Leisure facilities in railway station areas

Interdependency of leisure facilities and railway stations in terms of location choice motives and visitors / train travelers.

Tim van de Kruijs – Oktober 2013

UNIVERSITEIT TWENTE.

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Samenvatting Nederlands

Er is verbazingwekkend weinig aandacht voor de vrijetijdsmobiliteit in onderzoek. En dat terwijl vrije tijd voor de meeste verplaatsingen in het vervoer zorgt. Slechts een klein deel van deze vervoersmassa gebruikt het openbaar vervoer. NS heeft echter de laatste jaren opgemerkt dat voorzieningen vaker gepland en gebouwd worden in de stationsomgeving en wil graag inzicht krijgen in de mate waarin stations een rol spelen in de locatiekeuze van voorzieningen. Onder voorzieningen worden faciliteiten verstaan die gericht zijn op het vermaak van de bezoekers. Voorbeelden zijn: bioscopen, theaters en attractieparken. Naast de locatiekeuze van voorzieningen is NS ook geïnteresseerd in het aandeel bezoekers van voorzieningen op stationslocaties dat per trein komt, mede omdat vrijetijdsmobiliteit vaak in de daluren plaatsvindt. Het doel van deze masterthesis is:

Inzicht krijgen in de mate waarin stations een rol spelen in de locatiekeuze van voorzieningen en stations en in het aandeel bezoekers van voorzieningen op stationslocaties dat per trein komt.

De relatie tussen locatiekeuze van voorzieningen en stations is onderzocht met behulp van interviews met deskundigen van voorzieningen en academische experts. Het aandeel treinreizigers is onderzocht met een bezoekersenquête bij meerdere voorzieningen op stationslocaties in Twente en de Randstad. De bezoekers zijn ook gevraagd naar het belang van het station en redenen voor hun vervoerwijze keus.

Uit de interviews is gebleken dat de aanwezigheid van een station een grote rol speelt in locatiekeuze, maar niet van doorslaggevend belang is. Andere factoren zoals grondprijs, voldoende bezoekers uit de omgeving en algemene bereikbaarheid zijn belangrijker. Het aandeel treinreizigers wat naar voorzieningen op stationslocaties komt is gemiddeld zeer hoog: 23%. Er zit hierbij wel verschil tussen de voorzieningen onderling. Een voorziening met een nationaal verzorgingsgebied trekt meer treinreizigers dan een voorziening met een regionaal of lokaal verzorgingsgebied. Culturele voorzieningen hebben ook een hoog aandeel treinreizigers. Het belang van een stationslocatie wordt eveneens door de bezoekers onderstreept: 52% van de treinreizigers overweegt niet meer te komen als er geen station bij de voorziening had gelegen.

Deze resultaten bieden kansen voor NS. In de daluren is er nog restcapaciteit, wat door bezoekers van voorzieningen gevuld kan worden. Dit kan onder andere worden bereikt door het assortiment van de Spoordeelwinkel uit te breiden. Dit is een online winkel speciaal gericht op het verkopen van toegang tot evenementen en voorzieningen in combinatie met een treinkaartje. Een andere optie is om met bepaalde voorzieningen die veel bezoekers trekken te overleggen over wanneer en waar naartoe latere treinen zouden kunnen rijden. Als laatste zou NS het groepsticket of avondretour opnieuw te introduceren. Beide tickets zullen de trein helpen om op prijs te concurreren met de auto.

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Summary English

Although leisure mobility accounts for the largest share in trips of people mobility, there has been amazingly little attention for leisure mobility in scientific research. A small part of leisure mobility consists of people traveling by public transport. NS has noticed that it seems as if leisure facilities tend to locate themselves more often in station areas and wants to gain insight in the role of stations in the location choice of leisure facilities. Furthermore, NS is interested in the number of visitors arriving by train, as they often travel during off-peak hours. So the research goal of this master thesis is:

To provide insight in the role of stations in the location choice of leisure facilities and in the number of visitors that will use planned stations to visit leisure facilities.

To examine the interdependency between leisure facilities and stations, interviews have been held with leisure facility representatives and academic experts. The number of people coming by train to leisure facilities has been researched by making use of a questionnaire at leisure facilities near stations in the Randstad and Twente. Visitors have been asked for their mode of transport, but also for their opinion on the accessibility of the facility and the importance of the station and reasons for their modal choice.

The expert interviews pointed out that a station is very important in the location choice process of a leisure facility, however it is not decisive in their choice. Other factors like ground prices, enough visitors from nearby and general accessibility are of higher importance.

The number of visitors taking the train to a leisure facility at a station location is very high: 23%. There are mutual differences between leisure facilities: a facility with a national catchment area attracts more train travelers than one with a local or regional catchment area. Cultural leisure facilities are also more likely to attract visitors by train. The importance of the nearby station is also emphasized by visitors: 52% of them considers not coming to the facility anymore if there was no station nearby.

These results provide opportunities for NS. During off-peak hours there is still space available in trains to transport more people. This space can be filled with visitors of leisure facilities, as they usually travel during these off-peak hours. To achieve this, NS could consider to expand its assortment of leisure tickets available via 'Spoordeelwinkel'. Spoordeelwinkel is an online shop aimed at selling a combination of train and leisure tickets with a discount. Another option is to discuss additional late night trains with specific leisure facilities that attract a lot of visitors. Finally, NS could also consider introducing group- or evening tickets. These competitively priced tickets will be an attractive alternative to a trip by car to leisure facilities.

Dankwoord

Beste lezer,

Voor u ligt mijn afstudeerscriptie voor de master Civiele Techniek. Naast mijn eigen inspanningen is de scriptie tot stand gekomen met de hulp van een grote groep mensen. Ik ben hen heel erg dankbaar, de hulp was onmisbaar bij het slagen van dit project!

Als eerste mijn begeleider bij NS: Carmen Leutscher. Zij was echt een fantastische begeleider: kritisch op het juiste moment, constant duwtjes in de goede richting en spoorde mij goed aan bij het ondernemen van acties. Ze liet mij vrij in de aanpak van het project, maar wanneer nodig hielp zij mij de juiste weg te vinden. Mark van Hagen, als tweede begeleider bij NS, was heel behulpzaam bij de inhoud van het verslag en de theoretische diepgang.

Mijn dagelijkse begeleider van de Universiteit Twente, Tom Thomas, wil ik graag bedanken voor alle middagen dat wij in Enschede hebben zitten sparren over mijn stukken en diepgaande analyses. Karst Geurs bedank ik voor zijn feedback en kritische blik op het project. Deze hebben mij vaak tot diep nadenken gedwongen.

Ik heb bij dit project ook veel hulp, advies en raad gekregen van vrienden en familie. Voor het afnemen van enquêtes bij bezoekers van drie grote voorzieningen in de Randstad heb ik hulp gekregen van: Bas, Fenneke, Harriët, Janna, Peter, Remco en Yoeri. Het enthousiasme waarmee jullie op mensen afstapten zal ik niet gauw vergeten. Zonder jullie hulp was ik nooit aan genoeg respondenten gekomen!

Voor het schrijven van het verslag zijn een viertal mensen zeer behulpzaam geweest. Samen met Peter heb ik een intelligent script ontworpen waarmee reistijden en afstanden van alle respondenten uit 9292ov en Google Maps verkregen konden worden. Dit script is ook toegepast door Roland in zijn verslag. Roland wil ik trouwens ook bedanken voor de controle op inhoud en taalgebruik, jouw tips en commentaar hielpen mij om met een frisse blik mijn eigen stukken door te nemen. Ook mijn vader is van belang geweest bij het verbeteren van het verslag, vooral voor het Engels taalgebruik.

Als laatste wil ik Janna nog uitgebreid bedanken. Niet alleen heeft zij ervoor gezorgd dat ik in de lastigste tijden gedurende het project er altijd weer bovenop kwam, maar heeft ze ook veel input gehad in de structuur van het verslag.

Ik realiseer mij dat het nogal wat mensen zijn die hebben bijgedragen aan dit project. Dit heeft mij weer eens doen inzien dat een behulpzame vriendengroep en betrokken familie echt van onschatbare waarde is!

Ikzelf ben nu compleet klaargestoomd voor de arbeidsmarkt en ik hoop dan ook dat die mij gunstig gezind zal zijn!

Tim van de Kruijs,
Utrecht, oktober 2013

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2   Definitions

Leisure

Leisure is a complex notion and is used in diverse ways. Definitions in dictionaries and literature are alike: time or opportunity for ease and relaxation, freedom from the demands of work or duty. Leisure activities do not involve any obligation; people do them out of free will. Education and healthcare are often included in leisure for convenience although they do not really belong to the term. Public utility would be a more appropriate label for them.

Leisure facility

A facility aimed at leisure (see term above) with a local to national scope which people want to visit based solely on their attraction value. Visitor numbers can range from several ten thousands to a million per year. The attraction points are able to function on their own, but might benefit from surrounding activities. Examples: cinema, museum and theater.

Leisure trip

A trip with a visit to a leisure facility as the main motive.

Local leisure facility

Visitor catchment area of 0 – 15 km

Regional leisure facility

Visitor catchment area of 0 – 75 km

National leisure facility

Visitor catchment area of 0 – 250 km

Station area / surroundings

The area around a station with a radius r = 1 km

Types of leisure facilities

Pop stage, theater, cinema, museum or attraction. Large retail is not considered a leisure facility, but is included due to one questionnaire which was administered at a retail facility.

3 Introduction

The Netherlands Railways (NS) would like to gain insight into location choice motives of leisure facilities in railway station areas and the number of train travelers these facilities attract. Due to the recent economic crisis[1] there has been a decline in spatial developments and planning around stations. In contrast to houses and offices, leisure facilities are still considered an option in urban planning for spatial developers. Other organizations have also shown interest in this subject. For example Stedenbaan+, a collaboration of public and private organizations on spatial developments and high quality public transport, has introduced a monitor on leisure facilities in station areas as one of their projects. (Bureau Stedelijke Planning, 2012a) This monitor is used to observe the changes in (planned) square meters of leisure facilities.

This master thesis is done for the department of NS responsible for exploring new railway station locations. They research the potential supply of train travelers within a certain distance of a station. This type of research is typically done as a consequence of external demands for new stations, which originates from local governments or other parties. In 2012 four new stations were built on the part of the Dutch railway network where NS provides transportation. However, other possible locations were also examined as requested by the local governments and other parties. Each of these requests has to be treated with care. Many requests for service are not considered profitable for NS.

Aside from realizing an increase in train travelers, NS is also interested in travel patterns of these travelers. One example is the distribution of travelers between peak- and off peak hours. Chain mobility, which is the connection between one or multiple transport modes, is another. NS is interested in this subject as it will enable them to make better informed decisions on whether a new station will attract enough train travelers to be profitable, without hindering the current train service. For existing stations, it informs them which leisure facilities are most beneficial to the station in terms of number of travelers they attract.

Little or no research has been done on the role of stations in the location choice of leisure facilities and the number of train travelers they attract. After an elaborate literature review and collaboration with experts in the field, no studies were encountered about the coupling of the location choice of leisure facilities to station areas in The Netherlands

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[1]Economic growth in the Netherlands has been low since the financial crisis of 2008. Real growth numbers for the past three years were: 2009: -3.7%; 2010: 1.7%; 2011: 1.3% (source: Indexmundi)

4 Theoretical background

4.1 Increase of leisure activities and facilities

Leisure activities are defined as activities which do not involve any obligation. Leisure can be defined as time or opportunity for being at ease and to relax. In other words, it is freedom from the demands of work or duty. Not all types of leisure activities are included in this study; it focuses on leisure activities done at leisure facilities. For example: visiting relatives is not included, while a visit with relatives to a theater is. Public utility like education and healthcare are often grouped with leisure for convenience, but are no part of this study.

Leisure facilities are an increasingly important subject, as the number of leisure activities in the Netherlands has increased over the past years. According to a bi-annual monitor survey on leisure behavior of the Dutch citizens ('ContinuVrijeTijdsOnderzoek' (CVTO)) the total number of leisure activities has grown 14.5 %[2] in the period 2006-2011. This figure includes activities like sports and outside recreation. When only leisure activities at leisure facilities, such as fun shopping, going out, visiting attractions, culture, events, and wellness are counted, it increases with 25,4 %[3]. Research carried out by NVM also shows a specific increase in number of cinemas, theaters and other large leisure facilities (NVM, 2009).

Leisure activities did not only grow in number, but also in money spent on them. They are of growing importance to society as a whole. The contribution of leisure to the Dutch gross domestic product (GDP) was 3% in 2008, which is equal to € 36.9 billion. When compared to 2001, this contribution has grown with 24%. The construction sector was the only one to show a higher growth during this period. The leisure sector also provides jobs for approximately 400.000 people. (NVM, 2009). While the time spent on leisure activities has decreased over the previous decades (1985 – 2009), the amount of money spent on leisure has increased with a third over that same period of time (NVM, 2009, Sociaal Cultureel Planbureau, 2011, Beyers, 2002). Around 45 hours a week are spent on leisure activities. This means that Dutch citizens have 6 hours of free time every day on average, including weekends, which is about half an hour more than surrounding countries. (Sociaal Cultureel Planbureau, 2011) These developments make leisure time very valuable (NVM, 2009).

The observed trend in growing use and number of leisure facilities can have multiple causes, most of them social: The growing group of couples who both work, either part- or fulltime, are willing to spend their precious free time as efficient as possible. The aging population also contributes to an increase in money spent on leisure. Retired people have the luxury of time and money for which they want comfort in return. Economic developments can also lead to the observed growth by NS. For example, changes in spatial developments can lead to growth in the development of leisure facilities. As the Dutch house- and office market has come to a standstill in the recent years (Elsinga, M., de Jong-Tennekes, M., & van der Heijden, H., 2011) project developers have turned to other options for maintaining their productivity. At central locations, often close to railway stations, they prefer to invest in leisure buildings. (NVM, 2009) NS also noticed a change in type of leisure being developed in and around stations. Facilities like shopping malls, factory outlet stores or big cinemas seem to be planned more frequently in station areas. There are social and economic trends which may be responsible for the growth in general. However, NS is mainly interested in specific leisure facilities near railway stations. The next paragraph will elaborate on that subject.

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[2] 3,418 billion (10^9) to 3,914 billion
[3] 1,380 billion to 1,731 billion

4.2 Leisure facilities near railway stations

A large share of leisure facilities is situated within the area of influence of high quality public transport ('HoogwaardigOpenbaarVervoer' (HOV)), which consists of train-, tram- or frequent bus connections (Bureau Stedelijke Planning, 2012). Cultural activities are often situated within the influence area, which is defined as a walk of 5-10 minutes to the closest HOV-stop, but leisure facilities which require a lot of space are usually found outside this area. An increase of new leisure facilities around planned stations has also been noticed by the stations research department of NS.

An increase of leisure facilities around stations might be related to the type of station. NS distinguishes six types of stations. (Table 1) In the Netherlands, only 44 stations can be categorized as type 1, 2 or 3, but they are responsible for 3 out of 5 travelers. These stations should be of particular interest for leisure facilities development. The other types should not be neglected, as the majority of Dutch stations fall within this category and there often are leisure facilities nearby as well.

	City center	City outskirts	Rural
HST / Intercity / Sprinter	1 (4, 23%)	-	-
Intercity / Sprinter	2(29, 32%)	3 (11, 8%)	-
Sprinter	4 (140, 23%)	5 (77, 9%)	6 (102, 5%)

Table 1. Station typologies. The initial number indicates the station typology, the first number between the brackets represents the number of stations in the Netherlands of this type; the according share of passengers is showed next to it. (Hagen, 2002)

4.3 Modal split of visitors of leisure facilities

Leisure activities, called 'social-recreational activities' by NS, are responsible for up to 30 % of train trips. Other research indicates 20% train use for medium- and long range leisure travel (Limtanakool & Dijst, 2006). Limtanakool and Dijst also stated that people with low incomes and people living in urban centers are more likely to go by train to reach their leisure activity. Research by Harms (2008) shows a different picture. When short range trips are included, only 3% of trips account to public transport, representing 9% of the total amount of kilometers. Car mobility claims up to 80% of total kilometers and a 50% share of trips. The remaining 47% is divided between the modes walking and cycling. This strengthens the claim by Limtanakool and Dijst that the train, and maybe also public transport in general, is mainly used for leisure travel at medium and long distances. This medium and long distance use could explain why planners of leisure facilities are eager to settle near stations, as they attract not only visitors from the vicinity, but are also attractive to visitors from further away.

In terms of total mobility, leisure traffic takes up 38% of all trips (Figure 1) and 44% of all traveler kilometers in The Netherlands, all transport modes combined. (Harms, MON, 2008). This large share makes it very interesting to look into mode choice of visitors of leisure facilities.
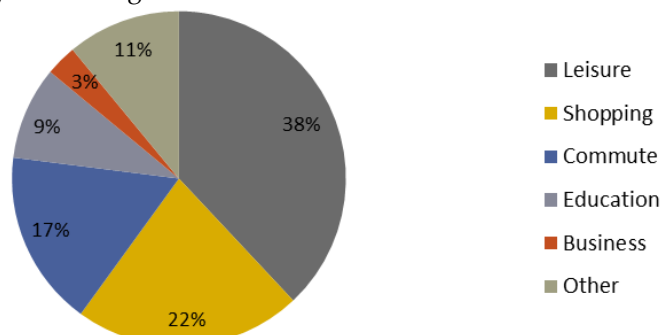

Figure 1. Percentage of trips per motive on an average day. All transport modes are included in this piechart. (Harms, 2008)

The distribution of different modes used to reach leisure activities over the years is shown in Table 2 below. Data has been obtained from Tijdsbestedingsonderzoek (TBO), which is a research on time spent on various activities by Dutch citizens. The shares do not really differ over time, which indicates no change in modal split for leisure travel. The travel time to free time ratio is standing out, with a larger part of free time being spent on traveling to a leisure location. This can indicate two things: people are willing to travel further for their leisure activities or they have better knowledge of leisure facilities further away.

Year	Total free time (h)	Free time away from home (h)	Travel time (h)	Travel time share	Travel time by car	Travel time by bike / walking	Travel time by PT
1975	47,9	14,8	2,6	15,2%	54,0%	32,0%	14,0%
1985	49,0	15,0	2,9	16,2%	58,0%	30,0%	12,0%
1995	47,3	15,3	3,2	17,2%	58,0%	30,0%	12,0%
2005	44,7	13,9	3,5	20,0%	58,0%	30,0%	12,0%

Table 2.Travel time share of free time per modality. (Tijdsbestedingsonderzoek (TBO), SCP, 2006)

4.4   Modal choice of visitors of leisure facilities

Modal choice is dependent on a large number of factors. Visitors of leisure facilities weigh these factors and decide which mode will be optimal to reach the leisure facility. Flawless rational decision-making is not possible, as visitors are not expected to value all factors perfectly. So, the decision often is made on obvious benefits like: 'going by car is three times as fast as public transport' or 'I will ride my bicycle because it is free'. Nonetheless, which factor is regarded as important differs per person. An overview of factors influencing mode choice is described here, starting with personal characteristics.

People of different ages will have a diverse taste in which transport mode they like the most. Elderly people often choose the most convenient and comfortable mode while younger people are more likely to choose cheap and fast options. (Pozsgay, M., & Bhat, C., 2001) Gender, income, lifestyle and education levels might influence mode choice as well. Attitudes and perceptions are also grouped under personal characteristics. One individual might consider the train very comfortable, while another thinks it is a Spartan way of transporting themselves.

Trip characteristics like the reason for the trip, the time of day and if any luggage should be transported are a second set of mode choice factors. Trip characteristics differ from transport characteristics in that they are only valid for a single trip. Transport characteristics are related to the various parts of the transport system. (Olsson, A. Li., 2003) They are aimed at the transport mode that can be used. Examples are: proximity to a station, level of service, travel time for each mode and distance. The level of service is an aggregate indicator for the amount of effort needed to reach a destination. The transport mode might be comfortable, quick, frequent, scenic, short, etc. Station types can be grouped under level of service as well.

The last type of characteristics are external. Available parking space in an area around the destination is an example. Weather, economic incentives, policy restrictions and layout of the area are characteristics as well. Literature indicates multiple ways of structuring all these factors. They can be divided into hard- and soft factors, internal- and external factors or even subjective- and objective

factors.[4] Neither way is right or wrong, they just differ in approach. For this research, combining knowledge from every source, the following conceptual model is proposed:
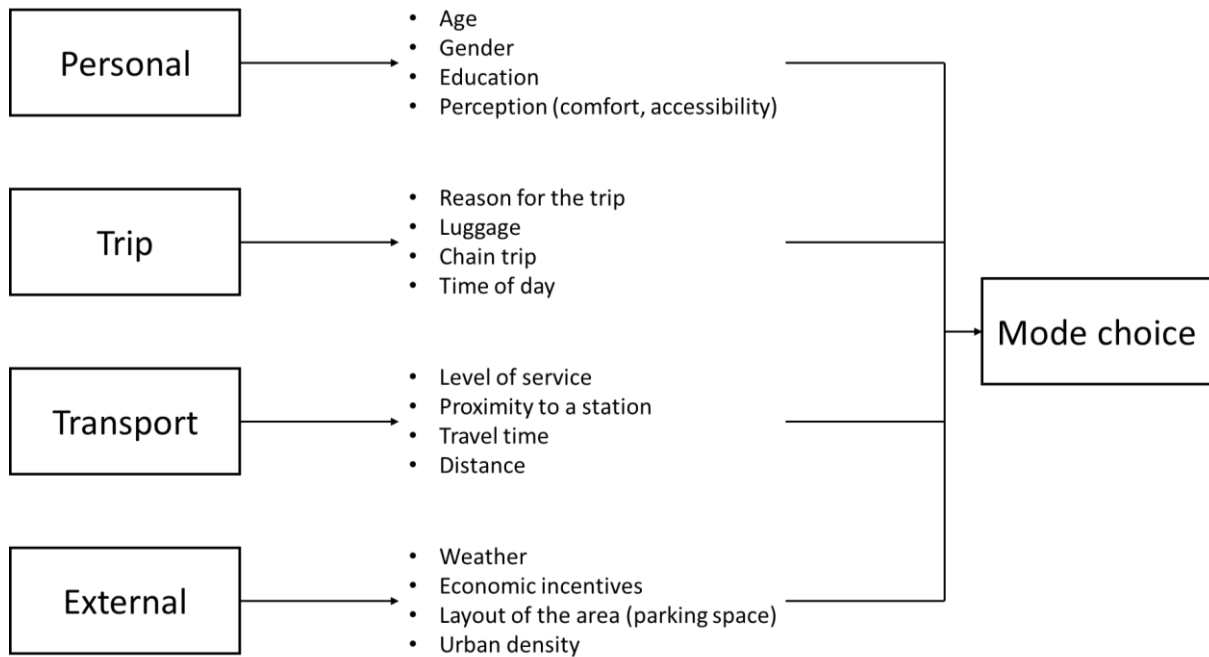

Figure 2: Mode choice of visitors of leisure facilities. Sources: Acker, V. Van, Boussauw, K., & Witlox, F. (2011), Perkins, T., & Curtis, C. (2006), Grigolon, A. (2012) and Olsson, A. Li. (2003).

Factors influencing mode choice are divided in four categories: personal, trip, transport and external. Examples of corresponding factors are shown in the middle of Figure 2. The model does not incorporate every factor of influence, it only states a few examples. An individual will make a decision on their mode of preference by comparing alternatives and scoring factors. Which factors are weighed, differs per person and situation. All proposed factors will influence mode choice to leisure facilities in some way.

4.5 Location choice motives of leisure facilities

Location choice theories
A multitude of studies have been performed to determine location choice motives of companies. The great majority of these studies have focused at start-ups, relocations or expansions of offices, industry and other company types, but omit leisure facilities. The available theories and research aimed at firms and industrial companies were used to form a theoretical background on location choice motives in general.

