

Mobilityhubs: a positive factor in the rural-urban divide?



Figure 1: an example of a mobility hub in Stuttgart, Germany (Cutlip k., 2022)

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Summary

Mobility hubs are an increasingly popular topic and option, and the government sees them as a viable solution to certain problems, such as issues with mobility for certain people and climate change. Right now, it is the case that the ways in which people have access to mobility differs between rural and urban areas. In rural areas, people are more likely to use their car to commute to their work or certain amenities for example. In urban areas, people are more likely to use public transport to get to their job or other amenities.

Research has already been done on the relation between car ownership and the degree of urbanization in a certain municipality, however this had not been done for mobility hubs and car ownership, in which case people might expect a similar relationship.

Based on this, this thesis aims to answer the following main question:

How do current and future mobility hubs influence the rural-urban mobility divide in Gelderland?

In addition, the following sub-questions were formulated:

Where are current mobility hubs located and where will they be located in the future?

What types of mobility hubs do currently exist, and which types are planned for the future?

For the analysis conducted here, a database has been created in excel, after policy documents had been analysed per municipality, and classified as being a certain type of mobility hub. The analysis did yield some significant results, when some variables did predict a certain amount of cars per household in a municipality. This was the case for a variable that indicated whether or not a municipality has a mobility hub at all. Furthermore, also the most relevant type of mobility hub in a municipality was relevant, along with the second mobility hub in a municipality, the frequency of service offered at a mobility hub, and the amount of mobility hubs in a certain municipality.

An interview was also conducted with a representative of the provincial government of Gelderland to gain further insight into the policy for mobility hubs by them. From the interview, it became clear that the provincial government is currently experiencing a shift due to recent election results, in which the rural areas also get more attention, because it used to be the case that most of the mobility hubs were primarily aimed at urban areas. It also became clear that the government does not want to force people to take public transport, but they do want to make using mobility hubs a better alternative, so that people will decide to use them themselves.

In the analysis, it became clear that there are not enough future plans to say much about where and how future mobility hubs will take shape. This can only be based on the currently existing

plans. It is often the case that municipalities do have plans, but they are not concrete enough to actually analyse them, as it is not exactly clear yet what type of mobility hub it will be and where it will be realized.

After the variables were analysed individually, a univariate analysis was run to see if the model in total could explain part of the number of cars that people owned per household in a certain municipality. To not make the model too complex, only three variables were included as independent variables, namely the frequency of service, the amount of existing mobility hubs and the type of mobility hub that is most relevant in a certain municipality.

From the univariate analysis, it became clear that part of the ownership of cars per household in the municipalities in Gelderland could be explained by the selected variables. The adjusted R squared is not particularly high and it does therefore not explain a lot of the variable, but this makes sense as other research points out that income and age for example also play a big role in the number of cars people own.

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1. Introduction

1.1 Introduction

Mobility hubs seem to be a development in which there is a decent amount of interest, as evidenced by the plans that the government has at various levels, and the mobility hubs that are under development or already exist. For example, the website mobilityhub.nl (n.d.) makes it clear that many actors are interested. Furthermore, the government is a partner at various levels, nationally such as the Ministry of Infrastructure and Water Management, at provinces such as the province of Noord-Brabant and municipalities such as the municipality of Barendrecht and the municipality of Rotterdam. The literature also indicates that the mobility hub concept is gaining popularity. Innovations such as 'mobility as a service' can also ensure that the concept will gain even more popularity, because it can increase the ease of access for shared forms of mobility, as is the case with 'mobility as a service', where digital integration is used to simplify the process of switching to another means of transport and will ensure that people experience a smaller threshold to use it (Rongen et al., 2022).

Mobilityhubs are referred to in different ways in literature. It is not a new concept, but it is used increasingly more often. This becomes clear when the term 'mobility hubs' is entered in web of science. Over the past decade, the amount of publications has more than doubled over the past decade, going from 24 publications in 2013 to 57 publications as of August 2023, while the year has not passed yet. The term 'mobility hub' can sometimes be a vague concept that is mentioned often but it does seem to be used in different ways by different actors. A definition created by 'CoMoUK' that is cited in scientific literature is: '*A mobility hub is a recognisable place with an offer of different and connected transport modes supplemented with enhanced facilities and information features to both attract and benefit the traveller*' (Arnold et al., 2022). By using this definition, most railway stations in Gelderland already qualify as a mobility hub, as they are recognisable places that offer different and connected modes of transport, such as trains, buses and bikes that can be hired. These train stations provide facilities, such as shops or vending machines, and information on schedules of the different modes of transport.

Because the concept can be rather vague and the definition of 'mobility hub' is quite broad, literature distinguishes six types of mobility hubs. These consist of the so-called 'community hubs', 'neighbourhood hubs', 'suburban hubs', 'city district hubs', 'city edge hubs' and 'city centre hubs'. The 'community hub' is a type of hub that is usually located in privately owned areas, and they often offer shared cars or mopeds for example. The 'neighbourhood hub' is a type of hub that also consists of shared vehicles, but it usually has a connection to public transport. 'Suburban hubs' are hubs that focus on the accessibility of suburban areas. These hubs often require a vehicle to get to the hub. The so-called 'City district hub' exist to improve the quality of life for residents living nearby. They are often located in places where there are not a lot of parking spaces. At this type of hub, there are usually a plethora of options to commute. The 'city edge hub' is a type of hub that focuses on the mobility between rural and urban areas. It often consists of a park and ride location located on the outskirts of the city.

Lastly, there are 'city centre hubs'. These hubs usually have high-quality options of transport available and are relatively easily reachable on foot or by bike. They also have the most options for public transport such as metros, train and trams.

A more in-depth analysis of each type of mobility hub is described later on, in the theoretical framework.

1.2 Problem statement

So-called 'mobility hubs' seem to have attracted the interest of government organizations at multiple levels. For example, there are local governments that have included the wish for a mobility hub in structural visions and provinces, but also the national government, are interested in it (mobility hub, n.d.). At present, public transport in rural areas often lags behind compared to urban areas. There are fewer places where people can come or board, it takes longer to cover a certain distance and the means of transport also pass by less often (Rongen et al., 2022). That is why more use is made of public transport in urban areas than in rural areas (Centraal Bureau voor de Statistiek, n.d.). The plans for mobility hubs seem to focus mainly on urban areas. **This study will examine whether this difference in mobility options will change with the arrival of new types of mobility hubs.** The selected geographical area for the research will be the province of Gelderland, because the entire country of the Netherlands would be out of scope for this bachelor thesis. This so-called mobility divide is defined as follows: in rural areas, people are currently more likely to use a car and it will likely stay that way in the future. Usage of public transport is low in rural areas, and this means that profitability is increasingly under pressure. People do not necessarily see this as a problem if they possess a car, but it can be a problem if there is no access to a car. Also in the future, if public transport would need to play a bigger role, it is necessary that it is a viable option (Ministerie van Infrastructuur en Waterstaat, 2023). Simply said, the main factor dividing urban and rural mobility is the way people commute, with people in cities being more likely to use public transport, and people in rural areas being more likely to use their car.

Based on this, the following main question was formulated:

How do current and future mobility hubs influence the rural-urban mobility divide in Gelderland?

In addition, the following sub-questions were formulated:

Where are current mobility hubs located and where will they be located in the future?

What types of mobility hubs do currently exist, and which types are planned for the future?

1.3 Societal relevance

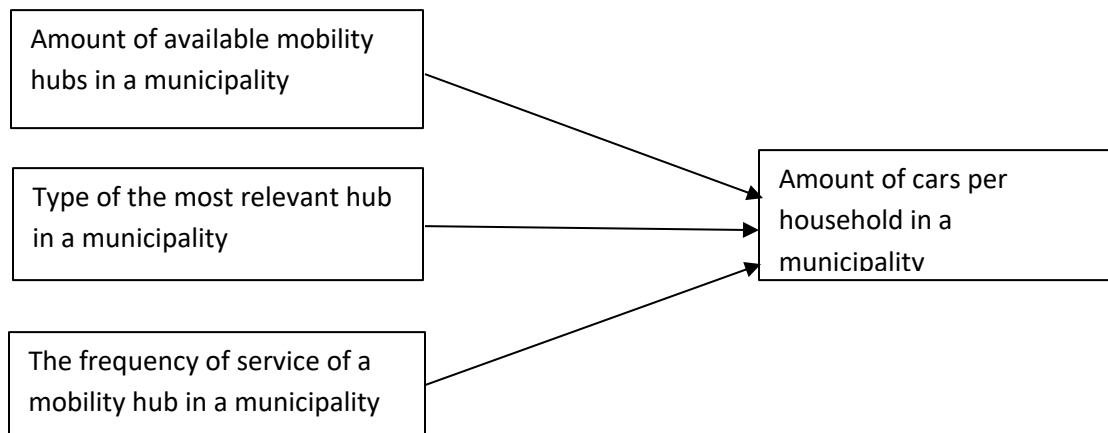
The province of Gelderland faces a major task in the coming years, namely realising the energy transition in order to achieve the climate goals. Mobility hubs are presented as a sustainable option for transport in the future. There are plans for mobility hubs in rural, but also in urban areas. When mobility hubs are used to replace transport that would otherwise take place by car with a combustion engine, it is a more sustainable alternative. Furthermore, mobility hubs can also improve the accessibility of certain places for people who do not have access to a car. There are some plans for urban mobility hubs in the Netherlands, such as the 'E-lympic Mobility Hub' in Amsterdam (Municipality of Amsterdam, n.d.). These plans can be found relatively often online. There are also plans for mobility hubs in rural areas. Plans have even already been realised here, such as in Wieringerwerf in North Holland (CROW, 2021). However, there is less to be found about these plans and they also appear to be smaller in scale. At the moment there is no central overview for the plans and already existing mobility hubs in Gelderland. Through this bachelor thesis, insight can be gained into the difference between the number and type of mobility hubs that already exist, and the number and type of mobility hubs that are not yet ready. This makes it possible to see what influence this will have on the mobility of certain regions in the future. Furthermore, a database with all currently available mobility hubs and their types, along with plans for new mobility hubs in the future will give better insight for citizens and policy makers.

