike sharing is the next valuable service in these rural hubs. Semi-urban hubs have the highest demand for car parking and car sharing, combined with high demand for bicycle parking to facilitate the first or last part of people's trip and still some demand for e-bike sharing. They act as efficient transfer points, combining active modes for the first and last mile. Urban hubs have a more singular active mobility profile with the highest demand for bicycle parking and shared bicycles. They are not solely destinations, but nodes that support an urban lifestyle, where shared mobility and public transport are important. Even so, cars remain relevant in cities, primarily as an additional option.

Table 3: Percentages of desired preferred mobility services

	Total (n=1010)	*Rural (n=304)*	*Semi-Urban (n=390)*	*Urban (n=316)*
Public transport	68.7	71.7	68.5	66.1
Bike parking	45.0	36.5	47.4	50.0
Car sharing	36.5	33.6	40.3	34.8
Car parking	34.5	35.9	41.8	24.1
Bike sharing	30.5	15.5	29.0	46.8
E-bike sharing	29.0	23.0	27.9	36.1
Car sharing/pooling	19.8	21.1	19.0	19.6
Scooter sharing	17.2	13.8	17.7	19.9
Other	3.8	3.3	5.6	1.9

3.2. Facilities: convenience and comfort in the city, local quality outside the city

This paragraph discusses the preferred facility services in each context. It describes the key characteristics of each context and the differences between them. Figures 7 and Table 4 show the percentages of each indicated service out of all the possible facility services indicated by respondents. An overview of the top five services is provided for each context.

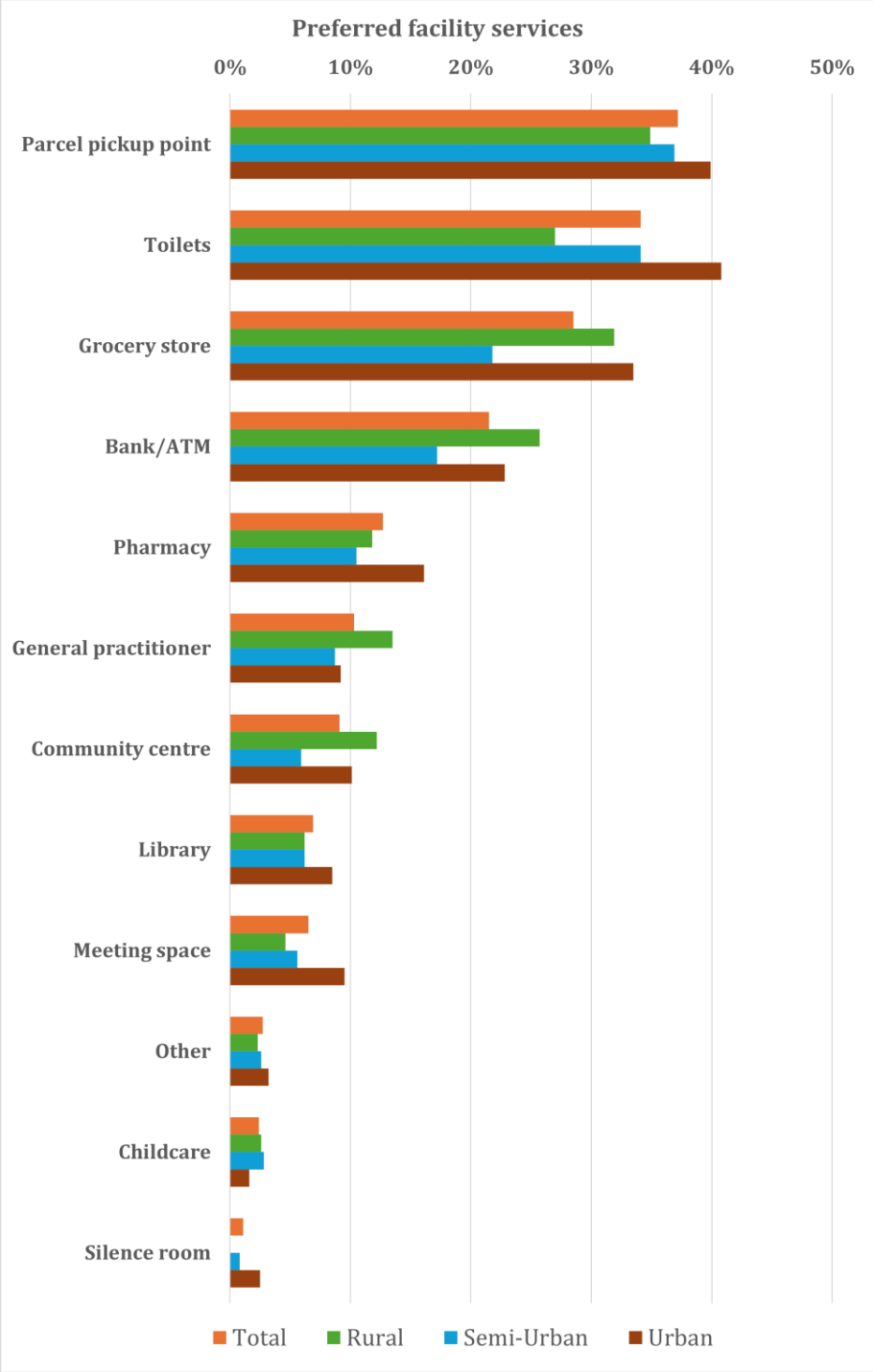

Figure 7: Percentages of preferred facility service types.

The most important takeaways from the preferred facility services are:

- **Facility preferences shift in emphasis from comfort and convenience in urban areas to local quality of life improvements in rural areas.**
- **Parcel pickup points and toilets consistently rank as the most desired practical facilities across all hub locations.**
- **Rural hubs show a higher demand for social and community functions compared to other contexts, functioning as more than simple transit hubs.**
- **Semi-urban hubs function primarily as transit points where facilities directly support travel logistics: quick daily tasks, such as collecting parcels or picking up children from childcare.**
- **Urban hubs are centred around urban lifestyles, providing locations where short shopping trips are seamlessly integrated into a wider range of daily activities.**

Rural: social functions with facilities that enhance the local level of amenities and liveability

Practical facilities dominate in rural hubs, but there are clear indications that respondents also view these hubs as a means of improving liveability. The top three desired facilities are parcel points (36.9%), grocery stores (31.9%) and toilets (27.0%). Importantly, the preference for grocery stores is substantial, indicating that respondents value the hub as a potential place to access everyday essentials. Although these shares are lower than in urban hubs for some facilities (for instance, parcel points 39.9% and toilets 40.8%), reflecting a generally higher desire in urban areas compared to rural areas for many facilities, they are still substantial, as they do not fall far behind desired levels in more urbanized contexts.

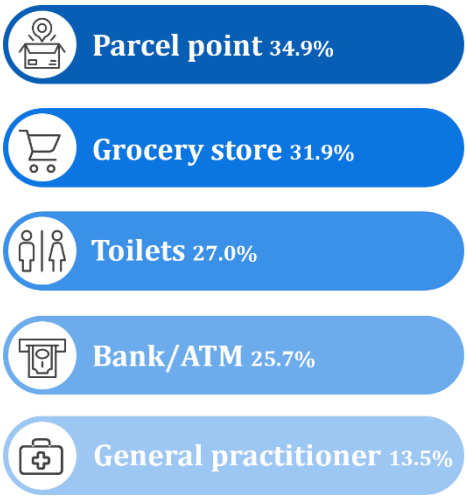

Figure 8: Top 5 facility services rural hubs

At the same time, facilities that enhance the liveability score relatively high compared to the other contexts. The preference for a general practitioner is highest in rural contexts (13.5%), higher than in semi-urban (8.7%) and urban (9.2%) settings. Whereas the 'social function' in urban areas more often indicates a meeting place, in rural areas it is more about community bonding. The hub functions here as a destination to meet acquaintances and to strengthen social cohesion. This explains why the desire for a local, actively community centre is highest in rural hubs (12.2%) and why meeting places (4.6%) score relatively low here compared to the urban areas. It is also notable that ATMs have the highest share in rural contexts (25.7%). All in all, this suggests that respondents in rural settings are more likely to associate the hub with a community function and with the bundling of otherwise sparsely distributed services. In addition, the hub is also regarded as a facility that can help to counteract the decline of services in the region.

Semi-urban: facilitating quick needs during travel

Semi-urban hubs are associated with less strong amenity desires. Parcel points (36.9%), toilets (34.1%) and grocery stores (21,8%) remain important but at 17.2%, the demand for ATMs is significantly lower than in rural (25.7%) and urban (22.8%) settings. Demand for community centres (5.9%) and general practitioners (8.7%) is also relatively low here. This indicates that semi-urban hubs are mainly approached as functional transfer points where facilities primarily support travel, and less as places where people expect additional services or a strong community component.

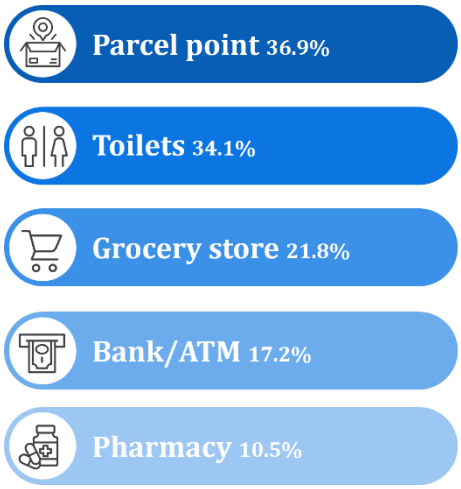

Figure 9: Top 5 facility services semi-urban hubs

Within this functional profile, childcare is a minor exception: 2.8% in semi-urban areas, compared to 2.6% in rural areas and 1.6% in urban areas. Although the absolute numbers are limited, this fits with the idea that semi-urban and rural residential environments are more family-oriented and that daily logistics, such as dropping off and picking up, may be more closely intertwined with travel chains in the perception of users.

Urban: facilities that support urban lifestyles

The facility preferences for urban hubs are most oriented towards convenience and functional services. Parcel points (39.9%) and toilets (40.8%) are the highest of all urbanity contexts. Grocery stores are also relatively often desired (33.5%), as are pharmacies (16.1%). This points to an urban hub image in which the hub is not only a transfer point, but also a place where everyday tasks can be performed. In an urban context, the ATM is at 22.8%, higher than in semi-urban settings and slightly lower than in rural settings. This difference is significant: in the city, the ATM fits into a broader convenience package, while the higher score in a rural context may indicate the bundling of basic services that are less available elsewhere.

