

Park and Ride in Breda

A research on the possibilities of developing P&R in
Breda



Master thesis

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Preface

This thesis is the result of my graduation research for the master Urban, Port and Transport Economics followed at the Erasmus School of Economics in Rotterdam. Besides that, this thesis is also the end product of my internship at the municipality Breda, division Ruimtelijke Ordening/ Mobiliteit, Groen en Water.

My interest for mobility and the influence it has on economy but also on the climate and quality of life has grown during the lectures of the third and fourth year of my study at the Erasmus. During the fourth year it becomes clear to me that I will finalise my study with a research on mobility and especially on ways that put a smaller burden on the living environment. Finally it became a research on the possibilities that Park and Ride could have for, because of my internship, the city Breda.

Writing this thesis and doing research on the topic was quite nice and I've learned a lot. I would like to take the opportunity to thank some people that were essential for the final result.

First, Giuliano Mingardo and Rob Temme, my supervisors, they enthusiastically helped me writing this thesis. Without their supervision, comments and advices the end product hasn't been what it is now.

Besides them there were also a number of people I interviewed. These interviews were essential for the research and to get knowledge about P&R.

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Content

	Preface	ii
	Abstract	v
1	Introduction	1
1.1	Problem statement	2
1.2	Methodology	2
1.3	Structure	3
2	The P&R concept and its relation with urban policies	4
2.1	Definition	4
2.2	Theoretical concept of P&R	5
2.2.1	Travel behaviour	7
2.2.2	Travel behaviour modification	9
2.2.3	CPV and travel behaviour modification, the case of P&R	10
2.3	The context of P&R	11
2.3.1	Urban competitiveness	11
2.3.2	Transport and environmental policies	14
3	Experiences with Park and Ride in Dutch cities	16
3.1	Introduction	16
3.2	Use of P&R	18
3.3	Relation with other policies	19
3.4	Costs	22
3.5	Public Transport connection	22
3.6	Conclusion	23
4	Characteristics of Breda	24
4.1	Functions of the city centre	24
4.2	Inner city transport	26
4.3	Transport policy	28
4.4	Environmental policy	29
4.5	Economic vision for the city	29
4.6	Conclusion	30
55.1	The possibilities to introduce P&R in Breda	31
5.2	Local entrepreneurs	31
5.3	Municipality	33
5.4	Province Noord Brabant	35
5.5	Visitors of Breda's inner city	35
	Discussion	39
66.1	Conclusions and Recommendations	42

6.2	Conclusions	42
	Recommendations	43
7	References	46
	Appendix 1	50
	Appendix 2	51

List of figures

Figure 2.1	Determinants of the Customer Perceived Value of Park and Ride	6
Figure 2.2	Ingredients of methods to change travel behaviour	9
Figure 3.1	P&R in 's-Hertogenbosch and Nijmegen	16
Figure 3.2	P&R in Groningen and Tilburg	17
Figure 3.3	P&R in Leiden and Rotterdam	18
Figure 4.1	City centre Breda	24
Figure 4.2	Parking areas in the city centre	27
Figure 4.3	Bus Rapid Transport (HOV) in the Breda region	28
Figure 5.1	Possible P&R locations mentioned by interviewees	32
Figure 5.2	Possible P&R locations mentioned in Verkeersplan 2003	33

List of tables

Table 3.1	Use of P&R	19
Table 3.2	Parking fees in city centre and costs of using P&R	20
Table 4.1	Car ownership inner city of Breda	25
Table 5.1	Modal split visitors	35
Table 5.2	Length of visit and group size	36
Table 5.3	Frequency of visit	36
Table 5.4	Motive to use transport mode	37
Table 5.5	Use of P&R	38
Table 5.6	Origin of non-car users	40
Table 5.7	Modal split with P&R and willingness to use	40
Table 5.8	Number of P&R users per day	41

Abstract

The accessibility of cities is one of the aspects that is important for the competitiveness of cities in order to be attractive for visitors, firms and residents. But transport can also cause problems as congestion and pollution what hurts the quality of life. This thesis will make clear *if is possible, and under which conditions, to develop P&R in Breda, serving the inner city and what the target groups are?*

Developing P&R can have several goals but the most important is to improve the accessibility. To stimulate the use of P&R it is needed that P&R offers the user a higher value than the other non-desired mode does. Besides that, people make their choice between travel modes also because of habits, they don't choose automatically a transport mode if it offers them a better value.

Besides aspects regarding P&R itself, also the municipal policy should be in line with P&R, economically but especially the transport policy. P&R should be combined with a restrictive parking policy that reduces the attractiveness of parking in the inner city compared with using P&R.

Research among cities already exploiting P&R shows that most cities started because congestion and problems regarding the quality of life. P&R is mostly used by commuters and visitors. Essential for P&R is a relation with the municipal policy, tariff differences with inner city parking, a fast and frequent public transport connection and a good accessible location.

Besides the functions living and working the inner city of Breda is very attractive for visitors and has one of the largest shopping areas of the Netherlands. The modal split of Breda is dominated by cars, around 70% which is high compared to other cities. The high car use increasingly causes congestion, which hurts also public transport, and pollution. Breda offers enough parking capacity but the current capacity is not used efficiently. The municipal policy wants to change the modal split in favour of bike and public transport. It is not possible to facilitate the use of cars in the current amount. The economic policy wants to make Breda more attractive for visitors, and one of the aspects that play a role is accessibility. The municipal policy all named P&R as one of the options to reduce the number of cars in the inner city.

Local entrepreneurs are in favour of the development of P&R, but some of them is against the combination with restrictive parking. They see the car as very important and are afraid that a restrictive policy will damage the attractiveness of the city for visitors. The municipality is willing to accept a restrictive parking policy in combination with P&R, P&R fits within their aim to change the modal split.

The survey showed that around 50% of the visitors came by car. Bikers and pedestrians visit Breda shorter but more frequent than car users. Around 50% of the visitors are willing to use P&R, not only users of cars but also users of other modes. Unintended use of P&R is thus possible, as it is the case in other cities. Of them that are willing to use P&R a large part is also willing to pay for the use of it.

Concluding it can be argued that, although problems are not that large as in the other cities, there is room to develop P&R. But it is needed that P&R met some conditions, related to policies and the design of P&R. P&R will be useful, especially in the beginning, for tourist. A rightly developed P&R can contribute to the change of the modal split in Breda.

1. Introduction

Just like firms also cities want to promote their products and they try to make the city as attractive as possible for residents, visitors, businesses and investors. One of the factors that plays a crucial role in the attractiveness and competitiveness of a city is the accessibility (van Winden, 2005). A good accessibility means that visitors can easily come to the city and implies also efficient and effective transportation within the city.

In a lot of cities a major part of the transportation within the city is done by car which means that besides roads also a lot of space is needed for parking. When parking space is needed the question arises where to build these parking facilities; close to the inner city or more away of the centre to decrease the negative effects of car transport in the inner city. One of the options for parking out of the city centre is a Park and Ride facility, a parking place where visitors can park their car and use another mode of transport (often public transport) for the last part to the city centre. The aim of these Park and Ride facilities is to improve or guarantee the accessibility of the city without the negative effects of car traffic in the city centre.

The Park and Ride facility, also called 'transferium' in the Netherlands, is the topic of this master thesis. Because the writing of the master thesis is combined with an internship at the municipality of Breda this research will mainly focus on a park and ride facility in Breda, serving the inner city. The city of Breda has a regional function with regards to shopping and tourism. Until now the municipality hasn't express their preference towards one of the modes of transport. Car traffic, which has a high share in the modal split, in the inner city causes more and more congestion which also affects public transport. Also the large supply of parking space in the inner city is a reason for the high car use. Until now the supply of parking space is enough but the distribution among the various parking areas isn't optimal.

Because of the problems caused by car use; congestion and impact on air quality and climate, increased attention is paid on alternative traffic policies which favour the use of public transport and bike instead of the car. One of the possibilities, suggested by various political parties in Breda, is the development of a Park and Ride facility. Such a facility could be developed together with large scale area developments at the fringe of Breda. When a park and ride facility is developed one of the criteria is that the accessibility of Breda remains of high quality. Visitors now consider the accessibility and parking space availability very positive, Park and Ride (P&R) shouldn't damage this.

1.1 Problem statement

The main research question of this master thesis about a Park and Ride facility is:

Is it possible, and under which conditions, to develop Park and Ride in Breda that serves the inner city and what are the target groups?

The following sub-questions will be asked in order to answer the main research question:

What are the characteristics, and positive and negative aspects of a park and ride facility?

How does the development of a park and ride facility fits within the general urban policy, with special attention to economic and transport policies?

What are the lessons that can be derived from park and ride facilities in other cities?

What are the characteristics of (the centre of) Breda which make the development of a park and ride facility desirable?

What are the opinions of the (local) stakeholders about a park and ride facility in Breda, i.e. the attitude of urban government, visitors and the business community?

This research has both societal and scientific relevance. First it points out what the possibilities of a park and ride facility are for Breda and what the opinions of the stakeholders are; the persons that have to use a park and ride facility. Besides that, this research could also be used for other cities that are thinking of park and ride facilities or are going to change their parking policy because this research will clarify important characteristics of park and ride facilities.

Secondly this research has also scientific relevance. It can be used in the ongoing debate about the possible conflict between restrictive parking policies and a good accessibility of the city, which plays a role in the competitiveness of the city. The research sheds light on the opinions of the stakeholders and their possible behaviour if P&R is developed in Breda.

1.2 Methodology

The research for this thesis will consists of two parts. The first part of the thesis, that answers the first and second sub question, will be mainly desk research; the review of (scientific) literature on park and ride, urban competitiveness, mobility management and parking policies.

Besides desk research, empirical research is needed to answer the third and fourth sub questions (combined with desk research) and the fifth sub question. To provide answers on the last sub question interviews will be held with various stakeholders in the city of Breda. These stakeholders are the municipality, which is responsible for parking policies, the inner city business community and finally the visitors of the city, the potential users of a park and ride facility. Interviews

with visitors are needed to know their intentions for the mode of transport they use and their willingness to use P&R.

1.3 Structure

This report will have the following structure. The next chapter will pay attention to the first and second sub-questions. Chapter three will consist of the research among other cities that already have a park and ride facility, the third sub-question. The characteristics of Breda and the opinions of the local stakeholders are described in chapter four and five. The answer on the main question will be given in the last chapter together with recommendations for the development of a park and ride facility in Breda and for further scientific research.

2 The P&R concept and its relation with urban policies

Before the main question of this research can be answered, it should be clear what exactly is meant with a park and ride facility (P&R). Secondly, this chapter will pay attention to travel behaviour and how governments can change this behaviour. Also the context of Park and Ride should be known, when can governments use Park and Ride facilities and how does it fit with their other policies. This chapter deals with these questions and is divided in two parts, the first part deals with sub question 1, the characteristics of P&R, and the second part is about the context of Park and Ride, sub question 2.

2.1 Definition

A Park and Ride facility can be described as a parking space with good connections to the public transport network where car drivers can park their car and use public transport for some parts of their journey. This combination of public and private transport enables multimodal transport (Santos et al., 2010).

There are three different types of Park and Ride: P&R with a origin function, this one intercept car drivers at the start of the journey, P&R with a destination function, this one intercept car drivers at the end of their journey, and the last type of P+R intercept car drivers somewhere in between their origin and destination (Mingardo, 2009a).

In this research, the focus is on the second type of Park and Ride, a facility that serves the inner city of Breda, intercepts car drivers at the fringe of the city and offers them a public transport connection to travel to the city centre. Although the focus is on P&R with a public transport connection, P&R could also be combined with biking (Park and Bike) or walking. The multimodality of P&R make it possible for people to optimize their transport and to use sustainable transport (Santos et al., 2010).