The research field of location choice for companies originated in 19th century with the classical theory. In this classical theory, location choice was based on transport costs which should be

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[4] Hard factors: travel time, ticket price, Soft factors: psychological, flexibility. Internal: demographics, habits, External: travel time, costs. Subjective: easy to quantify e.g. travel time, price. Objective: more difficult to quantify, often an individual perception of lifestyle, security and comfort.

minimized (Van Thunen, 1882). Van Thunen introduced a theory on location choice assuming perfect competition, which means a fixed market price. The theory is based on an agricultural entrepreneur aiming to maximize his profit. Location choice is based on transport costs, which should be minimized. As the difference between the fixed market price and minimized transportation costs is his revenue, the entrepreneur should be as close to his outlet as possible. This theory has been expanded to cover labor costs, weight of raw materials and agglomeration factors as well[5] (Weber, 1909). The combination of factors most favorable to companies will determine their location choice.

Later on three other theories have been developed for location choice: neo-classical theories, behavioral theories and institutional theories. Neo-classical theories include some points which were not present in classical theories: non-perfect types of market competition, maximizing revenue instead of minimalizing costs and internal scale advantages[6].

Neo-classical theories like Hotellings' describe the fact that entrepreneurs take the spatial behavior of their competitors into account, expanding on the agglomeration factors of Weber (Reijmer& VanNoort, 1999). As they all want the very best spot for their business, it usually results in establishing businesses of similar types close to each other, to be able to cover a large market area. Starting a business elsewhere will mean a disadvantage compared to their competitors. Nowadays, this can still be observed in car dealers and furniture shops cluttering together at industrial areas and malls.

Behavioral theories are aimed at matching location characteristics to requirements of the entrepreneur. The knowledge of an entrepreneur and his ability to use it plays an important role in valuing the location. The behavioral theory seeks to understand actual behavior of entrepreneurs and focuses on the decision making process. The firms are considered to have limited knowledge, are rationally bounded and settle for sub-optimal locations instead of continuously looking for a better spot. All required knowledge about a location choice, or full rationality, can never be achieved, especially not in combination with maximum utilization. The perfect decision can therefore never be made (Brouwer, Mariotti, & Van Ommeren, 2004).

Allen Pred made a matrix based on the behavioral theory in 1969. It clearly shows the relation between the extent of knowledge that a firm has available and its ability to use it. Firms that have a high ability to use their knowledge, which means they are looking around to find the optimal spot for their business, are called 'adaptive'. Firms that act in a random manner and have no ability to use their knowledge are considered 'adoptive'. This term originates from the economic system that adopts firms that suit in their environment. The star shaped icon in Figure 3 shows the most successful firms as optimizers; they have extensive knowledge and the ability to put it to good use. In practice, this almost never is the case (Reijmer& VanNoort, 1999).

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[5] Agglomeration states the fact that firms obtain benefits when they are located close to each other.
[6] Internal scale advantages means lower production costs which firms obtain due to their size.

Neo-classical and behavioral theories have received criticism as they consider the firm as an active decision making agent in a static environment. The environment is however volatile and influenced by many things such as society's cultural institutions and value systems. Therefore, the latest iteration on location choice theories is called the institutional theory.

Institutional theories incorporate a volatile environment and have external factors as their key concept. This concept is transferable to leisure facilities, which are heavily influenced by their surroundings. For example: hypermarchés[7] are ubiquitous in France, while none of them are situated in the Netherlands. In this case, it is due to governmental policies that prohibit large retail facilities on the outskirts of towns because they are considered a threat to retail in inner cities.

Categorization of location choice motives

Location choice motives of companies can be categorized in various ways. These motives can be categorized into micro-, meso- or macro factors. (Figure 4) Micro factors include internal firm factors, meso factors are part of the local environment in which the business operates, and macro factors are defined at a national to global level and cannot be influenced by the firm at all.

Alternatively location choice motives can be categorized as either push factors (i.e. incentives for companies to move from their current site) or pull factors (i.e. which attract companies to a new site). Examples of both push or pull factors are: commute distance, reorganization, governmental policies, representativeness of surroundings, accessibility, space (m[2]) and corporate financial (Centraal PlanBureau (CPB), 2002).
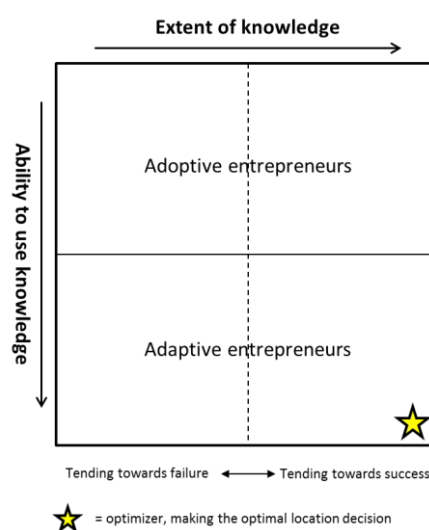

Figure 3: Adoptive versus adaptive entrepreneurs. The star in the bottom right corner is the optimal position for a (re)locating company. (Reijmer& VanNoort, 1999)

[7]Very large retail markets (hypermarkets) comparable to Walmart. They combine a full-service supermarket, pharmacy, garden center and many other stores into one.

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In yet another classification system location choice motives can be categorized as firm internal (i.e. quality of management, organizational goals, ownership structure), firm external (i.e. government policy, regional economic structure, technological progress) or location factors (i.e. characteristics of location site, for example lot size, expansion space, distance to suppliers and accessibility) (Dijk & Pellenbarg, 1999).

Accessibility as location choice factor

Regardless of how location choice factors are categorized, one factor in particular has been described to play an important role in the choice of a company for a new site: the accessibility of the new site. This is especially valid when the company is expanding or moving (Brouwer, Mariotti, & Van Ommeren, 2004). In a survey among 64 recently relocated offices and businesses the dominant location choice motive (54%) is the accessibility in general. (Figure 5) The presence of railway stations near companies contributes to this accessibility. However, because various traveling modes including foot, car, bicycle, railway, airport, and seaport all contribute to the accessibility of a company's new location, the exact contribution of railway stations to the accessibility might be marginal. In the study of (Willigers, 2006) only three percent of the companies in this survey indicated public transport accessibility (including railway accessibility, but also other public transport modes) as their dominant location choice motive.
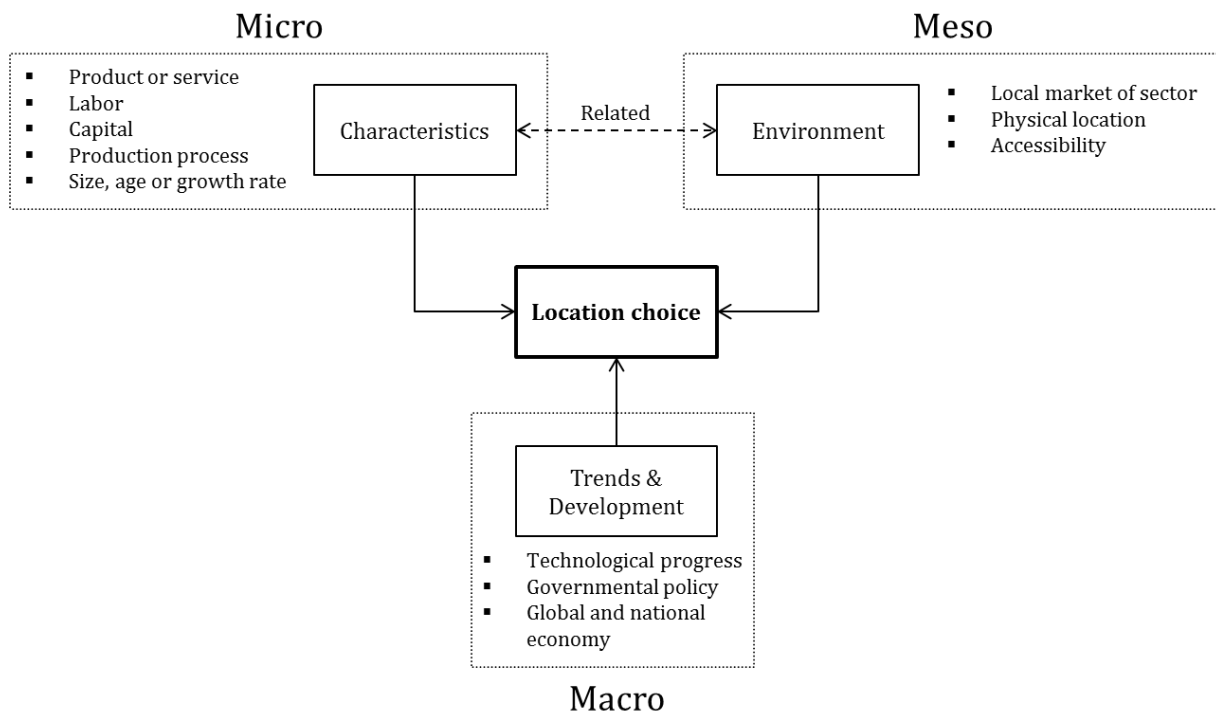
Figure 4. Micro-, meso- and macro factors which influence location choice of companies. Composed by the author of this thesis. Sources: De Bok & Van Oort (2011), Reijmer& Van Noort (1999), Dijk & Pellenbarg (1999), Brouwer, Mariotti & Van Ommeren (2004)

In the same study, the office establishments were largely unaware of the level of service that the nearest high-speed railway station provided and were generally unsure which station was closest to them.(Willigers, 2006) This study is actually one of the few studies which related company locations to the presence of a nearby railway station. There are very few other studies that relate the travel demand to the use of leisure facilities, probably due to the complexity and diversity of leisure facilities. (GoudappelCoffeng, 2010)

Figure 5. Dominant location factors in the Netherlands. Result from a company survey under 64 recently relocated companies. (Willigers, 2006)

4.6 Problem statement & Research questions

Over the past couple of years, leisure activities are of growing importance to society. Concurrent with this increasing trend in leisure activities, a change has been noticed by NS in spatial developments around stations in the past years. Instead of the usual offices and hou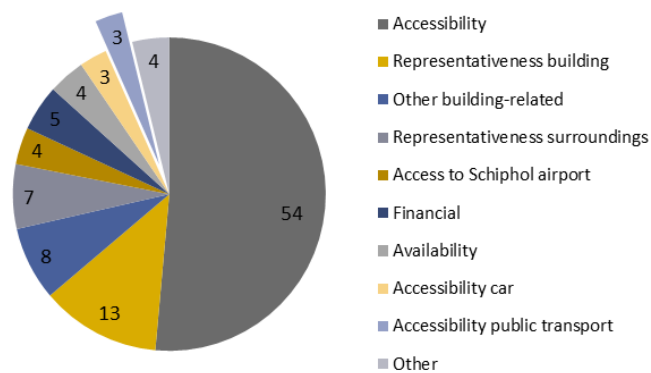sing, a growth has been observed in the planning and construction of leisure facilities. It is not clear whether the observed growth represents a trend of an increasing presence of leisure facilities near station surroundings. Moreover, although many studies have been performed to explore location choice motives of companies in general, little is known about the location choice motives of leisure facilities specifically. Therefore the exact contribution of the presence and type of railway stations to the location choice of leisure facilities has yet to be investigated.

Furthermore the stations research department of the NS, responsible for exploring new railway station locations and spatial development around new or existing station areas, researches the potential supply of train travelers within a certain distance of a station. This type of research is typically done as a consequence of external demand for new stations, which originates from local governments or other parties. In order to justify their request external parties often claim that station surroundings, including new leisure facilities, will attract many train travelers. However, the actual contribution of leisure facilities to the train travel demand remains unknown. Therefore, the following research objective is proposed:

To provide insight in the role of stations in the location choice of leisure facilities and in the share of visitors that will use planned stations to visit leisure facilities.

Currently there is a knowledge hiatus in location choice of leisure facilities. The number of visitors that are attracted by leisure facilities in station areas are unknown as well. The research objective leads to two research questions. Although these research questions both cover a part of the objective, a connection between them is made throughout this thesis.

How does the location and type of station affect the location of planned leisure facilities and decision-making regarding this location?

- Is the location and type of existing stations positively related to the location of leisure facilities which have been built during the last decade?
- How do leisure facilities make decisions regarding their new location, and what is the influence of the location and type of an existing or planned station on this decision-making?

The first research question is divided in two sub questions: a measurable trend in leisure facilities around stations and how leisure facilities make decisions regarding their location. Together, they will give insight in whether more facilities have been built around stations in the last decade and if leisure facilities are more aimed at station areas than other areas. The second research question is oriented towards the modal choice of visitors.

Which share of visitors of leisure facilities might use planned (or existing) stations to visit various leisure facilities with various catchment areas?

- Which factors influence the choice between public transport and car for visitors of leisure facilities?

- Which leisure facility types with a local, regional or national catchment area are most attractive to train travelers?
- Which explanatory factors can be used as variables in a predictive model for mode choice for visitors of leisure facilities?
- What does a predictive model on mode choice for visitors of leisure facilities look like?

The second research question is divided in four sub questions. All of them will be answered by making use of a visitor questionnaire survey and resulting data analysis.

5 Methodology

In this study both quantitative analyses and qualitative analyses were performed in which four types of input were used to answer the research questions: [1] secondary data analysis, [2] interviews with experts, [3] interviews with leisure representatives and [4] a visitor questionnaire survey. The inputs were in some cases used for multiple research questions. The interviews were used for determining the decision-making of leisure facilities, to reflect on the relation between stations and leisure location and as input for the visitor questionnaire. The methodology belonging to each of the analyses is explained in this chapter.

5.1 Secondary data analysis

To be able to determine an interdependency between station areas and the location of leisure facilities, a quantitative analysis of two databases (NS trip data and CBS Statline) was conducted. These databases were used in order to identify stations where an increase in leisure facilities has been observed and to make a comparison between station surroundings and other areas possible. This is done both from a train traveler perspective (i.e. an increase in the number of leisure trips to stations) and from a leisure facility perspective (i.e. an increase in the number of leisure facilities in station surroundings). Both perspectives combined should clarify which relation between the location of leisure facilities and stations exists.

The trip data of NS is very useful, as it points directly to stations which have seen an increase in travelers with a social recreational motive. The database is also unique, there is no similar source of train travelers to leisure facilities. CBS Statline data is also very useful, as it provides detailed distance figures per municipality per year. There are similar databases available with a higher resolution of data, but they are not accessible for this research.

Train traveler perspective

NS trip data was suited for the train traveler perspective, as it includes data on the amount of travelers with a social-recreational activity that are traveling to a station. Other data sources which indicate number of visitors to leisure facilities were, to my knowledge, not available. NS trip data were used to identify stations with an increase in train travelers with a leisure motive. It consisted of two spreadsheets with trip destination motive shares for all stations in The Netherlands for the period 2004 – 2011. Trip destination motives can be explained as follows: each trip made by a person is done with a certain motive in mind. Examples are commuting, leisure or shopping. A destination motive means that only trips arriving at the station in question are included.

One data source contained data on a national level, another contained station-specific values. A national trend in leisure travel was extracted by plotting relative and absolute shares of the leisure trip destination motive over a period of eight years. A station specific leisure trend was obtained in two steps. Firstly, shares for 2011 and 2004 were subtracted, leaving a percentage increase. Secondly, these shares were sorted and filtered by station type, to make outliers and high shares stand out. Station types that are most often used for leisure trips have been identified. Individual stations which have shown an increase in travelers with a leisure motive have been examined into further detail as it might have been caused by a new leisure facility near that station.

A separate leisure motive was not present in the data, so it had to be created. All possible trip destination motives on a national level are shown in Figure 6 on the next page. The social-recreational motive might resemble leisure trips, but 'friends & relatives' and 'sport & hobby' are no feasible

motives for trips to leisure facilities. Therefore, the leisure motive is defined as trips with either a 'shopping' or a 'holiday & daytrip' motive. They are shown in dark yellow in Figure 6**.**
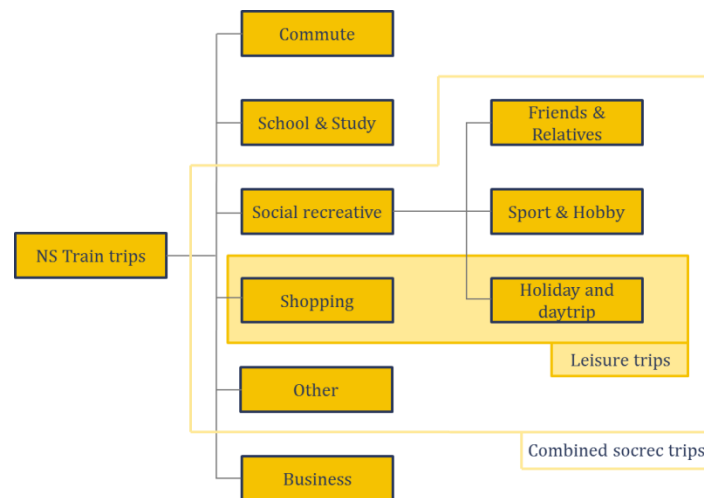

Figure 6: NS trip data was available on two detail levels. Station specific data is only detailed on social-recreational, 'socrec', trips (light yellow), while national data is available on leisure trips specific (darker yellow)

Unfortunately, this level of detail was only available on a national level. Station specific trips were only distinguished between motives: commute, school & study, shopping, business and other. Social-recreational trips were part of the 'other' motive. For analysis purposes, the shopping motive and other motive were combined to form a new 'combined socrec' motive, light yellow in Figure 6. The 'combined socrec' motive is used in station specific analyses while the 'leisure' motive is used on a national scale.

Data for the spreadsheets have been gathered from multiple sources. One of these sources is the 'KlanttevredenheidsOnderzoek'(KTO), which is NS's own customer satisfaction survey. In this research 80.000 people are queried on a periodical basis. The spreadsheets also used other sources than KTO to calibrate the number of trips: traveler counts at stations and within trains and use of the OV-chip card[8].

Leisure facility perspective (CBS Statline)

Together with train traveler perspective data, data from a leisure facility perspective was used to determine whether location and type of station are related to the location of leisure facilities. Leisure perspective data consists of proximity values for leisure facilities of all Dutch municipalities and were obtained from CBS Statline (Dutch Central Bureau of Statistics, CBS). This database was preferable to another database named LISA, which was initially considered to be a valuable database to pinpoint at locations where leisure facilities have grown. LISA contains employment data on every building in the Netherlands and includes all categories of leisure buildings. However, NS only had access to 'zip-code 5' LISA data[9], and the distinction between sectors was not present. It rendered LISA useless to this research.

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[8] An OV-chip card: A smartcard payment system used for all types of public transport in the Netherlands. Check-in and check-out data is logged, and provides accurate arrival- and departure data.
[9] Zip-codes in the Netherlands have the following format: #### AA. The first four numbers indicate the district, the first letter a neighborhood and the last one (part of) a street. Zip-code 6 level means detail up to street level as it includes all 6 alfanumerical values.

The period over which data was available varied per leisure facility and spanned from 2006 to 2012. Proximity values were aggregated average distances of all municipality inhabitants to the nearest leisure facility. Distances were measured via roads accessible by car; bicycle paths and sidewalks were not included. An example of CBS data for one year for the municipality of Gouda is shown in Table 3. The distances are averages for every inhabitant of the municipality.

Gouda, 2009 (km)	Library	Pool	Ice rink	Museum	Cinema	Spa	Solarium	Attraction
Distance	1	1.4	18.4	1.8	1.8	1.9	1.7	15.6

Table 3. Example of CBS Statline data: Average distance of inhabitants of Gouda to the nearest leisure facility in 2006. Numbers are shown in kilometers

For each leisure type, every municipality which had seen a > 20% decrease in average distance was filtered. This was done for every set of years in the dataset (e.g. 2007-2008 and 2011-2012) for which values existed, isolating several clusters of municipalities which were close to each other. For each cluster an attempt was made to identify the corresponding new leisure facility through internet search and Google Maps. Finally, the leisure facility was coupled to a station type if it was less than a kilometer walking distance away. This coupling enabled a comparison between leisure facilities in station areas and those in other areas, revealing differences and a possible positive relation to station areas. The second method of gaining information for this thesis is making use of expert and leisure representative interviews. They will be discussed in the next section.

5.2   Interviews

Literature indicates multiple ways to assess factors playing a role in location decision making. (Willigers, 2006) Willigers examined seven methods and their (dis)advantages: case studies, entrepreneurial interviews, expert judgment methods, LUTI models, location choice models, regional partial product functions and spatial equilibrium mobdels. For this research, a location and leisure type specific method would be best. Therefore, spatial equilibrium models, regional partial production functions, and LUTI or location choice models are not fit for the job, as they require data that will not be available or have too little spatial detail. Leisure representative interviews are especially valid, as this research will also look for perceptions and 'soft' location factors, which are obtained by asking open questions during the interviews.

Personal preference of the decision maker and the unique appeal of leisure facilities are important in location choice. Various studies have suggested a strong relation between these individual characteristics and the location choice of a company. It makes the choice for a location almost idiosyncratic.[10] The ideal location choice for leisure companies does not exist. Every different type of activity has (slightly) other motives or reasons to choose a location

Virginia Carlson has tested the similarities between location choice motives which were taken out of a survey or statistical analysis and the actual moving of firms to a new location. Firms are reasonably accurate in their prediction of which kind of location will be attractive to them. (Carlson, 2000) The following difficulties were observed during the study:

- Firms may give answers to some questions which they hope will influence future policy-making. A question on local taxes might be answered in the companies favor;

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[10] The needs of individual companies and characteristics of available locations combined in such a way that it makes virtually every decision unique

- Actual reasons may fade over time. Respondents are more likely to reflect the current core business situation on location choice motives of the past.
- The person(s) responsible may have left. In case of multiple persons that are responsible for the location choice, multiple interviews have to be done and compared.

The article concludes that firms give truthful answers when their location choice motives are being asked during interviews. Therefore, to determine how managers of leisure facilities make decisions regarding their new location and the influence of a nearby station, a qualitative analysis was performed of interviews with experts on the subject and leisure facility representatives. The literature review stated that it is difficult to make generalizations about the determinants of location because the surveys differ in design, location factors explored, and sample groups. (section 4.4) The challenge will be to make generalizations where possible, based on interviews alone.

Expert interviews

Experts have been interviewed first, as they would be able to provide a background on the subject next to the location choice motives. Seven academic experts with experience in the fields of leisure, mobility and social geography were selected based on publications used in the theoretical background, recommendations from NS- and university supervisors and recommendations from experts themselves (see Appendix A for full references). These experts have been interviewed using a pre-defined interview outline (see Appendix B10). A broad interview outline was used, in which several subjects were included: interdependency of leisure facilities and station areas, insight in leisure facilities' decision-making regarding their location, leisure visitor mobility and trends that influence the leisure market. Some example questions of the expert interview are outlined below:

- Do you recognize a change in leisure facilities in stations areas? Have they become more present or aimed at stations?
- Do you have insight in the type of transport mode visitors use to reach their leisure facilities and possible reasons for choosing this mode?
- Is the theory on location choice for companies applicable to leisure facilities? Which parts are and which are not?

The answers on most questions were used to determine the decision-making of leisure facilities and the relation between leisure facility locations and station areas. A part of the interviews was used to be able to set up a visitor questionnaire later on. In addition to these questions, experts have also been also asked for their feedback on the preliminary results of the database analyses.

Leisure representative interviews

Secondly, leisure representatives of three companies (a cinema, a pop stage and a theater, see Appendix A9 for full references) have been interviewed (see Appendix C for the interview outline). Subjects that were covered during the interview were roughly the same as those in the expert interviews: factors that play a role in their decision-making regarding a location and their opinion on the relation to a nearby station. Where the experts made a statement about which motives leisure facilities would experience, leisure facility representatives were of course able to speak for the facilities they work for. The leisure representatives have been asked to put the macro-, meso- and micro factors

taken from the conceptual model (see Figure 4) in order of importance. The following table shows the factors that were asked. Most of them were meso factors, which means they consist of location choice factors not influenced by the firm itself.

Micro factors	Meso factors	Macro factors
Financial (rent, ground price)	Location historically chosen	Spatial policies
Characteristics of the building	Accessibility by walking / cycling	Economy
-	Accessibility by public transport	-
-	Accessibility by car	-
-	Location in town / versus competition	-
-	Catchment area of visitors	-

Table 4: Location choice factors

A preview on the second research question on visitor mobility has been made by asking the representatives for modal split of their visitors, reasons for choosing a transport mode and reasons for visiting a leisure facility. The answers from all experts and leisure representatives combined were used to present an overview of location choice motives for leisure facilities.