1.4 Scientific relevance

The scientific relevance of this bachelor thesis is the bridging aspect that is applied. There is different scientific literature on different topics regarding mobility hubs, however none of them seem to really focus on the rural-urban divide. The rural-urban divide is in this case the amount of cars owned by households per municipality in Gelderland. There are analysis being conducted on the relation between the distance to train stations and car ownership, but these do not take the newly emerging mobility hubs in mind(CBS, 2020). The scientific literature to date does discuss how and where mobility hubs can be implemented in the Netherlands, and concepts such as 'mobility as a service' are discussed. Mobility as a service (MaaS), for example, is a system in which the search, booking and payment of these mobility services can be arranged at a mobility hub. This could lead to greater adoption of the system.(Rongen et al., 2022) It is also discussed how mobility hubs in rural areas could improve mobility here (Frank et al., 2021). Furthermore, it is also discussed, for example, how it is necessary to discourage other modes of passenger transport, such as the use of a private car to make mobility hubs more successful (Witte et al., 2021). However, there is no scientific research into the difference in accessibility of certain locations that could arise from the arrival of mobility hubs. The aforementioned database can be used by other researchers to base their research on.

2. Theoretical framework

As a theoretical framework, the amount of available mobility hubs, type of mobility hub and the frequency of service have been chosen as independent variables. As has been shown in the literature, there are less available spots where someone can hop on public transport (Rongen et al., 2022), and as discussed beforehand, it also seems like there are less plans for mobility hubs in rural areas. This is why 'amount of available mobility hubs' has been chosen as the first independent variable. Furthermore, the second independent variable is the type of mobility hub that is the most relevant in a certain municipality. The type here has been chosen because it shows that mobility hubs can be divided into six categories (Weustenenk et al., 2023), but not all types are likely to be found in all areas. For example, as the name suggests, it is unlikely that one may find a 'city centre hub' in a rural area. As the third independent variable, 'frequency of service' has been chosen. As shown by literature, public transport arrives less frequently in rural areas. This disadvantages people in rural areas as it makes the service less user friendly. This variable also refers to the quality of services provided at a mobility hub (Rongen et al., 2022). Furthermore, the distance to locations where people want to go also is part of the model, as amenities are often closer in urban areas (Centraal Bureau voor de Statistiek, 2022). For this variable, a few amenities have to be selected that people often need access to. Together these three independent variables lead to the dependent variable, namely the 'rural/urban mobility divide'. The rural/urban mobility divide is in this case the car ownership per household per municipality. Based on this, the following model was created:



This model implies the following hypothesis:

The existence of a mobility hub should decrease the amount of owned cars

The type of mobility hub should influence the amount of owned cars

If a service is more frequent, there will likely be fewer cars.

2.1 Rural/urban mobility divide

A large proportion of urban and rural residents hardly experience any problems in terms of accessibility. This is surprising since the potential accessibility of many facilities, such as education, jobs and shops, do differ between rural and urban areas. Potential accessibility is lower in rural areas. Several factors are cited as explaining this, namely: car ownership, sufficient income to use a car, social skills to arrange a ride and internet access to efficiently plan or even replace travel-related activities. These factors appear to positively influence the perceived accessibility, especially in rural areas.

In any case, the difference in potential accessibility looks set to diverge even further in the future, because the number of inhabitants of the Netherlands will continue to increase, but many places in the countryside will continue to shrink (Ministerie van Infrastructuur en Waterstaat, 2023).

Based on this information, to not complicate the model too much, the rural/urban divide is in this case defined as the car ownership per household per municipality, because it seems to be the most relevant actor in the divide.

2.2 Types of mobility hubs

Because the use of the term mobility hub can be quite confusing, since it is not a fixed concept where it is completely clear what exactly the concept means, other literature is cited here to better define this concept. In this study, the focus is on mobility hubs that are used to enable passenger transport, large-scale freight transport is omitted. In the literature, six types of mobility hubs are further distinguished by Weustenenk et al.:

The community hub is a mobility hub that can only be used by a small group. These mobility hubs are usually located in privately owned areas, such as a garage or parking lot. Shared cars, bicycles and mopeds are often available here. In general, there is no connection to public transport, nor are there any other services for the neighbourhood, since this mobility hub is not located in the public space. Developers sometimes implement these mobility hubs because they reduce the number of parking spaces needed to increase the density of built housing.

The 'neighbourhood hub' also consists of shared cars, bicycles and mopeds, but there is usually a connection to public transport here. Users usually come to such a mobility hub on foot or by bicycle. Neighbourhood hubs are usually located near supermarkets, for example, and additional services are often available, such as picking up a package. It is true that neighbourhood hubs are less well connected to public transport than 'suburban hubs', trains or buses usually pass here less often.

Suburban hubs are mobility hubs that focus on the accessibility of suburbs. It is often necessary to use your own vehicle to reach these places, which means that they have many parking spaces. Because these mobility hubs are located in the suburbs, it concerns an area that is less urban than, for example, the 'neighbourhood hubs'. There are fewer transport options than in so-called 'city edge hubs', and there are often no other options such as the possibility to pick up a package.

The 'city district hub' is a type of mobility hub that is characterised by a focus on quality of life. It concerns a convergence of functions that can improve urban development. These mobility hubs are often located in places where there are fewer parking spaces, to ensure that visitors and residents can be mobile. Many forms of transport come together in these places, such as trains, buses, metros, trams, taxis and shared cars, bicycles and mopeds. Often additional services are also offered, such as small shops and parcel points. In addition, city district hubs are more focused on an (inter)regional scale, while suburban hubs and neighbourhood hubs are more focused on a local scale.

In addition, there are also 'city edge hubs'. This type of mobility hub is sometimes referred to as a 'transfer hub', because it offers the possibility to travel between cities and rural areas. This type of mobility hub is often developed as a 'park and ride' location. Often there are few facilities but it offers the possibility to switch from private vehicles to public transport such as a bus or a tram. These hubs are often located on the outskirts of the city, close to a ring road or in the outer urban area. The modes of transportation they offer are less complex than city centre hubs or city district hubs. However, they often offer the possibility to park, charge cars and carpool.

There are also 'city centre hubs'. These are mobility hubs that are located in the city centre and are characterised by high quality public transport. They are relatively easy to reach on foot or by bicycle. They have the most options for transport such as taxis, trains, metros, trams and the aforementioned forms of shared mobility. There is usually little space to park, as these mobility hubs are often also located in places where the price of land is relatively high. Often a city centre hub is a large train station and it is the only form of mobility hub that operates on a national scale (Weustenenk et al., 2023).

In the table below, the different types of mobility hubs are summarized by giving them different indicators which they are easier to identify by (Figure 2).

Name	Connection to public transport	Place of mobility hub	Other facilities	Operational scale
Community hub	1	Privately owned areas	Nothing	Very local
Neighbourhood hub	2	Near supermarkets	Extra services such as a parcel collection point	Local scale
Suburban hub	3	Suburbs	Usually nothing	Local scale
City-district hub	4	Places with few parking spaces	Shopping facility and parcel points for example	(inter)regional scale
City-edge hub	3	Outskirts of a city, close to a ring road or in the outer urban area	Usually nothing	Urban-rural connection
City-centre hub	4	City centre	Highest level of quality and complexity	National scale

Figure 2: Most relevant points for determining a certain type of mobility hub. The connection to public transport has been ranked from 1 to 4, with 1 having usually no options available, and 4 having a plethora of transport options available(Weustenenk et al., 2023).

2.3 Insights from interview

To gain further insight into the way mobility hubs play a role in the mobility divide in the province of Gelderland an interview was conducted with someone who represents the provincial government in Gelderland and knows insight into the policy of the government on mobility hubs. The interview provided various insights into the way the provincial government thinks of mobility hubs currently.

Firstly, from the interview, certain things were confirmed that already became clear from the literature analysis. For example, the current rural/urban mobility divide mostly entails that people in rural areas are more designated towards using cars, as opposed to people in urban areas who more often use public transport. According to the respondent, this is also something that the provincial government accepts, however it can sometimes cause issues when people want to travel from rural to urban areas. In that case, they might end up in a traffic jam. Because of that, it makes sense that people have other options to continue the last part of their journey. For example with city-edge-hubs, people might reach the edge of a city with their car, and continue their journey by using a shared bicycle or by using public transport, such as trains or busses. That way, traffic jams can be avoided, and it can therefore be a better option for a traveller.

Currently, there appears to be a shift towards more rural-oriented public transport. This is the case because, when the interview was conducted, there had just been elections for the provincial states. The 'BoerBurgerBeweging'-party was new and immediately became the biggest party in all provinces (den Burger, 2023). In Gelderland, the party got almost a quarter of the votes. Because of this, the party demanded that there has to be public transport in every village (BoerBurgerBeweging, 2022). After these elections, the mobility vision from the government of the province of Gelderland has to be changed slightly in some places, as before the elections the focus was mainly on urban areas, mainly focusing on Nijmegen, Arnhem and the foodvalley area. The foodvalley-area consists of a partnership between eight municipalities in Gelderland, namely Ede, Barneveld, Nijkerk, Renswoude, Rhenen, Scherpenzeel, Veenendaal and Wageningen.

According to the respondent, the focus on urban areas is important, because if no action will be undertaken there, traffic will eventually get completely stuck, as the road network becomes increasingly busy.

Currently, the topic of mobility hubs does not seem to be very relevant among citizens according to the respondent. However, public transport does seem to be ought to be relevant by some people, and he does seem to believe that if mobility hubs are fully functional, and people realize how much of an advantage they can offer, they will automatically become more relevant, and they will be seen as a better alternative to using a car to enter a city. An example of this is Nijmegen, where there is a park and ride location in the North of the municipality. It is possible to park a car there and continue your journey to the city centre by bus. This is relatively affordable as the city wants fewer people to enter the city with a car.