The concept of P&R exist already for some decades. The first P&R facilities were build in the United States in the fifties of the previous century, although the idea was already mentioned in 1932 by the Dutch scientist Bernhard Mees. In 1979, the first P&R was opened in the Netherlands in Schagen. In the Netherlands two different forms of P&R are distinguished: P&R and transferium. P&R mainly targets user of public transport and tries to keep the use of public transport attractive while transferia are build for car drivers and try to persuade them to use public transport for the last part of their trip (Crow, 2004). This last one is also the kind of P&R, which is the topic of this research. The distinction between P&R and transferium is only made in the Netherlands, elsewhere and in this research only Park and Ride (P&R) is used.

As described above P&R facilities tries to persuade car drivers to use public transport instead of their car for the last part of their trip. Besides this goal, Park and Ride policies can have several other goals as listed below (Parkhurst, 2000; Mingardo, 2009a).

- Improvement of the accessibility of the inner city by a reduction of car traffic (Santos et al., 2010)
- Improvement of the exploitation of the public transport through an increase in the number of users.
- Improvement of the quality of life of the inner city trough an reduction of car traffic that reduces the emissions.
- Stimulation of economic growth in city centre through an improvement of the accessibility.
- Providing of additional or replacement parking facilities.

The aims of P&R as described above makes clear that Park and Ride facilities become an option when problems such as congestion and a decrease of the quality of life arise in the city centre. In general Park and Ride is thus not the first parking measure a city would use, it is only used when parking in the city centre causes too much problems. As described by Mingardo and Warnar (2008) three phases regarding the development of cities and parking can be distinguished. In the first phase cities start with parking control and time restriction, paid parking is introduced in the second phase, only in the third phase of urban development, when paid parking in the city centre is not sufficient anymore and causes too much problems or uses too much space, P&R becomes an option.

2.2 Theoretical concept of P&R

P&R facilities want to induce visitors to use public transport for the last part of their journey instead of parking in the city centre. To be successful in this it is needed that car drivers add more value to the use of P&R than to inner city parking. A model to clarify this is the Customer Perceived Value (CPV) model (Kotler and Keller, 2006). The CPV is the difference between the customer's evaluation of all the benefits and costs of an offering, the Customer Delivered Value (CDV), and of the perceived alternatives. Based on this a model of the Customer Perceived Value for Park and Ride is developed (Fig. 2.1; cf. Kramer and Pauwels, 2005). In this model the General Transportation Costs are the sum of monetary costs, the time each option takes and the effort needed. The total benefits are the sum of the functional and emotional value that customers attach to that option. The functional value is the value users attach to the functions, thus for a P&R facility the value that users attach to the availability of parking space, the accessibility of the P&R area and the quality of the public transport connections (Bos and Van der

Heijden, 2005). The emotional value is about the feelings the user have about a P&R, do they like the concept, what is the image of park and ride. An example of this could be when users concern much about the environmental consequences of car use and therefore choose for a Park and Ride facility. The value user attach to P&R depends besides the characteristics of P&R also on personal factors such as age and purpose of the trip (Bos and Van der Heijden, 2005). To ensure that car drivers choose for P&R the CDV of P&R should be higher than that of using the car for the whole trip. This could be done either by measures that improve the CDV of P&R, or measures that reduce the CDV

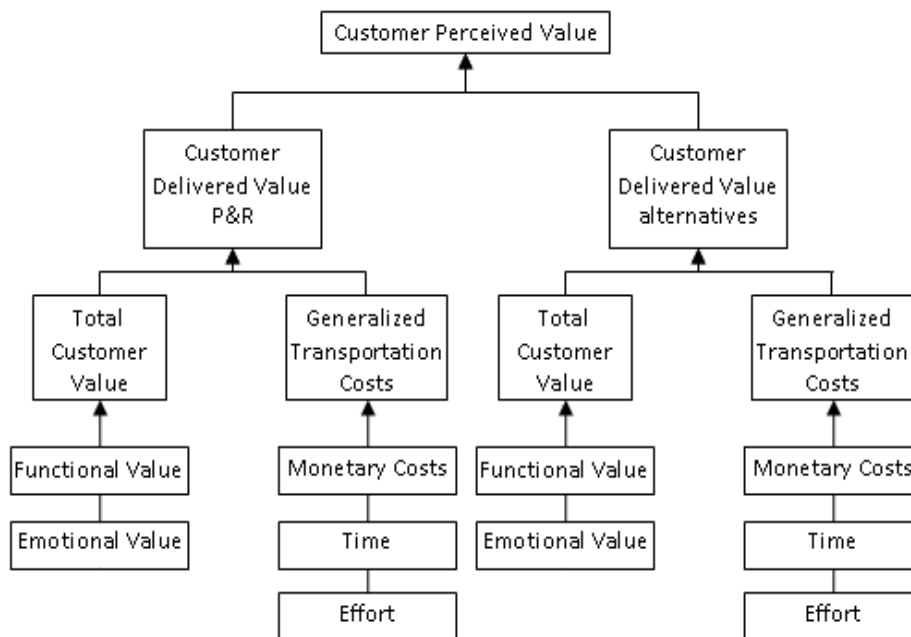


Figure 2.1 Determinants of the Customer Perceived Value of Park and Ride

for using the car or a combination of both, where a combination will be the most effective (Bos and Molin, 2006). When there are plans for a P&R it is thus important to know what value travellers will attach to the facility and what their wishes are, e.g. high frequent and fast public transport, safety, easily accessible and enough parking capacity (cf. Crow, 2004).

This model makes also clear that it is possible that the CDV of a P&R is higher than the CDV of other desirable options, such as using the bike for the whole trip. In such cases the P&R facility have unintended effects because visitors that does not use the car before now do in combination with a Park and Ride facility. A study of the effects of P&R in Rotterdam showed that around 34% of the users formerly used public transport or bicycle (Mingardo, 2008a). Besides attracting users from other modes, there are more unintended effects. First, it is possible that because the use of P&R more space is available on the inner city road network, which could attract additional car traffic; a net reduction of car traffic will thus not automatically arise, although this will largely depend

on the scale of the facility. Secondly it is possible that because of the improved accessibility additional trips are created (Parkhurst, 2000; Mingardo, 2009a). This effect could also be intended when the Park and Ride has to improve the accessibility of the city in order to attract more visitors. A final unintended effect, observed by Mingardo (2008a), is the undesired use of the P&R area, car drivers that use the area as a normal parking area and do not use public transport. This effect reduces the capacity of the area for the desired function, serving the inner city. At the other hand it could be possible to develop a P&R area that besides the P&R function also serves as a parking space for surrounding firms, this to add more functions to the area and increase the usage, especially during off-peak hours. This could be especially relevant when visitors of the inner city use the P&R at other times (e.g. weekend) than employees of firms close by (during daytime).

2.2.1 Travel behaviour

The model of Customer Perceived Value is useful in understanding the elements that together create the value of using a certain mode of transport. Despite this usefulness, the model has some weaknesses.

First, if the model is used to explain travel behaviour the underlying assumption is that people always base their decision on reasoned considerations of all the costs and benefits of each option. This assumption could be criticised, many scholars argue that much behaviour, and also travel behaviour, is habitual and that people not always elaborate all the costs and benefit (Aarts et al., 1997). This means that the introduction of P&R not automatically means that people will use it, although the value it offers is larger than the travel mode they use before.

A second critical remark on the model of Customer Perceived Value is that people should know all the costs and benefits of each option before they could make a decision. But in reality people don't know all the costs and benefits of each travel mode, and base their decision on the limited information they have. Their lack of knowledge is especially the case with the introduction of a new travel mode; for instance a new Park and Ride facility.

In theories about human behaviour often a distinction is made between habitual or automatic behaviour and planned behaviour (Dijst et al., 2002). With regards to travel behaviour the discussion is about the question whether this behaviour is habitual or planned. The answer on this question has consequences for policies aiming at a change of the modal split, because for each type of behaviour different instruments are needed to achieve a change. The theory that travel behaviour is mainly habitual is partly based on the relation between prior and later behaviour. Analyses show that prior behaviour is

a significant predictor of later behaviour, over and above intentions and perceptions. It is argued that when travel behaviour is planned the relation between prior and later behaviour should only be indirect. A study of Aarts et al. (1997) showed that people with a strong habit use less information for the choice between travel modes than people with a weak habit. Habitual travel behaviour thus means that people choose their travel mode without much consideration.

At the other hand, it is argued that the relation between prior and later behaviour not automatically indicates that behaviour is habitual. It is argued that the relation only shows that behaviour remains stable over time and that travel behaviour still could be planned (Bamberg et al., 2003a). If travel behaviour is planned and circumstances remain the same over time, it is only logical that also the choice between travel modes doesn't change. The study of Bamberg et al. (2003a) used the Theory of Planned Behaviour (TPB) of Ajzen to explain the choice for a travel mode. According to this theory human behaviour, also travel behaviour, is guided by beliefs about the likely consequences of the behaviour (Attitude), beliefs about the normative expectations of other (Subjective norm), and beliefs about the presence of factors that may facilitate or hinder the performance of the behaviour (Perceived Behavioural Control). These three factors together create a behavioural intention which is the immediate determinant of behaviour. Behaviour is thus assumed to be reasoned, controlled and planned. Several studies have been done to test the TPB in combination with travel behaviour, these studies showed that the providing of information about other travel options could be successful in changing travel behaviour (cf. Bamberg et al., 2003a, 2003b). The weakness of these studies is that they often studied situations with changing circumstances (such as moving or changing work) and therefore do not say much about the impact of providing information when all circumstances remain stable.

The paragraphs above make clear that there is no consensus about travel behaviour. But maybe it is not possible to say that it are only habits or only intentions that predict behaviour. A study among university staff focuses both on habits and intentions. The results were that intentions indeed predict behaviour, as the Theory of Planned Behaviour argued, but also that the stronger the habits the weaker the predicting value becomes (Gardner, 2009). Also the model of Gärling and Fujii (2009) on ingredients for travel behaviour modification is based on both habits and intentions (see fig. 2.2). In the following paragraph this model will be used to describe travel behaviour modification instruments.

2.2.2 Travel Behavior Modification

There are three types of modification methods: methods of money, methods of power and methods of words. The first two methods are structural methods, such methods aim at changing travel options. Methods of words are psychological methods with the aim to change travel behaviour, without changing travel options (Gärling and Fujii, 2009).

Money methods refer to the introduction of new travel options or the modification of these options in order to increase the value these options can offer to travellers compared to the value the undesired option deliver to them. An example of it is the improvement of public transport. Power methods refer to physical power such as the closure of roads and to political power. An example of political power is the prohibiting of cars in the city centre and force car drivers to use other travel modes or to park somewhere else.