5.3   Questionnaire

The methodology used to answer the second research question consisted of a visitor questionnaire. A questionnaire was chosen, as there was no data on visitors of leisure facilities available. The data that was available was either protected by the leisure facilities themselves, or did not contain the right information. A questionnaire provided the most direct way to gain knowledge about modal choices of visitors and reasons for their choice. The greatest advantage of developing a questionnaire is that one is able to design it with their own research objectives and goals in mind. Further details on the development of the questionnaire are given in the next section. The questionnaire was administered to visitors at multiple leisure facilities.

Developing the questionnaire

The questionnaire was set up using inputs from the expert- and leisure representative interviews and database analysis. One specific element of interviews was dedicated to visitor mobility, the representatives and experts were asked for visitor modal split, leisure facility catchment area and specific reasons why visitors might choose a particular mode.

The questionnaire consisted of three main elements: (1) travel characteristics, e.g. transport mode, perception of accessibility and group composition; (2) relation to the nearby NS station, e.g. walking distance and influence on mode choice; (3) personal characteristics, e.g. age, gender, origin and education. The questionnaire is found in Appendix E13. Element 1 has nine questions, element 2 has three questions and element 3 consists of seven questions. Travel characteristics and the relation to the nearby station are essential for answering the general research question, while the personal characteristics were mainly used as input for factors in a predictive model. Before the questionnaire was used, it has been reviewed by multiple employees of NS on clarity, consistency and flow of the questions. The questionnaire was administered to visitors at leisure facilities with local, regional and national catchment areas in different regions, to maximize the diversity of examined leisure facilities.

Administering the questionnaire

Students of the University Twente have been asked to assist during questionnaires, as part of a bachelor course ("Kwantitatieve Basis voor Beleid"). The chosen leisure facilities belong to one of the six defined types: cinema, theater, pop stage, museum, attraction and large retail, and are all at close distance to a railway station (Enschede, Hengelo or Enschede Drienerlo). All leisure facilities operate on a local or regional level. Students were allowed to choose their preferred leisure location. The leisure facilities which were chosen by the students are presented in Table 5. The groups consisted of four to five students each. They have been asked to question visitors at an appropriate time: mostly during weekends or evenings and sometimes even both. This is peak time for the leisure facilities, which ensures enough respondents and it also belongs to the off-peak period for NS. The aimed sample size was 75 respondents per location. The questionnaire used by the students can be found in Appendix D.

Name	Type	Nearby station	Catchment area
Cinema Hengelo	Cinema	Hengelo	Local
Cinestar	Cinema	Enschede Drienerlo	Regional
Grolsch Veste	Attraction	Enschede Drienerlo	Regional
Rabotheater	Theater	Hengelo	Regional
Atak	Pop stage	Enschede	Regional
Metropool	Pop stage	Hengelo	Regional
Intersport	Retail	none	Regional
Twente Museum	Museum	Enschede	National
Beatrix theater	Theater	Utrecht	National
Pathé Arena	Cinema	Amsterdam	National
Heineken Music Hall	Pop stage	Amsterdam	National

Table 5: Leisure facilities selected for visitor questionnaires in the 'Twente' and 'Randstad' area.

In addition to visitors of local and regional leisure facilities, questionnaires were also administered to visitors of three national leisure facilities. These national leisure facilities were chosen based on a short discussion with supervisors. Considerations in this choice were: very close to a type 1, 2 or 3 station, distinction between interesting leisure types and sufficient respondents. The chosen leisure facilities are also presented in Table 5. The questionnaire for national leisure facilities was administered by the author of this thesis and a few assistants. This questionnaire differed slightly from the one used for local or regional facilities and can be found in Appendix E13. Differences included taking out the question on reasons for a visit, as visitors come to these facilities for a specific performance and the adding of origin and destination options to determine whether visitors have made a chain trip. For each facility, one time slot was available to gather a hundred or more respondents. The positioning within each facility was just after the entrance, when visitors enter the foyer, to make sure they were at ease after buying their ticket or gaining access.

Data analysis of questionnaire survey

Data from all questionnaires combined were coded into SPSS format (21.0) to be able to perform an efficient data analysis on the large sample group. Although every student used the same questionnaire, eight different ways of sorting and analyzing this data were done by them, as no

predefined format was made available to process the answers. To make sure all data was coded uniformly, it has been checked thoroughly before putting it in the SPSS data file.

Attractiveness of leisure facilities to train travelers

The first analysis on the visitor questionnaire was to show differences in preferred mode and origins for the different leisure types and catchment areas. To gain insight quickly, origin maps were made.[11] Next to these origin maps, modal split percentages for train were extracted from the dataset per leisure type and catchment area. One of the questions on interdependency with stations was used as well to indicate which leisure facility would lose the most visitors if they were not situated near a train station. Visitors had three answer options: (1) I would still come, (2) I would not have come, (3) I would come less often. Option 2 and 3 were put together to illustrate a worst case scenario for the leisure facility.

Enriching the database with travel time and distance

To make a predictive model of travel mode choice to leisure facilities possible, additional data had to be gathered to enrich the data obtained from the visitor questionnaire. Travel time and distance were considered to be the most logical explanatory variables for mode choice, but no items on travel time or distance were included in the questionnaire. These were not included, as visitors generally cannot accurately determine their travel time and distance travelled. (Péruch, Giraudo & Garling, 1989) Therefore, visitors were asked for their zip code of origin. Travel time and distance were then acquired as follows. The two most common route planners for car-[12] and public transport[13] trips in The Netherlands were used to gather extract travel time and distance. By making use of a Matlab-script[14] the needed strings were extracted from web pages. The script follows these steps:

- Zip codes from visitor origin and leisure destination are required in "####aa" format.
- These zip codes are pasted in an URL-string pointing to Google Maps, the HTML page is saved.
- Car travel time, distance and city of visitor origin are extracted from the HTML page;
- Zip codes, city of visitor origin and leisure destination are pasted in an URL-string pointing to 9292ov, the HTML page is saved;
- Public Transport travel time and number of transfers are extracted from the HTML page.

In Appendix F14 the script is presented. The comments (after each % sign) contain a more detailed description for each step the script takes to create its result. The distance, travel time by car and public transport, zip codes, number of transfers and city of origin and destination were added to the database.

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[11] Origin maps were made by submitting zip codes of origin and destination and mode to http://www.batchgeo.com/nl. The maps were zoomed in and cropped accordingly.

[12] Google Maps (http://maps.google.nl)

[13] 9292 OV (http://9292.nl)

[14] Written in cooperation with Peter Wessels (peterwessels51@hotmail.com)

Factors determining mode choice

A small part of the expert and leisure representative interviews contained questions on mode choice of visitors of leisure facilities. Their answers provided insight into some factors that play a role in mode choice. Other factors of influence were obtained by using the questionnaire. Every variable was tested for a relationship with modal choice between public transport and car. The first test was visual: corresponding charts were drawn. A relation can be easily distinguished from a chart. If a possible relation was found, a statistical test was done. As transport mode is in this case a nominal (dichotome) variable, a chi square analysis is the most logical choice to test the relationship. The H_0 hypothesis was always that transport mode and the variable in question are unrelated. H_0 will be tested with a two-sided test in which p should be equal to or exceed 0.05. If $p < 0.05$, H_1 will be accepted that states that transport mode and the variable in question are related. If H_1 is accepted, the variable influences mode choice. Cramer's V was used to test the strength of the relation. The results are reported as follows:

N = included cases, X^2 = chi-square value, p = significance, V = Cramer's V

A distinction between public transport and car was chosen for one main reason: the number of train travelers for some leisure facilities. In order to maintain a large part of the dataset, public transport was chosen. Another argument for choosing public transport over train alone is public transport modes share a lot of characteristics in comparison to car transport.

Factor analysis reasons for choosing a transport mode

The questionnaire item 'reasons for choosing a transport mode' has 11 answer categories. Most of these reasons had a small sample size. In order to increase the explanatory value of the reasons, the amount of cases per reason should be higher. A factor analysis has been done to see if grouping some of these answer categories was valid. The factor analysis used was the 'principal component method' in which a varimax rotation was added. A scree plot and eigenvalues were used to determine whether grouping was useful. The questionnaire was designed with mutually exclusive reasons in mind, so clustering is not expected.

Estimating a model of train travelers to leisure facilities

The results of the questionnaire can be used to indicate which of the examined leisure facilities are most attractive to train travelers. To be able to indicate a similar attractiveness for other leisure facilities than the examined ones, a model should be estimated. This model can then be used by NS to indicate which share of visitors of a leisure facility near a station might come by train.

The estimation of a model for train travelers to leisure facilities can be achieved in multiple ways. The most common method is estimating a logit or probit model, based on utility. Utility means the use one can get out of something. The higher the utility, the higher the chance that an individual will choose something. When applied to the context of mode choice, utility consists of the trip attributes for every mode: the costs, the waiting time, the 'in vehicle' travel time, the number of interchanges, the comfort etc. The concept of utility works in such a way that combining these attributes will result in one measure which is similar for all transport modes.

However, a utility based (logit) model is far too detailed for the objective of this thesis, which is to gain insight in the amount of train travelers that are attracted towards leisure facilities near stations. Furthermore, it requires data like costs (parking, fuel), waiting time and other attributes

which were not available. An alternative was found in basing a model on the trip characteristics which were available: travel time and distance. The model will provide expected values on train share for leisure types and catchment areas, based on this factor for every respondent.

Also, other factors explaining mode choice from the questionnaire will be examined as well (see also: 'factors determining mode choice'). Including them maximizes the variance explained by the model. The factors explaining mode choice will be tested on correlation with each other. If a correlation is found, the variables can be combined or one of the two can be eliminated.

5.4   Summary of available data

Table 6 presents an overview of the methods of obtaining data and their corresponding research questions. A more detailed description of each used method was given in sections 5.1 through 5.3. The next chapter will discuss the results.

Research question	Data	Source	Format
Is the location and type of existing stations positively related to the location of leisure facilities which have been built during the last decade?	Trips and motives of train travelers NS	NS	Quantitative
	Proximity data of leisure facilities	CBS	Quantitative
How do leisure facilities make decisions regarding their new location, and what is the influence of the location and type of an existing or planned station on this decision-making?	Interviews with academic experts	Experts (Appendix A)	Qualitative
	Interviews with leisure representatives	Leisure representatives (Appendix A)	Qualitative
Which share of visitors of leisure facilities might use planned (or existing) stations to visit various leisure facilities with various catchment areas?	Visitor questionnaire at local / regional leisure facilities	Survey administered by students	Quantitative / Qualitative
	Visitor questionnaire at national leisure facilities	Survey administered by the author	Quantitative / Qualitattive

Table 6: Methods of obtaining data for research questions

6   Results

The results from this study are categorized in the following order: databases, interviews and visitor questionnaires. The databases section contains results from the NS trip data and proximity data from CBS Statline. The interviews section will discuss interviews with leisure facility representatives and academic experts. The last section on visitor questionnaires examines the outcome of visitor questionnaires held at multiple leisure facilities.

6.1   Databases

Train traveler perspective

The total number of train trips operated by NS increased from 316 million in 2004, to 366 million in 2011. (Table 7)

	2004	2005	2006	2007	2008	2009	2010	2011
Train travelers per year (million)	314	326	334	341	353	357	352	366

Table 7: Number of trains trips made with NS per year (millions)

Both the absolute number and relative share of leisure trips, consisting of both holiday & daytrips and shopping trips (see also Figure 6 for an elaboration on trip motives), were quite steady for years with only a slight increase in 2005 and 2011. (Figure 7) This is due to a sudden growth in holiday & daytrips (Figure 7, yellow lines). The changes are not that large though, so a general assumption on leisure trips share cannot be formulated. The absolute number and relative share of shopping trips declined slightly since 2004. Again, changes are minimal. The rather steady share for leisure trips does not indicate that leisure facilities in station areas have become more important. However, individual station types may have seen a growth in travelers with a leisure motive.

As indicated in the methodology (paragraph 5.1), data on a station specific level was only
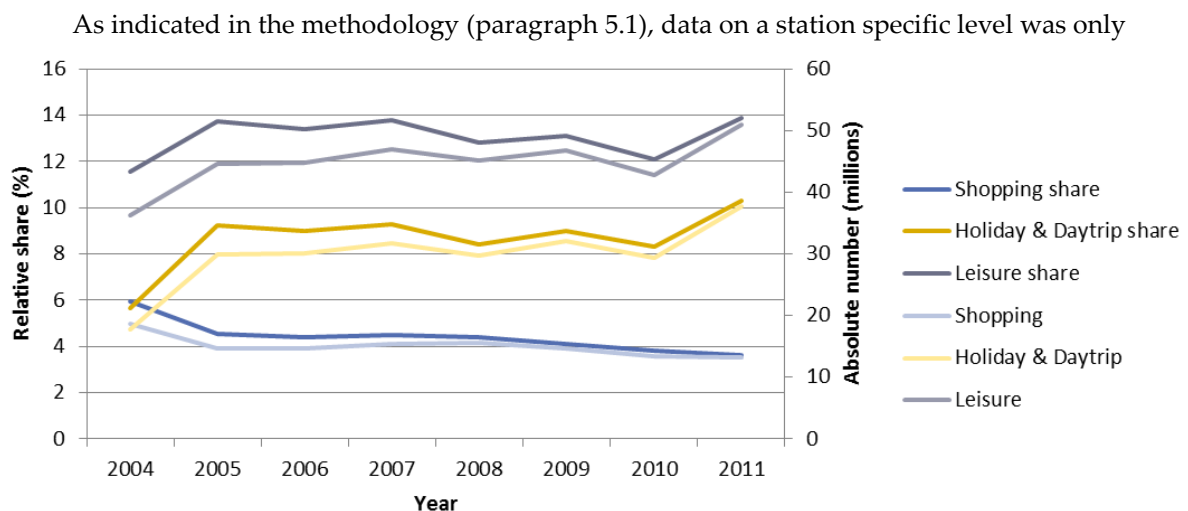
available for a general 'social-recreational' motive. An explanation of this motive and the sub-motives it contains was given in Figure 5. The share of social recreational trips declined over the period between 2004 (share of 46%) and 2011 (share of 44%) for almost all station types[15] (Figure 8 on the next

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[15] Except station type 5, it increased its combined social recreational share with 1% from 2004 to 2011

page). Station types all show a similar decline to the average of around 1-2% (Figure 8). Again, a direct link with an in- or decrease of leisure facilities cannot be made, only an indication is possible. From a train traveler perspective, another level of detail was available: the individual station level. Individual stations with a high share or increase in social recreational travelers were considered for the visitor questionnaire.

Figure 7: Distribution of train traveler shares for the leisure motive (total = 100%). Transparent lines (e.g. "leisure") represent absolute number of trips, the darker lines (e.g. "leisure share") represent the relative share of trips. Based on NS trip data.
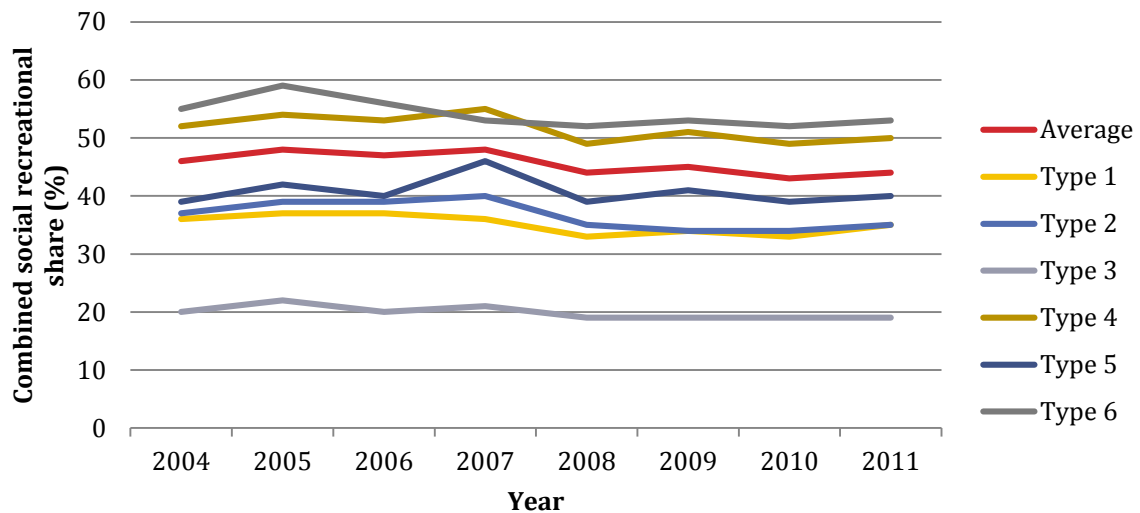

Figure 8: Combined social recreational share (see section 5.1) of train travelers per station type. Source: NS trip data (MOA)

To identify station areas of interest for the visitor questionnaire, individual numbers on stations were extracted from the NS trip database. Table 8 presents per station type the two stations with the highest share of social recreational travelers. It also presents for each category the station with the highest increase in social recreational share with 2004 as baseline. Station types 1, 2 and 3 have high sample sizes and their figures are therefore the most reliable. Type 1 and 2 stations have a rather large share of travelers with a social recreational motive, especially when compared to type 3. The high shares for station types 4, 5 and 6 are mostly due to low sample sizes. Whether an increase in social recreational motive for the mentioned stations is due to a new leisure facility is discussed in the next section.

Type	Highest shares		Highest increase
1	Amsterdam (43%)	Schiphol (41%)	Rotterdam Centraal (2%)
2	Groningen (51%)	Maastricht (48%)	Venlo (16%)
3	Schiedam Centrum (33%)	Rotterdam Alexander (28%)	Amsterdam Bijlmer Arena (5%)
4	Zandvoort aan Zee (74%)	Enkhuizen (69%)	Echt (32%)
5	Hoek van Holland Strand (80%)	Hoorn Kersenboogerd (68%)	Vleuten (26%)
6	Hoogkarspel (79%)	Nieuw Amsterdam (75%)	Driehuis (56%)

Table 8: Highest shares and increases of combined socrec motive for 2004-2011

The three levels of detail for the train traveler perspective only show whether certain stations, station types or NS as a whole have seen an increase in leisure travelers. To determine a trend in leisure facilities in station areas, another type of data is necessary: leisure facility proximity data. It is covered in the next section.

30

Leisure perspective

Here, we distinguish between leisure facilities built in station areas and leisure facilities built elsewhere. When comparing station areas to the rest of the Netherlands, a rough estimate has to be made which areas are within the influence of a station and which are not. Assumptions had to be made to distinguish station areas from the rest of The Netherlands. These assumptions were made: (1) railway stations and leisure facilities are always built in urbanized areas, (2) around 15% urbanized areas in the Netherlands, (3) 400 stations in total with a radius that does not overlap (4) a one kilometer walking radius around a station and (5) a land surface area of around 34.000 square kilometers.[16] With these five assumptions in mind and assuming a random distribution of leisure facilities over the Netherlands, approximately 25%[17] of the new leisure facilities are hypothetically built within a station area, as this part of the urbanized area in the Netherlands is within influence radius of a station. For a detailed calculation, see footnote 18 at the bottom of this page. The 25% figure is used purely for comparison purposes and is by no means an exact figure. The comparison will be made between station areas and non-station areas.

Assuming that around 25% of leisure facilities should be built in station areas, new pop stages and cinemas are far more likely to be placed there than the other leisure facilities. (Table 9) Museums, attractions, swimming pools and spas are often situated at the outskirts of a town. Museums score quite high at this point, as they include all kinds of small rural locations. Detailed data on which leisure facilities have emerged in a station area can be found in Appendix G. For example: In 2008 a new ice rink was being built in Enschede in a station area, near a station of type 5 (Enschede Drienerlo).

In absolute figures, some leisure facilities have grown and some have declined in number. (Table 9, right side) A decrease of leisure facilities means that facilities stopped their activities. For example, 33 new libraries were built in the period between 2006 and 2012 but 235 were closed, resulting in a decrease of 202.

The reason for a decline or growth is different for each type and can range from the rise of e-books (for libraries) or a growing number of visitors for wellness (for spas) to more general causes like re-urbanization. Academic experts and leisure representatives were also asked for reasons for a decline or growth. Their view is described in the chapter 6.2 An elaboration on Table 6 and detailed amounts per year per leisure type can be found in Appendix H.

| Facilities | Avg. distance inhabitants to leisure (km) | | | | | | | New leisure facilities | | | Total # of facilities |
	2006	2007	2008	2009	2010	2011	2012	Station area	Other area	Perc.	In-/decrease since '06
Library	1,7	1,7	1,7	1,7			1,8	7	26	21%	-202
Ice rink			18,5	18,5	18,3	18,0	18,2	1	1	50%	+1
Swimming pool			3,9	3,9	3,6	3,6		1	17	6%	-56
Museum	3,6	3,5		3,5				1	43	2%	+35
Performing arts	5,4					5,3		2	10	17%	+12
Pop stage	26,0					25,7		3	3	50%	-17
Cinema			6,9	6,9	6,8	6,7		5	3	63%	+11
Spa			8,9	8,7	8,6	8,3		1	21	5%	+40
Attraction			9,5	9,2	8,6	8,2		1	23	4%	-

Table 9: Left side: Average proximity to leisure facilities for the Netherlands (km). Data were not complete for some years and leisure facility types. Right side: New leisure facilities near stations versus other locations. Source: Appendix H**.**

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[16]Land surface and urbanized area were sourced from the 'Compendium voor de leefomgeving' website: http://www.compendiumvoordeleefomgeving.nl/indicatoren/nl0063-Stedelijk-gebied-in-Nederland.html?i=4-34

[17] 34.000 (area of the Netherlands) * 0.15 (part urbanized) = 5.100 km^2 urbanized area | 400 (stations) * π * 1^2 (km radius) = 1.257 km^2 influence area of stations. 1.257 / 5.100 * 100 = 25% of Dutch urbanized area within influence of railway stations.

The average distance that an inhabitant of The Netherlands lives from each leisure type obtained from CBS Statline is presented also in Table 9 (left side). The absence of values on a national level for a specific year also means no data on a municipal level. On average every leisure type is closer to inhabitants than a few years ago with the exception of libraries.

6.2 Interviews

The results from the interviews are aimed at three subjects: mobility of visitors of leisure facilities, interdependency of leisure facilities and station areas and insight in the location selection process for leisure facilities. Pieces of text which are based on an interview are followed by an abbreviation of the corresponding expert(s) or representative(s) between parentheses. Their abbreviations can be found in Appendix A. When an expert or representative is cited, quotations marks are present.

Mobility of visitors of leisure facilities

Literature indicated an increase in travel time and travel time share for trips with a leisure motive (see also Theoretical Background, section 2,3), Experts indicated that the number of kilometers travelled in The Netherlands has been growing, but that this is not the case for the leisure motive (DE, LH). Leisure trips are made less often, but have increased in distance (PJ). It has declined in peripheral areas and public transport in general (LH). The only section in which the leisure motive is growing is in air traffic and on longer trips (AP). The difference between the experts statements and introduction can be explained by the range of data in the introduction (up to 2005) while experts were asked for a scope of the last decennium. NS trip data (Figure 7) also showed a slight increase in trips with a leisure motive since 2004. As train trips are not the only modality in public transport, a direct comparison is not feasible. Some experts stated that the reason for an increase in leisure trips might be found in train tickets sold by 3rd party retail channels[18] (AP). They are quite popular with travelers on a longer journey. Experts also agreed on the unattractiveness of many large leisure facilities to public transport users in the Netherlands. (JW, NB, LH) A large table in Appendix I shows that almost none of the top 50 leisure attractions in the Netherlands is situated in a station area.