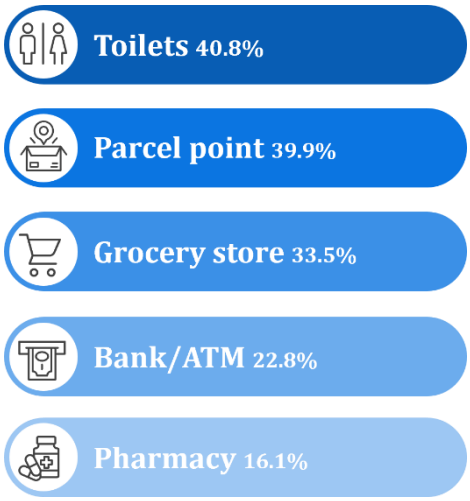

Figure 10: Top 5 facility services urban hubs

Hubs in urban areas are mostly seen as a place for everyday tasks. Nevertheless, some social functions are also mentioned, such as a meeting space (9.5%) and a community centre (10.1%). However, the nature of this social need can differ from that in rural areas. Instead of a community function, the need is more focused on a functional nature: time efficiency or practical appointments. The hub functions here more as a functional meeting spot, which makes it possible for the urban traveller to seamlessly combine travel and quick (business or social) appointments. The fact that the social role of the urban hub is primarily functional and goal-oriented instead of community-building is further supported by the desire for other types of facilities, such as a library (8.5% in urban hubs compared to 6.2% in the rural area). Nevertheless, these figures show that, although the emphasis in the city is on comfort and efficiency, the hub also fulfils a clear social desire in an urban context that goes beyond merely travelling. However, these social functions are less dominant than functional facilities that directly support comfort and efficiency. This is consistent with the fact that urban commuters place a strong

emphasis on saving travel time when choosing public transport routes involving transfers, even when some interchanges can offer a higher level of comfort (Chowdhury, Ceder and Schwalger, 2015).

Summary

Urban hubs are primarily framed around urban lifestyles, with facilities that support short (shopping) activities such as grocery and pharmacy and meeting other people. Rural hubs show relatively higher demand for facilities that support the local community and quality of life, emphasising their role in improving local liveability, the bundling of facilities to counteract regional decline, and their more community-building social connection function. They combine this with a substantial demand for access to everyday essentials, with grocery stores standing out as a prominent preference alongside other core facilities such as health (GP) and parcel pickup. For semi-urban hubs, the demand for facilities has the most distinct functional relation with travel, as community-oriented functions are mentioned less often than quick activities that are easily to be combined during a transfer, linking this transit function to the convenience of combining travel with daily chores, such as picking up parcels or dropping off/picking up children.

Table 4: Percentages of desired preferred facilities

	Total (n=1010)	*Rural (n=304)*	*Semi-Urban (n=390)*	*Urban (n=316)*
Parcel pickup point	37.2	34.9	36.9	39.9
Toilets	34.1	27.0	34.1	40.8
Grocery store	28.5	31.9	21.8	33.5
Bank/ATM	21.5	25.7	17.2	22.8
Pharmacy	12.7	11.8	10.5	16.1
General practitioner	10.3	13.5	8.7	9.2
Community Centre	9.1	12.2	5.9	10.1
Library	6.9	6.2	6.2	8.5
Meeting space	6.5	4.6	5.6	9.5
Other	2.7	2.3	2.6	3.2
Childcare	2.4	2.6	2.8	1.6
Silence room	1.1	0	0.8	2.5

3.3. How people want to reach the hub: walking and cycling dominate, while the role of the car varies by urbanity

This paragraph discusses the preferred facility services in each context. It describes the key characteristics of each context and the differences between them. Figures 11 and Table 5 show the percentages of each indicated service out of all the possible mode of transports indicated by respondents. An overview of the top five services is provided for each context.

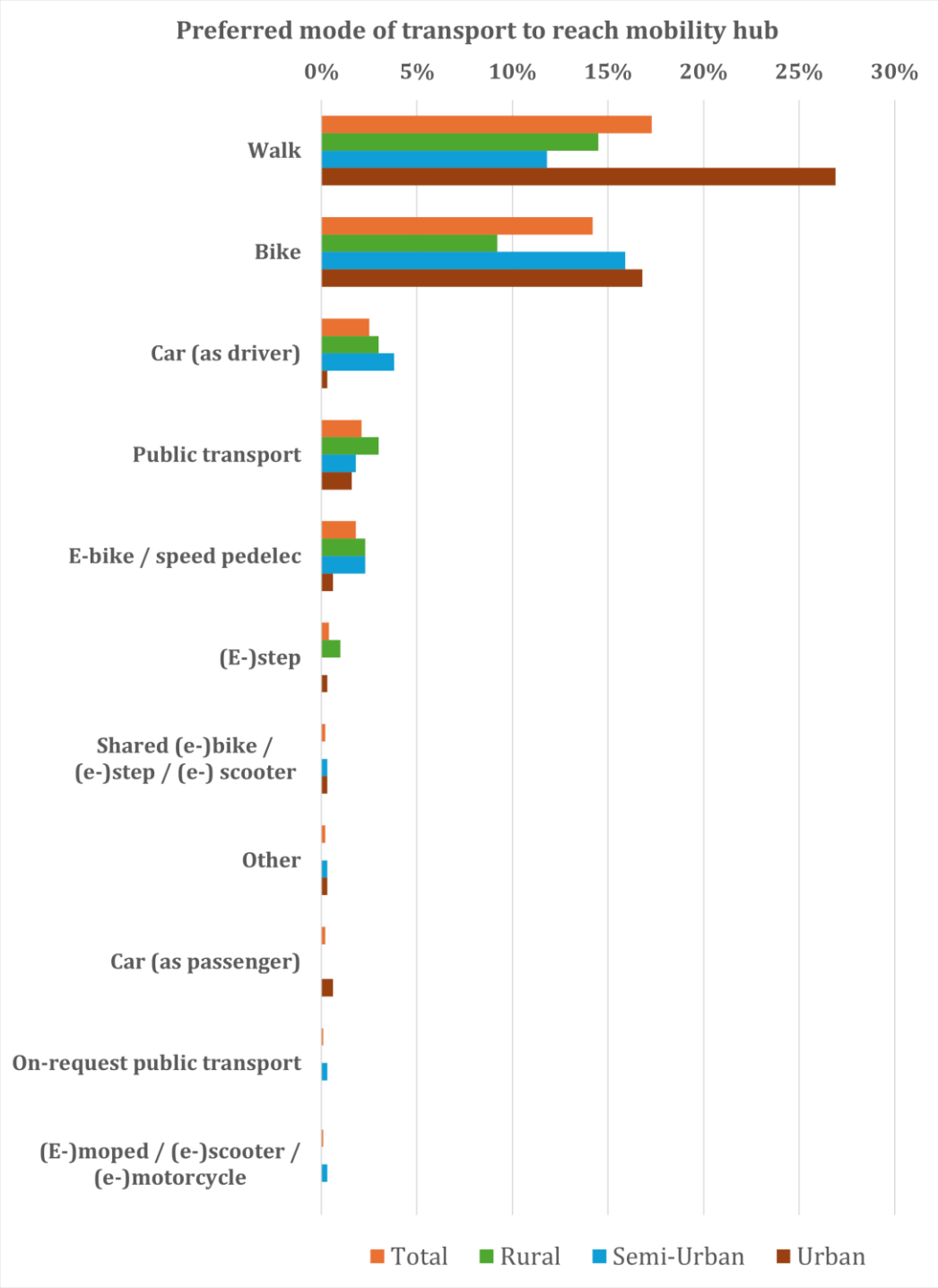

Figure 11: Percentages of preferred mode of transport to reach mobility hub

The most important takeaways from the preferred mode of transport are:

- **Most people prefer to reach their local hub on foot or by bike, which highlights the need for bike parking facilities.**
- **While motorised access is more prevalent for rural hubs than for other regions, active transport remains a key access method.**
- **Semi-urban hubs need to accommodate high levels of bicycle access and car access simultaneously, requiring careful balancing of competing infrastructure needs.**
- **Walking and cycling are the primary modes of accessing urban hubs due to higher urban density, strong proximity expectations and shorter distances.**

Rural: less active supply, more space for motorized access

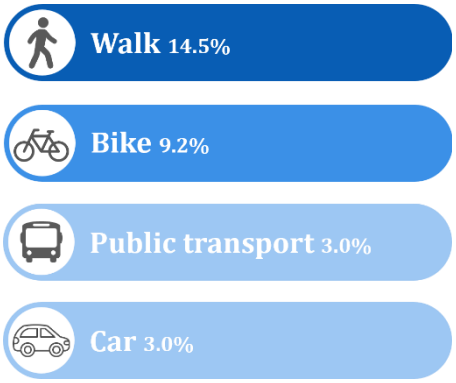

Figure 12: Top 3 preferred mode of transport to reach rural hub

Overall, most people would like to access hubs with active modes, reflecting general travel preferences across the entire population. For rural hubs, walking (14.5%) and cycling (9.2%) are preferred less often than for urban hubs. The car as a driver is mentioned by 3.0%, higher than in an urban context (0.3%). This higher stated preference for driving aligns with the mobility services profile, in which car parking is relatively important (35.9%), and suggests that (private) motorized transport plays a more prominent role in rural settings. At the same time, the proportion of people wanting to walk indicates that some hubs are situated in or near compact village centres. Where shorter distances and a clear centre make it feasible to access the hub on foot, provided direct and safe walking and cycling routes are available.

Semi-urban: cycling remains strong, but car dependency is most visible

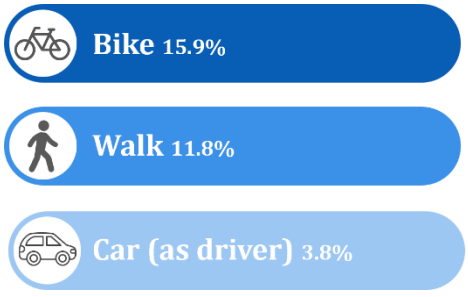

Figure 13: Top 3 preferred mode of transport to reach semi-urban hub

The transport mode preferences for accessing semi-urban hubs show a mixed transport pattern. Walking preferences are relatively low (11.8%), while cycling is high (15.9%), almost equal to urban (16.8%). Car use as a driver is highest in a semi-urban context (3.8%), which is consistent with the strong preference for car parks (41.8%) and car sharing (40.3%). This suggests that semi-urban hubs are often located in environments where cycling works well for part of the journey, while car use remains important both out of necessity for longer distance legs of the trip. The combination of high bicycle supply and high car demand underlines that semi-urban hubs must be able to serve both logics in terms of design and capacity.