Drawbacks of structural methods are the costs, which are often high, and they could raise negative public attitudes. Furthermore drivers, especially those with a strong habit, not always become aware of the improved value that other travel mode can offer to them. To reduce the costs of structural methods also temporary structural methods could

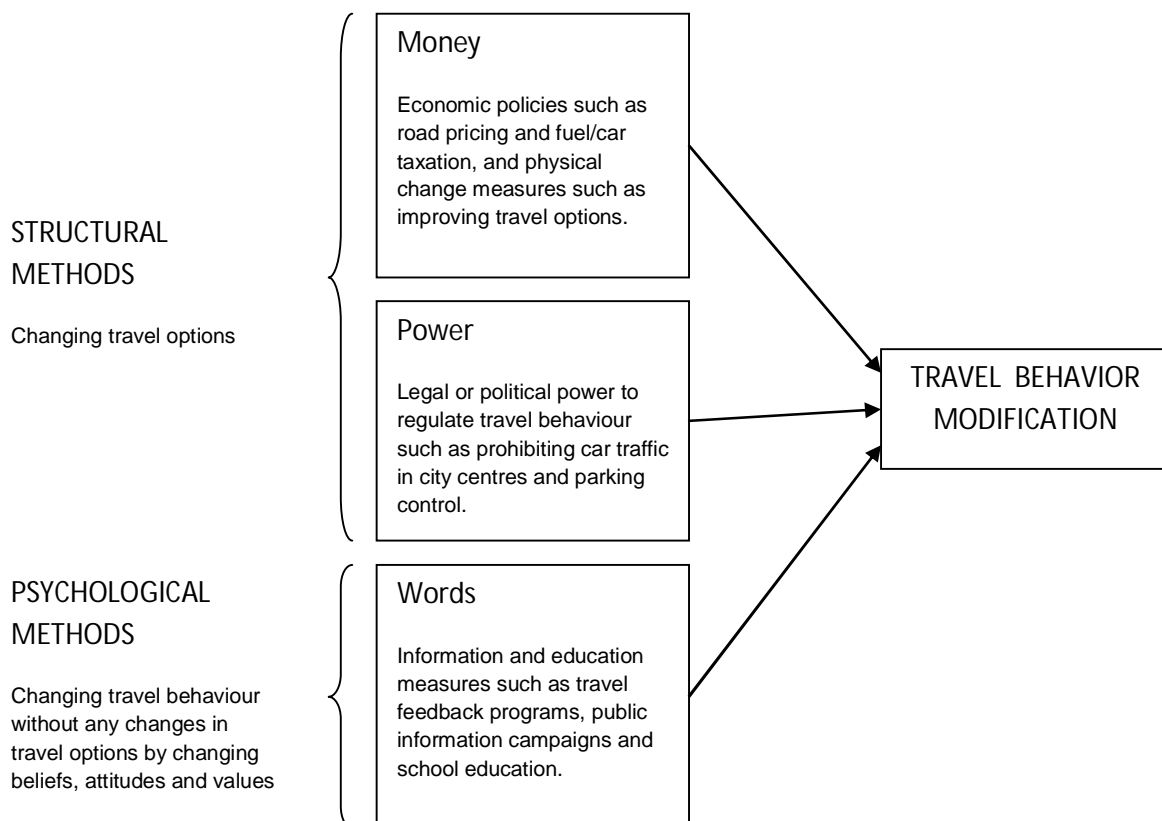


Figure 2.2 Ingredients of methods to change travel behavior (Gärling and Fujii, 2009)

be used. A successful example is the offering of free public transport tickets for a short period (Fujii and Kitamura, 2003).

Psychological methods are mainly methods of words or communication and consist of two types, individual and mass communication. These methods aim at changing psychological factors such as cognitive skills, beliefs, attitudes and values or norms (cf. Garvill et al., 2003). Psychological methods could be useful when car drivers are not aware of the value that other travel modes can offer them, either because of habits or because they never used other travel modes before. Individual communication could be the offering of personal travel plans to new employees or residents (Bamberg et al., 2003b; Dijst et al., 2002). A study on the Theory of Planned Behaviour among users of Park and Ride in Groningen showed that egoistic concerns, the consequences of using P&R for themselves, are an important reason to use P&R. This result implies that in order to promote attitudes in favour of using P&R, it is important to communicate the individual advantages of using P&R (De Groot and Steg, 2007). Such Individual communication could be successful in breaking habits (Gärling and Fujii, 2009). Mass communication is also an option but has as a drawback that it is not customized to the attitudes of the receiver and it could be easily ignored. The effects of these methods could be enlarged when several methods are used together (Gärling and Fujii, 2009). Sometimes combinations are necessary, if for example psychological methods aim at increasing awareness on public transport it could be necessary that the value that public transport offer gets improved with structural methods.

2.2.3 CPV and travel behavior, the case of P&R

This paragraph will combine the theories about travel behaviour and how to influence this behaviour with the model of Customer Perceived Value. This combination should make clear how to make that potential users of Park and Ride add a higher value to it compared to undesired travel modes.

First structural methods are needed to make it possible that the park and ride facility is able to offer a better value. These methods thus aim at the functional value and the costs of the travel mode, for instance the development of good bus connections and a good location. Besides that, also political measures are needed, the park and ride policy should be integrated in the broader long term transport policy, this will be discussed in the next paragraphs (Bos and Van der Heijden, 2005). The previous paragraph made clear that offering a good product is not enough to convince people to use P&R. To convince them also psychological methods are needed. Psychological methods target the emotional value P&R can offer and besides that make people aware of the costs and functional benefits of P&R, thus making people aware of the results of structural methods. Which psychological methods are used depends on the target group; employees or visitors, and the role habit plays a role.

Especially for employees, who drive the same route every working day, it is plausible to assume that habits play a role. In that case it is necessary to contact them when they are open to new information, such as changing home or job. Secondly, the communication of the benefits park and ride can offer to them is important, because research made clear that egoistic motives play a role. Finally they should have the possibility to experience the benefits of park and ride, perhaps with the offering of free tickets.

Tourist doesn't come that often to a city and it is therefore more difficult to contact them. At the other hand it is possible that they don't know exactly where the parking possibilities are in the city. Their search for parking possibilities automatically should bring them to park and ride facilities and should make them clear what the benefits are of using park and ride. This could be done via communication via internet or on the road with road signs that direct them towards the facility.

Breda is a regional shopping centre, it could therefore be assumed that a large part of the visitors visit the city relatively often and thus habits can play a role. When habits play a role there is a minimal search for information about other travel modes.

Communication methods therefore should bring the potential users in contact with the information and the information should be as customized as possible. For instance, inhabitants of Etten-Leur are offered different information about travel options than inhabitants of Oosterhout.

2.3 The context of Park and Ride

As stated above the goals of Park and Ride could be on stimulating economic growth and improving the accessibility of the inner city. These goals make clear that the Park and Ride concept is a part of the wider urban policy. Park and Ride policies are part of economic, transport, and environmental policies. The following paragraphs will elaborate the relation of P&R with these urban policies.

2.3.1 Urban Competitiveness

To sustain and/or improve the urban economy it is important for a city to be attractive. Cities had to attract various target groups towards their city and to do this they had to compete with other cities or regions with offering better value for money (Begg, 1999; Van Winden, 2005). Urban competition can focus on several target groups but in relation with Park and Ride the three relevant groups are visitors/tourist, companies and residents. Tourists are important for the local businesses; retail, tourist accommodations, etc, where they spend their money. Companies generate besides local tax income also employment for local residents. Residents are important for cities because the income they spend and their local tax payments.

Park and Ride is relevant for visitors of a city because of their modal split; a large percentage of the visitors of Dutch cities travel by car and thus parking possibilities are needed in these cities. P&R can be relevant for residents of the target area (inner city), especially when P&R is combined with a restrictive parking policy that limits the parking possibilities in the centre of a city. At the other hand some cities restrict parking for visitors by shifting parking space from visitors towards residents.

The last group affected by a park and ride facilities are companies. Companies need parking space for their staff and when they are located in the target area the park and ride policy should pay attention on these firms. In order to know when a city offers a better product there are several factors that influence the competitive force of the city. Because the various target groups all have their own reasons to choose a location each target group will be discussed separately.

Companies choose their office location based on the supply, quality and costs of their production factors at a specific location, the accessibility of the location, industry structure and the quality of life (Begg, 1999, Van Winden, 2005, Braun, 2008). The supply of production factors makes clear that companies locate there where there potential employees are located. Van Winden (2005) discusses in his framework more factors but they are less relevant for the Park and Ride concept. The question is how important accessibility and especially parking possibilities are as a decision factor for their location choice; are firms willing to accept a restrictive parking policy and the advantages of reduced traffic levels or will the parking policy be a reason for relocation (Still and Simmonds, 2000). A study of Marsden (2006) shows that parking policies are not a reason for firms to consider their location, transport option becomes important when the decision to re-locate has been taken, but only 15% of the firms indicate staff parking as a key influence on their location choice. This study also stated that integrated transport demand management strategies can do much to offset the impacts of a restrictive parking policy. At the other hand firms can use parking availability as a threat towards local authorities (Mingardo, 2009b).

The second group of companies affected by a parking policy are retailers. Retailers often see the availability of parking space as essential for retail vitality (Still and Simmonds, 2000). However studies in the Netherlands showed that link between the income visitors spend in retail locations and their modality is weak, the spending per week per person differs only a bit per modality (Mingardo et al., 2009). This result does not mean that parking is not important because a large percentage of shoppers come by car but there is no reason to favour car users especially because the costs of parking cars are much higher than parking costs for bikes and also the fear of retailers for restrictive parking policies is not justifiable.

According to Braun (2008) residents look for a place where they can live, thus a location with attractive housing, job opportunities, shopping and leisure possibilities, close to friends and family, etc. These aspects are in fact part of the quality of life in a particular city. Also part of the quality of life are environmental aspects such as the air quality which is negatively affected by pollution created by traffic. In Western countries most residents own and depend on cars, the availability of parking space is therefore a factor that can have influence of on their location choice. Restrictive parking policies could result in a house move, although little is known about the relation between restrictive parking policies and long term housing location decisions of residents (Marsden, 2006). The availability of parking space makes clear that P&R have an impact on residents that live in the target area of the Park and Ride facility.

For visitors and tourist there are five factors where the attractiveness of the city depends on (Van den Berg et al., 1995). These factors are the primary and secondary tourist products, thus where tourist mainly come for, examples are museums, cultural heritage and shopping and gastronomy possibilities. The third factor is the image a city has; visitors should be convinced they would have a pleasant time when they visit a city. The last two factors, especially relevant for Park and Ride, are the internal and external accessibility. The external accessibility is about the effort needed to reach the city/destination from the origin. The internal accessibility can regarded as the efforts needed to reach the tourism products once arrived in the city. Although all five factors are important especially the primary tourist products should be developed well because this is what attracts visitors to the city. Furthermore each type of visitor (e.g. tourist, fun shoppers, etc.) has his own type of demand for tourist products.

Part of the accessibility of a city is also the availability of parking space. Park and Ride facilities has the aim to intercept visitors somewhere between origin and final destination and these facilities thus have impact on the external as well as the internal accessibility. When P&R is combined with restrictive parking policies this could have an effect on the willingness of visitors to visit the city. A study at a shopping street in Rotterdam showed that around 11% will not come again to the city when parking tariffs are increased (Mingardo, 2009b). This effect could probably be minimized when restrictive parking policies are offset by improvements of other transport options, for instance Park and Ride. Although accessibility is important, 'koopstromenonderzoek' shows that shoppers choose their shopping location mainly because of the distance between home and shopping location, the amount of shops available and the character/ambiance of a city, accessibility and parking plays only a minor role (SES, 2005).

2.3.2 Transport and Environmental Policies

The previous paragraph showed that accessibility, and also parking possibilities, play a role for the three target groups. The research showed also that parking sometimes is seen as very important but that in fact the relation between restrictive parking policies and choice location is often limited, especially when restrictive parking is combined with transport demand management, which can offset much of the impacts of the policy. This conclusion is important for the park and ride concept because it is often stated that Park and Ride should be combined with a restrictive parking policy in the target area (cf. Mingardo, 2008a). This paragraph will discuss the relation between P&R and transport and environmental policies.

The first paragraph of this chapter described several goals of a park and ride policy. Some of these goals are also the aims of the broader transport policy. First park and ride is often used in a transport policy to change the modal split of the city in favour of public transport. The P&R facility should stimulate the use of public transport in the inner city. The change of the modal split is needed when car use in the inner city is so high that congestion occurs or not enough parking spaces are available, which hurts the accessibility of the city. Another reason for reducing the use of car is because environmental reasons. Car transport in the city centre is one of sources of pollution that affect the air quality in the city via the emissions of NO_x and particulates. Furthermore, a reduced air quality can reduce the quality of life, one of the location factors of residents. Especially in the last years the attention to the environmental problems caused by transport has increased. Because of the congestion and environmental problems, governments are trying to reduce the transport intensity whilst at the same time maintaining economic growth, thus decouple economic growth from transport growth (Mingardo, 2008b).