Leisure representatives of national leisure facilities provided the following insight in the mobility of visitors of their facilities. According to the representative of Stage Entertainment (national theaters), differences in programming attract different types of visitors. A musical will typically attract visitors up to 1,5 hours away, while a business event attracts visitors from all over the country. These visitors also differ in which modality they choose to reach the theater. As visitors are unable to travel by train late in the evening they have no other option than taking a car. Chain trips are also a great cause of car preference: from work to friends to the theater etc. Despite past efforts of the theater to make sure that visitors were able to take the train back home late in the evening by starting their theater shows earlier in the evening, past experiences have shown that this does not really work for the general public. The modal split for the Beatrix theater in Utrecht is: 60-70% car, 25% train and 5% other modalities. Alex Keizer noted that a share of 25% visitors by train is quite substantial, although this is not surprising taking into account the positioning of the theater next to Utrecht CS. Modal shares have not changed over the last couple of years.

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[18] 3rd party tickets sold by grocery shops and pharmacies. These are often tickets for a whole day, excluding morning rush hour for the whole Netherlands. They are considerably cheaper than regular tickets.

According to the leisure representative of Wolff Cinemas, visitors often combine a trip to the cinema with another activity and usually visit in groups with an average group size of 2.6. The number of visitors which arrive by train might have increased slightly.

The coverage area of the Doornroosje pop stage is the city itself and its direct surroundings (70 % of visitors). Only 30% of the visitors travels further than 35 km. This is because every major city in The Netherlands has its own pop stage. Per target group the distance traveled differs. Overall modal split figures are: 40-50 % car, 40% bike, 10-20% train (including bus transfer). Local bands can attract up to 80% visitors on a bike.

Interdependency of leisure facilities and station areas

Leisure facilities should have a very high accessibility due to their placement or be unique in their kind if they want to be successful. People are willing to travel to popular spots no matter which transport mode reaches it, which means that developments are not bound to station areas. (DE) LH stated: "I cannot imagine that developments in the leisure market are aimed at stations". This leads to think that there is no major dependency of leisure facilities on station areas.

Leisure representatives had a somewhat different view than the experts, stating that there is indeed interdependency. According to Stage Entertainment, large leisure facilities cannot ignore station locations, due to their superb accessibility. If a new (large) facility is built, a station location of type 1,2 or 3 is almost always viable. However, other aspects like centrality in The Netherlands and ground price may play a more important role. Theaters also function great when they are not near a station: DeLaMar (also owned by Stage Entertainment) is situated in the center of Amsterdam, but not near a railway station. Still a lot of people choose public transport to reach DeLaMar, but more often as a park+ride option.

Wolff Cinemas shares Stage Entertainment's view. Cinemas always have regional coverage and in nearly all cases there is a station nearby. The only Wolff cinema with no station nearby is in Huizen, as it has no station at all. The interdependency of a station and a cinema is directly related to walking distance. Direct access is not necessary, but walkable within 15 minutes is an important requirement. Toine Tax of Doornroosje stated that the presence of a station might be of influence on a leisure facility. Night trains might attract more visitors, but could also lead to people going to the Randstad instead (in the case of Doornroosje). Types of leisure which would have interdependency with a station would be ones that do not rely on a large group of visitors coming from close by: it should be something that people are absolutely willing to travel for.

Experts also came up with numerous examples of a missing link between leisure facilities and stations in The Netherlands. An example is Zoetermeer, where Dutch Water Dreams and Snow World, two large leisure attractions, are not close to a station. (NB) The same applies to 'De Efteling' (JW, NB, LH) and many others (see Appendix I). In general, most (large) leisure facilities in that list are not near a station at all. According to most experts, location choice preference for stations areas might be more based on coincidence than on actual preference of leisure attractions owners. Other reasons most likely play a larger role and will be discussed in the next section.

Insight in the location selection process for leisure facilities

In the introduction a knowledge hiatus in the location decision-making of leisure facilities has been recognized. Therefore, experts have been asked to give insight into that subject. The main difference between the location choice of businesses and leisure is the target group. Businesses will target

consumers, while leisure facilities aim at visitors. Leisure facilities sell an experience, while most businesses sell products. (NB) The location choice of leisure facilities and businesses can therefore not be compared directly, only some elements of location theory can be applied. Experts have been asked which motives managers of leisure facilities have when they decide to move somewhere. Reasons stated by the experts are:

- They all take general accessibility of their facility very seriously, often not preferring a specific transport mode;
- They tend to get close to other leisure facilities which are typically not of the same type, so called agglomeration effects. This impacts competition in two ways: although other facilities aim at a comparable target group of visitors, with a reduction in clientele as a direct result, visitors might also choose to combine two or more facilities.
- Most leisure facilities have a vision on their location. However, they differ per facility: it is due to a multitude of reasons that a specific location can be chosen. Reasons range from building appearance to the owner's preference or even the preference of a municipality.
- Existing leisure facilities have sometimes been at the location for a long time, rational location decision-making is therefore not applicable as most factors have changed over time;
- Railway stations are usually no part of the choice process, but this differs per leisure type e.g. cultural facilities are more likely to take them into account.

Leisure representatives recognized these motives and added some of their own. The most important reasons for Stage Entertainment to choose their location for the Beatrix Theater were: capacity, overall accessibility and centrality in The Netherlands. Theaters consciously invest a lot in an optimal location, as they very much depend on it. They strive for an optimal distribution between accessibility, appearance and price (location, ground price).

Cinemas recognize accessibility as an extremely important factor in their location choice as well. Parking policy, bike stalls and the availability of public transport all contribute to an easier journey and more customers. Wolff only builds cinemas on a large scale: always open, high service quality etc. It means a lot of square meters, almost impossible to realize in city centers. Therefore, the most practical locations for a new cinema are at city outskirts or in redeveloping areas around stations. Other important location choice factors are: other cinemas in the area, does the catchment area supplies supply enough visitors, the type of cinema that is built and the target group. Cinemas in provincial areas are not comparable to cinemas in highly urbanized regions (Randstad) when it comes to location decision-making.

For a pop stage, visitors coming from close by are essential. A pop stage is unable to function when there are no inhabitants in the vicinity to fall back on. As Doornroosje is currently in the process of relocating, research has been done on 31 locations, which were selected on basis of accessibility and other possibilities. This research showed that a central location is more important than the vicinity of a railway station.

After the leisure representative and expert interviews were done, visitor questionnaires were administered at 10 locations in both the Randstand and Twente. The next section discusses the results.

6.3 Visitor questionnaire

An overview of the questionnaire locations, their catchment areas and number of respondents is given in Table 10. The total dataset contained 883 entries. Intersport, a retail facility for sports gear, was not used in the analysis as this facility was outside the scope of this thesis, leaving 808 valid entries. The questionnaire itself was considered clear and was well received by visitors of the facilities.

Name	Type	Catchment area	Station location	# respondents
Rabotheater	Theater	Local	Hengelo	78
Cinestar	Cinema	Regional	Enschede Drienerlo	80
Bioscoop Hengelo	Cinema	Regional	Hengelo	76
Grolsch Veste	Attraction	Regional	Enschede Drienerlo	40
Metropool	Pop stage	Regional	Hengelo	51
Atak	Pop stage	Regional	Enschede	50
Twente Museum	Museum	National	Enschede	72
Beatrix theater	Theater	National	Utrecht	95
Pathé Arena	Cinema	National	Amsterdam Bijlmer Arena	146
Heineken Music Hall	Pop stage	National	Amsterdam Bijlmer Arena	120

Table 10: Percentages and counts of train travelers per leisure facility, only trips >5 km are included, only car and train modes. Catchment area definitions are given in the 'definitions' section.

Train travelers to leisure facilities

The visitor questionnaire shows that on average 23 % of the visitors examined leisure facilities choose the train as their transport mode. This percentage is high, but can be explained by the presence of well-serviced train stations next to them. Usually, public transport is only responsible for three percent of leisure trips (Harms, 2006), so the examined leisure facilities near a station benefit greatly from the presence of that station. The percentages and counts of train travelers per leisure facility are presented in Table 11. These figures are based on a dataset of 766 entries, the count shown next to the train share percentage is the sum for all modalities.

Train share (% / n)	Pop stage		Theater		Cinema		Attraction		Museum		Total	
National	26 %	120	37 %	95	19 %	146	-	-	18 %	72	29 %	433
Regional	27 %	99	6 %	41	9 %	79	20 %	40	-	-	17 %	259
Local	-	-	-	-	10 %	74	-	-	-	-	10 %	74
Total	26 %	219	25 %	136	14 %	299	20 %	40	18 %	72	**23 %**	**766**

Table 11: Percentages and counts of train travelers per leisure facility

Train trips have the largest share when trips are 26 kilometer or longer. On trips less than 5 kilometer (n = 132) public transport only has a marginal share. To illustrate the competitiveness of the train product against car mobility, an additional table was made for trips which are > 5 kilometers in length and only consider a choice between train and car. (Table 12, next page) By excluding these small distances and other transport options, the train has gained in share for leisure facilities with a local or regional catchment area. The share for national leisure facilities did not change much.

Train share (% / n)	Pop stage		Theater		Cinema		Attraction		Museum		Total	
National	26 %	111	40 %	84	25 %	102	-	-	32 %	41	30 %	338
Regional	43 %	51	12 %	41	11 %	64	38 %	21	-	-	24 %	177
Local	-	-	-	-	25 %	28	-	-	-	-	25 %	28
Total	31 %	162	31 %	125	20 %	194	38 %	21	32 %	41	27 %	543

Table 12: Train traveler counts and shares per leisure facility. The dataset excludes distances < 5 kilometer and trips made by walking / bike or other forms of public transport.

A better illustration of the importance of train trips to facilities with a national catchment area is given by origin maps. (Figure 10) These maps show where visitors come from and which transport mode they use. The comparison is made between Rabotheater Hengelo in the lower left corner (local catchment area, 6 % train) and Beatrix Theater Utrecht in the lower right corner (national catchment area, 37% train).The visitors that Rabotheater attracts by train are coming from a little further away. Beatrix Theater, with a national catchment area, attract train travelers from all over The Netherlands. The map also shows that train travelers often originate from a town with a railway station. High resolution origin maps for each examined leisure facility are found in Appendix J.
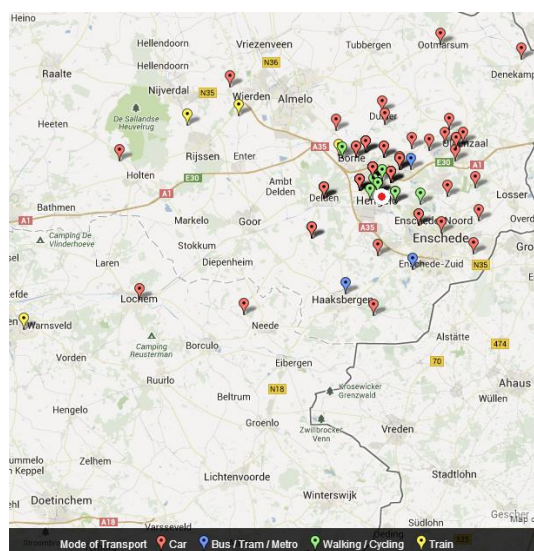

Figure 9. Origin maps of the Rabotheater (above) and Beatrixtheater (right). The leisure facilities are indicated by a red dot, transport modes have the following colors: car: red, bus / tram / metro; blue, walking / cycling: green and train: yellow. Origin maps for all other facilities are found in Appendix J

One specific question of the visitor questionnaire regarded the importance of the train station to visitors of the leisure facility. The percentage of visitors coming by train, that would not visit a leisure facility anymore, or visit it less often if the corresponding station was not situated next to it are presented in Table 13. National leisure facilities are clearly more dependent on their station than leisure facilities with a regional or local catchment area. The national cinema (Pathé Arena) really jumps out with 86 % of visitors.

Importance of station	Pop stage	Theater	Cinema	Attraction	Museum	Total
National	32 %	41 %	86 %	-	45 %	51 %
Regional	63 %	20 %	57 %	12 %	-	49 %
Local	-	-	87 %	-	-	87 %
Total	47 %	38 %	81 %	12 %	45 %	52 %

Table 13: The percentage of visitors coming by train that would not visit the leisure facility anymore, or visit it less often if the corresponding station was not situated next to it.

Adding distance and travel time to the dataset

In addition to the answers of the questionnaire, for each respondent a public transport travel time, car travel time and distance to the leisure facility was obtained by making use of a script (detailed description in Appendix F). These were based on the zip code of the respondents. Adding travel time for public transport and car and distances into the dataset was only possible for 630 entries. The rest named an invalid zip code, no zip code at all or produced other errors. Invalid zip codes were inspected manually and adjusted if possible to retain as much entries as possible. Two separate datasets were created: the original dataset is used for analyses that do not have any link to travel time or distance, the dataset including distance and travel time is used for the remaining analyses.

Factors influencing mode choice of visitors

The questionnaire included questions on possible factors that could influence a choice between public transport and car. Data analysis came up with five factors that have a strong relation with mode choice: distance travelled, public transport use frequency, car ownership, reasons for choosing a transport mode and the perception of accessibility. The statistical values of the relation between each factor and mode choice are given in Table 14, a further explanation of each individual relation is described hereafter. Age, gender, level of income and other factors did not have a significant relation with mode choice and are not considered in modelling mode choice later on.

Relation transport mode and variable	N	Chi Square	p	Cramer's V
Perception PT – Perception Car	495	90.82	.00	.43
Car ownership	722	99.12	.00	.371
Public transport use	530	64.59	.00	.349
Distance (categories)	737	433.37	.00	.542
Mode choice reasons	530	64.59	.00	.349

Table 14: Statistics on variables that influence mode choice of visitors of leisure facilities.

Perception of level of accessibility

Visitors were asked for their perception on accessibility of the leisure facility by public transport and car. Accessibility was not defined in the questionnaire, so the results are only based on what the visitors perceive as accessible. The perception of accessibility by public transport and the perception of accessibility by car of each respondent were subtracted (scale 1 to 5), resulting in a perception of accessibility for the location (range -4 to +4). A positive number indicates a location which is perceived to be better accessible by public transport. Figure 11 shows that people with a low perception of car accessibility and a high perception of public transport accessibility will choose public transport more often.
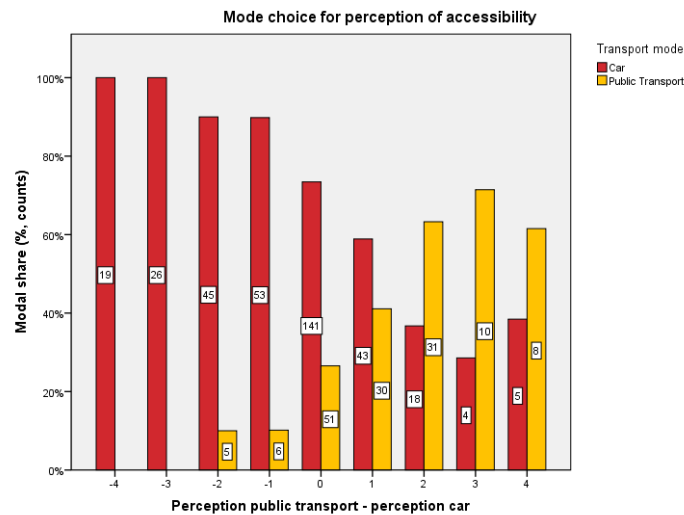

Figure 10: Visitor mode choice for different perceptions of accessibility

Car ownership

Car ownership is the second factor of influence of mode choice. Visitors who do not own a car come significantly more often by public transport. This is a logical consequence. There were also people who did not have a car, but still came by one. These are the people travelling in a group or travelling as a passenger.
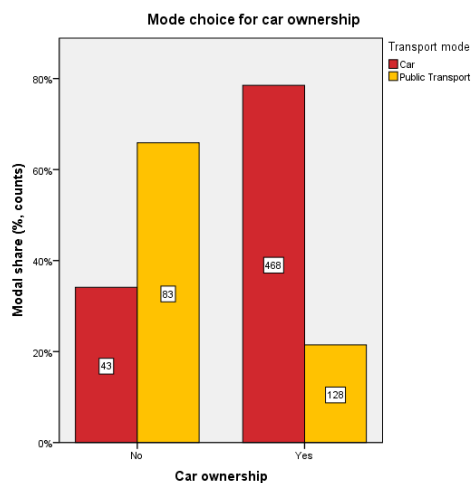

Figure 11: Mode choice for car ownership

Public transport use frequency

The third factor of influence on mode choice is the frequency of public transport use of visitors. Visitors who use public transport more often during a year, are more likely to take the public transport for their visit to a leisure facility. This also is a logical relationship.
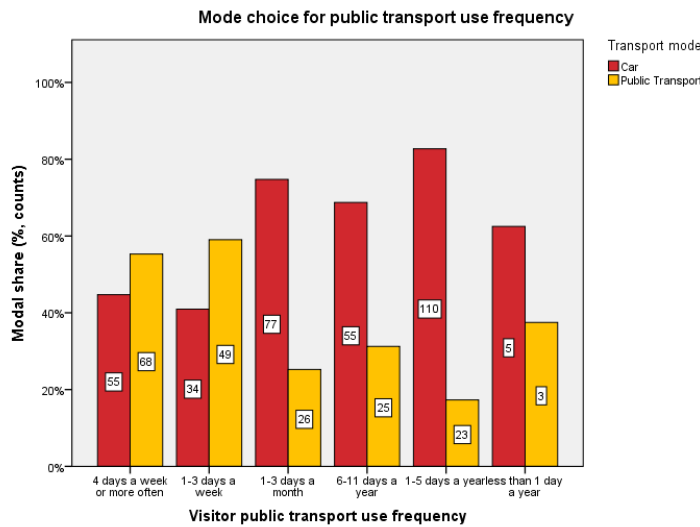
Figure 12: Mode choice for public transport use frequency

Distance

To enable an illustration of the relation between distance and mode choice, distances were combined into bins. The bins were chosen on basis of the number of respondents in them. Each bin contains around one hundred data points. Figure 14 shows that the walking / cycling mode is only used for short distances, while car and train modes dominate the longer distance categories.

Figure 13: Mode choice for distance categories

Reason for choosing a mode

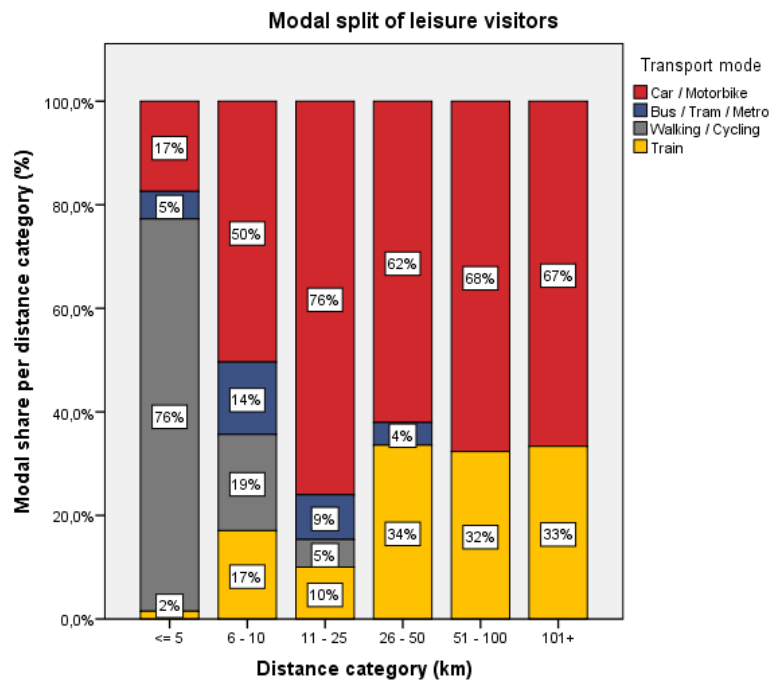Nineteen percent of public transport users have no alternative available and often consider public transport a cheap option. A part of this result can be assigned to students who travel with their free public transport card**.** However, students were not the only ones who chose 'cheap' or 'no alternative', visitors of other ages and educations did as well. The ability to use alcohol at the leisure facility was mainly chosen as a reason to take public transport. Visitors who came by car mostly did because it is fast and reliable or comfortable and easy. A small part of visitors was picked up, creating a chain trip for the driver of the car.
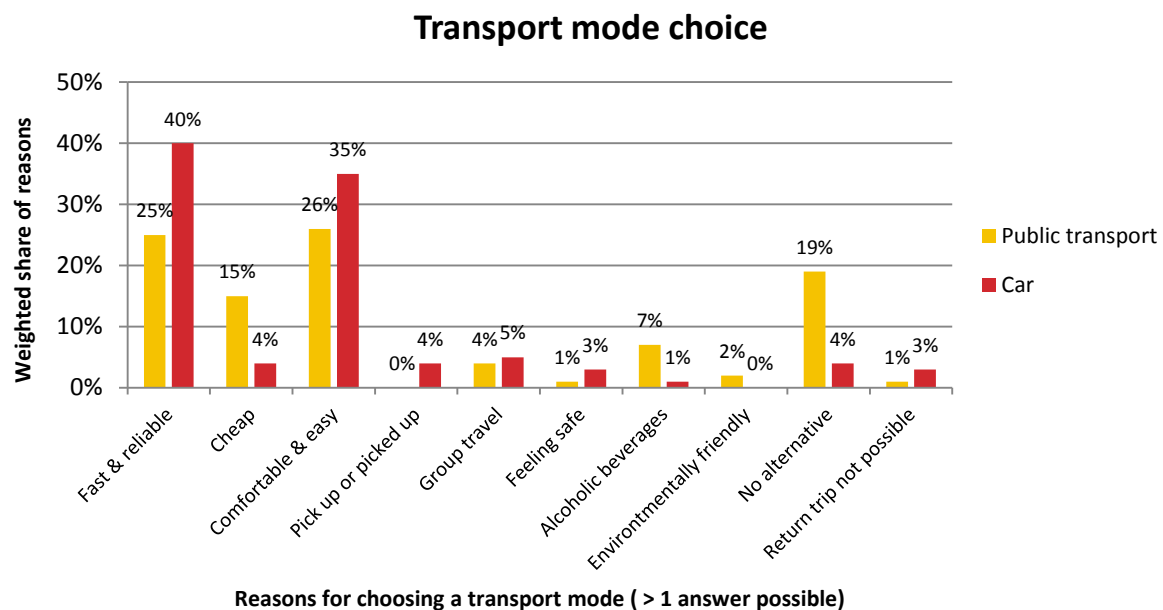
Transport mode choice

Figure 14: Reasons for choosing public transport or car as a transport mode to a leisure facility

A separate question within the questionnaire was aimed at chain trips. It showed that visitors did not have a preference for public transport or car, whether they came from home, work, school or picked up a friend along the way.

The explanatory value of the mode choice reasons might be enlarged by combining several reasons into one. A factor analysis is used to see whether it is possible to combine some of the reasons stated in Figure 15. This is done in the next section.

Factor analysis reasons for choosing a transport mode

Most of the reasons for choosing a transport mode had a small number of respondent. For example: only 17 respondents considered the environment in their choice for a transport mode (Figure 15). In order to increase the explanatory value of the reasons, the amount of cases per reason should be higher. An attempt was therefore made to group some of these reasons by making use of a factor analysis. A factor analysis tries to assign variables to components. In this case, there are ten variables (reasons). The method searches for the least amount of components that explains the largest amount of variance.

The factor analysis showed a near impossible combination of answers. At least five components should be made, which would at their best explain 60% of variance on transport mode choice. In addition to these five components, it has to be known in which component the reasons can

be placed. For each reason, two or more options were valid (> 0.2 of variance explained). (Table 15) The analysis shows that the reasons used in the questionnaire are not explaining the variance in transport mode well and are impossible to categorize. Small fractions (< 0.2) are suppressed for clearness / visibility. As no grouping was possible, individual reasons that had a significant relationship with mode choice were selected. These were: pick up & picked up, alcohol use and no alternative. The outcome of this factor analysis is quite logical, as the questionnaire was designed with mutually exclusive reasons in mind.