Urban: walking and cycling dominate, while the car remains relevant through services

Urban hubs would be reached much more often on foot and by bicycle than hubs in rural settings. Walking accounts for 26.9% here, compared to 11.8% in semi-urban and 14.5% in rural contexts. Cycling accounts for 16.8%, which is higher than in rural areas and comparable to semi-urban areas. This pattern is consistent with high density, shorter distances and an urban 'proximity expectation', whereby facilities must be close by and active mobility is a common choice.

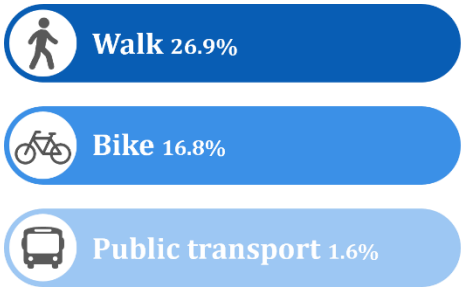

Figure 14: Top 3 preferred mode of transport to reach urban hub

At the same time, car dependency remains visible in urban contexts, not so much in terms of mode of transport, but in terms of the desired service package. The preference of reaching hubs by car as a driver is hardly mentioned (0.3%), but car sharing (34.8%) and car parking (24.1%) remain relevant (Table 3). This indicates that, even where most people prefer to reach hubs by active modes, respondents still value car-related options as part of what an urban hub should offer.

Summary

The transport mode preferences for accessing urban hubs are primarily walking and cycling, which is in line with higher urban density and short distances within urban areas. Semi-urban hubs demonstrate the greatest tension between active transport and car-related preferences, with high cycling shares alongside a strong preference for car parking and car sharing. For rural hubs, preferences for active transport are lower and there is a higher demand for motorised access, consistent with a park-and-ride profile for mobility services. To successfully implement these contextual profiles, it is crucial to maintain a clear balance between providing facilities and mobility services.

Table 5: Preferred mode of transport to reach mobility hub in percentages

	Total (n=1010)	*Rural (n=304)*	*Semi-Urban (n=390)*	*Urban (n=316)*
Walk	17.3	14.5	11.8	26.9
Bike	14.2	9.2	15.9	16.8
Car (as driver)	2.5	3.0	3.8	0.3
Public transport	2.1	3.0	1.8	1.6
E-bike / speed pedelec	1.8	2.3	2.3	0.6
(E-)step	0.4	1.0	0	0.3
Shared (e-)bike/step/scooter	0.2	0	0.3	0.3
Other	0.2	0	0.3	0.3
Car (as passenger)	0.2	0	0	0.6
On-request public transport	0.1	0	0.3	0
(e-)Scooter	0.1	0	0.3	0

Chapter 4: Cluster analysis and comparison with existing hubs

4.1. Purpose and interpretation of the cluster analysis

In addition to understanding what residents would like to see in a mobility hub, it is also important to understand where they would like to see hubs located. The map-based survey identified a large number (1010) of preferred hub locations throughout the province of Groningen. Many of these locations are close to each other, especially in and around the city of Groningen, while other locations are more scattered across smaller towns and rural areas (Figure 15). Therefore, a cluster analysis was performed to identify spatial concentrations of preferred hub locations and translate individual points into a manageable number of more relevant aggregated locations for further analysis and comparison with existing hubs.

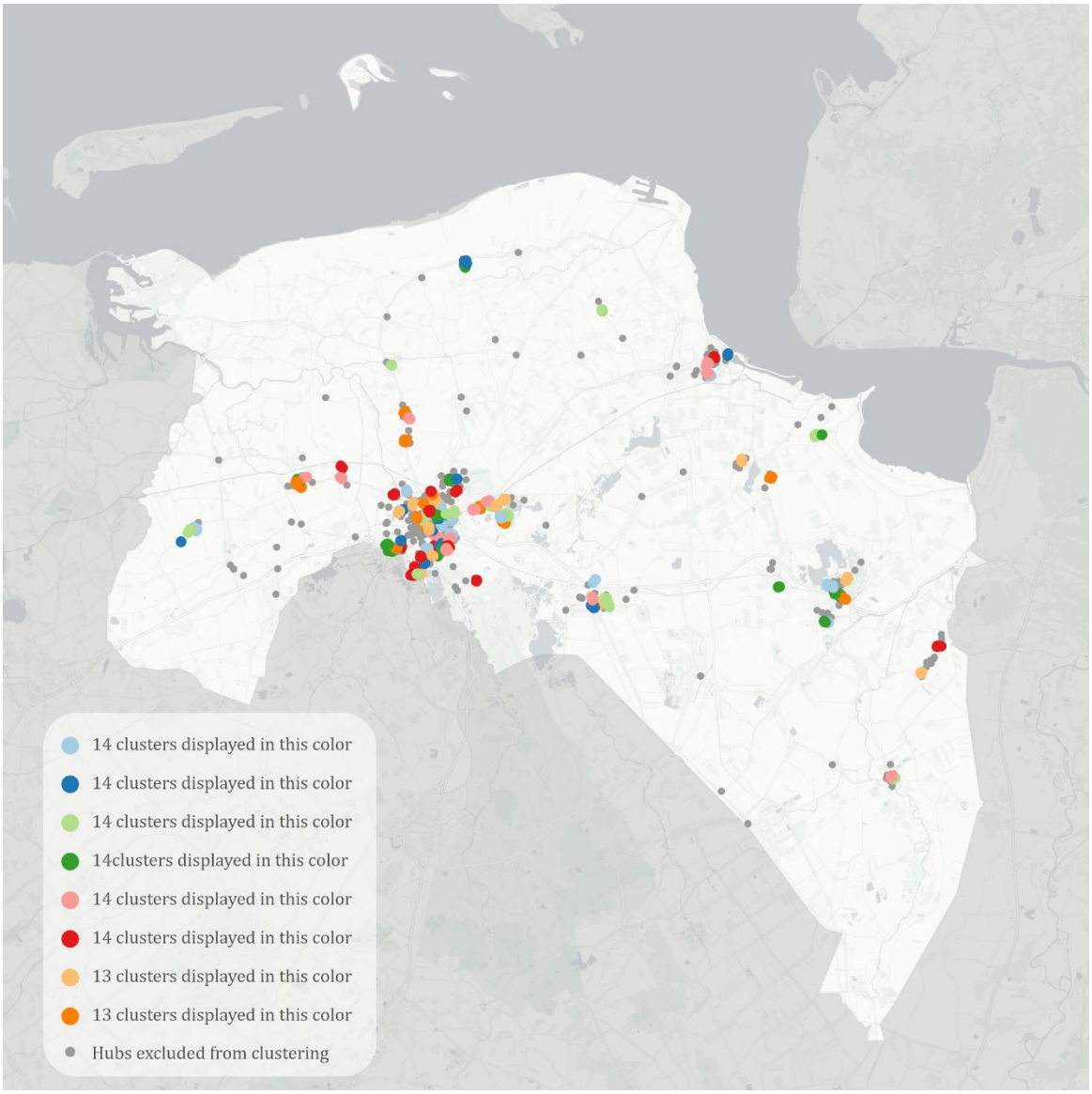

Figure 15: All 1010 hub locations across province of Groningen

The purpose is to identify differences in needs between spatial contexts. The survey strategy has also been adapted to this end, with people being surveyed by post. As a result, this data set is not a good representation of the most desirable location. Thus, as indicated in Section 2.4., this analysis should not be seen as identifying the best or most desirable location for a hub in the province. It does, however, offer general insights into where people would like to see a hub in the area.

4.1.1. Cluster method

The preferred hub locations are clustered using a distance-based method, whereby points can only be included in the same cluster if they are close enough to each other. Three rules are applied in this analysis:

1. Maximum nearest-neighbour distance of 350 metres. Points can only be placed in the same cluster if the distance between points is no more than 350 metres.
2. Anti-linkage to prevent chain formation. To prevent long "chains" of points from forming a single stretched cluster, the furthest point of a cluster may not be more than 350 metres from the first linked point. This keeps clusters compact and prevents a cluster from stretching over a large area because each interlying point falls just within the threshold.
3. Minimum number of 3 points. A cluster is only defined as a cluster when three or more preferred hub locations meet the above requirements.

The choice of 350 metres is related to the assumption that the maximum distance people will walk to reach a bus stop or public transport access point is 500 to 700 metres. With the distance value for clustering set at 350 metres in combination with the anti-linkage rule, clusters remain compact, ensuring that, in the worst-case scenario, no one has to walk more than 700 metres to reach a Hub. This maximum walking distance is based on a study by Van der Waerden, Van der Waerden and Burger (2024), who examined the maximum walking distance to bus stops in the Netherlands.

4.2. Spatial patterns of preferred hub locations

Based on this method, 110 clusters of preferred hub locations were defined. Figure 16 shows the centroids of these clusters. Each extent refers to a figure in Appendix ii. An interactive version of this Figure 16 is available with the following link. The most important lessons learned from the spatial patterns of the preferred hub locations are:

- **The overall spatial pattern confirms that a successful mobility hub functions simultaneously as a transfer point and a place where daily activities converge.**
- **Preferred hub locations are placed with two spatial logics: one centred on the community and its facilities, and another one nodes in the road infrastructure and public transport network.**

High concentration in and around the city of Groningen

The clusters are densest and most prevalent in the city of Groningen, where many preferred hub locations are marked close to each other. Despite the clustering, the points here remain relatively finely distributed, which means that many nearby locations are still designated as different (Figure i). This is consistent with the higher density of destinations and the fact that residents in urban areas can make distinctions between nearby hubs, streets, and amenities.

Spread across the entire province

In the Ommeland, clusters are more spread across, in medium-sized towns and villages (Blauwestad Figure ii, Delfzijl Figure iii, Hoogezand-Sappemeer Figure iv, Meerstad, Figure v, Zuidhorn Figure vi). The pattern shows that residents not only designate hubs at traditional transport junctions, but also at locations that function as local centres in their immediate living environment.