Although a reduced number of cars can mean that also emission are reduced, also public transport creates emissions and when the use of the bus connection is too low emissions can be larger than before (Meek et al., 2009). Increasing transport infrastructure to reduce congestion problems is for most cities no longer an option because of the scarcity of land, needed are measures on the demand side of transport that reduce the need for travelling and especially for travelling by car, also called mobility management. Park and Ride can be part of mobility management because it reduces the need for car travel in the inner city, although the car is still needed to reach the park and ride facility.

The last reason for lowering car use and increasing use of other modes is to improve the profitability and efficiency of public transport. In order to make the P&R facility successful

in reaching these goals it is needed that the transport policy besides P&R also have some other ingredients which are restrictive parking policy, public transport policy and the road network to reach the P&R facility.

A restrictive parking policy, already mentioned a few times, means that parking in the affected area (inner city) is made less attractive. This could be done in two ways or a combination of both; make parking in the inner city much more expensive or make it less possible with a reduction of parking space. But when increased parking fees result in a reduction of parking it is needless to remain parking capacity at the same level. A restrictive parking policy will reduce the Customer Derived Value of parking in the inner city, which is needed to make the use of Park and Ride more attractive.

The two other needed components of the transport policy are more aimed at the improvement of the Customer Delivered Value of the P&R facility itself. Research showed that P&R users want a high frequent public transport connection; the connection also should not be affected by congestion (Meek et al., 2009; CROW, 2004). Investments in the quality and frequency of public transport connections between the park and ride facility and the destination are thus necessary. At the other hand, it is important that investments in public transport are not made at the expense of investments in other parts of the public transport network or investments in bicycle infrastructure. If that would be the case Park and Ride also damages the CDV of other desirable modes of transport and people that don't have access to a car, for instance because they have a low income, and thus had to use the other transport modes get socially excluded (Parkhurst, 2000).

Finally, the road connection from the origin of the visitor towards the P&R should be of good quality. Congestion on these connections should be minimized to make the facility fast and easily accessible and the road connections should be able to handle an increase in car traffic caused by the P&R facility. Easy access also implicates that road signage towards the P&R is developed; people that use the P&R for the first time should have no difficulty in finding the area (Mingardo, 2009a; Bos and Van der Heijden, 2005).

2.4 Conclusion

This chapter made clear that there are five factor which are determined for the use of P&R; monetary costs, time, effort and functional and emotional value. To stimulate the use of P&R these factors should also be investigated on the other travel options. To influence the five factors structural and psychological measures are available, the latter are mainly used to make potential users aware of the benefits P&R can offer them and to influence habitual behaviour. Structural measures aims at the characteristics of P&R and on the municipal policy where P&R should be part of. The following chapter will shed more light on the characteristics of P&R and P&R policies.

3 Experiences with Park and Ride in Dutch cities

There are a number of cities in the Netherlands that had developed P&R, although not always facilities with a destination function. This chapter is based on interviews held in various cities with a park and ride facility that serves the inner city. The experiences of these cities are useful for Breda when a decision is made to develop P&R and to prevent that mistakes will be made. This chapter also shows the importance of the integration of park and ride policies with the broader municipal policies. Interviews were held in Groningen, 's-Hertogenbosch, Nijmegen, Tilburg and Leiden. The first four cities are comparable with Breda on number of inhabitants. The choice for Leiden is justified by the uniqueness, it is the only city in the Netherlands where private parties developed P&R. Furthermore, attention is paid on Rotterdam, based on research already done (Mingardo, 2008a).

3.1 Introduction

's-Hertogenbosch has an old city centre with narrow streets and medieval details, which make the city not very accessible by car. This was one of the reasons in the eighties to start with park and ride; development of additional parking capacity in the city centre would harm the unique characteristics of the centre and too much car traffic will harm traffic safety and air quality. 's-Hertogenbosch started with one P&R facility with limited opening hours, this facility was mainly used by tourist and shoppers. Nowadays there are three facilities, with a total number of 1700 parking lots, and plans for a fourth, and opening hours are expanded which make the facilities also attractive for employees who



Figure 3.1 P&R in 's-Hertogenbosch (right) and Nijmegen work in the centre of the city. Between the P&R facilities and the city centre shuttle services are operated with a frequency of six busses per hour.

The main reason in Nijmegen to start with P&R was the limited capacity of, and congestion on the Waalbrug (Waal bridge), the only entrance from the north. Already in the seventies, the municipality started with policies to stop the growth of car traffic on the Waalbrug connection. In the nineties additional bus lanes were constructed at the bridge and in 2007 a park and ride facility was developed 4 km north of the city. The aim of the facility was to provide a faster and congestion free connection to the city centre and the university area Heyendaal. The P&R facility is mainly aimed for commuters but also visitors can use it.

Groningen, a compact city which make it very suitable for public transport and bike use, started in the nineties with P&R. Groningen choose for limited parking capacity in the centre because parking needs a lot of space and affects the quality of life. In the first years the facilities were located close towards the city centre but nowadays the aim is to locate P&R facilities further away of the centre to make them able not only to serve the centre but also other parts of the city. In the first years, the facilities mainly target visitors but nowadays commuters are the largest group of users. Between the various P&R's and the centre bus connections are developed with a frequency that varies between six and 10 busses per hour.

The inner city of Tilburg is good accessible by car and the municipality tries to improve the accessibility even more. Until now car traffic towards the centre causes no real problems and also in the near future no problems are foreseen. There are therefore no plans to reduce the number of cars in the city centre and to change the modal split. The



Figure 3.2 P&R in Groningen (left) and Tilburg

initiative for P&R, developed in September 2009, came from the political parties who see P&R as an option to improve the accessibility of the centre and as an alternative for inner

city parking. The bus connection, with a frequency of six busses per hour, is only operated during peak shopping hours; evening sale, Saturday and Shopping Sunday. There are also bike lockers available which can be used by employees working in the city.

In Leiden the non-profit organization 'Stadsverkeersplan Leiden' exploits since 1995 a park and ride facility close to the centre. Leiden has an old city centre with not so much space available for cars. According to Stadsverkeersplan the municipality deals in a wrong way with their visitors, they pay little attention to their wishes and demand regarding traffic and parking. Therefore, entrepreneurs themselves developed P&R in Leiden. Users can park their car at the parking area and are transported to their destination in the centre with small busses. These busses are not bound to fixed routes; they can bring and pick up their customers wherever they want in the centre. The facility is open 24 hours a day, busses drives from 6.30 until 02.00. Stadsverkeersplan is an attractive location for parking and there are plans to expand the capacity from 460 towards 900.



Figure 3.3 P&R in Leiden (left) and Rotterdam

Rotterdam has developed P&R because additional parking in the centre will cause a lot of traffic, which could lead to more congestion. However, parking possibilities are seen also as important for the local economy and therefore the decision was made to develop parking spaces outside the city centre. Rotterdam has developed a large number of park and ride facilities, with four top locations in each direction, connected to the existing public transport network. Commuters as well as visitors of the city use the facilities. Research showed that the main reasons to use P&R are comfort, travel time and costs.

3.2 Use of P&R

The use of the P&R facilities is in most cities relatively good, some cities such as Leiden, 's-Hertogenbosch and Nijmegen already had to expand the number of parking places.

Groningen has developed during the years a number of additional P&R facilities and will continue this in future. Some P&R's in Groningen and 's-Hertogenbosch are nearly full during peak hours. The use of the facility in Tilburg, with a capacity of 140 cars, is very low, on the busiest days only 20 to 30 cars are parked. Most cities don't know how large the percentage is of visitors or commuters using P&R. Research in 's-Hertogenbosch showed that around 10 % of the visitors use P&R, this is 20% of the car-using visitors from outside the city.

TABLE 3.1
Use of P&R

	Main reason use	Unintended use*	Main type of user
s-Hertogenbosch	Accessibility P&R location	Occurs, no data	commuter/visitor
Nijmegen	no congestion, cheap parking	Occurs, no data	commuter
Leiden	??	Occurs a bit	??
Groningen	Accessibility destination and accessibility P&R location	17% (Mingardo, 2003)	commuter/visitor
Tilburg	??	??	visitor/commuter
Rotterdam	Comfortable and fast	34% (Mingardo,	commuter

* percentage of users that before used public transport or bike

Most cities are confronted with users that before the introduction of P&R used public transport or the bike, but often no research is done to the size of it, and they have limited possibilities to reduce this (table 3.1). Furthermore the P&R facilities are used as an ordinary parking place, without using the public transport connection, e.g. in Groningen and Rotterdam, although this causes hardly any problems and they don't have possibilities to reduce this. At the other hand there are cities, e.g. Groningen, where this kind of use is stimulated, one P&R facility is also the parking area of an ice rink and there are plans to develop camper pitches on the P&R facilities.

P&R is mainly used because the good accessibility of the areas compared to parking in the city centre. P&R provides also, especially for tourists, a cheap alternative for inner city parking and it provides a fast and congestion free connection to the final destination, e.g. in Nijmegen and Rotterdam. In most cities the largest group of users are commuters but also shoppers and tourists are important users, especially during week-ends.

3.3 Relation with other policies

In all the cities surveyed, there is a clear distinction in parking fees between parking on a P&R facility and parking in the city centre (table 3.2). In 's-Hertogenbosch for instance a bus ticket costs €2.-, on this ticket up to four people can travel between P&R and city

centre. Parking in the city centre costs €2.- per hour, thus already after 1 hour parking on a P&R is cheaper than parking in the centre. In the other cities, comparable tariffs are used, with the exception of Leiden and Rotterdam. In Leiden the tariff differs with the duration of parking between 4 and 10 euro. In Rotterdam parking is free but users had to buy individual public transport tickets, which make the system more expensive compared

TABLE 3.2

Parking fees in city centre and costs of using P&R (spring 2010)

	parking for 2 hours		parking for 6 hours	
	P&R	city centre	P&R	city centre
s-Hertogenbosch	€ 2.00	€ 4.00	€ 2.00	€ 12.00
Nijmegen	€ 2.50	€ 4.20	€ 2.50	€ 12.60
Leiden	€ 4.00	€ 4.80	€ 6.00	€ 14.40
Groningen	€ 2.00	€ 5.10	€ 2.00	€ 13.60
Tilburg	€ 2.00	€ 3.60	€ 2.00	€ 10.80
Rotterdam*	€ 9.60	€ 5.20	€ 9.60	€ 15.60

* round trip metro Kralingse Zoom - metro Beurs, parking in centre:
WTC/V&D

to other cities, Rotterdam is also the most expensive city for parking in the city centre. In chapter two it was argued that the parking policies and the P&R policy had to be consistent with each other. Especially in Groningen and Den Bosch this integration took place. Both cities choose not to build additional parking space in the city centre but to develop it outside the centre at the fringe of the city. 's-Hertogenbosch also reduced capacity in the centre with the abolition of on-street parking and to use existing parking garages only for residents of the centre, the Parade-square has been closed for car parking although they build a parking garage in the centre as compensation. In Groningen they called the use of P&R: 'inner city parking on distance'. The city discourages on-street parking and wants to realize future expansion of parking capacity on park and ride facilities. To prevent that employees park their car for free in neighbourhoods around the centre, parking is in these areas only allowed for inhabitants of these neighbourhoods.

Rotterdam chooses to realize the needed additional parking capacity outside the city centre to prevent that traffic levels in the centre will rise. Leiden, a small city, wants to have parking capacity at the fringe of the inner city instead of in the centre.

Nijmegen developed park and ride especially to reduce congestion on the route towards the inner city and not to keep parking out of the city centre. The city not really has a restrictive parking policy, although if additional parking capacity is needed only for peak hours this will be realised on the P&R facility and not in the centre of Nijmegen.