Component matrix	Component				
	1	2	3	4	5
Fast & reliable	-,539	,355		-,409	
Cheap	,380	,633			
Comfortable & easy	-,516			,558	
Pick up & picked up		-,334	,574	,218	-,449
Group		,210	,673	-,291	,311
Feeling safe	-,349	,473			,366
Alcohol	,405	,508			-,296
Environment	,370	,366	-,313	,210	
No alternative	,574				,642
No return			,335	,613	

Table 15: Factor analysis performed on the question on reasons for choosing a transport mode. Small fractions (< 0.2) are suppressed for visibility

Travel time ratio

Public transport- and car travel times showed no significant relationship with mode choice. That travel times on their own have no relation is expected: if a car travel time becomes longer, the travel time by public transport will be longer in most cases as well. However, the travel times might still explain variance in mode choice if they are combined into a ratio: the vf factor (Heuvel & Goeverden, 1993). The vf factor of each visitor was calculated by dividing public transport travel time and car travel time. The distribution of this ratio is visible in Figure 15. For smaller distances, the vf factor differs greatly. When the distance traveled becomes larger, the ratio between the travel times becomes smaller. The average vf factor for a visitor coming by public transport to a leisure facility is 1.65 and for a visitor coming by car 1.83. Although these differences are small, visitors make a rational choice regarding the speed of their transport mode. This can also be seen from the figure: the majority of public transport users are below the fitted line. The fitted line is quadratic, and indicates a slowly declining vf factor when distance increases.
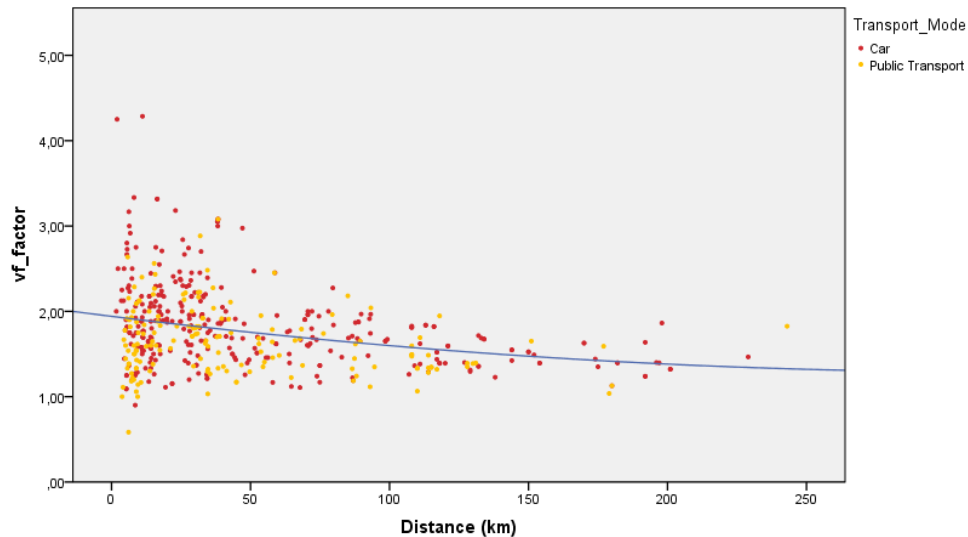
Figure 15: VF factor plotted with car and public transport modes indicated, n = 630

A clear method of illustrating the relation of the vf factor to mode choice over distance is binning it into three categories. It illustrates that vf factor does explain variance in modal choice, contrary to public transport travel time or car travel time on their own. (Figure 16) The vf factor is statistically significant with mode choice when it is binned this way. (N = 630, c_2 = 75.00, p = .00 and V = .244). Dividing the vf factor in four or five number of bins yielded statistical significance as well. Three bins were chosen as it makes model estimation easier later on.

Figure 16: Binned VF factor

Eliminating variables

The variables from the questionnaire directly influencing transport mode choice were (see Table 14 and subsequent figures):

- Perception public transport – perception car
- Car ownership
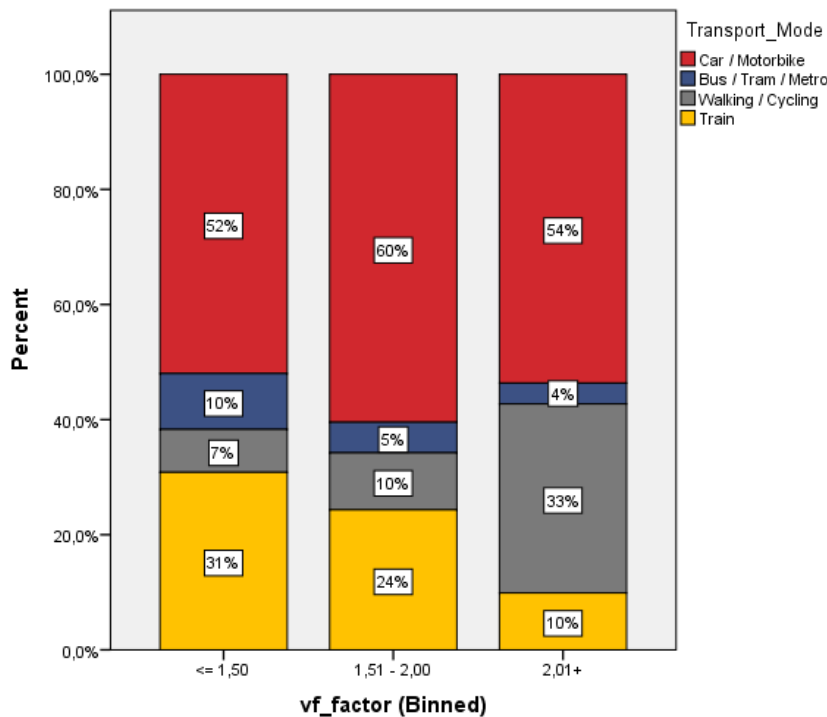- Public transport use
- Distance (categories)
- Mode choice reasons

On mode choice reasons, a factor analysis was then performed to see whether some of the reasons could be combined. No possibilities for combination were found (see 6.3, *Factor analysis reasons for choosing a transport mode*). The reasons which had the highest correlation with mode choice in a single regression analysis and a sufficient sample size were therefore chosen, instead of clusters of reasons. It is noteworthy that fast & reliable and comfortable & easy did not have a high correlation with mode choice. The following reasons did:

- No alternative to the chosen transport mode;
- The ability to consume alcoholic beverages at the leisure facility;
- The visitor was picked up or had to pick up someone else.

At last, as travel time was not directly related to mode choice, the travel time ratio between public transport and car, called the vf factor, was calculated for every respondent. The vf factor had a significant relationship with mode choice and is the last variable of influence on mode choice.

In order to make an estimation of the number of train travelers to leisure facilities as straightforward as possible, variables that explain a similar part of mode choice variance should be combined. If for example car ownership and being picked up are positively correlated, one of these two can be eliminated. Illogical combinations, like alcohol use with car ownership, were not considered. The following two combinations had similarities:

Variable 1	Meas. Level	Variable 2	Meas. Level	Statistical test
PT frequency	Ordinal	Reason: alcohol use	Dichotome	Chi-Square
Distance (categories)	Ordinal	VF factor	Ratio	ANOVA

Table 16: Variables with mutual relations, i.e. same part of mode choice variance explained.

Only two of the examined combinations have a relation with each other. The other variables can be used on their own in a model. The final list of variables that influence mode choice is:

- Perception public transport – perception car;
- Car ownership;
- Public transport use OR the ability to consume alcoholic beverages at the leisure facility;
- Distance (categories) OR VF factor;
- No alternative to the chosen transport mode;
- The visitor was picked up or had to pick up someone else.

Model estimation

The estimation of a model for mode choice of visitors of leisure facilities can be achieved in multiple ways, they were discussed during the methodology. A model based on travel time or distance would be ideal, as leisure facilities usually have an idea where their visitors are coming from. In addition to travel time and distance, personal characteristics of the visitors and location specific characteristics for the leisure facility can be added to increase the explaining power of the model.

Both travel time and distance are valid options to base the model on. The figures below show why: train use increases for longer distances and train use is higher for a lower vf factor (ratio between public transport travel time and car travel time).
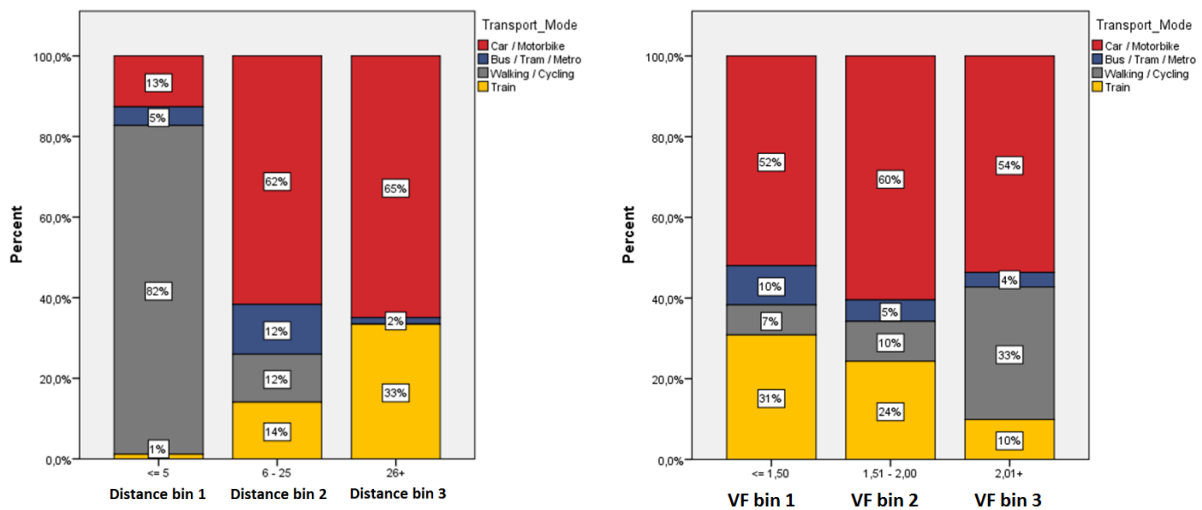
Figure 17: Mode choice for distance bins on the left and for VF bins on the right

The preceding section on eliminating variables showed that VF factor and distance are related. This can be an advantage, as the model can also be based on both. If the VF factor and distance are combined into one variable, it might be a solid variable to base the model on. The new variable was created by subtracting the bins of distance and vf factor, leaving a range between -2 and +2. Every respondent will be assigned the corresponding chance on train travel from the distance and vf factor combination (dist_vf). For example, a visitor who came from 175 kilometers away was placed in distance bin 3. The ratio between his public transport travel time and car travel time was 1.4, placing him in the first vf factor bin. This respondent has a dist_vf value of Distance bin 3 – VF bin 1 = dist_vf bin 2. The corresponding percentages are shown in Figure 18 (next page). A respondent with a dist_vf value of 2 has a chance to come by train of 42%. The combined variable of distance and travel time ratio is known for 630 respondents of the questionnaire and has an almost linear relation with train travel (Figure 18).
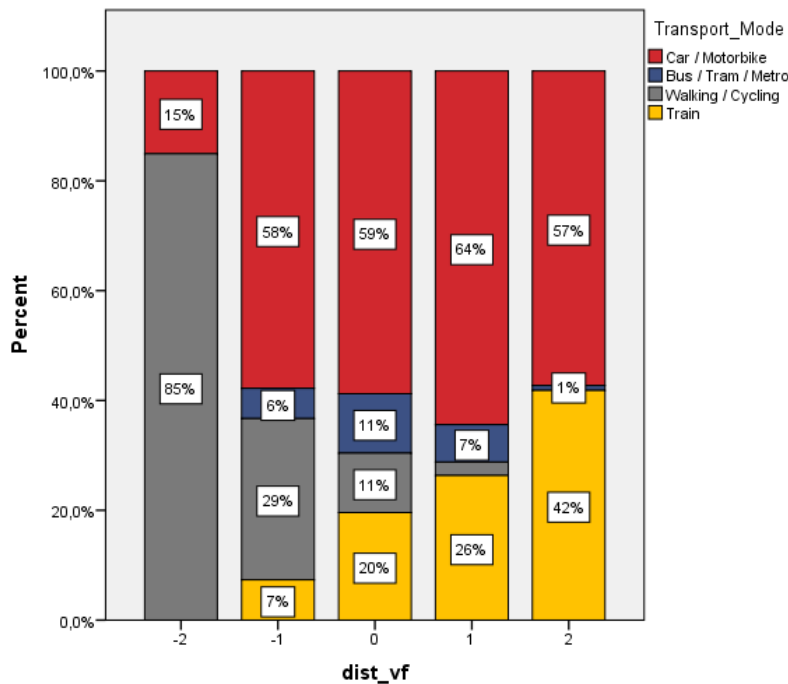
Figure 18: Combined binned distance and vf factor

To make sure the dist_vf bins can be used for the model, the following conditions apply:

- The visitor chooses a leisure facility near a station of type 1, 2 or 3 (see Table 1);
- The leisure facility is located at walking distance ≤ 1 km of the destination station;

If these conditions are met, the model could be used by NS to estimate for example which leisure facility in a station area has the highest chance to attract visitors by train. Table 17 shows the observed (questionnaire) and expected (by estimation via dist_vf) percentages of train travelers. Noticeable differences between observed and expected share of train travelers are found in the regional pop stage and theater. The pop stage attracted more train travelers than it should, based on distance and travel time while the theater had no visitors coming by train at all. According to the model, 12% of their visitors should have come by train.

The highest share of train travelers are expected at the national pop stage and theater. This is a logical consequence of choosing dist_vf as the basis for the model. National facilities attract people from far away, often from distance bin 3. This puts most visitors in the '1'or '2' dist_vf bin with high corresponding train traveler percentages.

Percentage	Pop stage		Theater		Cinema		Attraction		Museum		
	Obs.	Exp.	Obs.	Exp.	Obs.	Exp.	Obs.	Exp.	Obs.	Exp.	
National	25 %	30 %	38 %	31 %	19 %	25 %	-	-	15 %	14 %	
Regional	27 %	15 %	0 %	12 %	10 %	16 %	27 %	16 %		-	
Local	-	-	-	-	12 %	11 %	-	-		-	
Total	26 %	24 %	21%	22 %	15%	19 %	27 %	16 %	15 %	14 %	23 %

Table 17: Expected train share according to model based on distance_vf factor and observed values from the questionnaires. Totals are given for each leisure facility, both expected and observed.

The expected figures on train traveler share are higher than might be expected from literature, considering leisure facilities usually only attract 3% by public transport. (Harms, 2008) This due to the kind of researched leisure facilities, but might also be explained by other factors.

According to research by Bureau Driessen (1998) the preference of a traveler for a certain modality is coupled to its position in society. The position in society is determined by the cultural and economic lifestyle of a person. The cultural lifestyle is dependent on education levels and interest in forms of art. The economic lifestyle is linked with the amount of money a person has. People with a higher than average cultural lifestyle, are more likely to visit a cultural leisure facility and tend to use the train more often. (Driessen). As most examined leisure facilities were cultural facilities (except for the attraction, the Grolsch Veste), it might explain the high shares for some part.

Within categories, the difference between expected and observed values might be due to reasons like using alcoholic beverages, car ownership or other factors related to mode choice. Each factor which may indicate mode choice was tested. Take alcohol use for example.

Alcohol use	Expected	Observed
Yes	22.3 %	34.2 %
No	17.7 %	16.9 %

Table 18: Expected and observed train shares for mode choice reason: alcohol use

The observed train share of visitors who gave as reason for their choice that they wanted to drink alcoholic beverages that night, was 34.2 %. The expected value was only 22.3 %. It means that alcohol use explains a different part of the variance than the combination of distance and vf factor. However, as sample sizes of people ticking alcohol use as a reason were quite low, comparisons between types of leisure facilities could not be made. The same applies to other mode choice predicting variables like: no alternative to the chosen transport or being picked up. A variable that did have a large sample size was car ownership. It also differed per leisure facility (Table 19), which makes it a viable candidate to explain some of the variance left between leisure facility types.

Car ownership	Train share		Car ownership		
	Expected	Observed	Pop stage	Theater	Cinema
Yes	22.5 %	15.8 %	83 %	89 %	72 %
No	19.8 %	28.6 %	17 %	11 %	28 %

Table 19: Expected and observed train shares for mode choice reason: car ownership. Observed car ownership levels for leisure facilities

The model estimated a share of 19% train travelers to cinemas, while in reality is was only 15%. The difference between expected and observed at pop stages (+2%) and theaters (-1%) were smaller. By incorporating car ownership into the model, these differences could be eliminated partially:

- Car ownership is low for visitors of cinemas and higher for pop stages and theaters;
- The observed train share for respondents without a car is far higher than for respondents with a car;
- Combining these will lead to a higher expected train share for cinemas, while pop stages and theaters may see a small reduction in expected share.

However, including these variables into the model will probably not lead to a reliable predictive model, as the questionnaire was designed with revealed preference in mind. Revealed preference means that something is observed, which has already taken place. Apart from one question, the respondents were asked for personal characteristics or characteristics of their trip. The results reveal for example a modal split, or a difference in mode choice for catchment areas. What it does not tell the researcher, is whether they would come by train in the future.

For estimating a predictive model, the design of a questionnaire should be fundamentally different, and include stated preference observations. Stated preference asks respondents what they would do, if something happens. For example: would you choose the train, if the nearby station was more than one kilometer away or other hypothetical questions. Combined, they can generate scenarios or a model for mode choice.

7   Discussion

7.1   Conclusion

Academic experts and leisure representatives agree that the presence of a railway station plays a large role in the location choice process of leisure facilities, it is however not a decisive role. The results of the visitor questionnaire show that leisure facilities in station surroundings attract more train travelers than they expected: 23% of the visitors of researched leisure facilities choose the train. These train travelers also value the presence of the station: 52% of them would not have come if the station would not have been there.

NS assumed an increase in planning and building of leisure facilities in the presence of stations, this is not confirmed by the data analysis. The share of train travelers with a leisure motive has grown slightly, but it has no direct relation with the assumed trend. CBS Statline data on proximity of leisure facilities showed that there were not significantly more leisure facilities built in station areas then elsewhere. Although the trend is not confirmed by the databases, the academic experts and leisure representatives state that the presence of a railway station is becoming more important. A plausible cause could be demographic changes: people in their twenties do not value the possession of a car as high as previous generations and is fine with other alternatives of transport. (KiM, 2012). People also tend to stay a longer period of their life in cities or even return there (re-urbanization). This also causes lower car possession rates. Car possession for households in cities is around 75%, while in rural areas it is almost 90% (SCP, 2006).

Cultural leisure facilities have the highest share of train travelers, which is in line with previous research done by Bureau Driessen (1993). According to them, the preference of a traveler for a certain modality is coupled to its position in society. The position in society is determined by the cultural and economic lifestyle of a person. The cultural lifestyle is dependent on education levels and interest in forms of art. The economic lifestyle is linked with the income of a person. People with a higher than average cultural lifestyle are more likely to visit a cultural facility and tend to use the train more often.

Leisure facilities with a national catchment area, which means it attracts visitors from far away, have a larger share of train travelers. This is partly due to the travel time ratio between public transport and car (vf factor). It becomes smaller when people come from further away, which means public transport becomes more competitive when the visitor has to travel further. The share of train travel for distances above 25 kilometers is around a third. These two findings are in line with previous research by Limtanakool & Dijst (2006) and Harms (2008), which states that train travel is most important on medium to long distance travel.

Leisure facilities in metropolitan areas like the Randstad attract more visitors by public transport than areas outside the Randstad. This is largely due to the dense coverage of the public transport network.

The findings of this research are of importance to NS. By encouraging new leisure facilities near stations and cooperating with leisure facilities in existing stations areas, NS could further contribute to national sustainability objectives. The direct vicinity of a station will become safer, as more people are on the street during the evening. Leisure facilities and station areas complement each other quite nicely and a station location should therefore have a high priority for owners of leisure facilities when searching a new location.

The three main subjects of this thesis will be discussed separately into more detail, starting with interdependency between leisure facilities and station areas, then the location choice process of leisure facilities and finally the number of visitors that come by train.

7.2 Interdependency between leisure facilities and station areas

This study has not found a relation between location choice of leisure facilities and station areas. Two databases have been consulted: trip data from NS and leisure facility proximity data from CBS Statline. The analysis yielded the following conclusions:

- The number of trips with a leisure motive (for a detailed explanation of the motives, see Figure 6) has increased on a national level both in relative and absolute share.
- Some stations have seen an increase in social recreational motive (different from leisure motive, see Figure 6) and some have seen a decrease. Overall, the number of social recreational trips has decreased slightly.
- Leisure travel differs per station type, but there were no outliers in growth or decline. (Figure 8)
- Leisure facilities are on average closer to inhabitants of the Netherlands in 2012 than they were in 2006. (Table 9)
- Leisure facilities have not been built more in station areas than elsewhere. (Table 9)

The increase of leisure travel on a national level contradicts with a decrease at station level. This is due to the motive that was used. (Figure 6) Although on a national level, there was only a slight increase in leisure travel, specific stations have seen a large increase in social recreational travelers. Examples of these are: Venlo and Amsterdam Bijlmer Arena. The latter was used as a location for the visitor questionnaires.

In actual number of leisure facilities there were differences in growth of certain types. Performing arts venues and cinemas have seen a decent growth over the last years, while the number of libraries has suffered, probably due to the rise of e-books or cut backs from the government. Pop stages and cinemas were more often built in station areas when compared to other types of leisure facilities.

The academic experts and leisure representatives were also asked for their opinion on these findings. They too suggest that leisure facilities, in particular larger ones, did not appear more often in the presence of a station.

Interpretation

The slight increase of leisure travel on a national level is according to expectations, as NS assumes a trend. However, the growth is so small that no definitive conclusions can be made and moreover: an increase in leisure travel does not directly point to an increase in leisure facilities.

The decrease of social recreational travel and a station specific level is against expectation. In the introduction an increase in leisure activities was described, which should lead to an increase in travel as well. This result can be explained by the constructed nature of the social recreational motive. While the before mentioned leisure motive only consists of holiday & daytrip and shopping motives, the social recreational motive is a large container of social recreational motives. Next to holiday & daytrip and shopping, also visits to friends & relatives and sport & hobby are part of it (see Figure 6).

It implies that a decrease in social recreational motive will not necessarily mean a decrease in leisure trips. The national trend in leisure motive is therefore more important than the station specific social recreational trend.

With these constraints in mind, looking at station types individually, no real differences in the number of trips with a social recreational motive were found. Type 3 has a very low share of social recreational trips. This finding can be explained by the function of these types of stations. These stations are often situated near large office buildings and/or schools. They also serve as a key hub for suburban traffic that makes the switch to metro, tram or bus.

The total number of leisure facilities has more or less stayed the same. Although the actual number of leisure facilities was comparable to a decade ago, almost all of them (expect for libraries[19]) were situated closer to Dutch citizens in 2012 than in 2006. This finding can be explained by one or more of the following observations. First, there were more leisure facilities built in The Netherlands than were included in the analysis. Secondly, population growth has taken place at central locations. Thirdly, areas used to measure distance have decreased in size[20], or finally, people have been moving to more central locations over the examined period (re-urbanization).

Interviews with academic experts suggested that re-urbanization would be the most likely cause for this trend. Demographical trends of the last ten years point in that direction: students stay longer in towns, young parents give up a life in the suburbs for an urban lifestyle in the town center and the population of peripheral areas in the Netherlands has been declining for quite some time (SCP, 2008).

7.3   Location choice process

In the introduction, an overview of micro-, meso- and macro factors was given which influence location choice of companies (Figure 4). Academic experts and leisure representatives have been asked for their opinion on location choice of leisure facilities and whether location choice for companies was applicable.

The main difference between general companies and leisure facilities is the target group they attract. Companies attract consumers, while leisure facilities attract visitors. Visitors buy an experience, e.g. a movie, entrance to an attraction park or wellness treatment while consumers buy products, e.g. household utilities, food or furniture. This difference in target group reflects on location choice, which cannot be compared directly.

The experts stated three main reasons for a leisure facility to settle somewhere: general accessibility, appearance and price (location, ground price, area). Other factors of influence were centrality, capacity, enough visitors from close by, municipal policies, history, nearby competition and even personal preference of the owner. A location near a station plays a role, but is not considered decisive. Additional data was gathered on the 50 largest leisure facilities and their location. The table in 17 shows that only 8 out of the current top 50 leisure facilities in The Netherlands are within a station area. Experts suggested that a possible cause for this is simply a lack of space.