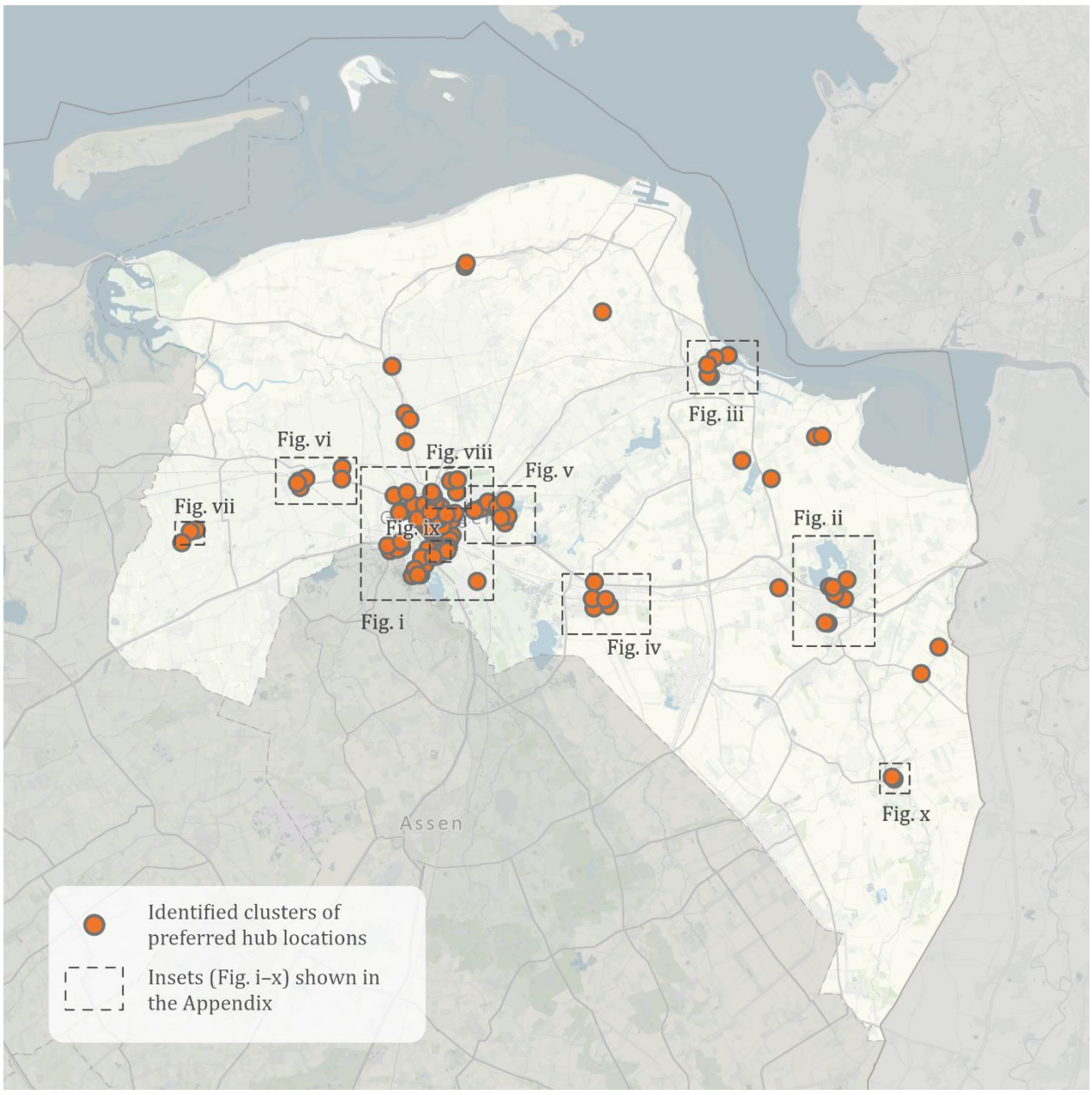

Figure 16: 110 Identified clusters, inset number refers to the close-up figures in the Appendix ii

Spatial logic placement of preferred hub locations

Two recurring location types are (clusters of) amenity locations and transport hubs. Throughout the province, clusters can be found in residential areas and local centres, often around the focal point of neighbourhood or village. In addition, there are clusters in places where multiple facilities are present, such as Beijum (Figure vii) Cluster 60 and Cluster 96, Helpman (Figure viii) Cluster: 76 Meerstad (Figure v) Cluster: 79. This indicates that some residents explicitly seek the link between public transport and facilities. Also, in more rural parts of the province, such as Vlagtwedde (Figure ix) cluster 43 is located near a supermarket and cluster 109 near the local café and shops. This is in line with the hub concept from this report, in which hubs function not only as transfer points, but also as places where mobility and daily activities converge.

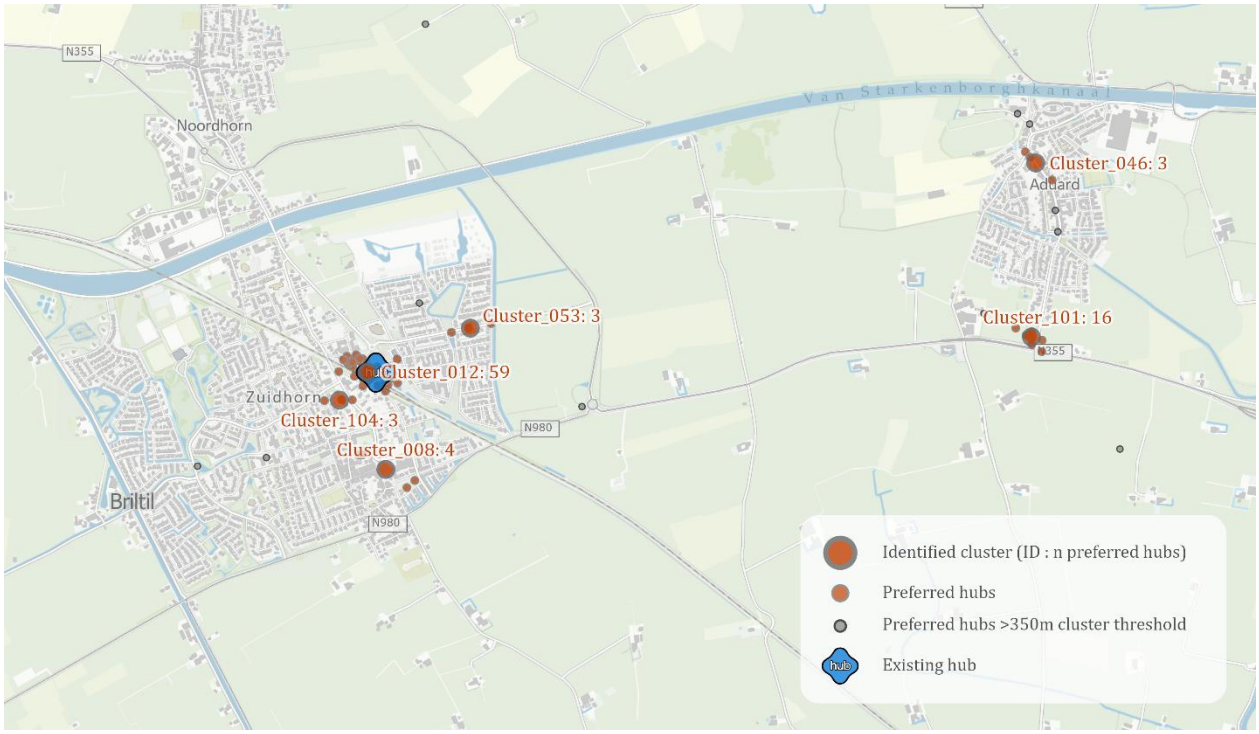

Figure 17: Identified cluster locations with included hubs and existing hub locations

Clusters can also be found at road intersections and public transport hubs. These include stations, bus stops, points near busy road infrastructure and locations near road junctions and access roads (to neighbourhoods). Examples of this 'infrastructure logic' are clusters at central points and access roads in Blauwestad: Cluster: 15, 36 and 64 (Figure ii), Delfzijl: Cluster 41 and 78 (Figure iii), Hoogezand: Cluster: 49 (Figure iv), Meerstad Cluster: 39, 045 and 97 (Figure v), and Grootegast Cluster 1 (Figure x), among others.

Both spatial logics can be observed in Aduard and Zuidhorn (see Figures 17 and vi). Firstly, infrastructure logic is reflected in locations where routes already converge. In Aduard, this can be seen in Clusters 101 and 12. Cluster 101 is located on the access road to the N355 from Aduard and currently features a bus stop and car parking. Similarly, Cluster 59 in Zuidhorn is located at an existing infrastructure node: at the railway station, main road through Zuidhorn and bus routes. The desire for proximity to social functions and amenities is also visible. In Aduard, Cluster 46 is located in the

village centre, next to a school and in a street with various shops. In Zuidhorn, Cluster 8 follows this same logic, as it is positioned in the village centre, where most facilities are located.

This mix is in line with the finding that the distance between home and preferred hub location is relatively small (see Section 4.3.). At the same time, despite this relative short distance, people often choose locations that also make sense in terms of network infrastructure. In other words, even when the hub is located nearby, it is often designated in places where different routes come together, where public transport is already available, or where multimodal accessibility is likely.

In addition, many points have been placed at locations that have already been identified as existing public transport hubs in a dataset from the provinces of Drenthe and Groningen (Province of Groningen, nd). Because there is both overlap and possible deviation in needs between existing hubs and desired hubs, a comparison can be made between user needs and existing facilities (see Section 4.4.).

4.3. Preferred location of the mobility hub

Overall, respondents tend to indicate a mobility hub close to home. This is reflected in the generally short distances between home and the chosen hub location, and it aligns with the broader preference for reaching hubs on foot or by bicycle.

Comparing the preferred hub environment with the urbanity shows whether residents would prefer a hub close to their familiar surroundings or if they would be willing to use a hub in a different area. This indicates which hubs mainly function 'locally' and which also have broader appeal.

The most important result is that the majority of respondents choose a hub in the same urbanity category as their current residence (see Table 6). Respondents from rural areas also choose a rural hub in 76.9% of cases. Those from a semi-urban residential area choose a semi-urban hub in 78.6% of cases. Urban residents most often choose a hub in their own category: 87.1% choose an urban hub. This suggests that people often logically place the hub in an environment similar to their own, as they expect it to offer the most suitable accessibility, functions and scale.

Table 6: Difference in Urbanity level Home and Hub

Urbanity change	***Amount***	***Percentage***
Rural to Rural	233	76.9
Rural to Semi-Urban	63	20.8
Rural to Urban	7	2.3
Semi-Urban to Rural	71	19.8
Semi-Urban to Semi-Urban	282	78.6
Semi-Urban to Urban	6	1.7
Urban to Rural	0	0.0
Urban to Semi-Urban	45	12.9
Urban to Urban	303	87.1

Despite this strong preference for hubs in similar contexts, there are clear shifts towards semi-urban hubs. Rural residents are more likely to choose a semi-urban hub than an urban one, 20.8% compared to 2.3%. Similarly, 12.9% of urban residents choose a semi-urban hub, while no urban residents

choose a rural hub. Semi-urban areas therefore appear to be an attractive "intermediate category" to some residents, possibly because they offer more space, car access, and a wider range of mobility and facility services. However, this remains an interpretation based on preferences, as we have no data on motives such as necessity or attitude.

Distance between home location and hub location

The distances between homes and the chosen hub location are generally small, which is in line with the clear preference for reaching hubs on foot or by bicycle. The average distance is 276.7 metres, with a median distance of 117.2 metres (Table 7). Urban hubs are closest to home. Aan average of 152.1 metres and a median of 102.2 metres. Rural hubs have a higher average distance (338.8 metres), but a relatively low median (104.5 metres). This means that many people in rural areas still mark their hub as being close by, while a smaller group is clearly further away, for example due to more scattered residential locations.