Tilburg has not integrated park and ride in the parking policy. The city wants to have a centre that is optimal accessible by car. P&R is just an additional parking option for people. The policy of Tilburg is not aimed to make the centre less attractive for car transport. Although it should be mentioned that Tilburg has enough space to allow and facilitate cars in the centre, car traffic will not hurt the quality of life in the centre as it is the case in 's-Hertogenbosch and Groningen.

Although many of the cities surveyed are active in trying to keep the car out of the centre, all cities focus not only on P&R. All cities provide parking capacity for the inhabitants of the centre, some cities developed parking garages especially for them to prevent on-street parking. Every city also keeps parking possibilities in the city centre for visitors, also Groningen, with has a good developed P&R policy still has around 2000 parking spaces in the inner city and 2800 on P&R facilities. This is however reasonable, especially for a short visit it will take much additional time when one had to use park and ride. Parking on P&R will in general take more time and therefore becomes only an option for longer visits. Besides that, the cities emphasize that their first goal is not to force car drivers to park outside the centre but to provide good alternatives for parking in the centre, people still can park in the centre but it will cost them a lot more money.

Besides a relation with parking policies, 'park and ride' could be linked with the economic policy of a city. P&R especially has impact on accessibility, one of the factors that determine the city's competitive strength, and can improve it. At the other side it is possible that a restrictive parking policy in the centre will hurt the accessibility.

Groningen, Nijmegen and Den Bosch emphasize that P&R have improve the accessibility, although it is difficult to measure this. In Nijmegen the number of cars using P&R is not such a large percentage of the total number of cars using the Waalbrug per day, but most of the cars otherwise would travel during peak hours which enlarges the positive impact of P&R. In Groningen and Den Bosch it would no longer be possible to provide space on the road and on parking facilities in the centre for those cars now using park and ride, especially during peak hours. P&R furthermore provides a possibility to reach the work destination without congestion, which can make the city more attractive as a location for businesses, although accessibility is only one of the factors determining the location choice. Finally, P&R can improve the image of the inner city, as was argued in Leiden. The prohibiting of on-street parking in the centre will improve the image of the streets and the quality of life, which can make the city more attractive for tourist.

Groningen and 's-Hertogenbosch address sustainability as one of the reasons for park and ride. Groningen has plans to develop a tram network, to improve the sustainability of park and ride. Car traffic has a negative impact on the air quality and park and ride could

decrease the number of car-kilometres. The banning of cars in the centre makes more space available for cleaner transport modes. A problem of park and ride is the attractiveness they have for people that formerly used the bike or public transport. At the other hand the impact of car emission on the air quality is mainly a local problem and the reduction of car kilometres in the centre will have a positive impact on air quality.

In Leiden the park and ride facility plays a role in the municipal climate policy, there are plans to develop charging points for electric cars on the facility and they try to make the bus connection more climate friendly, at the moment they have one bus that makes use of biogas.

3.4 Costs

The interviews showed that in each city the costs and benefits of park and ride are not in balance. First, a large investment is needed to develop the area and construct the facilities. Furthermore, costs are made for exploitation of the parking area and the public transport connection. In most cities public transport is part of the public transport concession which makes that the municipality do not bear costs but also revenues goes to the transport company when user had to pay only for the transport connection.

Groningen tries to cover all costs and use the revenues of paid parking in the centre to develop the park and ride facilities. This makes clear that inner city parking is often a important source of revenue for a municipality, the interview in Tilburg showed that these revenues are one of the reasons not to limit parking in the centre.

In most cities, higher governmental authorities are financially involved in P&R. In Nijmegen the first years subsidies were granted by the national government, the city region Arnhem-Nijmegen and the province of Gelderland. In Groningen the national government contributes to park and ride with the 'Regiospecifiek Pakket Zuiderzee', financial compensation for the discontinuing of developing a rail connection between the Northern provinces and the Randstad. Although in many cases higher governments contribute to park and ride, these subsidies are often temporary.

3.5 Public transport connection

In four cities, Tilburg, 's-Hertogenbosch, Nijmegen and Groningen, the bus connection has become part of the public transport concession. This means that not the municipally but another governmental layer, e.g. the province, is responsible for public transport and thus also for the link between P&R facility and city centre. In Leiden Stadsparkerplan have their one busses and Rotterdam has no public transport links especially for P&R. In some cities the first years the municipality was responsible for the bus connection. The advantage of it is that the municipality is not responsible for the costs but also their influence on the connection becomes less. Furthermore, it could be at the expense of the quality of the connections as is the case in Nijmegen. The connection between P&R and

centre is just one of connections wherefore the transport company is responsible. The importance of the connection is thus not so large for the company as it is for the municipality, for instance the dealing with complaints takes much more time than before. The research showed that it is better to develop a direct connection without stops in between. In 's-Hertogenbosch they had an additional stop at the central station, but this makes the park and ride facility also attractive for train users. These additional users of the park and ride facility and bus connection caused too much troubles regarding capacity, which goes at the expense of the quality. Both Groningen and 's-Hertogenbosch points out that it is better to have a direct connection in order to keep quality high, but as a drawback costs will be higher.

The bus connection often has a high frequency (6 busses per hour), especially during peak hours. Interviewees see this as essential in order to provide a fast alternative and make P&R successful.

3.6 Conclusion

The interviews made clear that there are some important characteristics of P&R. First P&R should be part of the municipal policies and restrictive parking policies are needed in the target area. Also the public transport connection is important because this should provide users with a fast and frequent connection with the inner city. Finally it is important that the P&R location is easily accessible by car, without congestion, locations on the route towards the centre are preferable.

4. Characteristics of Breda

This chapter will deal with the fourth sub question of this research and will make clear what the characteristics of Breda are, in relation with park and ride. Is the city of Breda for example confronted with parking problems wherefore park and ride could be a solution? Because the focus of this thesis is mainly on a park and ride facility that serves the inner city of Breda, the investigation of the characteristics will pay the most attention to the city centre. The first paragraph will describe the functions of the inner city, the paragraphs thereafter will pay attention on transport, environmental and economic policies for the (inner) city.

4.1 Functions of the city centre

The inner city of Breda concerns the area within the Singel, formed by the rivers Mark and Aa (see fig. 4.1). The inner city is divided in six neighbourhoods: City, Chassé Park,



Figure 4.1 City centre Breda (circled in red)

Valkenberg, Fellenoord, Schorsmolen and Stationsbuurt. The main shopping area is located in the City neighbourhood. The inner city mainly has three functions: it is a location for living, working and visiting.

The six neighbourhoods of the 'centrum' area together provide housing for 12,939 inhabitants, the total number of inhabitants of the municipality is 173,304 (CBS StatLine). Measured by population, Breda belongs to the ten largest municipalities of the Netherlands. The average disposable income of the inner city is around €27,500, somewhat lower than the average income of the whole city.

In relation with parking policies, and park and ride, the number of cars owned by the inner city residents is important. The data selection on this topic is based on the zip code of the inner city (4,811). The total number of cars owned by the city centre inhabitants is 5,318, which means that the car/residents ratio is 0.39 and the car/household ratio is 0.59 (CBS StatLine). These ratios are much lower than the average ratios for the whole municipality (table 4.1).

TABLE 4.1

Car ownership inner city of Breda

2008	Centre (zip code 4811)	Breda
Number of inhabitants	13,805	170,960
Number of households	8,975	79,892
Number of passenger cars	5,318	139,327
Car ownership per inhabitant	0.39	0.81
Car ownership per household	0.59	1.74

Source: CBS StatLine

The inner city is besides a location for living also an important provider of jobs. Around 20% of the jobs, created in the municipality, are located in the inner city (BreDATA). Main providers of employment are the sectors trade (mainly retail) and hospitality (cafe's, restaurants), which together create around 3500 jobs. The two other important sectors are the government and the health care, the importance of the government is mainly because the municipal offices are located in the centre of Breda. Especially for these two sectors it is possible that jobs are included which their real workplace outside the city centre, such as municipal gardeners.

The amount of jobs created by the sectors retail and hospitality make clear that Breda is an important shopping city, compared with other Dutch cities on the total square feet shopping floor Breda ranks seventh. In the inner city around 110,000 m² shopping floor is available and on the 'woonboulevard' (large shopping centre), at the fringe of the city, a comparable surface area is available. In the city centre, especially shops in the clothing and home ware branches are present. (Gemeente Breda, 2006a)

Tourism is the third major function of the inner city. A research among visitors showed that in 2008 1,513,000 individuals visit the city (mainly the inner city), with a frequency of 2.9 visits the total number of visits is 4,399,000 (NBTC-NIPO, 2009). This number of visits makes Breda the sixth visitor city in the Netherlands. The mostly undertaken activity of these visitors is (fun-) shopping, which is also explained by the high rank of Breda in the available shopping space. Visitors of Breda see the city as attractive as

showed by the second place the city won in 2009 in the election of most hospitable city and the election of Breda as city with the best inner city of 2009/2011. In both elections Breda scored well on accessibility and parking possibilities (Van Spronsen & Partners, 2009). These results are important for the decision on the development of a park and ride facility, if possible such a development should not damage the good image Breda now have. At the other hand, most regional shoppers choose Breda because the amount of shops available (36%), the distance to their home (33%) and the ambiance of the city (20%), parking possibilities were only for 1% the main reason to visit Breda (SES, 2005).

4.2 Inner city transport

At present the modal split of Breda is dominated by cars. Research among tourists showed that 77% of them use the car to reach Breda, only 21% use public transport (NBTC-NIPO, 2009). In the modal split of all external traffic, traffic that enters the city and have their origin outside, cars have a share of 85%, against 9% and 6% for public transport and bike (Goudappel Coffeng, 2009). Cars have a smaller share in the modal split of internal movements, 52%, public transport only 1% and bike 47%.

Now research is done on the modal split of employees in Breda, but data from the CBS showed that in the province of Noord-Brabant 65% use the car, 5% public transport and 24% bike. Compared with the modal split related to degree of urbanization, 60% and 63% for a strong respectively moderate degree of urbanization, it can be assumed that in Breda the modal will be around 63% and 59% when only car drivers are taken into account (CBS Statline). When this percentage is compared with the number of jobs (18,780) in the inner city, 11,000 car movements per day will be made. However this calculation assumes that each jobs represent one person and each employee is assumed to have their real work location in the centre and travel towards it every working day. Another research on mobility calculated 37,109 car movements per day for the inner city, and a share of cars in the modal split of 51%, but this calculation includes not only commuters but all car movements (Goudappel Coffeng, 2008).

If compared to other cities the share of cars in the modal split of Breda can be seen as relatively high (Goudappel Coffeng, 2009). Reasons for this are the good car accessibility of Breda, the large supply of parking space in the inner city and the relatively low parking fees (Heessels, 2010). Another reason could be that the municipality never expressed their preference for one of the transport modes. These factors together made that Breda nowadays is seen as a real car depended city. But the last years the large amount of cars becomes problematic because of congestion and pollution, which hurts the quality of life and accessibility. Furthermore the Singel is too often used as a route for through-traffic,

while it has not the capacity to handle this. The increased congestion in the inner city, mainly during peak-hours, also hurts the reliability and efficiency of the public transport network.

The inner city has a number of locations where visitors and commuters can park their car (Fig. 4.1). Besides some privately owned areas, the municipality is owner of three parking areas and 5 parking garages, and also on-street parking is possible, together around 8,500 parking lots are available. The parking fee within the Singel is €1.90 per hour and €1,60 per hour in parking garages. Outside the Singel area there are also some areas where paid parking is introduced against a fee of €1,20. Inhabitants of the inner city can buy a parking permit for €6,55 per month. Employees can buy parking permits with prices that differ between €20 and €46 and between €39 and €84 for the parking garages.