Right now, this option is often not attractive enough for travellers, as it is not easy for people to reach the bus stop from the parking lot. Furthermore, it is currently not such an issue to enter the city by car. A new bridge makes traffic in and around Nijmegen still manageable. However, in ten years it might be a more interesting alternative, when people are stuck in traffic and the bus can pass all of the cars on its own lane. If it is affordable, this might entice more people to choose this option. These so called city-edge-hubs do not exist that much yet in Gelderland according to the respondent. In other parts of the Netherlands, this hubtype is already more common and more successfully implemented. In Amsterdam, it is also possible for example to get to certain parts of the city, park the car there and then buy a ticket to get to the city centre. If you show the tram-ticket after you get back to the parking lot, the parking ticket will be relatively inexpensive.

In the interview, it was said that the government of Gelderland does not view every train- or bus stop as a mobility hub, but that it really has to be a place where people can switch from one way of transport to the other. By the definition of a mobility hub in this thesis, the park and ride location in Nijmegen Noord does not qualify as being a mobility hub, because it does not offer 'different and connected transport modes'(Arnold et al., 2022). People can switch from their car to the bus service, but their car is a private vehicle. In the case that this would be a mobility hub, every bus stop and every train station in Gelderland would be a mobility hub as it would be possible to reach them with private vehicles and continue the journey via public transport.

Furthermore, it was emphasised that it is important that forms of public transport connect well to other forms of public transport, for example, NS, the national railway operator in the Netherlands notices that people travel more on Tuesdays and Thursdays. This is the case because people tend to work more from home since the covid-pandemic hit. However, a relatively big amount of people choose the Tuesdays and Thursdays to be physically present at their job, while working at home on the other days. This plays such a big role that NS sees the Friday as a weekend day already in terms of the number of travellers commuting on that day. However, in the regional public transport, this is not the case. Two thirds to three quarters of the travellers commuting in regional public transport are students and young people. Those people are spread relatively evenly over all days, so there are not such peaks and dips as the NS experiences. For the NS, it might make sense to scale down services on certain days, but this causes slower journeys for people switching from regional transport to NS, because they will likely have longer transfer times compared to the situation in which the services are not scaled down.

It is also noted multiple times that mobility hubs play a big role in the mobility vision created by the government of the province of Gelderland. It is even said that mobility hubs are the most important topic in the vision.

Right now, it seems that the main purpose of mobility hubs according to the government of Gelderland is managing traffic in a better way, as forecasts show that our current road network will not be able to handle all the cars commuting in the near future. This will especially become problematic in the regions around Nijmegen, Arnhem and the Foodvalley, where there are plans to build 100000 houses before 2030. Because of this, alternatives are necessary, such as public transport, better bike lanes and mobility hubs. When asked if reducing carbon emissions was

also a goal of realising mobility hubs, he agreed, but he noted that the government does not want to force people to use public transport or bikes for example. However, he did say that using mobility hubs will become an increasingly more interesting option as the traffic congestion will increase and the quality and availability of mobility hubs will also increase. In that case, it can be faster and more comfortable, naturally making people leave their car behind.

Because of the future traffic congestion, traffic jams will likely also play a bigger role in places that right now are relatively calm and don't often have traffic jams. As an example, in the near future the frequency of train service between the train stations Doetinchem and Arnhem Centraal will increase. Once an hour there will be an intercity, not stopping at other stations in between the two cities. On an even longer term, there will be two InterCitys per hour. The provincial government has thought of this, because it seems that traffic jams starting in Didam might start at an earlier point seen from the 'Achterhoek', a region in the east of Gelderland. In the future, those traffic jams might start in Doetinchem. In that case, Doetinchem will provide a place for people to get to by car from the Achterhoek, and continue their journey using public transport. The Intercity-trains will provide a quicker option to get to Arnhem and beyond when people are able to skip the traffic jams.

In urban areas in Gelderland, the municipal government often wants people to travel according to the so called 'stop' or 'stomp' principle. It is a Belgian principle that suggest a certain order in which the local government prefers people to travel. It is a Dutch term that stands for: 'stappen, trappen, openbaar Vervoer, (Mobility as a service) and Privé auto. This translates to: walking, cycling, public transport, (Mobility as a service) and using a private car. This is clearly different from the policy that is usually common in rural areas, where they do not see it as a problem if people get to hubs by using a car (Personal communication, 2023).

2.4 Policy of the province of Gelderland

The government of the province of Gelderland recognizes that there exist various types of mobility hubs, they however decided to mainly focus on three types of mobility hubs until 2030. The three types of mobility hubs that the government will focus on are regional hubs, city-edge hubs with a park and ride function and urban hubs. The provincial government does not use the same qualification as used in the rest of this document. In this case, an urban hub is a type of hub which is easily accessible on foot, using a bicycle or using the bus. A city-edge-hub is, in this case, a type of hub where people can transfer from their car to a bus or a shared bicycle. The regional hub is a type of hub in a rural area where people can transfer from their car onto a train(Provincie Gelderland, n.d.). These classifications are slightly different than the ones found in the literature. It does however make sense that some hubs cannot be found in the policy from the provincial government. Community hubs are often associated with project development, and they are therefore not something that will likely come from the government of Gelderland (Weustenenk et al., 2023). It does seem that APPM and Goudappel, advising the provincial government on mobility hubs does also use different types of mobility hubs when advising different provincial governments. For example, the advice they gave to the provincial

government for realising mobility hubs in the western part of Northern Brabant does include something called a 'snelweghub', or a 'highway-hub' in English. This might be the case because they believe that different mobility hubs are necessary in different parts of the Netherlands

The two major players in advising the provincial government in Gelderland on mobility hubs are the aforementioned APPM and Goudappel. These are two consultancy firms that advise the provincial government on different topics, and also on mobility and therefore mobility hubs. Based on the analysis performed by these two firms, the provincial government has created a vision for what the future of mobility hubs in Gelderland might look like. Just like in the interview, the document notes that the foreseen growth of cities in Gelderland can cause issues regarding the current infrastructure. Because of this, it is necessary that there will be a transition in mobility options, and the provincial government wants to stimulate people to use active forms of transport such as walking and cycling. Furthermore, they also believe that public transport should play an increasingly important role (APPM et al., 2021).

The document does also note so-called micro-hubs, which seem to be relatively similar to the community hubs discussed in this thesis. They are hubs in residential areas that offer shared bicycles. This is only mentioned shortly however, and it does not seem to be the focus of the provincial government.

Rural hubs are in this case places where people can use their private vehicles to reach a mobility hub, as noted before in the interview this could be a car, but it can also be a bicycle. This is why the provincial government believes that it is important that there will be enough parking spots available to accommodate everyone reaching the mobility hub with their car. Also spots where people can safely park their bicycles are noted to be of importance, this can be realized in the form of a bicycle-safe for example. This is the case because the rural hubs are often found in places outside of neighbourhoods, where it is not always possible to keep an eye on everything happening there. In the report it is noted that the provincial government sees it as important that people living in both rural and urban municipalities keep having access to amenities, they do not clearly specify how they plan on achieving that goal however. It is notable that they did include this part however, even before the 'BoerBurgerBeweging'-party became much more relevant after the elections (den Burger, 2023).

The document uses different cases outside of the province of Gelderland as references. This might explain that the provincial government in Gelderland is not as far in the process of realizing mobility hubs as in some other parts of the country. For example, there are various plans being discussed, such as one in Amsterdam, where there is a part of the city that will quickly grow over the coming few years. From their analysis, it became clear that mobility hubs will provide the user with the most affordable, reliable and comfortable way of shared mobility. The only downside being that the walking distance to this mobility hub was more than in other cases. From the interview it did also become clear that some forms of mobility hubs, such as the one where people could park their car in a certain spot in Amsterdam and use the tram there to continue their journey further within the city, seem to not be successfully implemented as of yet in the province of Gelderland. It does however also make sense that the document looks at other

plans, as APPM and Goudappel have also provided advice for mobility hubs in different parts of the Netherlands. (APPM et al., 2020)

3. Methods

To be able to draw a comparison between the number of plans that have been realised and those that are ready for rural and urban areas, it was necessary to look at realised plans and policy plans for mobility hubs. This had to be done for all villages in all municipalities. Through the 'atlas.ti' program, an analysis can be performed and these plans can be classified into different aspects that determine the independent variables. These plans have to be gathered through different sources, for example there is a site that lists the plans for mobility hubs in the Nijmegen/Arnhem region (*Mobiliteitshubs in beeld - Groene Metropoolregio*, n.d.). These documents were found using the Google search engine. When conducting the analysis, it became clear that there often are municipalities that mention the term 'mobility hub', but they do not specify where the mobility hub will be built, or what type of mobility hub will be built. It is often simply a case of something that the government of the municipality is interested in but they have not yet figured out exactly how this will take shape in the future.

The geographical level at which everything will be analysed will be the municipal level. In the Netherlands, there does already exist a database of municipalities ranked from rural to urban. This database is based on the number of addresses per square kilometre. From this database, a selection could be made to include all municipalities in Gelderland. In this case, it was decided to classify scores 1 to 3 as urban and 4-6 as rural (Centraal Bureau voor de Statistiek, n.d.).

Because of this, it is necessary to determine which realised mobility hubs will be analysed in this thesis. For this, the aforementioned definition of mobility hub will be used. For future plans for mobility hubs, it is important that there is a reasonable amount of certainty that the plans will actually be realised. Because of this, only plans that contain a clear location and that have a clear description of the facilities that they want to offer at the location, will be analysed. These are also the only plans that could actually be analysed, as the things discussed in structure vision documents make it impossible to classify them. Mobility hubs that already exist but which will possibly be expanded, have been analysed in their existing form.

The type of second and especially third or fourth mobility hubs in a municipality did also not improve the model. However, considering the amount of existing hubs does seem practically important in this case, a variable was created that showed the amount of mobility hubs in a certain municipality. Because of this, only the first type of mobility hub in a certain municipality is actually being used in the analysis. The first type of mobility hub in the database is always the one that operates on the largest scale. From the largest scale to the smallest scale these hubs are: the city-centre hub, The city-district hub, the city-edge hub, the suburban hub, the neighbourhood-hub and the community hub.