Table 7: Distances (in meters) from home location to indicated hub location

	Mean (in meters)	***Median (in meters)***
Total	276,66	117,23
Less urban	338,82	104,47
Semi-urban	266,71	152,54
Urban	152,09	102,20

The most noticeable, and surprising, result is that the median distance is actually highest in semi-urban contexts: 152.5 metres, higher than both rural (104.5 metres) and urban (102.2 metres). A possible explanation is that semi-urban areas often have less of a “clear centre” than villages, but are also less dense and close together than cities. In a village, it makes sense to place a hub in the village centre, where everything is relatively close by. In the city, people expect amenities to be very close by, so the chosen hub location is often close to home. In semi-urban areas, the “logical” place for a hub may more often be a central location in the neighbourhood or town centre that works for more people, but is therefore slightly further away for individuals on average. This does not necessarily mean that semi-urban residents are willing to travel further, but rather that they place the hub at a point that they perceive as central and appropriate within a more spread-out residential environment.

4.4. Overlap between preferred clusters and existing hubs

As some clusters overlap with existing hubs, an analysis was conducted to compare residents' preferences with the services currently available at these locations. To identify this overlap, a buffer zone with a radius of 250 metres was created around each existing hub. The centroid of each preferred hub cluster was then used as a representative location for that cluster. If the centroid, or multiple centroids, fell within the radius, all the preferences from that cluster were considered and compared with the characteristics of the existing hub. This method indicates where current locations meet user needs and where there are opportunities for development, rather than providing an exact evaluation. The preferences regarding preferred hub location and available services are based on a dataset that was not designed to evaluate existing hubs, as this was not the aim of the study (see Section 2.4.). Therefore, the results should not be interpreted as an exact comparison, but rather as an indication of the degree of alignment and the most notable differences.

Mobility services

In general, comparing mobility services is of limited informational value because overlapping locations are, by definition, already public transport hubs. Consequently, the analysis primarily confirms the anticipated finding that public transport is central to these locations. In this respect, the mobility category is less useful for identifying differences because, in many cases, it concerns the same basic function. However, the comparison can provide insight into the supporting elements of mobility functions, such as bicycle parking, car access, charging facilities, and shared mobility. Overall, however, mobility services mainly confirm that many desirable clusters are logically connected to the existing public transport structure.

Facility services

The comparison reveals more differences when examining facility services. At locations where there is overlap, residents demonstrate a strong preference for basic amenities such as toilets and parcel collection points. However, the inventory indicates that these facilities are often missing from existing hubs. Although the categories chosen by residents in the survey, such as 'grocery store' or 'ATM', do not match the classifications of facilities in the existing dataset, the overall pattern is clear. Residents already recognise these locations as logical mobility nodes. The repeated desire to combine public transport with everyday amenities highlights the need to improve existing hubs. By providing facilities that make waiting, transferring and running errands more appealing, these locations can better support trip chaining and daily efficiency.

4.5. Summary

The cluster analysis translates 1010 individual map points into 110 specifically defined priority areas for hub development or improvement. The spatial pattern shows that preferred hub locations are not exclusively linked to traditional public transport hubs, but also to community centres, availability of amenities and locations that are logical in terms of the transport network and residents' daily routes. The overlap analysis suggests that part of the demand already connects to existing hubs, which offers opportunities to focus primarily on improving and completing hubs, in particular by strengthening facilities that increase comfort and daily usability.

Chapter 5: User preferences call for a context-specific hub design

The results show that mobility hubs in the province of Groningen benefit from a differentiated, context-specific design approach that is in line with local mobility practices and spatial characteristics.

If we look at preferences for hub facilities and mobility services, hubs are primarily seen as functional nodes in daily travel chains. Public transport forms the core of the hub concept, with public transport as the most desired service, which is not surprising as that is one of the primary purposes of transport hubs. Cycling-related functions, including both bicycle parking and shared options (bike sharing and e-bike sharing), are also essential. Which underlines the role of hubs as a link for first and last mile travel.

In addition to mobility functions, respondents particularly appreciate quick activities and time-saving facilities. Parcel points are mostly desired, followed by basic amenities such as toilets. Grocery stores and bank or ATM services are also commonly mentioned, suggesting that respondents value hubs as places where transfers can be combined with quick everyday tasks, rather than as destinations to spend time. This result may also reflect the current infrastructure and the lack of hubs developed as a fully integrated concept combining both facilities and transport services. Limited experience with such comprehensive hubs may therefore influence how respondents understand what a hub is and what it can offer.

Beyond this general picture, the results highlight the importance of considering the context specific differences between the urban, semi urban, and rural areas. **Rural hubs** have a clear profile in which public transport is combined with relatively strong demand for car parking, in line with the park-and-ride concept. Bicycle parking is also in high demand, but shared cycling options are less prominent, with bike sharing and e-bike sharing mentioned less often. Preferred modes to reach the hub reinforce this profile. Driving to the hub is mentioned more often than in more urbanized contexts. In terms of facilities, next to quick activities to be combined during a transfer, social and care-oriented facilities such as community centres and GP services are relatively more desirable compared to the more urban hub types. This reflects a perception that a mobility hub could contribute to the local amenity level and liveability of rural areas as a whole. **Semi-urban hubs** require a more hybrid configuration combining elements of both rural and urban travel needs. Bicycle services, including shared services, are strongly desired to cover the first or last leg of a trip, alongside e-bike, PT, and car services for longer legs of a trip. Preferences for how people want to reach the hub also show this mixed demand pattern, with cycling and driving being highest, while walking is considered less feasible. **Urban hubs** cater to urban lifestyles as a location for everyday tasks and meetings, while on the mobility side have a strong emphasis on bicycle-based (shared) mobility and walking. Public transport is also widely desired, indicating that the hub could be anchored in the regional public transport system even in dense areas. At the same time, car dependency remains visible through car sharing demand and a residual demand for parking.

Preferred hub locations are most prominent in and around the city of Groningen, but they also appear in medium-sized towns and village centres, indicating that desired hubs are linked not only to traditional public transport nodes, but also to local centres and amenity locations. The location

analysis shows a strong tendency to choose hub locations close to their home, albeit with some differences across contexts. Urban hubs are preferred closest to home on average, while semi-urban hubs show the highest distance, suggesting that respondents in semi-urban settings more often place hubs at perceived central points rather than directly near home.

Where preferred locations overlap with existing hubs, the comparison suggests that public transport is already present by definition, but that there is often scope to strengthen the 'place' function through basic comfort and convenience facilities, such as toilets and parcel points.

Further knowledge development for the mobility hub programme could be pursued by exploring several areas of future research. Firstly, profiling user preferences according to specific demographic variables, such as household type or education, would provide a deeper understanding of varying needs. Secondly, additional spatial analyses of the preferred hub locations could be carried out to gain insight into their placement, the relationship with the infrastructure network, and their proximity to key facilities and existing services. Thirdly, comparing existing and desired hubs could be enhanced by integrating external data sources to identify structural gaps in nearby facilities, such as pharmacies or libraries. Finally, it would be useful to extend the research beyond the borders of Groningen to include Drenthe and parts of Friesland. This would provide a more accurate picture of people's actual movements and align with the public transport network operating beyond the province's borders.

Furthermore, the analysis is primarily based on the location of the hub, while in practice users are not restricted to one specific context and can move between areas. A valuable subsequent step is therefore to shift the focus from the location to the user when analysing preferences for hub services and facilities. By focusing on socio-demographic characteristics and travel profiles, the interaction between the type of traveller and the physical environment can be examined. This makes it possible to determine whether needs and preferences stem from personal lifestyle, the spatial context, or the specific relationship between the user and the environment in which they are located at that time.

All in all, the analysis suggests that a one-size-fits-all approach is not the best way forward for mobility hubs in the province of Groningen. The data indicates that context shapes both people's expectations of a hub and their intended use of it. Rural hubs are primarily seen as transfer points, where car access and basic local amenities are important, and social functions come together. Semi-urban hubs require a hybrid mix that supports multiple access modes and perceived centrality. Urban hubs demand comfort and convenience, as well as strong integration of walking and cycling within everyday city life. Designing hubs around these distinct usage patterns will likely increase their relevance and adoption. Therefore, rather than a single 'ideal' hub model, the most robust conclusion is a flexible hub concept that can be adapted and combined in different ways depending on the context, with public transport at its core and a targeted set of facilities and services tailored to local needs.

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Appendix

i. Sample Descriptives

In addition to the information on age and gender provided in Chapter 2.6, our dataset offers an interesting overview of the population through sociodemographic figures. For socio-economic indicators (Table i), educational level and income, direct statistical comparison with provincial numbers is difficult due to differences in how data is measured. For example, this study asked about income at the household level, which makes it difficult to compare directly with personal statistics Nevertheless, the results indicate a slight deviation in the sample towards a higher socio-economic status, characterised by a relatively large proportion of respondents with a higher level of education and a higher household income.

In terms of household composition, couples without children (33.4%) and single-person households (29.5%) constitute the largest groups in the dataset. However, there is a strong spatial differentiation. In urban areas, more than half of the sample (54.2%) consists of single-person households, while in rural areas, multi-person households dominate.