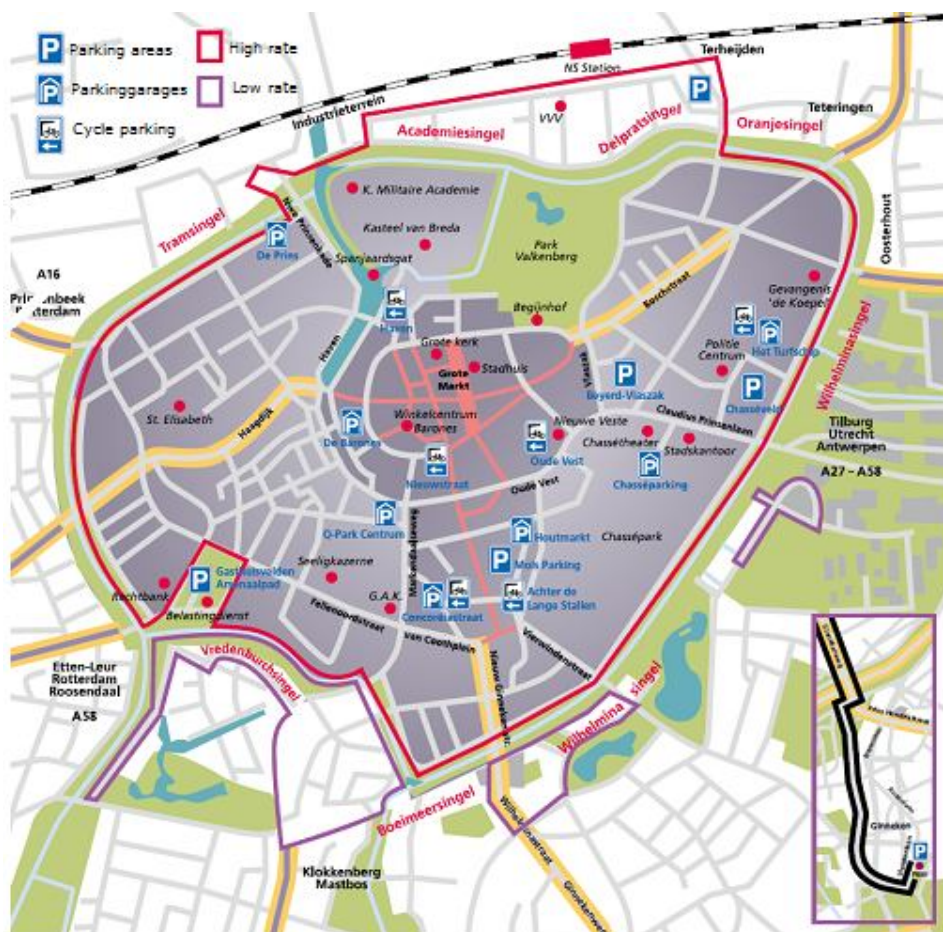


Figure 4.2 Parking areas in the city center

Until now enough parking capacity is available, at peak hours around 85% is occupied and around 1200 parking lots are available. However, the distribution between the various parking locations is not optimal, some parking garages face a occupation level that is too high, resulting in long waiting times and congestion, while others have a lot of

space available. The aim of the municipality is to have an occupation level of 90%, higher levels will increase waiting times and search traffic.

4.3 Transport policy

The last years the municipality increasingly pays attention on the problems caused by the large share of cars in the modal split. In Breda an extensive infrastructural car network is available, which makes Breda good accessible by car. But when car traffic level continue to grow an extension of the infrastructure is needed, however such an extension is not possible because of the scarcity of land. The 'Structuurvisie Breda 2020' therefore stated that it is necessary to maximize the use of the current infrastructure and to stimulate the use of other transport modes (Gemeente Breda, 2007a). A change of the modal split is thus necessary, especially in the inner city. In addition, the traffic policy published in 2003, had the aim to increase the use of the bike and public transport, but these targets were not met (Gemeente Breda, 2003). The reappraisal of the traffic policy also stated that a change of the modal split is necessary, the ambition is to stimulate bike use, especially on short distances, with investments that make Breda much more bike-friendlier, such as bike lanes and bike parking facilities (Gemeente Breda, 2010). The spatial vision of Breda designates Bus Rapid Transport, which provides a faster and more efficient way of transport than an ordinary bus connection, as the future carrier of public transport in Breda. There is already one BRT axis between Etten-Leur and Breda and there are plans to extend this axis towards Oosterhout (fig. 4.3)

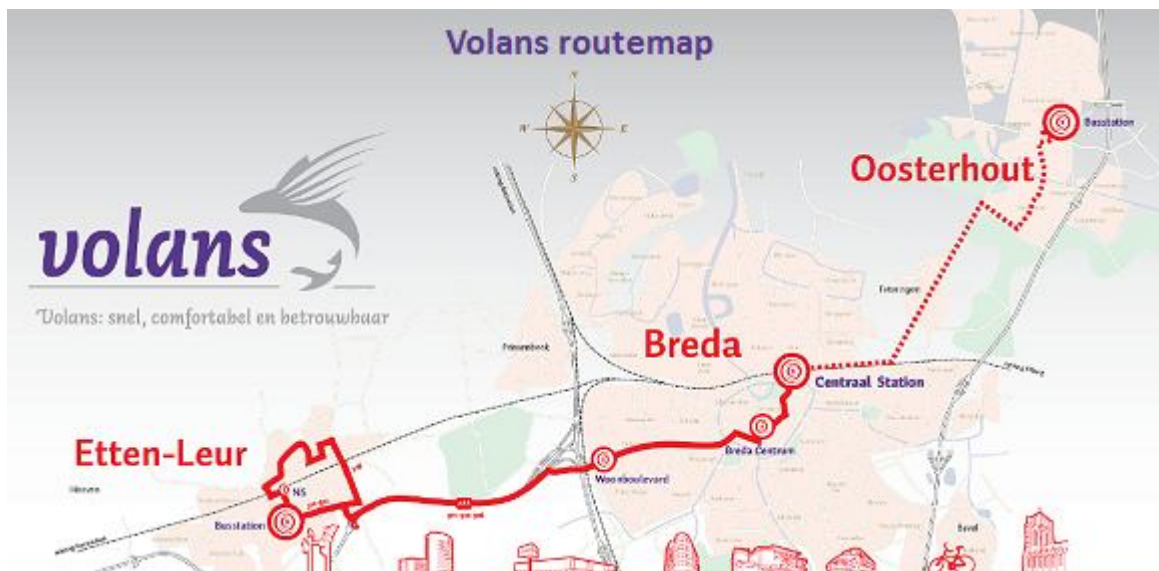


Figure 4.3 Bus Rapid Transport (HOV) in the Breda region

When the number of visitors continues to grow in the coming years it is no longer possible that around 75% of them come with the car and park in the centre with the current amount of parking space. Furthermore increasing car levels will hurt the quality of the inner city. The problem could be tackled by the construction of new parking spaces

in the centre or, preferable, elsewhere. Also a change of the modal split is an option to prevent problems. Parking policy is thus one of the instruments that can be used to change the modal split, although the reappraisal points out that until now parking policies are not used for this. An example of using parking policies is Park and Ride, mentioned by the spatial vision.

Not only the municipal organization pays attention on the modal split and the large share cars have in it. Also political parties pay attention, in their election programs they argued that the modal split had to be changed in favor of public transport and bicycle and they name P&R as one of the options therefore. However, the question is if they are willing to take measures aimed at reducing the possibilities to enter the city by car, for example with a restrictive parking policy.

4.4 Environmental policy

The last years more and more attention is paid on the climate and the possible influence humans have on it. Also the new coalition program of Breda pays attention on climate policies. The policy note "Steek positieve energie in het klimaat" (Gemeente Breda, 2008) described the climate policy of the municipality. Breda has the aim to be a CO₂ neutral city in 2044, in 2015 already a CO₂ emission reduction of 25% had to be made compared to the emission level of 2006. To realize this, the municipality will reduce the dependency on fossil energy sources and stimulate the use of durable energy. Breda wants to realize a CO₂ emission reduction on five different fields; transport, firms and organizations, municipal organization, houses and energy production. On the transport field a reduction have to be made by an increased use of more sustainable modes of transport such as bike and public transport, for example with the construction of fast bike lanes and cheap public transport. In addition, mobility management is mentioned as an option for businesses and organizations to change the modal split of their employees. The choice for transport and mobility as one of the fields to reduce the emission of CO₂ makes sense; transport is one of the biggest producers of CO₂ in the EU, the transport sector consumes 60% of all the oil in the EU. Successful measures on transport could thus be an important contribution to the aim of making the city CO₂ neutral. At the other hand, a municipality cannot force their residents to use cleaner ways of transport and energy.

4.5 Economic vision for the city

This paragraph deals with the economic policy of the municipality of Breda on the inner city and is based on two policy documents: 'Het stadshart moet kloppen' (Gemeente Breda, 2007b) and 'Ontwikkelingsvisie cultuur en economie' (Gemeente Breda, 2006b). To stimulate the local economy of Breda three different sectors are designated which can contribute to the economic growth. The stimulation of the economy became necessary

because the local economy falter, employment decreased, mainly because the closure of some production plants, and unemployment increased, especially among low educated and youngsters. The first sector is trade and logistics, with this sector Breda can profit from its strategic location between the Dutch Randstad and de Flemish Diamond and between the ports of Rotterdam and Antwerp. The second sector is the knowledge industry, and combined with this is the attention paid on creative industries. The third sector mentioned is hospitality; especially this sector is relevant for the inner city. The development of the hospitality sector aims at a quality improvement of the inner city as a regional shopping centre, a safe going out and meeting centre and as a podium for culture. In addition, the further development of retail and catering sector belongs to it with the redevelopment of several areas in the city area such as "De Lange Stallen". The policy on hospitality should increase the attractiveness of the inner city on various times and for various target groups (residents, leisure, visitors), this to increase the number of visitors. The policy pays not only attention on current residents, but also focuses on improving the living climate of the centre area to increase the number of inhabitants, which have consequences for parking when new residents ask for parking space. Part of the policy on improving the attractiveness of the inner city is, according to the policy documents, the accessibility of the inner city. The inner city should be easily accessible by every target groups and every mode of transport. Parking possibilities in the inner city also belong to this; the guiding of visitors towards the parking areas should be improved to reduce search traffic. Although accessibility is mentioned as important, the policy documents admit that an increase of car traffic towards the inner city is not possible and not desirable. To reduce the share of cars in the modal split the document mentions the improvement of public transport and biking possibilities. Besides that, also the P&R concept, in combination with peripheral area (re-)development, is mentioned as a possible option to change the modal split in the inner city.

4.6 Conclusion

Until now enough parking capacity is available, although the use is not optimal. However, in Breda parking in combination with the extensive use of the car causes problems. Because of car use congestion increased and the quality of life is affected. Besides that also the other transport modes are affected by the high car level. To solve these problems the municipality wants to change the modal split, the municipality is willing to take measures to reduce the use of the car because they see that a further grow is not possible and desirable. One of the mentioned options is P&R, this means that in Breda there is room to develop P&R.

5. The possibilities to introduce P&R in Breda

In this chapter the results of various interviews held with local parties will be described. Interviews were held with local entrepreneurs, most of them active in the retail sector in the inner city. They are asked for their opinion about the importance of cars for the local economy, parking policy and park and ride. Secondly, interviews were held with employees of the municipality to find out what the possibilities of P&R are in relation with current and future policies. One interview was held with the province of Noord-Brabant, not a local party but the province is responsible for public transport and, in the past years, financially supported the development of P&R. Finally, research was done among visitors of Breda's inner city. They were asked for the motive to visit Breda, their mode of transport and, most important, their willingness to use a future park and ride facility in Breda.