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[19] Libraries for example suffer from a decrease in readers, upcoming e-readers and municipal budget cuts while cinemas have seen a steady growth over the years due to increasing visitor numbers. (source: NVF).

[20] Figures obtained from CBS Statline are not always comparable over several years as municipality and area borders can change over time, changing the distance an inhabitant of an affected municipality lives from a leisure facility.

According to the experts and leisure representatives interviewed for this thesis, location choice motives for leisure facilities differ greatly per leisure type and also per location. However, all leisure representatives stated that accessibility has a great role in their decision making.

Leisure representatives were more optimistic than academic experts about the role a station plays in their location choice. The importance however differs strongly per leisure type and location. A theater with national coverage is more likely to take a nearby station in account than a local cinema or pop stage, which is more interested in the number of visitors they can attract from nearby.

Interpretation

The factors named by experts and representatives can be categorized by the micro-, meso- and macro factors. The most important are meso factors: the physical location, local market sector and accessibility in general were named as the most important factors. Leisure facilities thus tend to be most dependent on them. The micro and macro factors will also influence location choice, but to a lesser extent.

The finding that accessibility is an important factor in decision-making of facilities is in line with previous research of decision motives for companies (Willigers, 2006). This suggests that at least for accessibility, decision-making of leisure facilities might be similar to decision-making of companies in general. The influence of a railway station alone is not that great. Most leisure facilities search for an optimum in accessibility and, in most cases, a nearby station remains less important than accessibility by car.

7.4 Visitor questionnaire

Because leisure facilities in station areas were studied, a seemingly high percentage of 23% of visitors arrived by train. This is high compared to 3% of visitors that arrive by train at leisure facilities in general. (see Theoretical Background, Harms 2008). Leisure facilities with a national catchment area attract more train travelers than regional or local facilities: 30 percent on average.

The results from interviews with leisure representatives and questionnaires indicate that various factors influence the choice of visitors between public transport and car. These include distance and travel time[21] but also alcohol use, group composition and car ownership. Leisure representatives suggest that visitors of leisure facilities prefer the car as modality above the train when the leisure event starts later in the evening or when chain trips, especially related to work, are needed. The preference for car while making chain trips was not confirmed by the questionnaire.

Other findings from the questionnaire suggest that visitors of leisure facilities will choose public transport more often in the following situations:

- Car accessibility of the leisure facility is perceived to be low and public transport accessibility to be high;
- Public transport is used more frequently by the visitor;
- The visitor wants to consume alcoholic beverages during the event;
- There is a long distance between the leisure facility and the origin of the visitor.

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[21] Travel time only significantly influenced mode choice when it was combined for the car and public transport mode into a ratio, the so called 'vf factor'.

The last reason is another confirmation that different catchment areas of leisure facilities (national, regional and local) have an influence on mode choice. Regarding leisure types, no significant relation between mode choice and the type of leisure facility was found. If more car minded leisure facilities, like a theme park or a large shopping center would have been part of the questionnaire sample, differences might have occurred.

Another finding was that public transport travel time alone was also not an indicator for mode choice. When combined with car travel time into the vf factor (Heuvel, 1996), it was. Respondents with a low vf factor, which means a small difference between public transport travel time and car travel time, chose public transport more often.

Leisure facilities with a national catchment area had the largest share of visitors who travelled by train. The leisure facility which obtained the largest share of train travelers (37 %) was the Beatrix theater. The results also show that national leisure facilities are largely dependent on their station: up 86% of the visitors indicated they would no longer, or less often, travel by train to these facilities if it was not located next to a station. National leisure facilities are clearly more dependent on their station than leisure facilities with a regional or local catchment area. In total, 52 % of train travelers picked an option that marked the station as important in their choice.

If all modal choices were considered, pop stages and theaters were the most attractive leisure facility types for visitors by train. The Grolsch Veste, museums and cinemas attracted a smaller number of visitors by train. Local and regional cinemas had the smallest number of train visitors, together with local theaters.

Factors explaining mode choice
In this study various explanatory factors were discovered which can be used as variables in a predictive model for mode choice of visitors of leisure facilities. For all of the following variables a significant relationship was found with modal choice:

- Perception public transport accessibility –(minus) perception car accessibility
- Car ownership;
- Public transport use;
- Distance to the leisure facility;
- Several mode choice reasons (being picked up, no alternative available, alcoholic beverages);
- VF factor.

Other variables included in the questionnaire were also tested on their relationship with mode choice. Examples are: age, income or the frequency of visit to the leisure facility. These variables and some others did not influence mode choice and were not considered in the model estimation.

Model estimation
Different options were available to estimate a predictive model for the share of train travelers to a leisure facility. Logit models were too extensive to be used properly, due to their reliance on utility. Utility consists of all kinds of costs for the leisure trip, where only travel time and distance were known. A more elementary model was proposed, based on a combination of vf factor and distance. This choice was made, as those were the only trip characteristics available, and they seemed to explain mode choice quite well. Other factors that explain mode choice were then tested to see whether they could explain some of the variance that was left. Alcohol use as a reason for choosing the mode was a

good candidate, but sample sizes were too low. The same applied to other factors like 'no alternative available' or 'picked up'. Car ownership was a good candidate: it differed per leisure type and had sufficient sample size. Incorporating it into the model would lead to a larger part of the train share variance explained.

Interpretation

Across different types of leisure, modal choices of visitors were quite consistent. This is a valuable result, as it indicates that the type of leisure does not influence mode choice. Other characteristics are more important. Apparently, the catchment area of a leisure facility has a far higher influence on mode choice than the type of leisure has. On the other hand, one leisure representative suggested that the type of <u>event</u> (within the leisure facility) attracts different visitors with corresponding different mode choices. This is true for different movies, shows or concerts: they all attract various kinds of people with corresponding characteristics. However, the scale of catchment area remains a better indicator for mode choice than the type of leisure.

National leisure facilities are clearly more dependent on their station than leisure facilities with a regional or local catchment area. This is consistent with literature on mode choice for leisure travel, that suggests and increasing amount of train travelers on longer distances.

Leisure facilities in station areas had an average of 23 % of visitors who came by train, which is quite high. Especially taking into account that the competitiveness of train travel on short distances is generally very poor. The figure is even higher than the 20 % share of train travelers for medium- and long distances found by Limtanakool & Dijst (Limtanakool & Dijst, 2006). It is most likely a result of the selection of leisure facilities. All of them were near a well serviced train station, so the very top of leisure facilities in terms of train travelers was examined. If a random selection of leisure facilities would have been chosen, train share would have been far lower.

Differences in mode choice per leisure type are harder to identify. One might say that cinemas are less attractive for train travelers than for example a pop stage, but this can easily be caused by the characteristics of questioned visitors. The cinema attracted a younger audience than the pop stages. A young audience is in general more dependent on public transport.

The vf factor is an important variable in this thesis, as it combines both travel time from car and public transport. Together with distance, it forms the ideal basis for a predictive model on mode choice. Other non-trip related variables can then be used to make a model explaining the remaining variance. However, as the questionnaire was designed as revealed preference, a solid predictive model was not likely. To make a true predictive model of mode choice of leisure facilities possible, a future questionnaire should be designed with stated preference in mind.

7.5   Limitations of the methods used

Database analysis

The datasets used did not cover a large time span, only part of the last decade. NS trip data ranges from 2004 to 2011, CBS data from 2006 to 2012. A longer time stretch would have been necessary to make a better statement on trends in locations of leisure facilities. Also within NS trip data a specific leisure motive was not available, so it had to be created. This led to incomparable leisure motives for the national and station specific analysis. Furthermore, an increase in leisure trips is not a direct indicator for an increase of leisure facilities in station areas. It merely suggests that something might be changing.

In comparison with CBS Statline proximity data, LISA (a database on employment in the Netherlands) would have been a better tool to assess leisure facility locations, but it was not available at the required detail level. The proximity data was also not available for a large time span and several years were missing from the dataset.

To be able to compare leisure facilities in station areas to other areas, multiple assumptions had to be made resulting in an estimate of 25% of leisure facilities that should be built in station areas. (see Leisure Perspective, footnote 16). This assumption is far from exact and has as a consequence that a comparison between station areas and elsewhere is indicative at best.

Interviews

Ten people have been interviewed: three leisure representatives and seven academic experts. Interviews were chosen as they provided a valuable qualitative view on the subject and helped designing the visitor questionnaire. However, the variety in factors that influence location choice was too large to make a solid generalization. A larger sample size of leisure representatives in particular would have been preferred to make a categorization of factors influencing location choice of leisure facilities. However, getting leisure representatives to cooperate has proven to be very difficult and future studies should be aware of this.

Visitor questionnaire

Recoding the data from all questionnaires was difficult due to different formats. The students groups which were deployed in Twente for administering the questionnaire all made their own database, prone to manual errors. It was very time consuming to combine them all in one SPSS format, which was again a possible cause for human errors. The questionnaire itself also had its limitations:

- The three catchment areas were not included for all leisure facilities, which means that comparisons could not be made at all levels;
- During the design of the questionnaire, the answers to 'reason for choosing a modality' were formulated with mutual independency in mind, forcing people to pick different options for different modes. The results showed some differences in reasons, but the majority just chose fast & reliable or comfortable & easy. The mutual independency also made a successful factor analysis unlikely;
- Questionnaires were often administered at one time slot only. Most leisure facilities have a changing program or other shows every night, which makes generalizations difficult;
- Other types of leisure facilities could be included, like wellness centers, swimming pools, large retail facilities and libraries.

7.6 Recommendations

The high share of train travelers that the examined leisure facilities attract creates several opportunities for NS. Leisure facilities attract the bulk of their visitors during off-peak for NS: evenings and weekends. During the off-peak period, NS still has capacity left in its trains. Extra travelers mean in this case extra revenue without any extra costs, as trains are already running. NS could attract more train travelers by making arrangements with leisure facilities about when the last train leaves the station in any direction.

NS could also consider expanding its ticket options for leisure travelers. One thing that was often mentioned during the questionnaires was the costs for traveling with a group by train. A car is always (considered to be) cheaper when traveling in a group of 3 to 5 persons. NS very recently (re)introduced its group ticket, which would appeal to those groups. Another option would be an evening ticket, which enables visitors to have a round trip to a leisure facility for less. Further expansion of the 'Spoordeelwinkel' (NS ticket store specifically for leisure trips) is also a possibility.

By making use of the model for train travelers to leisure facilities, NS will be able to determine with a little more information whether a new station on a specific location will be profitable. NS also gains a better position in discussion with project developers and municipalities on which kinds of developments are preferable in a station area.

The dataset of the questionnaires can probably be used for additional research. A heavy focus was on transport mode choice in the analyses, while other factors of interest could also be looked into. One example could be the demographics of visitors of leisure facilities: which leisure type attracts higher educated or older people and which reasons do they have for visiting the leisure facility in question?

All leisure facilities that were included in this research were near a station. The named percentages are therefore a best case scenario and are definitely not representative for an average leisure facility. Further research could examine average leisure facilities and findings can be compared against leisure facilities in station areas.

The actual contribution of leisure facilities to the train travel demand remains uncertain, but some insight was gained during this research. Future research could look into travel patterns on a smaller scale to be able to differentiate between peak- and off peak leisure trips. Another option would be to include facilities of a type and catchment area that were not present in this research, for example an attraction with a national catchment area.

One of the questions NS asked at the beginning of this project was which leisure facility would be the absolute best to have near a station. Although a definitive answer cannot be given to that question, the following characteristics make a successful cooperation between a station and a leisure facility possible: a type 1 or frequently serviced type 2 or 3 station location, a leisure facility with at least a national catchment area, a leisure facility which attracts visitors during off-peak hours for NS and a leisure facility which attracts visitors that are more likely to choose the train. A national catchment area ensures that people come from afar, and are therefore more likely to choose the train. Almost all leisure facilities attract people during off-peak hours, but cultural facilities typically attract more public transport minded people, which makes them the most suited to be situated in a station area.

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9 Appendix A: Academic experts and leisure representatives

Nienke van Boom (ref: 'NB') is a researcher and PhD student at Tilburg University. Her subject of interest is the relation between leisure and urban development, with her research focused at the role of leisure activities in relation to residential choices of recently graduated students.

Dick Ettema (ref: 'DE') is associate professor at the Faculty of Geosciences of Utrecht University. His research interests include agent-based modeling of firm and household related processes. Other interests include the analysis of activity and time use patterns and the implications of travel and activity behavior for individuals' well-being.

David Evers (ref: 'DV') works for the Netherlands Environmental Assessment Agency (PBL) as a senior researcher and for the University of Amsterdam as assistant professor. He did his PhD research on the politics of shopping mall development in North West Europe, which makes him a retail expert.

Lucas Harms (ref: 'LH') wrote several reports that were featured in the theoretical background: 'Op weg in de vrije tijd' and 'Overwegend Onderweg'. He is a researcher in Urban Transportation Planning at the University of Amsterdam.

Peter Jorritsma (ref: 'PJ') is a senior researcher at KiM (Knowledge Institute for Mobility policy), which is part of the Dutch ministry of Infrastructure and the Environment (I&M). His areas of expertise include mobility and policymaking.

Albert Postma (ref: 'AP') is a professor at the European Tourism Futures Institute, which is part of Stenden University and is an expert on scenario planning in leisure.

Jasper Willigers (ref: 'JW') is a senior researcher at Significance, an independent research institute specialized in transport. He has written his PhD on the impact of high-speed railway accessibility on the location choices of office establishments and is one of the few who coupled company locations to the presence of a nearby railway station.

Leisure facility representatives
Martijn Visscher (ref: 'MV') is marketing director of Wolff Cinemas (3rd in their industry after Pathé and JT Bioscopen). Wolff has nine cinemas, of which Cinestar in Enschede is the largest.

Toine Tax (ref: 'TT') is director of Doornroosje, a regional pop stage in Nijmegen. Their current location is in an impracticable accommodation in a residential area. The pop stage will relocate to a location next to Nijmegen station sometime in the coming years.

Alex Keizer (ref: 'AK') is director of Stage Entertainment, which is the parent company of three national theaters in The Netherlands: Beatrix theater in Utrecht, DeLaMar theater in Amsterdam and Circustheater in Scheveningen (Den Haag).

10 Appendix B: Expert interview outline

The interviews started with a short overview of this research and the expert's part in the process was discussed. The interview then started and revolved loosely around several subjects:

- Trend in leisure facilities in general versus in station areas. How do leisure developments compare to offices and companies? Do they have any examples?;
- Insight in transport mode used to reach different (leisure) facilities;
- Relation between location choice of offices and companies versus leisure;
- Insight in location choice motives of leisure facilities and the importance of a station nearby;
- Trends in time spent on leisure activities;
- The ideal leisure attraction near a station.

In the second part of the interview, experts have also been asked for an opinion on the results from the data analysis and literature review. The subjects are shown below, including a reference to their section in the data analysis or literature review.

- No relative or real growth in social recreational motive, only in daytrip motive;
- Trends in free time (less) and money spent (more);
- People in The Netherlands are living closer to leisure facilities than a few years ago;
- Shopping in retail areas has grown less in station areas than in peripheral areas;
- Out of the 50 largest leisure attractions in The Netherlands, only 8 are relatively close to a railway station;
- Specific locations where leisure has grown are hard to find, do they exist?

For every expert a few additional subjects were discussed regarding their expertise.

11 Appendix C: Company interview outline (Dutch)

Opzet van het interview:

- Uitleg en opzet van het onderzoek;
  - Welke dingen je doet;
  - Waar je naar op zoek bent;
- Eerst samen de vragenlijst afwerken. Duidelijk uitleggen dat indien zij niet de volledige kennis hebben over de besluitvorming, dat de geïnterviewde dan zo goed mogelijk vanuit de geest van het bedrijf probeert te antwoorden;
- Vervolgens ruimte voor opmerkingen over de vragen;
- Bespreken wat voor data of andere informatie zij nog eventueel beschikbaar hebben.

Vragenlijst interview voorzieningen

Locatiekeuze

Hoe lang is dit theater al op deze plek gevestigd? (Vestigingsjaar) Bij meerdere vestigingen: overnames of nieuwbouw?

Welke factor of reden is nu het belangrijkste bij het kiezen van een locatie voor een vestiging van een theater?

Welke belangen wegen het zwaarst bij het kiezen van een locatie voor dit theater? Zet alstublieft de volgende factoren op volgorde van belangrijkheid. Mocht een factor totaal niet meewegen, geeft u dat dan alstublieft ook aan.

- Historisch zo gegroeid
- Bereikbaarheid met fiets / lopen
- Bereikbaarheid met OV (bus, tram, metro, taxi)
- Bereikbaarheid met de auto
- Bereikbaarheid met de trein
- Parkeergelegenheid
- Financiële redenen (grondprijs, huur, etc.)
- Locatie dicht bij een station (Utrecht CS)
- Locatie in de stad (veel andere voorzieningen / horeca dichtbij)
- Locatie t.o.v. de competitie / omvang verzorgingsgebied
- Eigenschappen van het gebouw (markant, imago, architectuur)
- Ruimtelijk beleid
- Toevalligheid?
- Geen alternatief
- Andere belangrijke factor, namelijk:

Wat is het verzorgingsgebied van dit theater (indien meerdere, uw gemiddelde). M.a.w. waar mikt u specifiek op qua factor? Km, min, dichtheid? Reistijd kan ook nog verschillen tussen de modaliteiten?

Heeft u lopende contracten met parkeerplaatsen of andere soorten autogebruik bevorderende maatregelen? Zo ja, welke?

Heeft u lopende contracten met OV-bedrijven (combikaartjes, spoordeelwinkel?) Zo ja , welke?

Bezoekers

Heeft u inzicht in de vervoerswijze keuze van uw bezoekers?

Welk aandeel met welk vervoermiddel komt?

En specifiek met de trein? Groeit dat aandeel?

Zijn er andere veranderingen in aandelen van modaliteit?

Heeft u inzicht in waarom uw publiek vooral voor deze vervoerswijze kiest? Is er een relatie met die eerder genoemde acties?

Waar komen uw bezoekers vandaan en op welke tijdstippen reizen ze heen en terug?

Doen mensen er nog een andere activiteit voor of na? Heeft u hier lopende acties met andere ondernemers?

Zit er verschil tussen publiek van verschillende voorstellingen en het vervoermiddel wat zij kiezen?

Weet u de verdeling van groepsgrootte voor uw bezoekers? (vaak alleen, samen, familie, grotere groep, wat is de verdeling daarin?) Dit maakt uiteraard ook uit per voorstelling, heeft u daar inzicht in?

Heeft u ooit wel eens problemen met teveel gebruik van een bepaald vervoermiddel gehad? (overvolle fietsenstalling, parkeerplaats, bezoekers die niet meer terug konden met de trein etc.)

Zijn er andere factoren die bij uw voorziening een rol spelen die invloed kunnen hebben op de vervoerswijzekeuze van bezoekers (*bijvoorbeeld alcoholgebruik of late openingstijden*)

Relatie tot de trein

Speelt de aanwezigheid van een station mee in de besluitvorming rond de locatie van een nieuw theater, in welke mate?

Indien station belangrijk: blijft dat in de toekomst gelijk of wordt dat anders?

Indien station niet belangrijk: blijft dat in de toekomst gelijk of wordt dat anders? Zijn er in de branche van bioscopen voorbeelden waarbij dit wél het geval is?

Worden bioscopen groter- of kleinschaliger? Kan de rol van de trein nog veranderen? Waar in Nederland zou dat eventueel nog kunnen?

Stel u zou nu een nieuw theater op een willekeurige plek in Nederland mogen bouwen, waar zou dat dan zijn? Waar let u dan voornamelijk op?

Welke grote voorziening heeft volgens u het hoogste aanbod van treingebruikers met een station er vlak bij (mag uw eigen type zijn, ook een ander type voorziening)?

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12 Appendix D: Local & regional questionnaire (Dutch)

Goedendag, zou u alstublieft mee willen werken aan een onderzoek door een aantal korte vragen te beantwoorden? Uw antwoorden worden gebruikt door studenten van de Universiteit Twente en voor een onderzoek voor de Nederlandse Spoorwegen.

1.	Beschikt u over een auto en/of rijbewijs?	o ja o ja, ik kan gemakkelijk een auto lenen o nee o nee, maar ik heb wel een rijbewijs
2.	Hoe vaak gebruikt u het OV?	o 4 dagen per week of vaker o 1-3 dagen per week o 1-3 dagen per maand o 6-11 dagen per jaar o 1-5 dagen per jaar o minder dan 1 dag per jaar
3.	Hoe makkelijk vindt u dat u bij de Cinestar kan komen met de auto? *Op een schaal van 1 (moeilijk) – 5 (makkelijk)*	1 / 2 / 3 / 4 / 5
4.	Hoe makkelijk vindt u dat u bij de Cinestar kan komen met het OV? *Op een schaal van 1 (moeilijk) – 5 (makkelijk)*	1 / 2 / 3 / 4 / 5
5.	Op hoeveel minuten lopen ligt de Cinestar volgens u van het dichtstbijzijnde station?	☐☐ minu(u)t(en)
6.	Bent u hier alleen, samen of in een groep gekomen?	o alleen o samen o groep (3 of meer personen)
7.	Hoe vaak bezoekt u de Cinestar?	o 4 dagen per week of vaker o 1-3 dagen per week o 1-3 dagen per maand o 6-11 dagen per jaar o 1-5 dagen per jaar o minder dan 1 dag per jaar
8.	Met welk hoofdvervoermiddel (langste afgelegde afstand) bent u gekomen?	o auto / motor o trein o bus o taxi o fiets / lopend o anders namelijk,
9.	Wat is/zijn voor u de belangrijkste reden(en) om dit vervoermiddel te kiezen? **(Meerdere antwoorden mogelijk!)**	Omdat: ☐ ik het snel en betrouwbaar vind ☐ ik het goedkoop vind ☐ ik het als comfortabel en gemakkelijk ervaar ☐ ik reis in een groep ☐ ik mij veilig voel ☐ ik de vrijheid heb om alcohol te nuttigen ☐ ik het milieuvriendelijk vind ☐ ik geen alternatief heb ☐ ik anders niet meer terug kom ☐ anders, namelijk: _____

Gaat u alstublieft verder aan de andere kant……………………

10.	Kwam u voordat u de Cinestar bezocht van huis of van elders?	o van huis o van elders
11.	*Let op: Deze vraag is alleen voor OV-gebruikers! Indien u met een ander vervoermiddel bent gekomen graag doorgaan met vraag 12.* Stel wij verplaatsen de Cinestar zodat de looptijd vanaf het station toeneemt, maak de volgende zin af:	De looptijd vanaf station Enschede Drienerlo is nu 4 minuten, als ik meer dan ☐☐ minu(u)t(en) onderweg ben naar de Cinestar vanaf het station zal ik kiezen voor een alternatief vervoermiddel of niet meer komen.
12.	Wat is de belangrijkste reden om voor de Cinestar te kiezen (1 antwoord mogelijk)?	o in de Cinestar draait een goede film o de Cinestar is kwalitatief beter dan andere bioscopen in de omgeving o het is goed bereikbaar met auto o het is goed bereikbaar met het OV o het is dichtbij o omdat ik er werk o omdat ik geen ander alternatief ken o anders, namelijk: _____
13.	Als er geen station in de buurt had gelegen, zou u dan nog steeds voor de Cinestar kiezen?	o ja o nee o minder vaak
14.	Open vraag: Naar wat voor soort voorziening zou u zeker met de trein komen als die direct naast een goed bediend station ligt?	_____ _____

Tot slot nog een aantal algemene vragen:

15.	Wat is uw geslacht?	o vrouw o man
16.	Wat is uw geboortejaar?	☐☐☐☐
17.	Wat is de postcode van uw woning?	☐☐☐☐ ☐☐
18.	Wat is uw opleidingsniveau?	o basisonderwijs o middelbare school o LBO of MBO o HBO of universiteit
19.	Heeft u verder nog opmerkingen over deze enquête?	_____ _____

Hartelijk dank voor uw medewerking! Wij wensen u veel plezier toe in de Cinestar!