Table i: Sample descriptives socio-economic factors

Variable		Percentage			
		Total	**Rural**	Semi Urban	Urban
Education	Primary education	0,5%	0,8%	0,8%	0,0%
	Lower secondary education	3,4%	4,6%	2,3%	2,9%
	Upper secondary education	9,6%	7,6%	7,3%	13,6%
	Short-cycle tertiary education	12,8%	19,5%	14,2%	4,1%
	Bachelor's or equivalent level	41,0%	37,5%	46,4%	40,9%
	Master's or equivalent level	26,3%	24,8%	23,8%	29,9%
	Doctoral or equivalent level	6,5%	5,3%	5,4%	8,7%
Income (by household)	€ 1,000 or less	7,5%	2,4%	6,8%	13,3%
	€ 1,001 - € 2,000	9,0%	5,0%	4,7%	16,4%
	€ 2,001 - € 3,000	15,7%	9,8%	14,0%	23,1%
	€ 3,001 - € 4,000	18,8%	14,5%	20,9%	21,9%
	€ 4,001 - € 5,000	14,4%	18,0%	17,4%	8,3%
	€ 5,001 - € 6,000	14,5%	20,4%	11,5%	10,5%
	€ 6,000 or more	20,1%	29,9%	24,7%	6,5%
Household	Couple with a child/children	28,5%	42,2%	33,7%	8,9%
	Couple without children	33,4%	37,7%	33,0%	28,9%
	One-person household	29,5%	11,8%	23,5%	54,2%
	Single adult with a child/children	4,5%	4,8%	6,8%	2,6%
	Other	3,2%	2,0%	1,9%	5,4%
Driver licence	No	12,2%	8,3%	7,6%	20,1%
	Yes	87,8%	91,7%	92,4%	79,9%

Having a public transport subscription	No	52,3%	66,3%	62,1%	28,9%
	Yes	47,7%	33,7%	37,9%	71,1%
Having a limitation in pt	No	99,6%	99,4%	99,2%	100,0%
	Yes	0,4%	0,6%	0,8%	0,0%
Having a limitation in cycle	No	96,2%	96,6%	97,5%	94,8%
	Yes	3,8%	3,4%	2,5%	5,2%
Having a limitation in walk	No	99,0%	99,2%	98,7%	99,0%
	Yes	1,0%	0,8%	1,3%	1,0%

In terms of mobility, the majority of respondents have a driving licence (87.8%). Ownership of a public transport pass is relatively low at 47.7%. The strong influence of the degree of urbanisation on this variable is also very noticeable. While only 33.7% and 37.9% of respondents in rural and semi-urban areas have a public transport pass, the percentage in urban areas is much higher at 71.1%. This difference highlights the varying mobility patterns and the greater dependence on car transport in the surrounding areas.