5.1 Local entrepreneurs

Breda has a modal split in which car traffic plays an important role. The interviewees, most of them active in the retail sector, see the car as an important transport mode, some of them think that car drivers spend more than users of other modes. But also when there is no difference in spending, car users are the largest group of visitors. To sustain the economic strength of Breda it is important that policies on car traffic don't result in a loss of visitors. At the same time they are aware of the problems car traffic causes in the centre, and they agree that in the future these problems can increase when the number of visitors continues to grow. Especially on peak moments congestion and long queues occur at some parking garages (e.g. De Barones).

Most interviewees are positive about policies aimed at making the use of public transport and bike more attractive, but points out that visitors not always have the opportunity to use other modes than car. Policies with the aim to reduce the attractiveness of using the car are met with resistance. Some of the interviewees see such a policy as a way of bullying cars and has the opinion that such a policy would make Breda less attractive which will finally result in a loss of visitors. Besides that, they argue that a restrictive policy is not in line with the aim of Breda to become more attractive for visitors. When Breda wants to attract visitors the city should investigate their needs and wants, in this case accessibility by car.

At the other hand the interviewees agree that something must happen in order to solve the problems car traffic now causes in the city centre. They often mention the improvement of the accessibility of parking garages; the road signage towards these garages should be improved, and it should be possible to show visitors where they can park in the centre and how much places are available.

Another option to improve the accessibility of the city is P&R, all interviewees are positive about it. Local entrepreneurs mentioned the idea already several times in the past. They see P&R as an good option for visitors of Breda, especially on peak hours. It could also be used for employees but this requires extended opening hours.

The combination of Park and Ride and a restrictive parking policy causes some resistance, 4 out of 7 interviewees are opposing this. Some of them clearly choose for a policy that both develops park and ride and improves parking, capacity and accessibility, in the inner city, although some see it as an option to develop new parking capacity on a park and ride facility if needed in the future. Around 50% of the entrepreneurs is positive about the combination of P&R and restrictive parking policies. According to their opinion parking in the centre of Breda will cause too much problems to the quality of life in the city. They see the replacement of parking capacity to P&R as an option to increase the attractiveness of the inner city and to improve the accessibility. Both options of restrictive policies, raising tariffs or reducing capacity, were seen as an option but the first is preferable, there should be a difference between tariffs on P&R and in the city centre. Other interviewees are opposed to raising tariffs; to their opinion tariffs are already high and according to them it is a better option to make park and ride very cheap or even free. The interviewees who are opposing restrictive parking policies in combination with P&R often say that making P&R cheap and easy will be enough to create demand for it.



Figure 5.1 Possible P&R locations mentioned by interviewees

Questions were asked on their preferences for a park and ride facility. All interviewees name safety as an important factor of an successful facility, if possible the facility should be manned and lighted. To their opinion P&R should have a good public transport connection with high frequencies. Furthermore the area should be easily accessible by car

which make it preferable to locate close to the one of the highways A16 or A27 (fig. 5.1). To conclude: all interviewees see P&R as a possible option for Breda and they agree that parking at present cause some problems, although the majority also wants to develop parking in the centre even further.

5.2 Municipality

Chapter four already mentioned that the municipality has tried to change the modal split in favour of the use of bike and public transport. The change especially had to be made in the inner city. The evaluation of the parking policy in 2010 showed that until now this change isn't made despite of large investments in biking and public transport. Also P&R was a few times mentioned as one of the options to change the modal split. For example the 'Verkeersplan' dating from 2003 showed some possible locations for P&R in Breda (Fig. 5.2). This policy documents saw P&R especially as an option during peak hours. The goal of P&R should be to reduce the traffic intensity and the need for parking in the



Figure 5.2 Possible P&R locations mentioned in Verkeersplan, 2003

centre, a further increase of traffic is not possible and not desirable. P&R is also seen as an instrument to shift from car traffic to more sustainable ways of travelling.

In the coming months a new traffic and transport policy will be composed. This will continue the current policy but is more aimed at feasible target. This creates room for the investigation of other ways of transport and the possibilities they have for Breda. Furthermore Breda should make a choice between the various travel modes in the inner city. A choice for cars will mean that it is not possible to develop good quality public transport and will reduce the spatial quality of the inner city. At the other hand Breda can choose for more sustainable transport which makes that cars get less space but the spatial quality and character of the inner city can be improved.

The introduction of P&R will fit in a choice for less car traffic in the inner city and an increased use of more sustainable ways of transport. But therefore it is needed to combine P&R with a restrictive parking policy in the inner city. The number of parking space is sufficient, the problems lies in the division between the various parking areas. In future an increased used of different parking tariffs and the development of a dynamic parking guidance system are possible. Furthermore, on-street parking could be limited which will improve the quality of the inner city. A choice for P&R means that in the future no new parking capacity should be developed in the centre. Introduction of P&R is a good time to change the distribution of parking capacity between residents, visitors and employees, which fits within the municipal goal to increase the number of residents in the centre. A reduced capacity for visitors could be compensated by P&R.

Regarding public transport a choice can be made between using the existing public transport network or the development of a dedicated bus line. This last option could be developed better according to the wishes of P&R users but has as a drawback that the costs will be high especially when a high frequency is required. Making use of the existing network is a cheaper option but has also some drawbacks. When a high frequency is required there are only a few location possible for P&R; the Volans-axis, the Terheijdenseweg and the Claudius Prinsenlaan (fig. 5.2). Furthermore the intervals of the existing bus lines are irregular and the Terheijdenseweg is not good accessible from the highways A16 and A27. Especially the first years the use of existing bus connection is preferable, with a adaption of current frequencies. To improve public transport the construction of bus lanes could be an option but there is only little room for in Breda. During the interviews it was several times mentioned that P&R would be an expensive policy measure. Maybe it is possible to use money of a future mobility fund, with the revenues of inner city parking. The imbalance between costs and revenues of P&R means that it is necessary to create enough support. P&R should be developed in such a manner that it is beneficial for the user and for the city itself compared to going on with facilitating inner city parking. It should be made clear what the cost and benefits will be for Breda and what the conditions for successful P&R are.

The conclusion of these interviews is that the municipality wants to change the traffic situation, especially in the inner city. More space will be created for bike and public transport and consequently less space for car traffic. The reduction of parking capacity in the centre fits within this and parking could be replaced to the fringes of the city with the development of P&R.

5.3 Province of Noord-Brabant

In recent years the province financially supported the development of P&R in Noord Brabant, for example in Tilburg. The reason for this support is that the province wants to reduce the use of cars and increase the use of public transport. Besides that the province sees it impossible for some cities to provide enough inner city parking space for their visitors in the future. The province is mainly financially involved in park and ride. In the current administration period money was available for the development of P&R at 'Bavelse Berg' in Breda, but this project was cancelled. For a new plan for P&R the province should investigate how much they will contribute. The current administration period will end in 2011 which make it unclear if a new administration will continue with the support of P&R, although in this period the choice for support was made unanimous.

When Breda choose to use existing bus lines for the public transport connection between P&R and city centre or choose for inclusion in the current public transport connection the province will be involved because the province is the concessionaire.

Finally it is possible to involve the province in the marketing of P&R in Noord Brabant. But in that case the system of P&R should be the same (similar way of paying for use) in all cities to make it really possible to promote it on a provincial scale. A similar style (logo) could be helpful in that case.

5.4 Visitors of Breda's inner city

The survey among visitors of the inner city were held on four afternoons, Wednesday 26 May 2010, Thursday 27 May 2010 (shopping evening), Friday 4 June 2010 and Saturday

TABLE 5.1

Modal split visitors

	All	Inhabitants Breda	Non-inhabitants Breda
	%	%	%
Car	53.8	23.8	73.4
Bike	17.5	36.0	5.6
Bus	8.7	13.4	5.6
Train	8.7	0.6	13.9
On foot	10.8	25.6	1.2
Other	0.5	0.6	0.4

5 June 2010 on three locations in the inner city (appendix 1). The survey first asked visitors for some general characteristics of their visit such as length, frequency, reason and travel mode. Secondly questions were asked on P&R. A total of 416 visitors has participated in this research, of which 39% live in Breda, and 32% live in other parts of Noord Brabant, the others live in other Dutch provinces and Belgium (10%).

The question on transport mode shows that around 50% of the visitors used their car, this is lower than the modal split described in chapter four (table 5.1). When a distinction

TABLE 5.2

Length of visit in hours and group size (averages)

	total		Inhabitants Breda		Non-inhabitants Breda	
	Hours	Size	Hours	Size	hours	Size
Total	3.3	2.1	2.5	1.9	3.8	2.2
Car	3.6	2.4	2.5	2.4	3.7	2.3
Bike	2.5	1.7	2.5	1.6	2.3	1.8
Bus	3.6	1.7	2.9	1.8	2.9	1.5
Train	4.6	2.2	2.0	2.0	3.9	2.2
On foot	2.3	1.7	2.3	1.7	2.7	1.7

is made between residents and non-residents of Breda it is clear that non-residents more often use the car for the visit. Visitors were also asked on car ownership; this showed that of the inhabitants of Breda 55% owns a car but didn't use it, while for non-residents this was only 15%.

The main reason to visit Breda is to shop (79.8%) or for leisure (16.6%), and around 50% answered that their visits lasts 2 or 3 hours, with an average length of 3.3 hours (table 5.2). There is a significant relation between the travel mode and the length of the visit, although it explains only 13,4%. Regression, $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 +$

TABLE 5.3

Frequency of visit

	Several times a week	About once a week	About once a month	Several times a year	Less	Total
	%	%	%	%	%	%
Total	14.4	22.0	28.1	26.7	8.8	100
Car	4,5	14,5	31,8	36,8	12,3	100
Bike	18,1	48,6	23,6	9,7	0,0	100
Bus	24,3	21,6	40,5	8,1	5,4	100
Train	5,6	11,1	25,0	38,9	19,4	100
On foot	56,8	25,0	9,1	9,1	0,0	100
Inhabitants	26.4	39.3	25.2	9.2	0.0	100
Non-	8.0	12.6	31.2	34.2	14.1	100

$\beta_4 X_4$, with Y as length of visit and X_2 through X_4 as dummy variables for bike, bus, train and on foot, showed that there is a significant relation between travel mode and visit length ($R^2 = .134$, $P = .000$), bikers and pedestrians visit Breda significantly shorter than

car users, while train users visit Breda longer, there is no significant difference between car and bus users.

Inhabitants of Breda have significant shorter visit than non inhabitants, $Y = \beta_0 + \beta_1 X_1$, with Y as visit length and X_1 as dummy variable for inhabitants ($R^2 = .146$, $P = .000$).

Beside length also the frequency of the visit is known (table 5.3). Regression showed that the inhabitants visit Breda more often, $Y = \beta_0 + \beta_1 X_1$, with Y as visit frequency and X_1 as dummy variable for inhabitants ($R^2 = .271$, $P = .000$). Also users of bike and bus and pedestrians visit Breda more often than car users, $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4$, with Y as visit frequency and X_2 through X_4 as dummy variables for bike, bus, train and on foot ($R^2 = .288$, $P = .000$).

Furthermore it is shown that visitors that visit Breda once a month or less are more willing to use P&R compared to them that visit Breda several times a week, $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4$, with Y as willingness to use and X_2 through X_4 as dummy variables for the visit frequencies less than several times a week ($R^2 = .288$, $P = .000$).

Most visitors came in groups of two (52.6%), groups of three (22%) or alone (12%) (table 5.2). The users of bike and bus and pedestrians visit Breda in smaller groups than car users, $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4$, with Y as group size and X_2 through X_4 as dummy variables for users of bus, bike, train and foot ($R^2 = 0.133$, $P = .000$). Also inhabitants of Breda visit the inner city in smaller groups than, $Y = \beta_0 + \beta_1 X_1$, Y is group size and X_1 a dummy variable for inhabitants of Breda ($R^2 = 0.043$, $P = .000$).