The variables that have been used in the univariate analysis are therefore:

'Existing_mobilityhub' which is a nominal variable with options for yes or no, considering if there already exists a mobilityhub in the municipality. The next variable that has been taken up in the

analysis is 'Type_existing_mobilityhub1' which is also a nominal variable that shows which type of mobility hub exists in a certain municipality or which one is operating on the largest scale. 'Frequency_of_service' has also been implemented into the model, which is an ordinal variable signaling whether or not a mobility hub has frequent service, train service in this case as this is what most of the mobility hubs consist of. If there was both train- and busservice, only train service has been analysed to not make the model too complex. Service is in this case frequent if there are more than two trains leaving a station every 30 minutes. The last independent variable of the model is 'Amount_Existing_mobilityhubs' which is a ratio variable that tells us how many mobility hubs exist in a certain municipality.

Data for car ownership per municipality is available from 2016 to 2022. To take these two years as comparison points does also make sense, because it is a period in which the hub function of many train stations changed, especially by the number of shared bicycles being used. The amount of rides undertaken by using an shared bicycle from the so-called 'ov-fiets'-programme has more than doubled between 2016 and 2019 alone, going from 2400000 rides in 2016 to 5200000 in 2019. The other forms of public transport such as trains and busses remained relatively similar in the same time period, going from 18.9 billion kilometres travelled by all travellers in 2016 to 20.3 billion kilometres travelled in 2019(Clo, 2022). This is the case while the amount of inhabitants of the Netherlands also grew from 16.979 million in 2016 to 17.082 million in 2019. This means that the usage of public transport grew by approximately 7.4 percent while the amount of inhabitants grew by approximately 0.6%(CBS, 2021). That is still a difference, however it is nowhere near as big as the difference between the usage of the 'ov-fiets' shared bicycles between 2016 and 2022, as it is already doubled between 2016 and 2019(Treinreiziger.nl., 2019).

The analysis has been ran two times, to see if there were any differences in the relation between the independent variables and car ownership between 2016 and 2022.

At first, it seemed like there were quite some plans in the near future for mobility hubs. However, when looking at the plans critically, there were only two municipalities that had plans for mobility hubs up to the point which was selected, which is 2030. This made the variable insignificant in the univariate analysis in SPSS, which makes it impossible to say things about the future based on the plans municipalities currently have for the future.

In atlas.ti, some factors as the frequency of available services is crucial to determine which type of mobility hub is being planned, or already exists. Various factors were analysed in Atlas.ti to analyse the documents. These factors are 'Bus/tram/subway', 'Frequent_service', 'Infrequent_service', 'Local_scale', 'Shared_bicycle', 'Shared_car', 'Shopping_facility' and 'Taxi'. In this case, the factor 'Frequent_service' means that there are more than two trains leaving a station per 30 minutes. Logically following up on this, 'Infrequent_service' means that there are two trains leaving a station per 30 minutes, or less than that. 'Local_scale' is in this case a factor that implies that a mobility hus is meant to function on a very small scale, intended mostly to be used by the citizens living in the neighbourhood. An example of this is Hely HUB in Ede, which in its description specifically implies that the service is meant for citizens living in the Enka

Neighbourhood(Hely Hub, n.d.). 'Shared_Bicycle' implies that a mobility hub features shared bicycles that can be hired through a certain system. Similarly, 'Shared_car' means that it is possible to hire a car at a mobility hub. 'Shopping_facility' means that it is possible to purchase certain things at a mobility hub, often in a form of being able to purchase foods and drinks there. The factor 'taxi' means that there are either places for taxi's available to stand or that the mobility hub itself has a partnership with a certain company to offer taxi services at the mobility hub.

To make it all clear, a database of the existing and future mobility hubs in Gelderland will be developed. This has been done in excel. The excel document contains thirteen different factors, starting with 'municipal code', which shows the municipal code of a certain municipality, which is useful so that there cannot be any confusion of which municipality someone might be talking about, because it is a unique code. The next factor is 'Degree_Of_Urbanity', which shows the degree of urbanization in a certain municipality ranging from one to six as discussed before. After that one comes 'Name_Municipality', which simply shows the name of a municipality. Furthermore we have 'Existing_mobilityhub', which shows if there are mobility hubs already in a municipality. Similarly, the next factor is 'Plans_mobilityhubs', which shows if there are concrete plans for mobility hubs to be realized in the future. In both cases, a simple 'yes' or 'no' are the only two options. Continuing, there is a factor called 'Type_existing_mobilityhub1', which indicates which type of mobility hub is the most relevant in a certain type of municipality. Following up on this, there are three factors that indicate what type of mobility hub, if any, are the second, third and fourth mobility hubs in a certain municipality. These factors are 'Type_existing_mobilityhub2', 'Type_existing_mobilityhub3' and 'Type_existing_mobilityhub4'. The next factor is 'Type_future_mobilityhub', which indicates which type of mobility hub is being planned in a certain municipality, if there are any. Next up is the factor 'Urban/Rural', which indicates whether a municipality can be classified as being urban or rural. This factor is based on the previously mentioned factor 'Degree_Of_Urbanity', every municipality with a score of one to three gets an urban label, while every municipality with a score of four to six has got the rural label. The next, and last two factors are 'Cars_Per_Household_2016' and 'Cars_Per_Household_2022'. These two factors show the amount of cars per household per municipality. In the case of 'Cars_Per_Household_2016', this is in 2016, and in the case of 'Cars_Per_Household_2022' this is the case for the year 2022.

After this, the differences were analysed by running different analysis through SPSS. So, for example, the variables 'existence of a certain type of hub', the 'distance to certain amenities' and the 'quality of the mobility hub' will determine a certain score, and with this, it can be analysed whether or not there are actually big differences when we compare these variables on a rural and urban bases. After that, a conclusion can be drawn on which aspects of different types of mobility hubs create the difference between the user experience for people in rural areas, and in urban areas. This will than be compared to the current situation, in which the mobility divide entails that people in rural areas are more likely to take the car instead of public transport.

To gain further insight into the current feelings of the difference in mobility options and the perspective for the future, an interview was conducted with someone from the provincial government of Gelderland. The answers from this interview can provide a better understanding of why the experience of mobility is different from rural to urban areas. Furthermore, it provided insight in the way mobility hubs play a role in the provincial government. Additional information was also gathered with regard to plans for new mobility hubs within Gelderland.

Having my own experience of living in an urban and rural area, I am aware of the differences in public transport availability. Because of this I am somewhat biased. It often strikes me that the quality and quantity of public transport in urban areas is considerably better. That is why it is important for me to look at the indicators as objectively as possible and not let my feelings influence the research. Furthermore, it is not the case that research is done on highly sensitive subjects for example, so that does not play a role in this study.

The basis of the research consists of analysing the policy documents. The interview is an addition to this, and is only used to gain further insight. The fact is that there are only limited possibilities in a Bachelor's thesis, which makes it impossible to conduct a number of surveys. As a result, the internal and external validity of the interview are quite low, since the interviewed person is in the provincial government, he/she will have a political agenda and will therefore not always provide objective information. The external validity is not great because it only involves one person. The analysis of the plans and currently realised mobility hubs have decent internal validity as the important aspects that make up a mobility hub are analysed thoroughly through the grounded theory analysis. The external validity is not great because the results cannot be generalised well over a greater geographical area. It is for example known that the quality of public transport varies per country.

3.1 Analysis in Atlas.ti

The conceptual theory that is developed here is based on the theory that there are six types of mobility hubs. This has been done by searching online for plans or realised plans per municipality. It became clear that in most cases, an existing mobility hub in a municipality consisted of a train station that has extra options for travellers, such as shared bicycles, shared cars. Or, what was also often the case, is that the train station offers also offers bus connections as commute options. Based on the aspects that were noted to be of importance for determining which type of mobility hub is being analysed, the documents were coded in atlas.ti. For example, The frequency of service, the travel options offered and certain facilities being offered were indicators.

After the indicators were placed in Atlas.ti, everything was written out in the appendix of this thesis. With the indicators, a certain type of mobility hub was determined, and that type of mobility hub was then entered into an excel spreadsheet.

4. Results

4.1 Introduction

Based on the previously discussed articles, car ownership seems to directly influence the rural/urban divide as it forms the basis for the divide itself, as people in rural areas tend to be less likely to own a car. There are various articles backing this up, such as one on car ownership for people between the ages of eighteen and thirty (CBS, 2018). It does also seem to be likely that the distance that someone lives from a train station influences the likelihood of them using the train (CBS, 2020), so it might be the case that the same can be said for mobility hubs. Car ownership is also thought to influence the relation between the availability of certain types of mobility hubs and the rural/urban divide, as owning a car might make it less likely for someone to use a mobility hub.

Car ownership has been analysed per municipality, and there are a few things that are important to keep in mind when analysing the changes in car ownership. Statistics from 2016 and 2022 are compared here because, as discussed earlier mobility hubs are a topic which only recently has gained interest from various actors. There are a few issues that had to be worked around. For a long time, the amount of municipalities in the Netherlands has been declining, because municipalities have been combined to form new, bigger ones (Rijksoverheid, n.d). Furthermore, the amount of inhabitants of municipalities might have grown or shrunk depending on various factors such as natural growth or migration.

In this case, this turned out to be a problem for the currently existing municipality 'West-Betuwe'. This municipality only exists since 2019 when it was created from the municipalities Geldermalsen, Lingewaal and Neerijnen. Because of this, the average amount of cars per household was calculated from looking at the statistics of these three municipalities (CBS, 2023), keeping the amount of inhabitants into account. This was the only municipality that changed in Gelderland in the selected time period.

In atlas.ti, a lot of train stations were analysed. The choice was made to label everything where trains in either direction would pass by each half hour, as infrequent service. If there were more directions, so for example three trains would leave each half hour, going different directions it would be labeled as frequent service. Trains leaving every 15 minutes for example going two ways would also receive the label 'frequent_service' in Atlas.ti.

In the appendix, a description of the transport modes being offered is available per municipality. From the transport modes being offered, together with the facilities being offered, every municipality has had their mobility hubs categorized into one of the categories of mobility hubs.