ii. Maps

Figure i Groningen

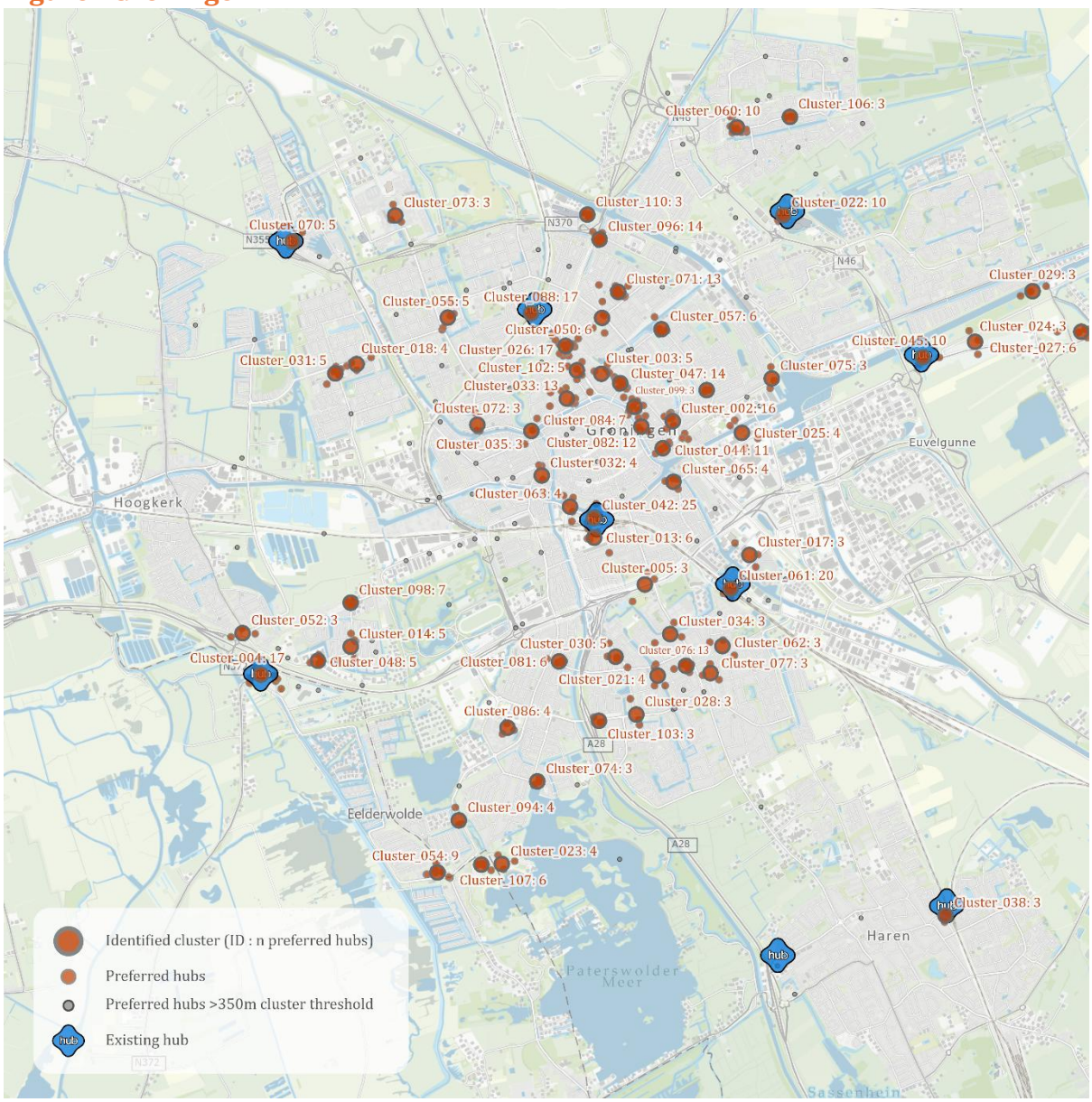


Figure ii Blauwestad

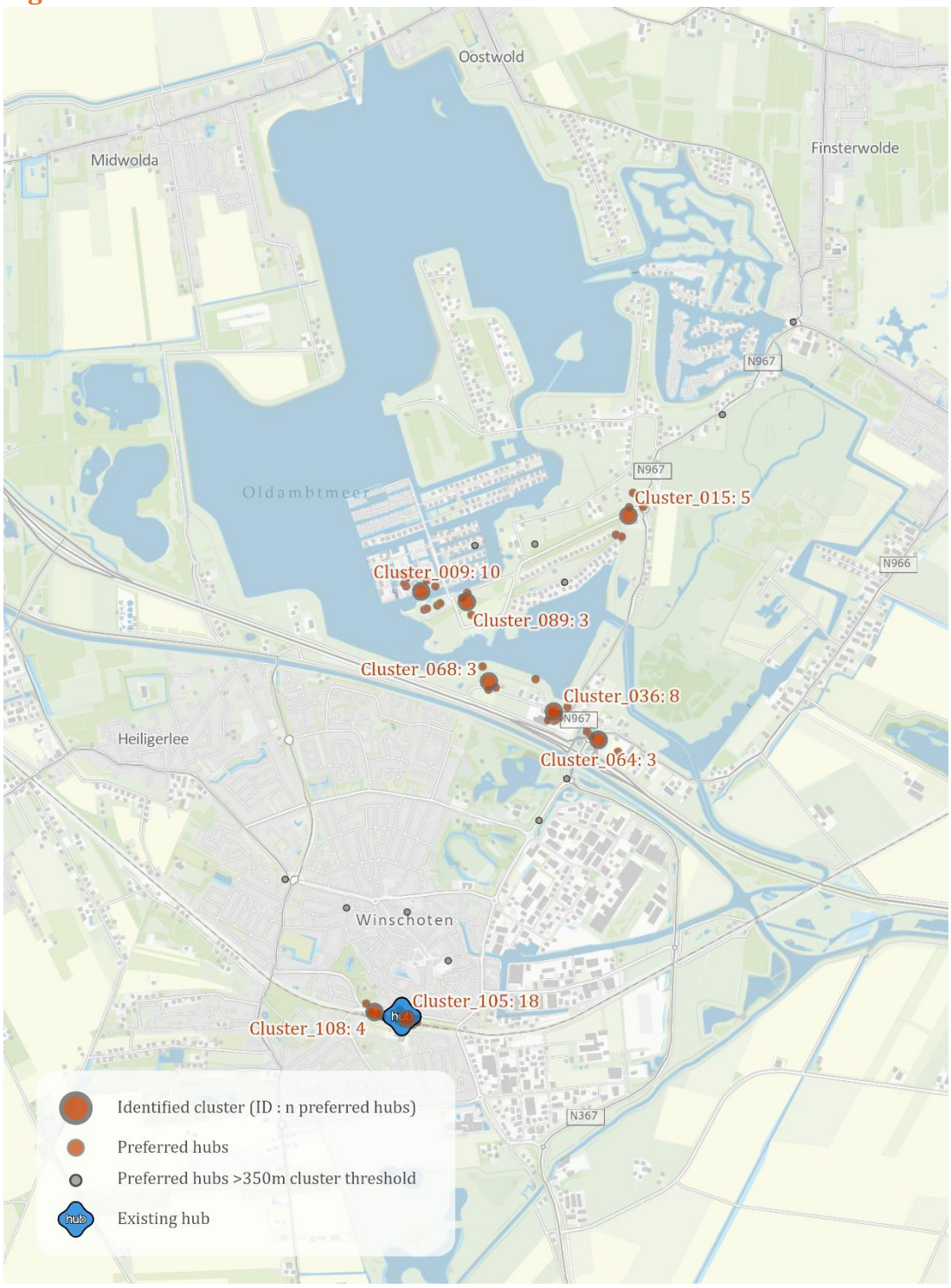


Figure iii Delfzijl

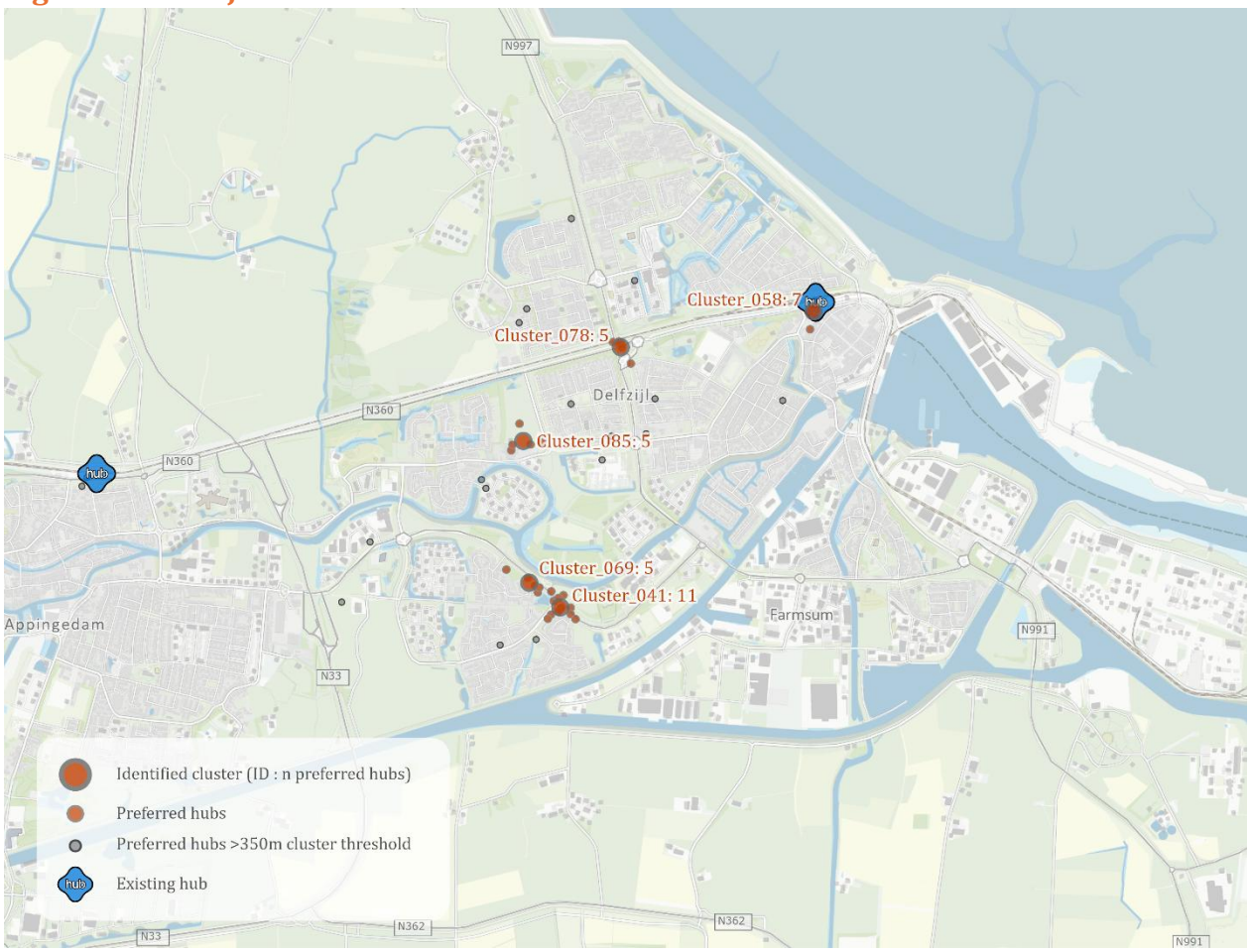


Figure iv Hoogezand-Sappemeer

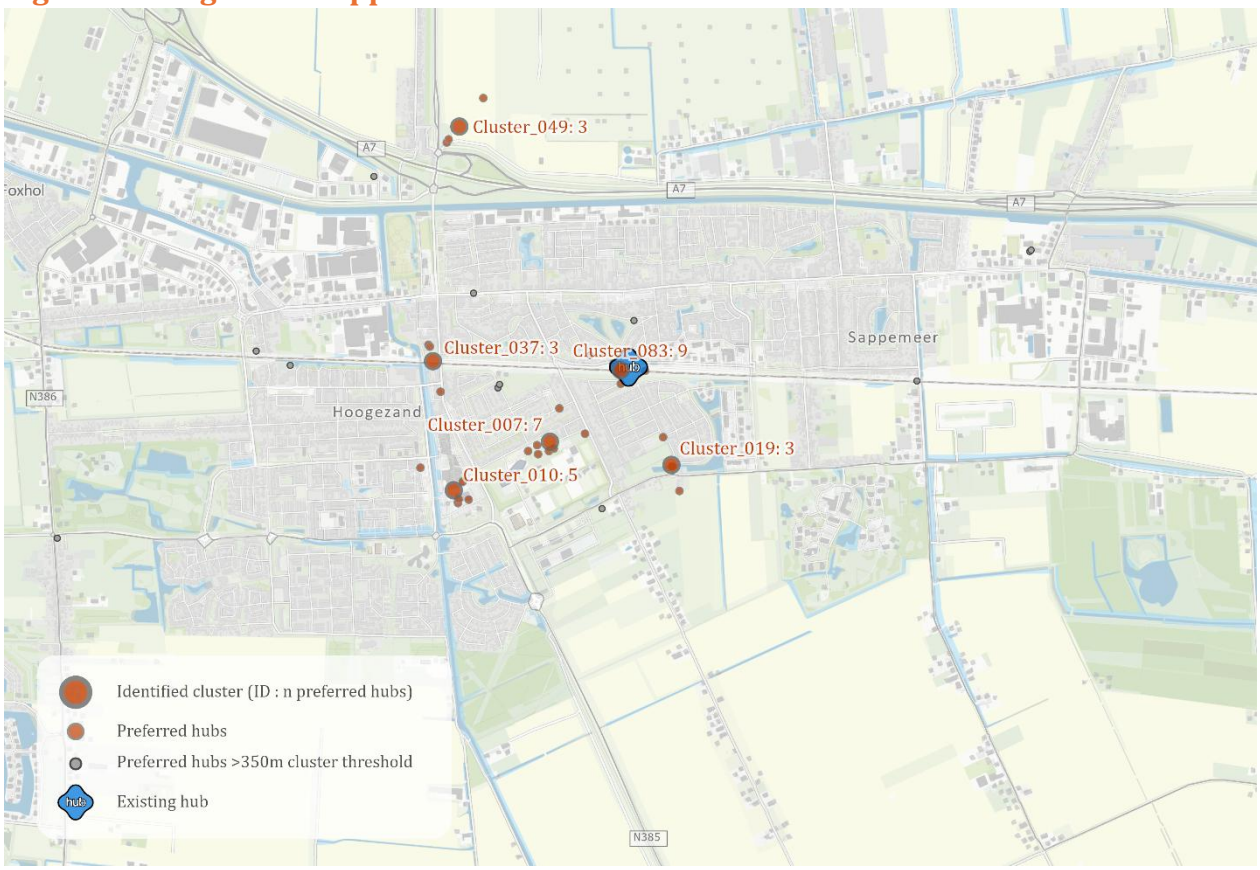


Figure v Meerstad



Figure vi Zuidhorn

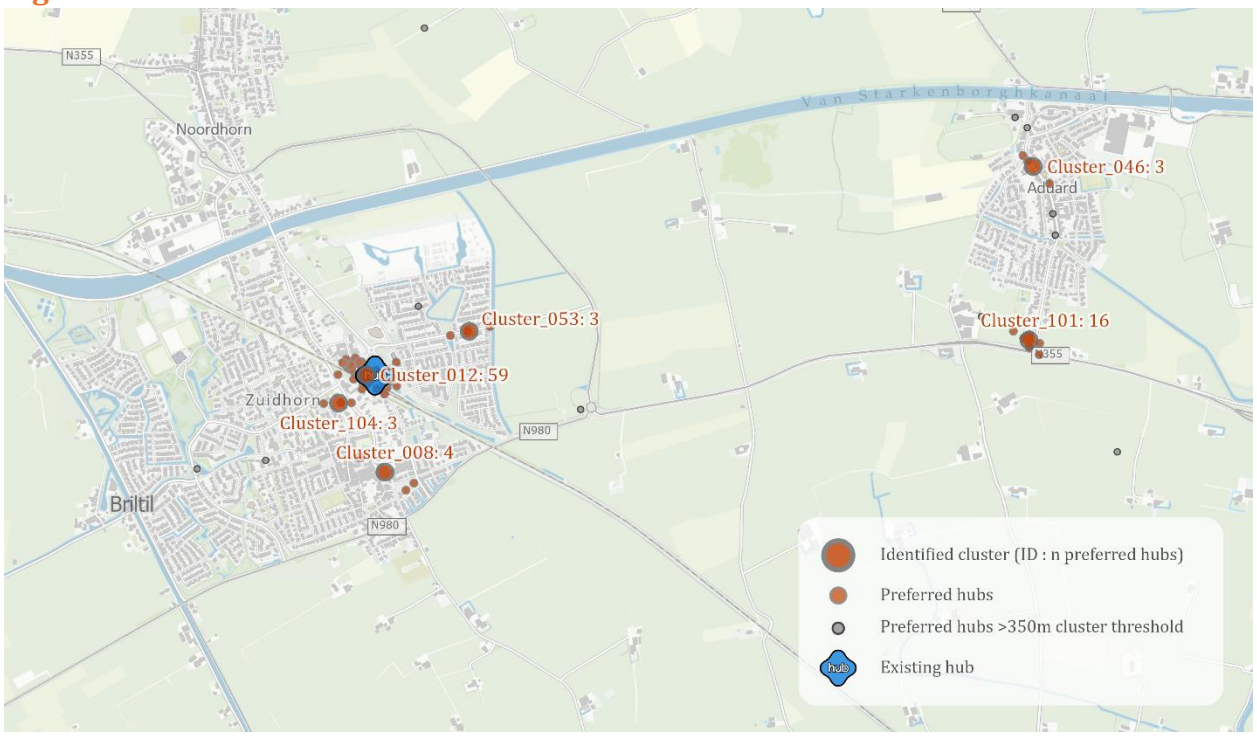


Figure vii Beijum

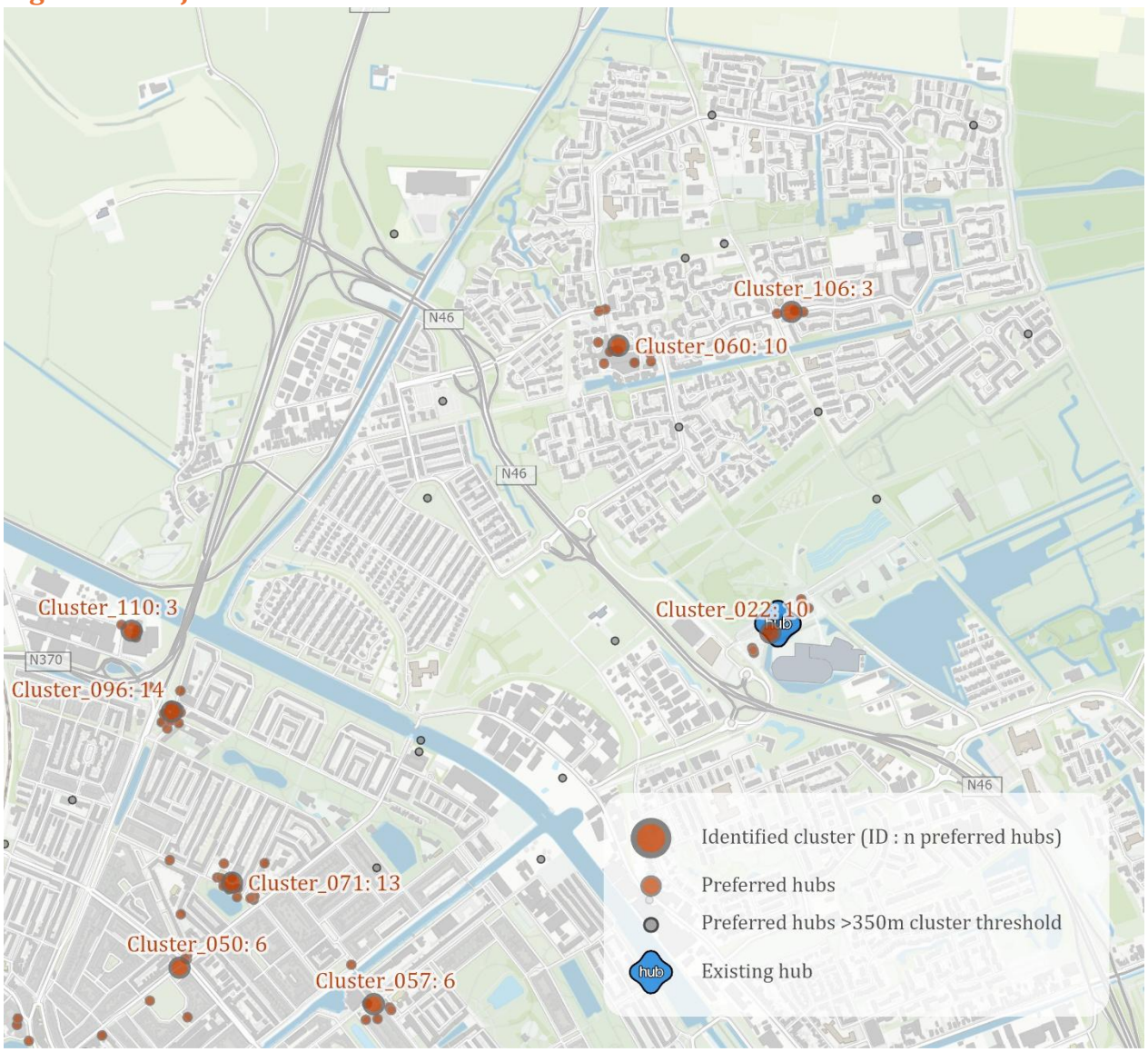


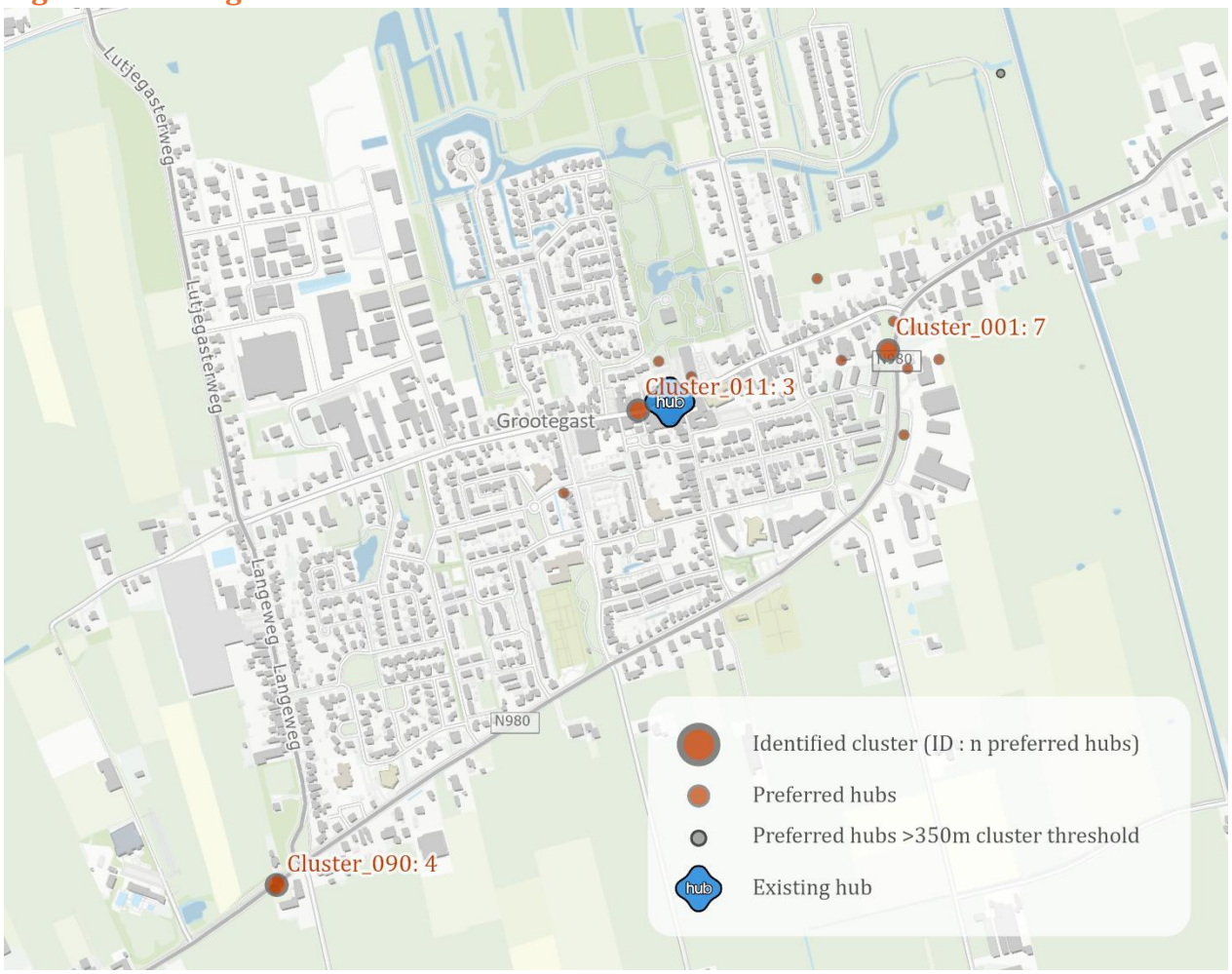
Figure viii Helpman



Figure ix Vlagtwedde



Figure x Grootegast



iii. Overview of respondents' neighbourhoods

Table ii: Overview of neighbourhoods, the number of respondents, and whether they were invited by post

Neighbourhood	Number of respondents	Postal invitation
Binnenstad-oost	49	Yes
Hortusbuurt-ebbingekwartier	44	Yes
Zuidhorn	37	Yes
Helpman	36	Yes
De buitenhof	31	Yes
Aduard	29	Yes
Indische buurt	27	Yes
Meeroevers	26	Yes
Piccardthof	21	Yes
Verspreide huizen zuidhorn	21	Yes
Beijum-west	17	Yes
De wijert	17	Yes
Bellingwolde	16	Yes
Professorenbuurt	16	No
Sauwerd	15	Yes
Verspreide huizen winschoten	14	Yes
Tersluis	14	Yes
Usquert	14	Yes
Vlagtwedde	14	Yes
Adorp	13	Yes
Verspreide huizen midwolda	13	Yes
Winschoten-centrum	13	Yes
Grootegast	12	Yes
Zuiderpark	12	Yes
Nieuwolda	10	Yes
Groenewei	9	Yes
Wagenborgen	9	Yes
Steenbakkersbuurt	9	No
Beijum-oost	8	Yes
Woldendorp	8	Yes
Reitdiepswaard	7	No
Verspreide huizen finsterwolde	6	Yes
Dethmerseiland	6	Yes
'T zandt	6	Yes
Gorechtbuurt	6	No
Noorderplantsoen	5	No
Schildersbuurt	5	No
Selwerd	5	No
Vinkhuizen-noord	5	No

Tuikwerd	4	Yes
Buitengebied sauwerd	4	No
Coendersborg	4	No
De vosholen-west	4	No
Hoornse park	4	No
Boerakker	3	Yes
Binnenstad-west	3	No
Bloemenbuurt	3	No
Gravenburg	3	No
Harkstede gn	3	No
Hoogkerk-zuid	3	No
Laanhuizen	3	No