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13 Appendix E: National questionnaire (Dutch)

Goedenavond, zou u alstublieft mee willen werken aan een onderzoek door een aantal korte vragen te beantwoorden? Uw antwoorden worden gebruikt door een student van de Universiteit Twente voor een onderzoek voor de Nederlandse Spoorwegen.

1.	Beschikt u over een auto en rijbewijs?	o ja, beiden o nee, geen van beiden o ik heb een rijbewijs en ik kan makkelijk een auto lenen van iemand anders o ik heb een rijbewijs, maar geen auto
2.	Hoe vaak gebruikt u het OV?	o 4 dagen per week of vaker o 1-3 dagen per week o 1-3 dagen per maand o 6-11 dagen per jaar o 1-5 dagen per jaar o minder dan 1 dag per jaar
3.	Hoe makkelijk vindt u dat u op dit moment bij Pathé Arena kan komen met de auto? *Op een schaal van 1 (moeilijk) – 5 (makkelijk)*	1 / 2 / 3 / 4 / 5 n.v.t
4.	Hoe makkelijk vindt u dat u op dit moment bij Pathé Arena kan komen met het OV? *Op een schaal van 1 (moeilijk) – 5 (makkelijk)*	1 / 2 / 3 / 4 / 5 n.v.t.
5.	Hoe makkelijk vindt u dat u kunt parkeren bij Pathé Arena? *Op een schaal van 1 (moeilijk) – 5 (makkelijk)*	1 / 2 / 3 / 4 / 5 n.v.t.
6.	Bent u hier alleen, samen of in een groep gekomen?	o alleen (door naar vraag 8) o samen o groep (3 of meer personen)
7.	*Let op: deze vraag hoeft u niet in te vullen als u alleen bent gekomen!* Wat is de samenstelling van uw gezelschap? **(Combinatie mogelijk!)**	☐ vrienden ☐ familie ☐ collega's ☐ anders, namelijk: _____
8.	Hoe vaak bezoekt u Pathé Arena?	o 4 dagen per week of vaker o 1-3 dagen per week o 1-3 dagen per maand o 6-11 dagen per jaar o 1-5 dagen per jaar o minder dan 1 dag per jaar

9.	Kwam u voordat u Pathé Arena bezocht van thuis of van elders vandaan?	o van thuis
		o van elders, namelijk:
		    o werk o vrienden / familie
		    o horeca o recreatie / winkelen
		    o school / studie o anders, namelijk:
		    _____

10.	Met welk hoofdvervoermiddel (langste afgelegde afstand) bent u gekomen?	o auto / motor o trein o bus / tram / metro o taxi o fiets / lopend o anders, namelijk:_____

11.	Gaat u nadat u Pathé Arena heeft bezocht naar huis of naar elders?	o naar huis
		o naar elders, namelijk:
		    o werk o vrienden / familie
		    o horeca o recreatie / winkelen
		    o school / studieo anders, namelijk:
		    _____

Gaat u alstublieft verder aan de andere kant……………………

12.	Wat is/zijn voor u de belangrijkste reden(en) om dit vervoermiddel te kiezen? **(Meerdere antwoorden mogelijk!)**	Omdat: ☐ ik het snel en betrouwbaar vind ☐ ik het goedkoop vind ☐ ik het als comfortabel en gemakkelijk ervaar ☐ ik ben opgehaald / ik iemand moest ophalen ☐ ik reis in een groep ☐ ik mij veilig voel ☐ ik de vrijheid heb om alcohol te nuttigen ☐ ik het milieuvriendelijk vind ☐ ik geen alternatief heb ☐ ik anders niet meer terug kom ☐ anders, namelijk: _____
13.	*Let op: Deze vraag is voor niet-OV-gebruikers!* Was u wel met de trein gekomen als er tot later op de avond treinen hadden gereden?	o ja o nee o n.v.t., geen station in de buurt
14.	*Let op: Deze vraag is alleen voor OV-gebruikers!* Stel wij verplaatsen Pathé Arena zodat de looptijd vanaf het station toeneemt, maak de volgende zin af:	De looptijd vanaf station Amsterdam Bijlmer ArenA is nu 1 minuut, als ik meer dan ☐☐ minu(u)t(en) onderweg ben naar Pathé Arena vanaf het station zal ik kiezen voor een alternatief vervoermiddel of niet meer komen.
15.	Wat is de belangrijkste reden om voor Pathé te kiezen (1 antwoord mogelijk)?	o in Pathé Arena draait een goede film o Pathé Arena is kwalitatief beter dan andere bioscopen in de omgeving o het is goed bereikbaar met auto o het is goed bereikbaar met het OV o het is dichtbij o omdat ik er werk o omdat ik geen ander alternatief ken o anders, namelijk: _____
16.	Als er geen station in de buurt had gelegen, zou u dan nog steeds voor Pathé Arena kiezen?	o ja o nee o minder vaak

Tot slot nog een aantal algemene vragen:

17.	Wat is uw geslacht?	o vrouw o man
18.	Wat is uw geboortejaar?	☐☐☐☐
19.	Wat is de postcode van uw woning?	☐☐☐☐ ☐☐
20.	Wat is uw opleidingsniveau?	o basisonderwijs o LBO of MBO o middelbare school o HBO of universiteit
21.	Heeft u verder nog opmerkingen over deze enquête?	_____ _____

Hartelijk dank voor uw medewerking! Wij wensen u veel plezier toe in Pathé Arena!

14 Appendix F: 9292 / Google maps script

```matlab
function output = ...
fileWissel5(index,potalCode1,potalCode2,goOnline,travelDate,desiredArrivalT
ime,cityName1User,cityName2User)
% function that calculates the travel time between two postal codes
% google maps is used for car travel time (and getting the names of the
cities belonging to the
% postal codes)
% ov9292.nl is used for the public transport travel time
% all webpages retrieved are saved using the index
%
% input:
%   index, just a number for indexing and saving the html file to
%   potalCode1: origin
%   potalCode2: destination
%   goOnline: use local saved files.. or collect from internet
%   travelDate: 2013-07-18
%   desiredArrivalTime: 2000
%   cityName1: overwrite the cityName1 (which is otherwise found by
%   google.maps) 9292ov.nl sometimes needs an indication of the province
%   hengelo-ov (for Hengelo in Overijssel)
%   cityName2: overwrite the cityName2 (which is otherwise found by
%   google.maps) 9292ov.nl sometimes needs an indication of the province
%   hengelo-ov (for Hengelo in Overijssel)
%
% output:
%   index
%   potalCode1
%   potalCode2
%   cityName1
%   cityName2
%   travel time car (minutes)
%   travel distance car (km)
%   travel time public transport
%   nr of transfers public transport
%   travel time public transport for
?bus=off&metro=off&tram=off&veerboot=off#
%   nr of transfers public transport for
?bus=off&metro=off&tram=off&veerboot=off#

% convert the input to lowercase (website otherwise refuses input) and
% strip ' '.
potalCode1 = strrep(lower(potalCode1),' ','');
potalCode2 = strrep(lower(potalCode2),' ','');
cityName1 = [];
cityName2 = [];
if nargin < 6
    disp('not enough input variables!')
end


% #########################
% GET TRAVEL PLAN FOR THE CAR
% #########################
% make the file name to store the html code
fileName = ['autoRoute' num2str(index,'%03d') '.html'];
% write the URL to visit
urlForMatlab = ['https://maps.google.nl/maps?saddr=' potalCode1 '&daddr='
potalCode2]
if goOnline == 1 % if 1 then really visit the website, otherwise a local
file could be used
    % visit website and locally save the html code
```

```matlab
    urlwrite(urlForMatlab,fileName);
end
% open the saved file
fid = fopen(fileName);
% --------------------------
% get information from the saved html file
% --------------------------
tline = fgets(fid); % get a text line from the .html file
while ischar(tline) % while there are text lines
    tline = fgets(fid); % get a new text line from the .html file
    % --------------------------
    % go find the city names
    % --------------------------
    if nargin < 8 % only dont if user does not provide two city names...
        titleLocation = findstr(tline,'window.gHomeVPage={title'); % look
for this string (this is close to the information we want)
        if isempty(titleLocation)==0 % if string is found...
            substring = tline(titleLocation+26:titleLocation+100);
% get the text close to the found string
            toLocation = findstr(substring,' naar ');
% search for the text ' naar ' in the substring
            minusSignLocation = findstr(substring,' - ');
% search for the text ' - ' in the substring
            fromDescription = substring(1:toLocation-1);
% get the description of the 'from' location
            toDescription = substring(toLocation+6:minusSignLocation-1);
% get the description of the 'to' location

            % do some processing on the location descriptions (strip the
            % postal code, and replace ' ' by '-'.
            % (www.9292ov.nl requires this)
            foo = findstr(fromDescription,' '); % find spaces
            cityName1Found = fromDescription(foo(2)+1:end);   % get the
city name
            foo = findstr(toDescription,' ');   % find spaces
            cityName2Found = toDescription(foo(2)+1:end);   % get the city
name
            cityName1Found = strrep(cityName1Found,' ','-');   % replace '
' by '-'
            cityName2Found = strrep(cityName2Found,' ','-');   % replace '
' by '-'

            % remote the appendix '-Zuid' (you should fix other problems by
            % providing the cityNames yourself.)
            zuidStringLoc = findstr(cityName1Found,'-Zuid');
            if isempty(zuidStringLoc)==0
                cityName1 = cityName1Found(1:zuidStringLoc-1); % keep the
city name, ignore the part '-Zuid'
            end

            zuidStringLoc = findstr(cityName2Found,'-Zuid');
            if isempty(zuidStringLoc)==0
                cityName2 = cityName2Found(1:zuidStringLoc-1); % keep the
city name, ignore the part '-Zuid'
            end

        end
    end
    % ------------------------------------------
    % now find the time and distance indication
    % ------------------------------------------
```

```matlab
        timeLocation = findstr(tline,'min.</span>');
        sizeOfTimeLocationString = size(timeLocation,2);
        % multiple time and distance results can be found.. store them all,
        % later select the best option.
        results = [];
        % if the string is found
        if sizeOfTimeLocationString > 0
            for timeStringCharacter = 1:sizeOfTimeLocationString
                % select a substring just before the text 'min.</span>'
                substring = tline(timeLocation(timeStringCharacter)-
35:timeLocation(timeStringCharacter)+2);
                numberBool = isstrprop(substring, 'digit'); % look for the
numbers in the string
                hourLoc = findstr(substring,'uur');        % look for the text
'uur'
                minuteLoc = findstr(substring,'min');      % look for the text
'min'

                if isempty(minuteLoc) == 0  % the text 'min' is found
                    from = find(numberBool(1:minuteLoc-2)==0,1,'last')+1;   %
select from character
                    until = minuteLoc-1;                               %
select until character
                    minuteString = substring(from:until);
                    minute = str2double(minuteString); % concert the string to
a number
                else
                    minute = 0; % else no information about minutes
                end
                if isempty(hourLoc) == 0 % the text 'uur' is found
                    from = find(numberBool(1:hourLoc-2)==0,1,'last')+1; %
select from character
                    until = hourLoc-1;                              %
select until character
                    hourString = substring(from:until);
                    hour = str2double(hourString); % concert the string to a
number
                else
                    hour = 0; % else no information about hour
                end
                % calculate the travel time in minuts
                travelTime = hour*60 + minute;
                % store the travel time in the results array
                results(timeStringCharacter,1) = travelTime;

                % also find the travel distance
                kmLoc = findstr(substring,'km</span>');
                locationFirstNumber = find(isstrprop(substring,
'digit'),1,'first');
                substring = substring(locationFirstNumber:kmLoc-2); % select
numbers before the string 'km'
                substring = strrep(substring,',','.');             % replace
the ',' by a '.'
                correspondingDistance = str2double(substring);
                results(timeStringCharacter,2) = correspondingDistance;
            end

            % of all the found travel times, and distances: use the combination
            % with the shortest travel time.
            [shortestTravelTime loc] = min(results(:,1)); % in minuten
            correspondingDistanceForShortestTravelTime = results(loc,2); % in
km
```

```matlab
    end
end

if (nargin >= 7)
    disp('user cityname 1 will be used!')
    cityName1 = lower(cityName1User);
else
    cityName1 = lower(cityName1Found);
end
if nargin == 8
   disp('user cityname 2 will be used!')
   cityName2 = lower(cityName2User);
else
   cityName2 = lower(cityName2Found);
end

% save the output
info.potalCode1 = potalCode1;
info.potalCode2 = potalCode2;
info.cityName1 = cityName1;
info.cityName2 = cityName2;
traffic.shortestTravelTime = shortestTravelTime;
traffic.correspondingDistanceForShortestTravelTime =
correspondingDistanceForShortestTravelTime;
% now done with google maps .html, so close it
fclose(fid);

% #######################################
% GET TRAVEL PLAN FOR THE PUBLIC TRANSPORT
% #######################################
%try % cityname might not exist, so try this code. otherwise provide N.A.
(not available)

    % write the URL to visit
    urlForMatLab = ['http://9292.nl/reisadvies/'  lower(info.cityName1) '_'
potalCode1 '/' lower(info.cityName2) '_' potalCode2 '/aankomst/' travelDate
'T' desiredArrivalTime]
    fileName = ['publicTransportRoute_' num2str(index,'%03d') '.html'];
    if goOnline == 1 % if 1 then really visit the website, otherwise a
local file could be used
        % visit website and locally save the html code
        urlwrite(urlForMatLab,fileName);
    end
    % open the saved file
    fid = fopen(fileName);
    % ---------------------------
    % get information from the saved html file
    % ---------------------------
    tline = fgets(fid); % get a text line from the .html file
    state = 0;          % this state is 0 at the beginning. and is 1 while
results are searched..
    subCounter = 1;     % count the results
    ovResults = [];     % save the results
    while ischar(tline) % while there are text lines
        tline = fgets(fid); % get a new text line from the .html file
        % ---------------------------
        % go find the city names
        % ---------------------------
        travelOptionsLoc = findstr(tline,'Reisopties');   % look for the
text 'Reisopties'
        if isempty(travelOptionsLoc)==0
```

```matlab
                % if found then go to the 'search' state (1)
                state = 1;
            end
            if state == 1
                % search for the number of transfers
                locTransfer = findstr(tline,'overstappen');
                if isempty(locTransfer) == 0 % if string 'overstappen' is found
                    numberOfTransfersString = tline(9:locTransfer-2); % this is
a string describing the number of transfers
                    numberOfTransfers = str2double(numberOfTransfersString); %
this makes the string a number
                    ovResults(subCounter,2) = numberOfTransfers;    % store the
results
                end
                % search for the travelTime
                locTravelTime = findstr(tline,'reistijd');
                if isempty(locTransfer) == 0 % if string 'reistijd' is found
                    travelTimeString = tline(locTravelTime+9:end);
                    locDubbelePuntTeken = findstr(travelTimeString,':');  %
find location of ':' in the string
                    hourString = travelTimeString(1:locDubbelePuntTeken-1); %
this part contains the hour value string
                    hour = str2double(hourString);                         %
this converts the hour value string into a number
                    minuteString = travelTimeString(locDubbelePuntTeken+1:end);
% this part contains the minute value string
                    minute = str2double(minuteString);
% this converts the minute value string into a number
                    travelTime = hour*60+minute;
                    ovResults(subCounter,1) = travelTime';
                    subCounter = subCounter + 1;
                end
                locOfEnding = findstr(tline,'</p>');
                if isempty(locOfEnding) == 0 % end of travel options text, so
stop searching
                    state = 0;
                end
            end
        end
    end
    % done searching so close the .html file
    fclose('all');
    % select the best travel time option from the results
    [bestTravelTime loc] = min(ovResults(:,1));
    % find the corresponding number of transfers
    correspondingNumberOfTransfers = ovResults(loc,2);
    publicTransport.travelTime = bestTravelTime;
    publicTransport.numberOfTransfers = correspondingNumberOfTransfers;

%########################################################################
###########
% GET TRAVEL PLAN FOR THE PUBLIC TRANSPORT BUT NOW WITHOUT THE BUS METRO
TRAM AND POND.
%
########################################################################
##########
    % write the URL to visit
    urlForMatLab = ['http://9292.nl/reisadvies/'  lower(cityName1) '_'
potalCode1 '/' lower(cityName2) '_' potalCode2 '/aankomst/' travelDate 'T'
desiredArrivalTime '?bus=off&metro=off&tram=off&veerboot=off#']
    fileName = ['publicTransportRouteLimited_' num2str(index,'%03d')
'.html'];
```

```matlab
    if goOnline == 1 % if 1 then really visit the website, otherwise a
local file could be used
        % visit website and locally save the html code
        urlwrite(urlForMatLab,fileName);
    end
    % open the saved file
    fid = fopen(fileName);
    % ---------------------------
    % get information from the saved html file
    % ---------------------------
    tline = fgets(fid); % get a text line from the .html file
    state = 0;          % this state is 0 at the beginning. and is 1 while
results are searched..
    subCounter = 1;     % count the results
    ovResults = [];     % save the results (and clear previous results)
    while ischar(tline) % while there are text lines
        tline = fgets(fid); % get a new text line from the .html file
        travelOptionsLoc = findstr(tline,'Reisopties');
        if isempty(travelOptionsLoc)==0
            % if found then go to the 'search' state (1)
            state = 1;
        end
        if state == 1
            % search for the number of transfers
            locTransfer = findstr(tline,'overstappen');
            if isempty(locTransfer) == 0 % if string 'overstappen' is found
                numberOfTransfersString = tline(9:locTransfer-2); % this is
a string describing the number of transfers
                numberOfTransfers = str2double(numberOfTransfersString); %
this makes the string a number
                ovResults(subCounter,2) = numberOfTransfers;  % store the
results
            end
            % search for the travelTime
            locTravelTime = findstr(tline,'reistijd');
            if isempty(locTransfer) == 0 % if string 'reistijd' is found
                travelTimeString = tline(locTravelTime+9:end);
                locDubbelePuntTeken = findstr(travelTimeString,':');    %
find location of ':' in the string
                hourString = travelTimeString(1:locDubbelePuntTeken-1);  %
this part contains the hour value string
                hour = str2double(hourString);                       %
this converts the hour value string into a number
                minuteString = travelTimeString(locDubbelePuntTeken+1:end);
% this part contains the minute value string
                minute = str2double(minuteString);
% this converts the minute value string into a number
                reistijd = hour*60+minute;
                ovResults(subCounter,1) = reistijd';
                subCounter = subCounter + 1;
            end
            locOfEnding = findstr(tline,'</p>');
            if isempty(locOfEnding) == 0 % end of travel options text, so
stop searching
                state = 0;
            end
        end
    end
    % done searching so close the .html file
    fclose('all');
    % select the best travel time option from the results
```

```matlab
    if isempty(ovResults)==0
        [bestTravelTime loc] = min(ovResults(:,1));
        % find the corresponding number of transfers
        correspondingNumberOfTransfers = ovResults(loc,2);
        publicTransportWithExceptions.reistijd = bestTravelTime;
        publicTransportWithExceptions.numberOfTransfers =
correspondingNumberOfTransfers;
    else
        % if no results are found: use Not Available
        publicTransportWithExceptions.reistijd = 'N.A.';
        publicTransportWithExceptions.numberOfTransfers = 'N.A.';
    end
% catch
%     % if requesting data from 9292ov.nl fails, use Not Available
%     % check: if postal code is real exists
%     % check: if 9292ov.nl add a province appendix (just manually input the
%     % postal code in the search bar and look in the URL that follows after
%     % the search...
%      publicTransport.travelTime = 'N.A.';
%      publicTransport.numberOfTransfers = 'N.A.';
%      publicTransportWithExceptions.reistijd = 'N.A.';
%     publicTransportWithExceptions.numberOfTransfers = 'N.A.';
% end

output =
{index,potalCode1,potalCode2,info.cityName1,info.cityName2,traffic.shortest
TravelTime,traffic.correspondingDistanceForShortestTravelTime,publicTranspo
rt.travelTime,publicTransport.numberOfTransfers,publicTransportWithExceptio
ns.reistijd,publicTransportWithExceptions.numberOfTransfers};

%teller = teller + 1;
```

15 Appendix G: Detailed leisure facility analysis

A lot of new library locations emerged from the analysis. Only seven of them were close to a railway station. Of those seven, Houten en Maastricht are the most interesting ones. The Maastricht location is interesting as it combines several functions into one leisure building : Centre Ceramique. The library in Houten is part of a reconstructed shopping center 'Het Rond', which is situated right next to Houten railway station.

Library	Year	Type	Details
Best	2009-2012	4	Cinema on station
Boxtel	2009-2012	4	
Goes	2009-2012	4	
Gorinchem	2009-2012	4	
Hilversum	2009-2012	2	
Houten	2009-2012	4	Houten Zuid
Maastricht	2009-2012	2	Centre Ceramique

Table 20: New libraries

Only one new ice rink was built in the past couple of years and it is part of the leisure area near station Enschede Drienerlo.

Ice rink	Year	Type	Details
Enschede	2008-2009	5	

Table 21: New ice rinks

The new museum the analysis came up with might not be valid. CBS data indicates a decrease in average distance to a museum for Bloemendaal of one kilometer between 2006 and 2007. Het Dolhuys, the nearest museum in Haarlem, was already open in 2005. Inhabitants of Haarlem also were 300 meters closer on average between 2006 and 2007. As the museum opened recently and is very close to Haarlem railway station, it is still considered interesting.

Museum	Year	Type	Details
Bloemendaal	2006-2007	4	Het Dolhuys? (Haarlem)

Table 22: New museums

Two venues of performing arts were built next to railway stations in the past couple of years. The one in Heerhugowaard, named 'Cool' is very close to the station. The one in Veendam is also close to a station, but was already there before the station (re)opened in May 2011.

Performing arts	Year	Type	Details
Heerhugowaard	2006-2011	6	Cool, very close to station
Veendam	2006-2011	6	Beresteyn

Table 23: New venues of performing arts

Several new pop stages have emerged near railway stations, but they are all just within the range of one kilometer and seem to be aimed more at city centers than at stations in particular.

Pop stage	Year	Type	Details
Deventer	2006-2011	2	Burgerweeshuis, founded 2006
Heerlen	2006-2011	2	Nieuwe Nor (Jan 2007)

Oss	2006-2011	4	Groene Engel? (1999)

Table 24: New pop stages

One large swimming pool has been built in the proximity of a railway station. It is located at exactly one kilometer, so its interest to this research is questionable.

Swimming pool	Year	Type	Details
Tilburg	2005-2008	5	Zwembad de Reeshof

Table 25: New swimming pools

The new cinema in Houten is located at the same shopping center 'Het Rond' as the library mentioned before. The cinemas in Enschede and Schiedam are reconstructions of older cinemas. The cinema in Hardenberg just falls within the one kilometer range.

Cinema	Year	Type	Details
Goes	2007-2008	4	Bioscoop da Vinci
Enschede	2008-2009	2	Bioscoop Wolff Cineast
Hardenberg	2008-2009	4	Movieskoop Hardenberg 1.0 km away
Houten	2009-2010	4	Bioscoop boven het rond
Schiedam	2010-2011	3	Relocation of cinema in city center

Table 26: New cinemas

Although quite some spas were opened the last few years, only one of them was close to a railway station.