As is seen in the database that was created, it quickly became clear that there are relatively few plans for mobility hubs that are clear enough for them to be analyzed here. Most of the existing ones are train stations that offer other modes of transport such as shared bicycles, shared cars, busses and taxi services. There are only a few currently existing hubs that do not fall under this category, and the same goes for plans. Most of the plans that can be found consist of vague descriptions, for example municipalities that want to conduct research if a mobility hub can be of added value to their municipality and if so, which mobility hub might be best, and in which

location, etcetera. In these cases it is not clear yet if there will be a mobility hub and if so, what type of mobility hub it will be. Because of this, it makes no sense to analyze these cases and it is also simply impossible.

4.2 Crosstab analysis

To start off the analysis, we will run a crosstab analysis through SPSS, to see if our variables have any connection to the rural/urban divide. This has been done by selecting the different variables and checking whether or not they have a significant correlation to the 'Rural/Urban'-variable in the dataset.

Moving on to the first independent variable, a crosstab analysis was performed on the 'Existing_mobilityhub'-variable and the urban/rural divide. There appears to be a significant correlation between an area being rural or urban and there existing a mobility hub in that place. This is also visible in the crosstabs section where it is clear that if there is no mobility hub, chances are 28 out of 43, or approximately 65% that a municipality is rural. If a municipality is urban, the chances of there being no mobility hub are 2 out of 18, or 11%. Turning this around, this means that there is a mobility hub in only 35% of rural municipalities, while there is a mobility hub in 89% of urban municipalities. This is a significant difference at a 95% confidence level (figure 3).

The same cannot be done for the plans that are clear enough to be analysed here. When running the crosstab analysis in SPSS, it leads to no significant results. In this case, it seems that there are not enough plans for the test to lead to a significant result. However, what we can see in the crosstabs is that there is one plan for a mobility hub to be realised in urban municipalities, and that there is one plan for a mobility hub in rural municipalities. Because of the lack of data, in this case, it does not make sense to further analyse this variable (Figure 4).

To gain more insight on the average number of cars people had in 2016 and 2022, a descriptive analysis has been performed. Through the descriptives, it becomes clear that the average number of cars per household has increased slightly from 2016 to 2022. It has increased from 1.2 to 1.24 (Figure 5)

After it was determined that there does seem to be a significant relation between there actually being a mobility hub in a certain municipality and it being rural or urban, it became relevant to see if the type of mobility hub that existed in that municipality also differed between rural and urban municipalities. In this case, the analysis was first performed on the most relevant hub of a municipality. There does indeed seem to be a significant relation between an area being rural or urban and what type of mobility hub is present in that place. In the crosstabs section, it becomes clear that in rural areas, there are no city-centre hubs and not a lot of city-edge hubs. In urban areas, the city-edge-hub is quite common with 11 out of 18, or 61.1% of being a city-edge-hub. The city-centre-hub is not common but has a percentage of 16.7 here. While in rural areas, there is most likely no hub at all with 67.4%, the suburban hub is more common here than in urban areas with 23.3%. Only in 2 cases, or 11.1% there was no mobility hub in an urban area (Figure 6).

Following up, an analysis was performed on the second mobility hub that potentially exists in some municipalities. It seems like that if there is a second mobility hub, it is also more likely that that hub is in an urban environment. 9.3% of rural municipalities have a second mobility hub, while 22.2% of urban municipalities have a second mobility hub. In case there is a second mobility hub, in rural areas it is more likely that it is a suburban hub, while in urban areas it is more likely that there is a city-district-hub or a city-edge-hub. The relation does appear to be significant in this case (Figure 7).

When we look at a potential third mobility hub, it seems that only urban areas in Gelderland have three mobility hubs. There are three municipalities with three mobility hubs, one with a city-district hub and two with a city-edge hub. The relationship does seem to be significant here, however there is not a lot of data backing it up. This may not make this analysis very reliable (Figure 8).

When analysing municipalities with a fourth mobility hub, the crosstab analysis leads to no significant results at a 95% confidence interval. We can however see that the only municipality that has a fourth mobility hub is, as expected from the analysis on a third mobility hub, an urban area. Because it is only one municipality in this case, it makes sense that it is impossible to run a reliable analysis here, which is supported by the insignificance (Figure 9).

Moving on, an analysis was performed on the types of future mobility hubs that are being planned. The analysis shows no significant results between urban areas and rural areas, when analysing the relation between an area being rural or urban and the type of mobility hubs that municipalities would like to realize in the future. This is likely because of a lack of available data on future mobility hubs in Gelderland (Figure 10).

The next variable that is thought to be relevant to analyse is the frequency of service. In this case, the frequency of service is the amount of trains leaving a station per 30 minutes. If this amounts to more than two, the service is labeled as frequent. If the amount of trains leaving per 30 minutes is less than two, the service is described as infrequent. In the analysis, we can see that there is a significant result when we compare the frequency of service in rural and urban areas. In rural areas, only 4 out of 15, or approximately 27% of municipalities that have a mobility hub have frequent service. In the case of urban areas that have a mobility hub, 12 out of 15, or approximately 80% of municipalities with a mobility hub have frequent service (Figure 11).

When checking for the amount of mobility hubs in a municipality, significant results could be found. It seems to be the case that urban areas have more hubs, as was already established before. In the crosstab analysis it becomes clear that it is especially unlikely that a rural municipality has more than one hub (Figure).

At last, the relationship between the cars per household per municipality was analysed with different variables. At the end, the univariate analysis was conducted with only the dependent variables for the car ownership. This way, a conclusion could be drawn to if there were any differences between the years 2016 and 2022.

At first, all types of mobility hubs were analysed in a univariate analysis in SPSS. This did however lead to there being a lot of variables, and therefore quite a low adjusted R-square.

Because of this, it was decided that it made more sense to cut down on the number of variables in the model.

This does seem to make sense if we look at a crosstab analysis of the amount of currently existing mobility hubs and the number of cars per household per municipality. The number of cars seem to decrease as there are more mobility hubs in a municipality. This seems to correspond to the earlier mentioned rural/urban divide in which it seems to be the case that people in urban areas are more likely to use public transport, while people in rural areas are more likely to use a car.

Continuing, a crosstab analysis was performed on different independent variables and the dependent variables as the car ownership in 2016 and 2022.

At first, it made sense to see if the variable for the amount of cars was, as expected, actually linked to a municipality being either rural or urban. The relation between an area being urban or rural and the amount of cars that people owned per household in 2016 seems to be significant at a 95% confidence level (figure 17).

Similarly, the relationship between an area being rural or urban and the amount of cars that people owned per household in 2022 does also seem to be significant at a 95% confidence level. This analysis was conducted as a check to make sure further analysis on the variables on car ownership could be performed (Figure 17).

These are the results:

There appears to be a relation between the type of mobility hub currently existing in a municipality and the cars per household per municipality in 2016. The relation is significant at a 95% confidence interval (Figure 13).

The relation between the frequency of service and the amount of cars per household in 2016 does not seem to be significant at a 95% confidence interval. This is interesting, because the hypothesis was that there should have been a relation (Figure 14).

Similarly, The relation between the existence of a mobility hub and the amount of cars in 2016 does also not seem to be significant at a 95% confidence interval (Figure 15).

4.3 Univariate analysis

When trying to run an univariate analysis, choices had to be made for which variables made sense to include in the model. Adding variables that do not add much to the model make the R-squared grade go down, which makes the model as a total more complex and worse. Because of this, only the variables that make up the amount of mobility hubs in a municipality, the most relevant mobility hub in the municipality and the frequency of service being offered in a certain municipality have been taken into account in this model.

In this case, it seems that there is a significant relationship at a 95% confidence level between the first type of existing mobility hub in a municipality when we compare it to the number of cars per household per municipality in 2016(Figure 18).

When adding the second variable, the significance decreases.

Adding the third variable makes the significance go down even further. However, the adjusted R squared keeps insignificant variables in mind, and it is 0.233. (Figure 19) This means that approximately 23.3% can be explained by the model. In practice, there are more variables that explain the average amount of cars per household in a certain municipality, such as income or age(Centraal Bureau voor de Statistiek, 2020).

These are however factors that are not relevant to this model, as they are not part of mobility hubs(Statista, 2022).

Continuing, the same multivariate analysis has been run, however the dependent variable has been changed to the number of cars per household per municipality in 2022.

Again, when there is only one variable, the interaction is significant. When adding more variables, the significance with all the variables in the models is insignificant for all variables. The results seem similar to the analysis conducted for 2016(Figure 20).

5. Conclusion

Concluding everything, we can say that there is a difference in the currently existing mobility hubs between rural and urban areas. It is more likely that a municipality has a mobility hub if it is urban, and if there is a mobility hub. It is quite unlikely that an urban municipality does not feature a mobility hub. Furthermore, city centre hubs are not found at all in rural municipalities in Gelderland, while city-edge hubs are uncommon in rural areas. When moving on to more mobility hubs existing in a single municipality, we can see that only 9.3% of rural municipalities have two hubs, while 22.2% of urban municipalities have two hubs. There seems to be a similar relation to the first mobility hub, in which it is more likely that there are city-district-hubs and city-edge-hubs in rural municipalities, while the suburban hub was found to be more common in rural areas. There are no rural municipalities that currently feature more than two hubs, while there are urban municipalities that have three or even four hubs. There are three urban municipalities that have three mobility hubs, and one that has four mobility hubs. This means that 38.9% of urban municipalities have more than one mobility hub, compared to the 9.3% on the rural side. The third and fourth mobility hubs in a municipality are rather uncommon, but a similar trend is found here, with them consisting of city-district hubs and city-edge hubs. However, these existing hubs themselves are so uncommon that not much can be said about the type of hub that they exist of, especially the fourth which consists solely of one mobility hub in the municipality of Nijmegen.

For future plans, no significant results were found. This is likely because of the lack of concrete plans for mobility hubs in the future. Because of this, this variable was left out of the univariate analysis.