Paddepoel-noord	3	No
Rietkampen	3	No
Zandplatenbuurt	2	Yes
Briltil	2	Yes
Bedum noord - oost	2	No
Binnenstad-noord	2	No
Buitengebied noord-'t zandt	2	No
Buitengebied tolbert	2	No
Centrum leek en omgeving	2	No
De meeuwen	2	No
De wijert-zuid	2	No
Europapark	2	No
Fivelzigt	2	No
Noorderplantsoenbuurt	2	No
Oosterpoort	2	No
Stadshart-noord	2	No
Sterrebosbuurt	2	No
Umcg	2	No
Veele	2	No
Villabuurt	2	No
Vinkhuizen-zuid	2	No
Winschoten-bomenbuurt	2	No
Ekamp	1	Yes
Verspreide huizen beerta	1	Yes
Bangeweer	1	No
Bebouwde kom enumatil	1	No
Bebouwde kom oostwold	1	No
Binnenstad-zuid	1	No
Bruilweering	1	No
Buitengebied zuid-termunten	1	No
Corpus den hoorn	1	No

De eems	1	No
De hoogte	1	No
De nieuwe held	1	No
De suikerzijde-noord	1	No
De wierden	1	No
Ezinge	1	No
Haren-centrum	1	No
Haren-noord	1	No
Haren-zuidoost	1	No
Harkstede	1	No
Hoogkerk dorp	1	No
Hunzeboord	1	No
Kalkwijk-noord	1	No
Kostverloren	1	No
Kropswolde	1	No
Leermens	1	No
Lintweide	1	No
Martenshoek en industriegebied martenshoek	1	No
Nieuw woelwijck	1	No
Niezijl	1	No
Noorderpark	1	No
Oldekerk	1	No
Oling	1	No
Olingermeeden	1	No
Onstwedde	1	No
Oogstbuurt	1	No
Oosterhaar	1	No
Oranjebuurt	1	No
Oranjebuurt	1	No
Paddepoel-zuid	1	No
Peizerweg	1	No
Rivierenbuurt	1	No
Ruischerbrug	1	No
Ruischerwaard	1	No
Sappemeer-oost	1	No
Schildwolde	1	No
Siddeburen buitengebied	1	No
Stadshart-zuid	1	No
Stadskanaal noord	1	No
Stadspark	1	No
Tripscompagnie	1	No
Ulgersmaborg	1	No

Van starkenborgh	1	No
Van swieten	1	No
Veendam-centrum	1	No
Verspreide huizen bourtange	1	No
Verspreide huizen nieuwolda	1	No
Verspreide huizen ten zuidoosten van bellingwolde	1	No
Verspreide huizen vlagtwedde	1	No
Westerpark	1	No
Woldwijck-oost	1	No
Zeeheldenbuurt	1	No
Zeeheldenbuurt	1	No
Zuidwending	1	No
Meerland	0	Yes
Niesoord	0	Yes