Spa	Year	Type	Details
Winterswijk	2010	4	

Table 27: New spas

16 Appendix H: Number of leisure facilities

Leisure	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Museums		873		828		775		773		810			
Cinemas			175	174	175	171	163	160	161	164	167	172	
Theaters	212		243		256		258		271		266	270	
Pop stages			64	64	75	69	70	56			48	53	
Swimming pools			1593									1537	
Libraries	1074	1101	1125	1123	1091	1083	1101	1056	1055	1031	899		
Spas									160			200	
Ice rinks													24

Several points are missing in this dataset due to multiple reasons. A thorough search was not sufficient to obtain figures for each type for every year. Most of the time figures simply do not exist. Swimming pools for example were only researched in 2002 and 2011. The years in between are unknown. There are also definition problems. Theaters come in many flavors, for example based on the amount of performances in a year. The data sources and facilities included in the numbers are explained in the list below:

- **Museums:** Data obtained from CBS Statline. It concerns not only companies or organizations with a museum as their main activity, included are also companies or organizations with a museum as a side activity, for example as part of a hospital or university.
- **Cinemas:** Figures are from *http://www.spronsen.com/downloads/* All cinemas in The Netherlands are included, also the ones showing only art-house movies and other alternative styles.
- **Theaters:** Only members of the theater board association (VSCD) were included. Data is obtained from *http://www.vscd.nl/dossiers/16/Theater_Analyse_Systeem_TAS_*
- **Pop stages:** Pop stages which are member of the Dutch Association of Pop Stages and Events (VNPF) are included. Data is obtained from: *http://files.goc.nl/files/pdf/bronnen_per_wereld/09%20vnpf_rapport_final_21.pdf*
- **Swimming pools:** Two separate swimming pool monitors were conducted in 2002 and 2011 by the Dutch Institute for Sports and Physical Activity. Source: *http://www.nisb.nl/*
- **Libraries:** Every year the Dutch association of libraries issues a reading monitor that includes all kinds of figures on libraries, including the current amount. These figures are found at *http://www.leesmonitor.nu/page/10001/bibliotheekcijfers*
- **Spas:** Rabobank conducts a theme update on several aspects of Dutch leisure every once in a while. The most recent one on wellness includes an estimate of spas in The Netherlands, exact figures are unknown. Source: *http://www.rabobank.nl/images/thema_update_wellness_april_2011_29342093.pdf*
- **Ice rinks:** There are a total of 24 ice rinks in The Netherlands in 2011, source: *http://www.kunstijsbanen.nl/site/?VKN:Kunstijsbanenbranche_in_Nederland* These only includes artificial ice rinks, either in- or outdoor. Ice rinks that rely on natural freezing temperatures are not included.

## 17 Appendix I: Top leisure attractions in the Netherlands

Rank	Visitor #	Attraction	Year	Type
1	4.125.000	De Efteling	1952	None
2	1.600.300	Van Gogh Museum	1973	None
3	1.505.000	Burgers Zoo	1913	None
4	1.503.529	Diergaarde Blijdorp	1855	1
5	1.450.000	Attractiepark Slagharen	1963	None
6	1.362.465	Attractiepark Duinrell	1935	None
7	1.261.000	Natura Artis Magistra	1838	None
8	1.104.233	Anne Frank Huis	1960	None
9	1.000.000	Rijksmuseum Amsterdam	1800	None
10	935.000	Ouwehands Dierenpark	1932	4
11	884.000	Keukenhof	1950	None
12	856.000	Safaripark Beekse Bergen	1968	None
13	850.000	Nationaal Zwemcentrum de Tongelreep	1962	None
14	800.000	De Uithof	1973	None
15	800.000	Amsterdamse Waterleidingduinen	1853	None
16	800.000	Sportiom	1998	5
17	775.000	Walibi Holland	1971	None
18	710.000	Dolfinarium Harderwijk	1965	None
19	700.000	SnowWorld Landgraaf	2001	None
20	695.000	Dierenpark Emmen	1935	4
21	675.000	DierenPark Amersfoort	1948	None
22	660.000	Madame Tussauds Amsterdam	1970	None
23	600.000	SnowWorld Zoetermeer	1996	None
24	550.000	Jaap Eden Ijsbanen	1961	5
25	545.000	Madurodam	1952	None
26	530.000	Heineken Experience	1991	None
27	525.631	Het Nationale Park De Hoge Veluwe	1935	None
28	525.000	Toverland	2001	None
29	510.133	Sexmuseum Amsterdam "Venustempel"	1985	1
30	503.125	Apenheul	1971	None
31	502.946	Science center NEMO	1997	1
32	500.000	Snowplanet	1999	None
33	461.787	Nederlands Openluchtmuseum	1912	None
34	450.000	Koningin Juliana Toren	1910	None
35	448.000	GaiaPark Kerkrade Zoo	2005	None
36	421.385	SPIDO Rotterdam Havenrondvaart	1919	None
37	413.500	Thialf	1967	*
38	400.000	Avonturenpark Hellendoorn	1936	None
39	375.000	Sportcentrum Kardinge	1993	None
40	340.000	Aquacenter Malkander	1999	None
41	336.000	Spoorwegmuseum Utrecht	1927	**
42	335.000	Hermitage Amsterdam	2004	None
43	334.796	Vogelpark Avifauna	1950	None
44	328.953	De Boetzelaer	1975	None
45	322.600	Paleis Het Loo	1685	None
46	302.198	Kröller-Müller Museum	1938	None
47	300.000	Aquarenabad	1933	None
48	300.000	Linnaeushof	1963	None
49	298.000	Deltapark Neeltje Jans	1986	None
50	295.000	Themapark Archeon		None

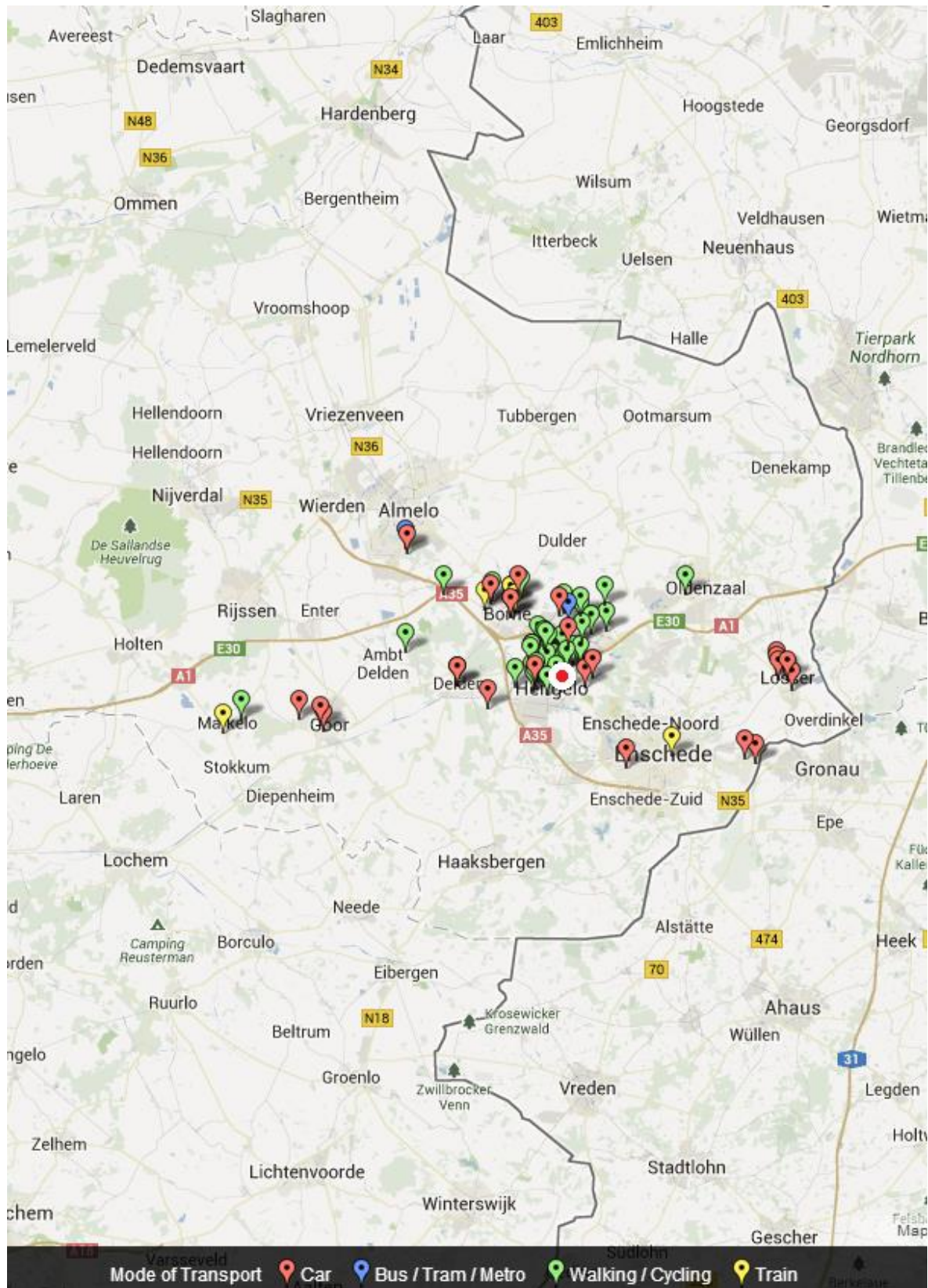* Thialf is the largest ice rink of the Netherlands and has its own station: Heerenveen IJsstadion.

** The Spoorwegmuseum (Railway Museum) has its own connection to the railway network and a station within its walls: Utrecht Maliebaan. It serves around 8 trains a day.

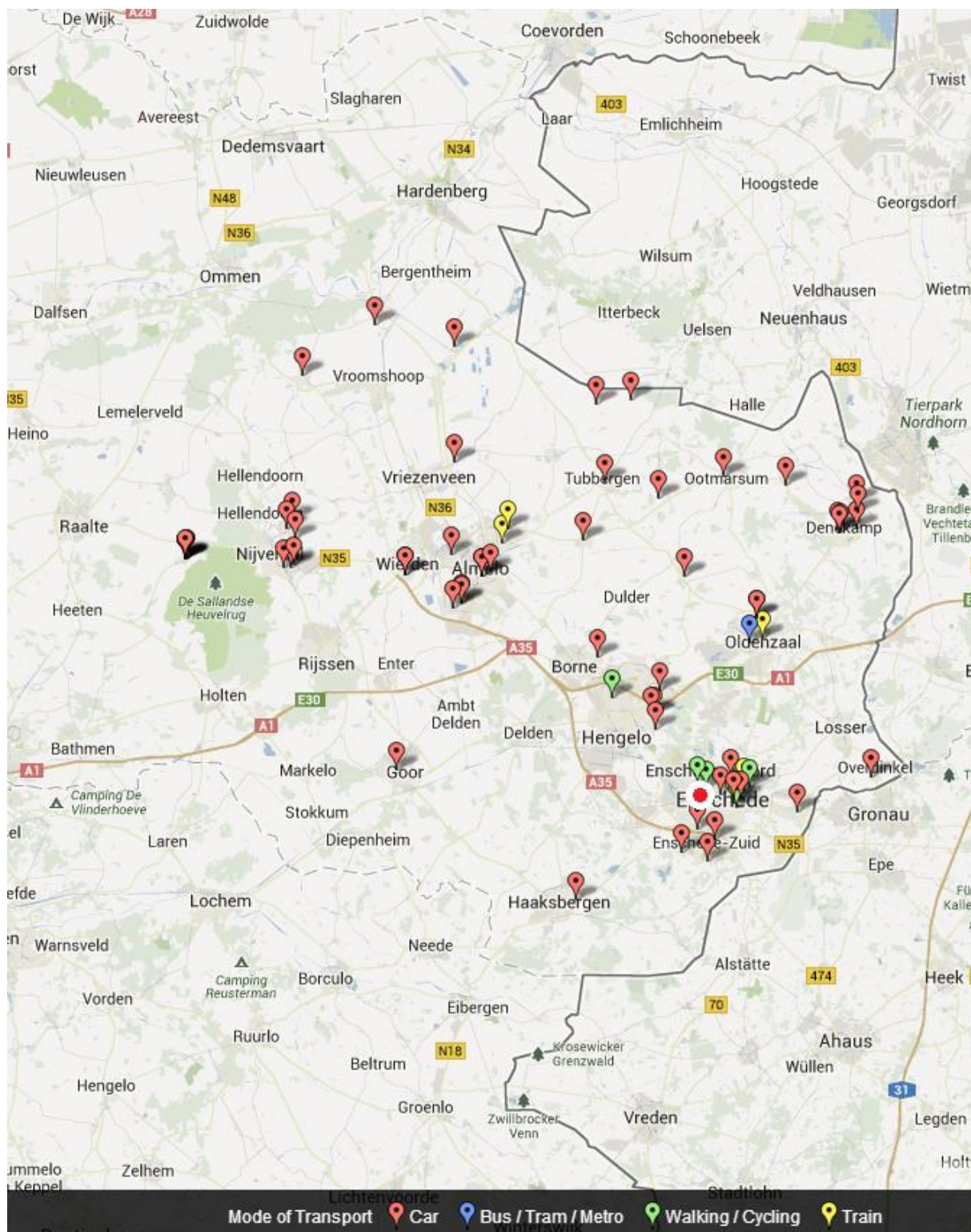## 18 Appendix J: Origin maps from batchgeo

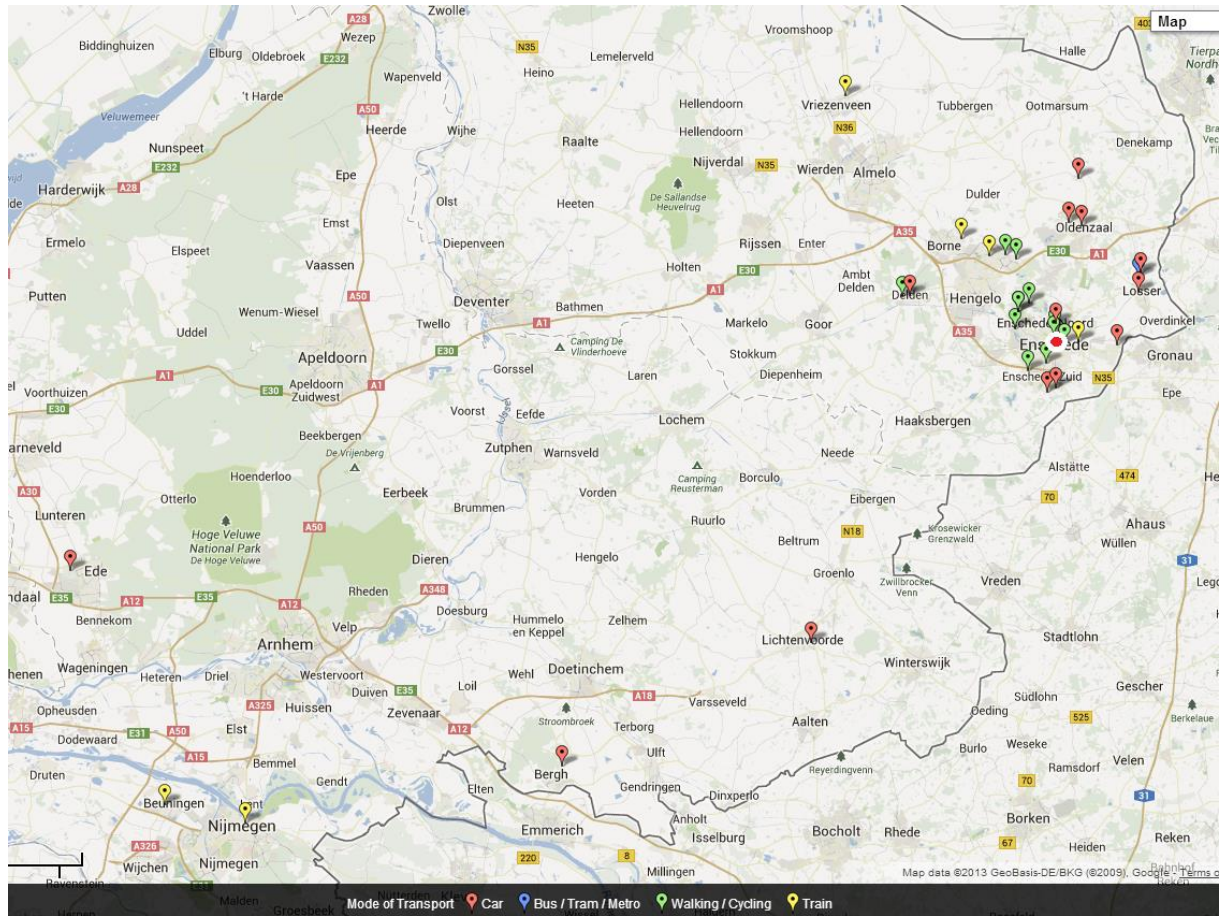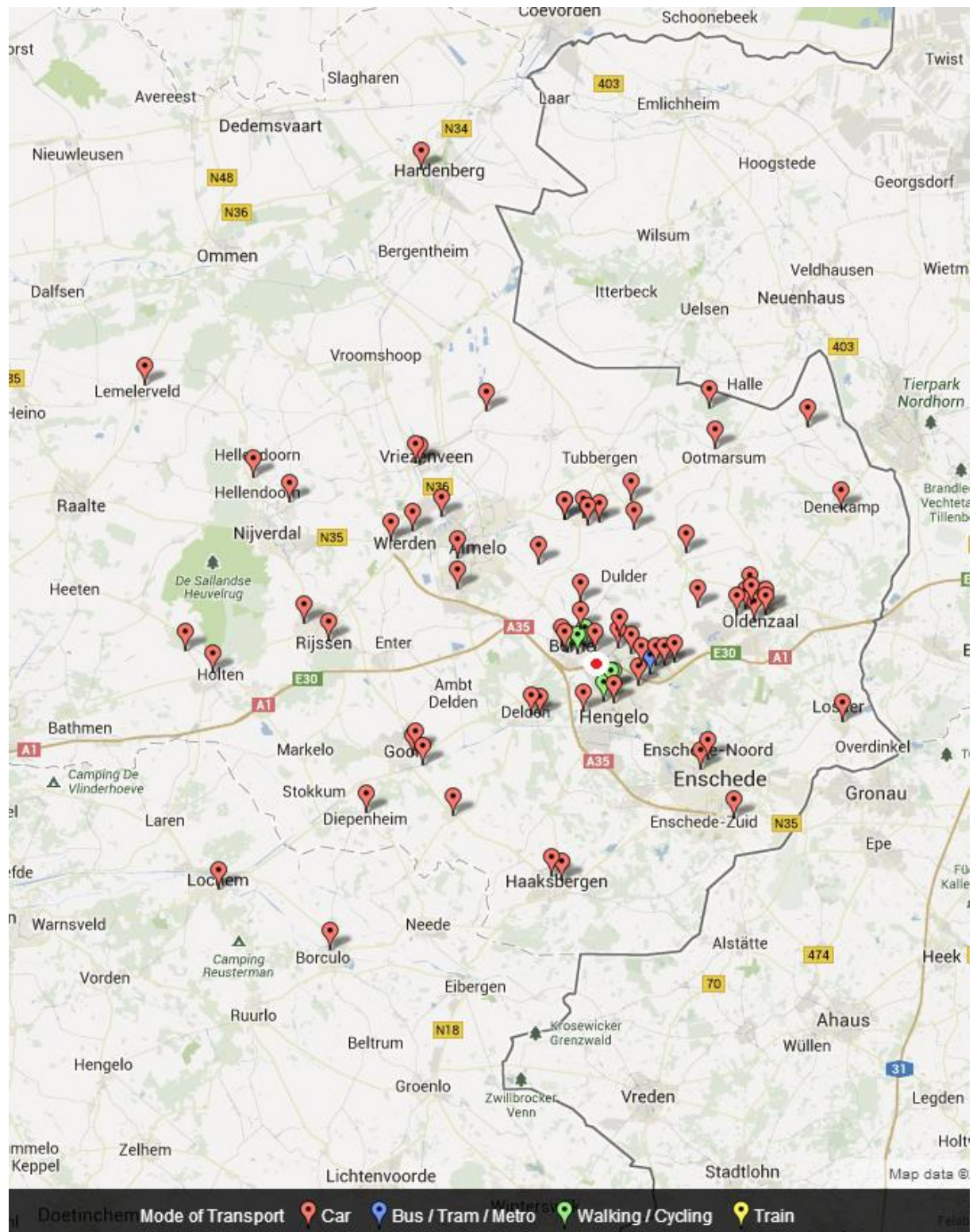Atak, Enschede
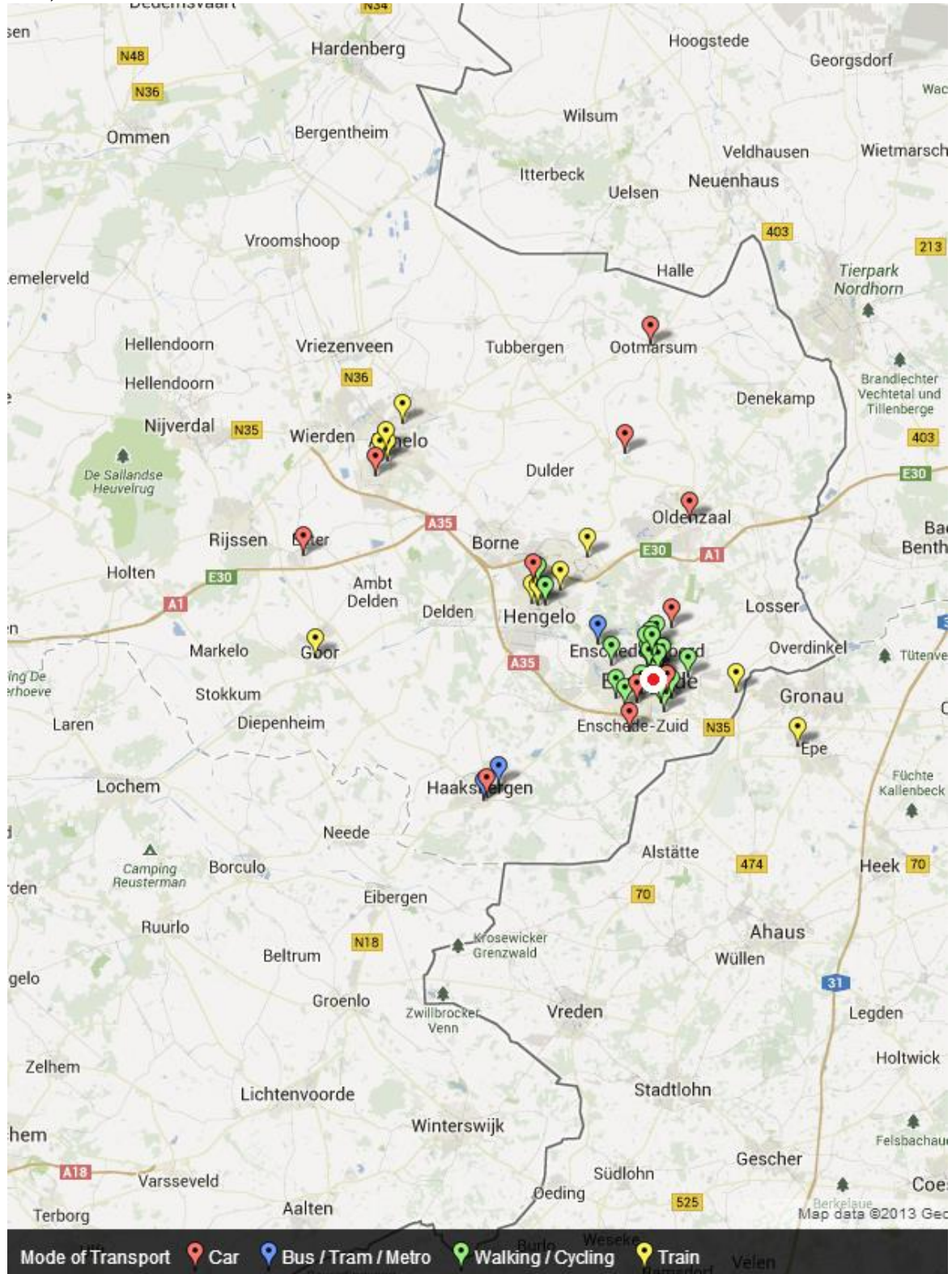
Cinema Hengelo, Hengelo

Cinestar, Enschede

Grolsch Veste, Enschede

Intersport Hengelo

Metropool, Hengelo

Museum Twente, Enschede

UNIVERSITEIT TWENTE.

Rabotheater, Hengelo

Beatrixtheater, Utrecht

Heineken Music Hall, Amsterdam

UNIVERSITEIT TWENTE.

Pathé Arena, Amsterdam