Altogether, we can conclude that from this analysis, it is necessary to be cautious when trying to say what the influence of future mobility hubs will be on the rural/urban divide, in this case measured by car ownership. Especially since it became clear from the interview that we are currently experiencing a policy change, in which it seems that the provincial government wants to invest more in public transport for rural areas, after the recent victory of the 'BoerBurgerBeweging'-party. It does currently seem to be the case that, as expected, there are significantly more mobility hubs in urban municipalities, and the type of hubs present here does also differ, with it being more common for city-edge hubs and city-district hubs to exist in urban municipalities. Suburban hubs seem to exist more in rural areas. Neighbourhood hubs and community hubs do not seem to be common among either rural or urban municipalities. City centre hubs are also uncommon, but when they do exist, they exist in an urban municipality as expected. Because of the frequency of service and the mobility options being offered at these hubs, if this trend continues it seems to be the case that the rural/urban mobility divide will not change much, as it seems to be a similar case to public transport in general, where options for urban areas are more widely available and easier reachable without a car. Therefore, it will likely still be the case that the car will be the predominant way of transport in rural areas, while public transport, and with that mobility hubs will play a bigger role in urban areas.

6. Discussion and future recommendations

At the time of writing this thesis, it might still be too early to conduct the research done here and be able to draw significant conclusions on what the influence of mobility hubs might be on the rural/urban divide in the future. The mobility hubs that currently exist are mostly altered train stations, and plans for future mobility hubs are often not concrete enough to determine which type it might concern, or where it will be placed in the future. As noted beforehand, the topic of mobility hubs is gaining traction and something that more and more is published on. It might be the case that in ten years for example, the vague plans currently written down by municipal governments will have become a lot more concrete, making it possible to analyse them properly. Therefore, a future analysis might provide more insightful results. This will be more thoroughly discussed in the critical reflection.

7. Critical reflection

At various stages, there were difficulties in deciding certain things regarding writing the thesis. One of these things was that it was sometimes difficult to classify mobility hubs, as it was not always exactly clear which type it could be best described as, as the definition of the different mobility hubs (Weustenenk et al., 2023) left some room for interpretation. For example, in the classification it is said that high-frequency train and tram connections are usually not available in suburban hubs, and that there are not that many logistical facilities. In this case, it suggests that these frequent train connections are usually not available, but it makes it impossible to instantly rule out that it might be a suburban hub, because that could still be the case if there is a high-frequency connection. This means that the classification cannot be totally objective and that there is always room for interpretation, which means that some people might disagree and classify the mobility hubs as being other types instead of how they have been classified in this case. Furthermore, the document does also not specify what frequent service entails. Because of this, a definition had to be created for this research. Similarly to the earlier raised point, people might disagree and come up with another definition.

Furthermore, the fact that most of the realised mobility hubs currently consist out of train stations that also offer bus connections or shared bicycles for example, means that the analysis can be quite similar to a general analysis on public transport. In this case, it again seems to be the case that it is early to conduct this research, as in the future there might be more types of mobility hubs realised so that it is not the case that the vast majority are train stations. This is the case in addition to there being more concrete plans available in the future.

8. Literature

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9. Appendix

Aalten

The municipality of Aalten consists of the villages of Aalten, Bredevoort, De Heurne and Dinxperlo(CBS, 2021). The degree of urbanisation in Aalten is four(CBS, 2020), and with that, it is classified as being a rural municipality. Currently, there is one location in the municipality that can be classified as a mobilityhub. This is the trainstation located in Aalten. The trainstation in Aalten gives travellers the option to continue their journey using a shared bike or the bus(9292, n.d.). There currently do not seem to be any plans to realise mobility hubs in the municipality in the future. The existing train station can be best classified as being a 'suburban hub'. This is the case because the company Arriva, that manages the railway in Aalten, has trains passing by less often than in urban areas in Nijmegen and Arnhem for example. The buses also pass by less frequently here, for example the bus to Bocholt only arrives once an hour(9292, n.d.). Trainstation Aalten does also have shared bikes through the OV-fiets system of NS, which is the national dutch railway-company(ProRail, n.d).

Apeldoorn

The municipality of Apeldoorn consists of Apeldoorn, Beekbergen, Loenen and Ugchelen(CBS, 2021). The degree of urbanisation of the municipality is two(CBS, 2020), therefore it is considered to be an urban area. At the moment, there is one location in Apeldoorn that can be classified as being a mobility hub. This location is the train station in Apeldoorn. The train station offers a shopping facility, shared bicycles, bus connections, taxi-services and frequent train connections. The train connections offer national options, and because of all of this, this train station can be classified as being a city-centre hub(9292, n.d.)(ProRail, n.d).

Arnhem

The municipality of Arnhem consists of Arnhem and Schaarsbergen(CBS, 2021). The degree of urbanisation of the municipality is two, and with that, it is considered to be an urban area. Currently, there are already various types of mobility hubs in existence in Arnhem(Groenemetropoolregio, 2021). These consist of the train stations Arnhem Centraal, Arnhem Velperpoort and Arnhem Zuid. Furthermore, there is also a plan to upgrade a current public garage to a mobility hub, namely the parking garage Rozet. Station Arnhem Centraal offers a shopping facility, shared bicycles, bus connections, taxi-services and frequent train connections on an (inter)national scale. Because of this, station Arnhem Centraal can be classified as a city-centre-hub. Station Arnhem Velperpoort offers shared cars, shared bicycles, taxi-services, a shopping facility, bus connections and frequent train connections. Therefore, it can be classified as being a city-district hub. Station Arnhem Zuid offers taxi-services, frequent train connections and bus connections. Because of this, station Arnhem Zuid can also be called a city-district hub. The plans for the parking garage Rozet reveal that it will feature bus connections, shared cars and shared bicycles. The shared cars and bicycles are meant for urban and neighbourhood-usage. Therefore, it can be best described as being a neighbourhood-hub(9292, n.d.)(ProRail, n.d).

Barneveld

The municipality of Barneveld consists of Barneveld, Garderen, Kootwijkerbroek, Terschuur and Voorthuizen(CBS, 2021). The degree of urbanisation is four(CBS, 2020), and therefore it is considered to be a rural area. Currently, there are two hubs in Barneveld. These are the trainstations Barneveld Noord and barneveld Centrum. Barneveld centrum offers a shopping facility, buses, taxi-services and shared bicycles. Because of this, Barneveld Centrum can be classified as being a city-edge hub. Barneveld Noord offers shared bicycles. Because of this,

Trainstation Barneveld Noord can be classified as being a suburban hub (9292, n.d.)(ProRail, n.d).

Berg en Dal

The municipality of Berg en Dal consists out of Berg en Dal, Beek Breedeweg, Millingen aan de Rijn, Ooij and Ubbergen(CBS, 2021). The degree of urbanisation is four(CBS, 2020), and therefore it can be considered to be a rural area. Berg en Dal currently does not have any mobility hubs and there are no plans for creating one in the future.

Berkelland

The municipality of Berkelland consists of Berkelland, Eibergen, Neede and Ruurlo(CBS, 2021). The degree of urbanisation is four(CBS, 2020), therefore it can be considered a rural area. Currently, there are no mobility hubs and there are also no plans for mobility hubs in the future.

Beuningen

The municipality of Beuningen consists out of Beuningen, Ewijk, Weurt and Winssen(CBS, 2021). The degree of urbanisation is four(CBS, 2020). Therefore it can be considered a rural area. Currently, there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future.

Bronckhorst

The municipality of Bronckhorst consists of Bronckhorst, Hengelo, Steenderen, Vorden and Zelhem(CBS, 2021). The degree of urbanisation is five(CBS, 2020), so it can be considered a rural area. Currently, there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future.

Brummen

The municipality of Brummen consists of Eerbeek and Brummen(CBS, 2021). The degree of urbanisation is four(CBS, 2020), so it can be considered a rural area. Brummen currently has one mobility hub, consisting of its train station. The train station also offers shared bicycles and buses. It does not offer any additional facilities. The train service is infrequent. Because of this, the mobility hub in Brummen can be best described as being a suburban hub (9292, n.d.)(ProRail, n.d).

Buren

The municipality of Buren consists of Lienden, Buren, Maurik and Beusichem(CBS, 2021). The degree of urbanisation is five(CBS, 2020), therefore it can be considered a rural area. Currently, there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future.

Culemborg

The municipality of Culemborg consists solely of Culemborg itself (CBS, 2021). The degree of urbanisation is three(CBS, 2020), therefore it can be considered an urban municipality. Currently, there is one mobility hub in Culemborg, consisting of its train station. The train station offers bus connection, shared bicycles and a shopping facility. The train station has frequent service. Because of this, the mobility hub in Culemborg can be best described as a city edge hub (9292, n.d.)(ProRail, n.d).

Doesburg

The municipality of Doesburg consists solely of Doesburg itself (CBS, 2021). The degree of urbanisation is four (CBS, 2020), therefore it can be considered a rural area. Currently, there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future.

Doetinchem

The municipality of Doetinchem consists of Doetinchem, Gaanderen and Wehl (CBS, 2021). The degree of urbanisation is three (CBS, 2020), therefore it can be considered an urban area. Doetinchem currently has two mobility hubs. These are the train stations Doetinchem and Doetinchem de Huet. Doetinchem offers shared bicycles, bus connections, taxi-services, a shopping facility and frequent train service. Because of this, it can be classified as being a city-edge hub. Doetinchem de Huet offers shared bicycles, bus connections, a shopping facility and frequent train service. Therefore it can be classified as also being a city-edge hub (9292, n.d.) (ProRail, n.d.).

Druten

The municipality of Druten consists of Druten, Afferden, Deest and Horssen (CBS, 2021). The degree of urbanisation is four (CBS, 2020). Therefore, it can be considered a rural area. Currently, there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future.

Duiven

The municipality of Duiven consists of Duiven and Groessen (CBS, 2021). The degree of urbanisation is three (CBS, 2020). Therefore, it can be considered to be an urban area. Currently, Duiven has one mobility hub. This mobility hub is train station Duiven. This train station offers shared bicycles, bus connections and frequent train connections. Therefore, this train station can be considered to be a city edge hub (9292, n.d.) (ProRail, n.d.).

Ede

The municipality of Ede consists of Ede, Bennekom and Lunteren (CBS, 2021). The degree of urbanisation is two (CBS, 2020), therefore, it can be considered to be an urban area. Currently, there are two mobility hubs in Ede. These consist out of the train station Ede-Wageningen, which is located in the municipality of Ede, and the so-called 'Hely HUB Ede'. The train station offers a shopping facility, shared bicycles, bus connections, taxi-services and frequent train connections. Therefore, the train station can be considered to be a city edge hub. Hely HUB Ede offers shared bicycles and shared cars. As can be seen on their website, this mobility hub is meant for citizens living nearby, and they offer subscriptions through their own platform (Hely Hub, n.d.). Because of this, Hely HUB Ede can be classified as being a community hub (9292, n.d.) (ProRail, n.d.).

Elburg

The municipality of Elburg consists of Doornspijk, Elburg and 't Harde (CBS, 2021). The degree of urbanisation is four (CBS, 2020), therefore it can be considered a rural area. Currently, there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future.

Epe

The municipality of Epe consists of Epe and Vaassen (CBS, 2021). The degree of urbanisation is four (CBS, 2020). Therefore it can be considered a rural area. Currently, there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future.

Ermelo

The municipality of Ermelo consists of Ermelo and Horst(CBS, 2021). The degree of urbanisation is four(CBS, 2020). Therefore it can be considered to be a rural area. There is currently one train station in Ermelo that can be considered to be a mobility hub. This train station offers a shopping facility, shared bicycles and bus connections. The train service is infrequent. Because of this, therefore it can be best described as being a suburban hub (9292, n.d.)(ProRail, n.d).

Harderwijk

The municipality of Harderwijk consists of Harderwijk and Hierden(CBS, 2021). The degree of urbanisation is two(CBS, 2020). Therefore it can be considered to be an urban area. Currently, there is one train station in Harderwijk that can be classified as being a mobility hub. The train station offers a shopping facility, bus connections, taxi services and shared bicycles. The train service is infrequent. Therefore, this train station can be best described as being a suburban hub (9292, n.d.)(ProRail, n.d).

Hattem

The municipality of Hattem consists solely out of Hattem itself(CBS, 2021). The degree of urbanisation is four(CBS, 2020). Therefore, it can be considered to be a rural area. Currently, there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future.

Heerde

The municipality of Heerde consists of Heerde and Wapenveld(CBS, 2021). The degree of urbanisation is four(CBS, 2020). Therefore, it can be considered to be a rural area. Currently, there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future.

Heumen

The municipality of Heumen consists of Heumen and Malden(CBS, 2021). The degree of urbanisation is four(CBS, 2020). Therefore, it can be considered to be a rural area. Currently, there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future.

Lingewaard

The municipality of Lingewaard consists of Lingewaard, Bemmelen, Gendt and Huissen(CBS, 2021). The degree of urbanisation is four(CBS, 2020). Therefore, it can be considered to be a rural area. Currently, there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future.

Lochem

The municipality of Lochem consists of Lochem, Eefde and Laren(CBS, 2021). The degree of urbanisation is four(CBS, 2020). Therefore, it can be considered a rural area. Currently, there is

one mobility hub in Lochem. This is the train station. The train station offers shared bicycles and bus connections. The train connections are infrequent. Because of this, the train station can be considered to be a suburban hub (9292, n.d.)(ProRail, n.d).

Maasdriel

The municipality of Maasdriel consists of Maasdriel, Ammerzoden, Hedel, Kerkdriel and Rossum(CBS, 2021). The degree of urbanisation is five(CBS, 2020), therefore it can be considered a rural area. Currently, there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future.

Montferland

The municipality of Montferland consists of Montferland, Didam, 's-Heerenberg, Beek and Zeddum(CBS, 2021). The degree of urbanisation is four(CBS, 2020). Therefore, it can be considered to be a rural area. There is one train station in the municipality, namely in Didam. This train station can be considered to be a mobility hub. It offers shared bicycles, bus connections and frequent train connections. Therefore it can be considered to be a city-edge hub (9292, n.d.)(ProRail, n.d).

Neder-Betuwe

The municipality of Neder-Betuwe consists of Neder-Betuwe, Dodewaard, Kesteren, Ochten and Opheusden(CBS, 2021). The degree of urbanisation is five(CBS, 2020). Therefore, it can be considered to be a rural area. Currently, there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future.

Nijkerk

The municipality of Nijkerk consists of Nijker, Hoevelaken and Nijkerkerveen(CBS, 2021). The degree of urbanisation is three(CBS, 2020). Therefore, it can be considered to be an urban area. Currently, there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future.

Nijmegen

The municipality of Nijmegen consists of Nijmegen, Oosterhout and Lent(CBS, 2021). The degree of urbanisation is two(CBS, 2020). Therefore, it can be considered to be an urban area. In Nijmegen, there are a total of four mobility hubs in the municipality. These consist out of the train stations Nijmegen, Nijmegen Goffert, Nijmegen Heyendaal and Nijmegen Dukenburg. Station Nijmegen offers a shopping facility, bus connections, taxi services, shared bicycles and frequent train service. It has options for travelling on a national scale. Therefore, it can be considered to be a city centre hub. Station Nijmegen Goffert offers shared bicycles, taxi services, bus connections and frequent train connections. Because of this, station Nijmegen Goffert can be considered to be a city district hub, Nijmegen Dukenburg offers taxi services, a shopping facility, frequent train services and bus connections. Therefore it can be considered to be a city-edge hub. Nijmegen Heyendaal offers shared bicycles, taxi services, bus connections and frequent train services. Because of this, it can be considered to be a city-edge hub (9292, n.d.)(ProRail, n.d).

Nunspeet

The municipality of Nunspeet consists of Elspeet and Nunspeet(CBS, 2021). The degree of urbanisation is four(CBS, 2020). Therefore, it can be considered to be a rural area. Currently, there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future.

Oldebroek

The municipality of Oldebroek consists of Oldebroek and Wezep(CBS, 2021). The degree of urbanisation is four(CBS, 2020). Therefore, it can be considered to be a rural area. Currently, there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future.

Oost Gelre

The municipality of Oost Gelre consists of Lichtenvoorde and Groenlo(CBS, 2021). The degree of urbanisation is four(CBS, 2020). Therefore, it can be considered to be a rural area. Currently, Oost Gelre does not have any mobility hubs. However, there are plans to upgrade the current bus station in Lichtenvoorde to a mobility hub. New options such as shared cars and bicycles will be added. Because of this, after the upgrade this mobility hub can be considered to be a suburban hub(8RHK ambassadeurs, 2021).

Oude IJsselstreek

The municipality of Oude IJsselstreek consists of Gendringen, Silvolde, Terborg, Uift and Varsseveld(CBS, 2021). The degree of urbanisation is four(CBS, 2020). Therefore, it can be considered to be a rural area. Currently, there are two places in the Oude IJsselstreek that can be considered to be a mobility hub. These are the two train stations. Station Varsseveld offers shared bicycles and bus connections. The train service is infrequent. Because of this, Varsseveld can be considered to be a suburban hub. Station Terborg also offers shared bicycles and bus connections. The train service is also infrequent here. Therefore, it can also be considered to be a suburban hub(9292, n.d.)(ProRail, n.d).

Overbetuwe

The municipality of Overbetuwe consists of Elst, Heteren and Zetten(CBS, 2021). The degree of urbanisation is four(CBS, 2020). Therefore, it can be considered to be a rural area. Trainstation Elst offers a shopping facility, shared bicycles, bus connections and frequent train services. Because of this, the train station Elst can be considered to be a city edge hub (9292, n.d.)(ProRail, n.d).

Putten

The municipality of Putten consists of Putten and Krachtighuizen(CBS, 2021). The degree of urbanisation is four(CBS, 2020). Therefore, it can be considered to be a rural area. There is currently one place in Putten that can be considered a mobility hub. This is train station Putten. The train station offers a shopping facility, shared bicycles, taxi services and bus connections. The train service is infrequent. Because of this, train station Putten can be considered to be a city-edge hub (9292, n.d.)(ProRail, n.d).

Renkum

The municipality of Renkum consists of Oosterbeek and Renkum(CBS, 2021). The degree of urbanisation is four(CBS, 2020). Therefore, it can be considered to be a rural area. Currently, there is one location in the municipality of Renkum that can be considered to be a mobility hub. This location is the train station Wolfheze. The train station offers shared bicycles, a shopping facility and bus connections. The train service is infrequent. Because of this, station Wolfheze can be considered to be a suburban hub (9292, n.d.)(ProRail, n.d).

Rheden

The municipality of Rheden consists of Dieren, Rheden and Velp(CBS, 2021). The degree of urbanisation is three(CBS, 2020). Therefore, it can be considered to be an urban area. There are currently three locations in the municipality of Rheden that can be considered to be a mobility hub. These are the train stations in Rheden, Dieren and Velp. Station Rheden offers shared bicycles and frequent train service. Therefore, it can be considered to be a city-edge hub. Station Velp offers a shopping facility, taxi services and shared bicycles. The train service is infrequent. Because of this, it can be considered to be a city-edge hub. Station Dieren offers a shopping facility, shared bicycles, taxi services, bus connections and frequent train service. Because of this, it can also be considered to be a city-edge hub (9292, n.d.)(ProRail, n.d).

Rozendaal

The municipality of Rozendaal consists solely of Rozendaal(CBS, 2021). The degree of urbanisation is four(CBS, 2020). Therefore, it can be considered to be a rural area. Currently, there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future.

Scherpenzeel

The municipality of Scherpenzeel consists solely of Scherpenzeel(CBS, 2021). The degree of urbanisation is four(CBS, 2020). Therefore, it can be considered to be a rural area. Currently, there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future.

Tiel

The municipality of Tiel consists solely of Tiel(CBS, 2021). The degree of urbanisation is three(CBS, 2020). Therefore, it can be considered to be an urban area. Station tiel is a suburban hub. Currently, there is one mobility hub in Tiel. This is the train station of Tiel. The station offers a shopping facility, taxi services, shared bicycles and bus connections. The train service is infrequent. Because of this, the train station of Tiel can be considered to be a city-edge hub (9292, n.d.)(ProRail, n.d).

Voorst

The municipality of Voorst consists solely of Twello(CBS, 2021). The degree of urbanisation is four(CBS, 2020). Therefore, it can be considered to be a rural area. Currently, there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future.

Wageningen

The municipality of Wageningen consists solely of Wageningen(CBS, 2021). The degree of urbanisation is four(CBS, 2020). Therefore, it can be considered to be a rural area. Currently,

there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future.

West Betuwe

The municipality of West Betuwe consists of Asperen, Beesd, Geldermalsen and Meteren(CBS, 2021). The degree of urbanisation is five(CBS, 2020). Therefore, it can be considered to be a rural area. Currently, there are two mobility hubs in the municipality of West Betuwe. These are the train stations of Beesd and Geldermalsen. Station Beesd offers shared bicycles and bus connections. The train service is infrequent. Therefore, Station Beesd can be considered to be a suburban hub. Station Geldermalsen offers a shopping facility, shared bicycles, taxi services, bus connections and frequent train service. Because of this, it can be considered to be a city-edge hub (9292, n.d.)(ProRail, n.d).

West Maas en Waal

The municipality of West Maas en Waal consists of Beneden-Leeuwen, Boven-Leeuwen, Dreumel and Wamel(CBS, 2021). The degree of urbanisation is five(CBS, 2020). Therefore, it can be considered to be a rural area. Currently, there are no mobility hubs in this municipality and there are also no plans for mobility hubs in the future (9292, n.d.)(ProRail, n.d).

Westervoort

The municipality of Westervoort consists solely of Westervoort(CBS, 2021). The degree of urbanisation is three(CBS, 2020). Therefore, it can be considered to be an urban area. Currently, there is one mobility hub in Westervoort. This is the train station Westervoort. Station Westervoort offers shared bicycles, bus connections and frequent train service. Because of this, station Westervoort can be considered to be a city edge hub (9292, n.d.)(ProRail, n.d).

Wijchen

The municipality of Wijchen consists of Alverna, Wijchen and Woezik(CBS, 2021). The degree of urbanisation is three(CBS, 2020). Therefore, it can be considered to be an urban area. There is currently one location in Wijchen that can be considered to be a mobility hub. This is the train station in Wijchen. Station Wijchen offers shared bicycles, bus connections and frequent train service. Because of this, it can be considered to be a city edge hub (9292, n.d.)(ProRail, n.d).

Winterswijk

The municipality of Winterswijk consists of Meddo and Winterswijk(CBS, 2021). The degree of urbanisation is three(CBS, 2020). Therefore, it can be considered to be an urban area. Currently, there is one mobility hub in Winterswijk. This is the main train station in Winterswijk. The station offers a shopping facility, shared bicycles, taxi services and bus connections. The train service is infrequent. Because of this, the train station in Winterswijk can be considered to be a suburban hub (9292, n.d.)(ProRail, n.d).

Zaltbommel

The municipality of Zaltbommel consists of Aalst, Brakel, Bruchem, Gameren, Nederhemert, Zaltbommel and zuilichem(CBS, 2021). The degree of urbanisation is four(CBS, 2020). Therefore, it can be considered to be a rural area. Currently, there is one mobility hub in the

municipality. This is the train station in Zaltbommel. Station Zaltbommel offers a shopping facility, shared bicycles, taxi services and bus connections. The train service is infrequent. Because of this, station Zaltbommel can be considered to be a suburban hub (9292, n.d.)(ProRail, n.d).

Zevenaar

The municipality of Zevenaar consists of Angerlo, Babberich, Giesbeek, Lobith, Pannerden, Tolkamer and Zevenaar(CBS, 2021). The degree of urbanisation is three(CBS, 2020). Therefore, it can be considered to be an urban area. Currently, there is one location in Zevenaar that can be considered to be a mobility hub. This is the train station in Zevenaar. Station Zevenaar offers a shopping facility, shared bicycles, bus connections and frequent train service. Because of this, station Zevenaar can be considered to be a city edge hub (9292, n.d.)(ProRail, n.d).

Zutphen

The municipality of Zutphen consists of Zutphen and Warnsveld(CBS, 2021). The degree of urbanisation is two(CBS, 2020). Therefore, it can be considered to be an urban area. Currently, there is one mobility hub in Zutphen. This is the train station in Zutphen. Station Zutphen offers a shopping facility, shared bicycles, taxi services, bus connections and frequent train services. Because of this, station Zutphen can be considered to be a city-edge hub (9292, n.d.)(ProRail, n.d).

9.1 Figures

Does the municipality have a mobility hub?/ is the municipality rural or urban?	Rural	Urban	Total
No	28	2	30
Yes	15	16	31
Total	43	18	61

Pearson Chi-Square	Value	df	Asymptotic Significance (2-sided)
	14,807	1	<,001

Figure 3: there does appear to be a relationship between a municipality having a mobility hub and it being rural or urban.

Does the municipality have plans for a mobility hub?/ is the municipality rural or urban?	Rural	Urban	Total
No	42	17	59
Yes	1	1	2

Total	43	18	61
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Pearson Chi-Square	Value	df	Asymptotic Significance (2-sided)
	0,288	1	<,591

Figure 4: there does not seem to be a relationship between the currently existing plans for mobilityhubs and an area being rural or urban

	N	Mean	Standard deviation
Average amount of cars per household in Gelderland in 2016	51	1,20	0,160
Average amount of cars per household in Gedlerland in 2022	51	1,24	0,167

Figure 5: descriptive statistics on the average number of cars per household per municipality in Gelderland in 2016 and 2022.

What type of mobility hub is the most relevant in a municipality/ is the municipality rural or urban	Rural	Urban	Total
City-centre-hub	0	3	3
City-edge-hub	4	11	15
Suburban-hub	10	2	12
No hub	29	2	31
Total	43	18	61

Pearson Chi-Square	Value	df	Asymptotic Significance (2-sided)
	29,891	3	<,001

Figure 6: there does appear to be a significant relationship between the most relevant type of hub existing in a certain municipality and the municipality being either rural or urban.

What type of mobility hub is the second hub in a municipality/ is the municipality rural or urban	Rural	Urban	Total
City-district-hub	0	2	2
City-edge-hub	1	2	3
Suburban-hub	3	0	3

No hub	39	14	53
Total	43	18	61

Pearson Chi-Square	Value	df	Asymptotic Significance (2-sided)
	8,269	3	<,041

Figure 7: There does appear to be a significant relationship between the second type of hub existing in a certain municipality and the municipality being either rural or urban.

What type of mobility hub is the third hub in a municipality/ is the municipality rural or urban	Rural	Urban	Total
City-district-hub	0	1	1
City-edge-hub	0	2	2
No hub	43	15	58
Total	43	18	61

Pearson Chi-Square	Value	df	Asymptotic Significance (2-sided)
	7,537	2	<,023

Figure 8: There does appear to be a significant relationship between the third type of hub existing in a certain municipality and the municipality being either rural or urban.

What type of mobility hub is the fourth hub in a municipality/ is the municipality rural or urban	Rural	Urban	Total
City-edge-hub	0	1	1
No hub	43	17	60
Total	43	18	61

Pearson Chi-Square	Value	df	Asymptotic Significance (2-sided)
	2,429	1	<,119

Figure 9: There doesn't appear to be a significant relationship between the type of hub existing in a certain municipality and the municipality being either rural or urban.

Are there plans for mobility hubs in a municipality/ is a municipality rural or urban	Rural	Urban	Total
Yes	1	1	2
No	42	17	59
Total	43	18	61

Pearson Chi-Square	Value	df	Asymptotic Significance (2-sided)
	0,288	1	<,591

Figure 10: there doesn't appear to be a relationship between there being plans for mobility hubs, and an area being either rural or urban.

Is the train service at a mobility hub frequent/ is a municipality rural or urban?	Rural	Urban	Total
Frequent	4	12	16
Infrequent	11	3	14
No mobility hub	28	2	30
Total	43	17	60

Pearson Chi-Square	Value	df	Asymptotic Significance (2-sided)
	24,668	3	<,001

Figure 11: There does appear to be a significant relationship between there being frequent train service at a mobility hub and a municipality being rural or urban.

Pearson Chi-Square	Value	df	Asymptotic Significance (2-sided)
	20,589	4	<,001

Figure 12: there does appear to be a significant relationship between the amount of mobility hubs realised in an area and the municipality being rural or urban.

Pearson Chi-Square	Value	df	Asymptotic Significance (2-sided)
	133,913	32	<,001

Figure 13: the amount of existing mobility hubs does seem to have a relation to the cars per household per municipality in 2016.

Pearson Chi-Square	Value	df	Asymptotic Significance (2-sided)
	24,572	14	<,039

Figure 14: the relationship between the frequency of service and the amount of cars per household per municipality in 2016 does not seem to be significant.

Pearson Chi-Square	Value	df	Asymptotic Significance (2-sided)
	15,003	8	<,059

Figure 15: The relationship between the existence of a mobility hub and the amount of cars per household per municipality in 2016 does also not seem to be significant.

Pearson Chi-Square	Value	df	Asymptotic Significance (2-sided)
	33,235	8	<,001

Figure 16: the relationship between the amount of cars per household per municipality in 2016 does seem to have a significant connection with an area being rural or urban.

Pearson Chi-Square	Value	df	Asymptotic Significance (2-sided)
	25,754	7	<,001

Figure 17: The relationship between the amount of cars per household per municipality in 2022 does seem to have a significant connection with an area being rural or urban

Corrected model	Type III sum of squares	df	Mean Square	F	Significance
	0,360	3	0,120	6,131	0,001

Figure 18: there seems to be a relationship between the first type of mobility hub in a municipality when we compare it to the number of cars people owned per household per municipality in 2016.

Corrected model	Type III sum of squares	df	Mean Square	F	Significance	R- squared
	0,534	12	0,44	2,264	0,28	0,233

Figure 19: when we complete the model, the significance seems to go down. The result is still significant at a 95% confidence interval.

Corrected model	Type III sum of squares	df	Mean Square	F	Significance	R- squared
	0,573	12	0,048	2,207	0,032	

Figure 20: the same can be said for 2022 in this case, the independent variables together create a significant effect. The R-squared is also similar as to 2016.