Visitors were also asked on their motivation to use their mode of transport. They could

TABLE 5.4

Reason to use transport mode

	Cheap	Fast	Comfortable	Other reason
	%	%	%	%
Total	11.8	21.2	61.1	6.0
Car	3.6	20.4	74.7	1.3
Bike	22.7	22.7	40.0	14.7
Bus	32.5	12.5	47.5	7.5
Train	21.6	18.9	59.5	0.0
On Foot	6.5	28.3	47.8	17.4

choose between fast, cheap, comfortable/easy and other reasons (table 5.4). A majority of the visitors (60%) choose comfort/easy as their main motive. Especially car drivers choose comfort/easy as their main motive (74%), while of the users of other modes around 50% choose this motive.

Visitors were asked if they will use a future P&R facility in Breda. This question shows that 38.7% answers yes, 6.1% will use it if P&R is cheaper than parking in the centre and 2% will use it only if P&R is easier than inner city parking (table 5.5). Especially non-

inhabitants of Breda are willing to use P&R, 71% of them that answered yes live outside Breda. Besides car users, users of other modes are willing to use a future P&R facility. 67% of them that answers yes used the car, 13.5% biked and 12% used bus or train. Visitors that didn't use the car for the visit, but are willing to use P&R are mainly (64%)

TABLE 5.5
Use of P&R

	Yes	Yes, if cheaper	Yes, if easier	No	Total
	%	%	%	%	%
Total	38.7	6.1	2.0	53.2	100
Car	48,2	6,4	3,2	42,3	100
Bike	27,8	4,2	1,4	66,7	100
Bus	33,3	9,1	0,0	57,6	100
Train	30,8	15,4	0,0	53,8	100
On foot	16,7	0,0	0,0	83,3	100
Inhabitants	27.2	5.7	0.0	67.1	100
Non-inhabit.	46.3	4.7	4.2	44.7	100

inhabitants of Breda.

The Chi-square test rejected the hypothesis that there is no relation between travel mode and willingness to use P&R. Car users are significantly more willing to use P&R than bikers and pedestrians, between car users and users of bus and train is no significant difference, $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4$, with Y as willingness to use P&R and X_2 through X_4 as dummy variables for bike, bus, train and on foot ($R^2 = 0.073$, $P = .000$).

There is no significant relation between reason to use a mode of transport and willingness to use P&R, $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3$, with Y as willingness to use P&R and X_1 through X_3 as dummy variables for the motives cheap, fast and 'other' ($R^2 = .006$, $P = .307$).

Visitors that were willing to use P&R or to use it under conditions were asked two additional questions. The first question asked them on their willingness to pay for P&R, around 50% is willing to do that, 40% only if parking in the centre is more expensive and 6% is not willing to pay. Finally they were asked which characteristic of P&R (one out of four) is in their eyes the most important. Around half of them select safety as the most important aspects, followed by extensive opening hours with 30%, good waiting rooms and bike facilities were seen as most important by 16% and 2% of the them.

5.5 Discussion

The interviews held with local entrepreneurs showed that they see parking and accessibility by car as very important for the economic functioning of the inner city. A majority of them expect that a reduction of parking capacity or other restrictive car traffic measures will cause a reduction in the number of visitors. But the survey among visitors showed that 50% came not by car and that the visit frequency of car drivers is lower than the frequency of bikers and pedestrians. A research of the municipality (Gemeente Breda, 2000) showed that car users spend around 3 times as much as bikers and pedestrians but corrected for visit frequency the differences are only minor. The opinion of entrepreneurs that car drivers contribute for the largest part to the turnover and therefore had to be favoured above others should be adjusted, especially when the high cost of providing parking space are compared with the investments needed for other modes such as biking and on foot.

The 'Koopstromenonderzoek West Brabant' (SES, 2005) shows that of the inhabitants of West Brabant that visit Breda do this mainly because of the number of shops (36%), distance (33%) and sphere (20%), only 1% visit Breda because of parking possibilities. Also other cities in West Brabant and comparable research in other parts of the Netherlands showed that parking is the most important reason to visit a city for only a very small percentage. However, this doesn't mean that parking is not important but it shows that restrictive parking policies not automatically will lead to a decrease of visitors.

A difference between entrepreneurs and the municipality is that the municipality sees restrictive car traffic policies as quite a logical step while entrepreneurs see this mainly as a way of bullying cars. The interviewees with entrepreneurs showed that there are more tensions between entrepreneur and municipality regarding parking.

The result that most visitors choose their transport mode because it is comfortable/easy shows that in the model of Customer Perceived Value especially non-monetary aspects, such as effort, play a role. This is confirmed by research that showed that people choose to use their car not only because of functionality but also because of symbolic and affective reasons (Steg, 2005). The high percentage of visitors that are willing to use P&R makes clear that they see P&R probably also as a comfortable way of travelling and see it as a good alternative for inner city parking. This despite the fact that the use of P&R requires an additional transfer. Maybe visitors see the use of P&R as comfortable because it is relatively easy to park the car and the bus connection brings them without troubles in the centre of the city. This is confirmed by the experiences in other city, often visitors use P&R because it is good accessible and thus easy to reach.

The survey showed that introduction of P&R can lead to unintended use of P&R by users of public transport or bike. Because the majority of these unintended users lives in Breda itself which means that mainly short trips are transferred to P&R and secondly the number of inhabitants that are willing to use P&R are only a minority in the total group that is willing (table 5.6). Furthermore this unintended use will depend on, and possibly

TABLE 5.6
Origin of non-car users

Use of P&R	Inhabitant		Non-inhabitant		Total	
	#	%	#	%	#	%
Yes	28	61	18	39	46	100
Yes if cheaper	5	50	5	50	10	100
Yes if easier	0	0	1	100	1	100
No	86	74	30	26	116	100

reduced by the choice of location. But as the experiences in other cities show, it is nearly impossible to prevent unintended use.

The percentage of visitors that are willing to use P&R is high and the question arises if these visitors really will use a future P&R facility. Probably there will be a difference between real and promised use. Especially in the beginning use will not be that high among visitors as the results in Nijmegen showed. Furthermore, even in 's-Hertogenbosch only 10% of the visitors of the inner city use P&R and 20% of the car using visitors. Thirdly, the number of visitors that will use P&R depends also on the

TABLE 5.7
Modal split with P&R and willingness to use

	Yes	Yes and if	Yes P&R and paying	42% of yes answers	> 2 hr. and willing to use & pay
	%	%	%	%	%
Car	29.0	23.7	39.9	44.8	48.9
Bike	13.2	12.2	15.3	16.2	17.0
Bus	5.6	4.8	7.1	7.2	7.6
Train	4.6	3.6	4.8	5.8	5.3
On foot	8.9	8.9	9.4	9.9	10.4
P&R	38.7	46.8	23.5	16.1	10.7
	100	100	100	100	100

location and number of the facilities, for instance only one facility or one east and one west of Breda.

The question on the willingness to use P&R is used to calculate a new modal split (table 5.7). The first column shows a modal split when everyone that answered yes really use P&R, the second column also included them that will use P&R under certain conditions,

Table 5.8
Number P&R users per day

	Yes	Yes and if	Yes P&R and paying	42% of yes answers	> 2 hr. and willing to use & pay
# users	4664	5640	1940	2832	1290
Needed capacity	2332	2820	970	1416	645
# cars less	3251	3895	1349	1932	859
# non intended users	1411	1748	585	889	429

while in the third column only these people are included if they answered yes on using and yes on paying for P&R. The fourth column is based on the situation in 's-Hertogenbosch. When 20% of car drivers use P&R, this is 42% of them that said yes on the question if they want to use a future P&R facility in Breda. This ratio of 42% is used to calculate the third modal split for each mode of transport. Also with this calculation the use of P&R is relatively high, 16%. In the fifth calculation of the modal split users of P&R are only them that are willing to use and pay for, and visit Breda longer than two hours. With this calculation 10% of the visitors will use P&R, comparable to 's-Hertogenbosch. Visitors are a large group in total traffic in Breda (especially in the inner city), but the given modal splits are only these of visitors and thus not new modal splits for all traffic in Breda. The percentages of P&R in the modal split can be combined with the total number of touristic visits per year in Breda (4,399,000, according to NBTC-NIPO, 2009). Converting this in visits per day and combining this with the percentages gives the number of tourists per day that use P&R (table 5.8). If assumed, based on experiences, that each parking lot can be used by two cars per day the needed parking capacity on P&R can be calculated.

6. Conclusions

This final chapter will provide an answer on the main question of this research. This answer will be based on the answers on the sub questions, answered in the previous chapters. Furthermore recommendations will be given for the municipality of Breda, these recommendations will be linked with the model of the Customer Perceived Value. Finally recommendations will be given for further scientific research.

6.1 Conclusions

Most examined cities started with Park and Ride because problems caused by the increasing level of car traffic in the inner city, which hurts the accessibility and quality of life. P&R tries to improve the accessibility and quality of life and to improve the exploitation of public transport. Also in Breda car traffic causes congestion in the inner city, but mainly on peak moments. However when nothing happens, no choice between the travel modes, increasing car traffic will cause more problems. Until now there is enough parking capacity in the centre, the main problem is an inefficient use of the current capacity. Car traffic has a large stake in Breda's modal split which can damage the quality of public transport and bike.

Local entrepreneurs and the municipality are interested in P&R, they see it as an option to improve and sustain the accessibility of Breda's inner city and to solve parking problems. The municipality sees P&R also as an instrument to change the modal split in the inner city at the benefit of public transport. Both parties see visitors as the main target group for a future facility and should especially be used during peak moments. They see it as an option to use it also for commuters but then it is required to operate it the whole week.

A significant proportion of the visitors indicate that they will use a future P&R facility. Although these are mainly car users, also users of other modes are willing to use it. It is thus plausible to assume that in Breda, just as in the other cities, P&R will be confronted with non-intended use; a shift from public transport and bike towards P&R.

The literature research and the experiences in other cities showed that is necessary to integrate a P&R policy with economic, environmental and transport policies, thus methods of power. Economic because P&R can contribute to the accessibility; one of the factors that plays a role in the urban competitiveness. Environment, because a shift from car to public transport can contribute to the reduction of emissions, especially in the inner city. Especially necessary is the integration with transport policies; P&R should be

combined with restrictive parking policies in the inner city. Some of the entrepreneurs are opposing the combination of P&R and restrictive parking policies; they prefer P&R in combination with an improvement of parking possibilities in the centre. The interviewees of the municipality agree that the combination with restrictive policies is needed, to make it possible to use P&R to change the modal split.

To stimulate the use of P&R it is needed that it can offer a better Customer Delivered Value to users than other modes, in this case inner city parking, do. Furthermore attention should be paid on the role that travel behaviour and habits plays, and the available psychological methods to influence this.

A P&R facility should meet several conditions in order to be able to provide a good functional and emotional value to the users. During the interviews safety was always mentioned as an important aspect and also the visitors of the inner city see safety as an important aspect. A second aspect is the location of a P&R facility; it should be good accessible by car without congestion, and therefore locations on the fringe of the city close to the highways A16 or A27 are preferable. Finally the public transport connection between facility and inner city is important. The connection should have a good quality which can be realized with a fast connection without stops in between and a high frequency, especially during peak hours. The best option is to use a shuttle bus.

To conclude:

Park and Ride can change the modal split of Breda and improve the accessibility of the centre.

P&R is especially relevant for touristic visitors of the inner city.

P&R should meet the conditions mentioned above and should be integrated in the broader urban policy.

6.2 Recommendations

P&R in Breda

Monetary costs:

To be competitive on price, P&R had to be cheaper than inner city parking when the visit takes longer than 2 hours, thus around €3.50, this is because around 50% of the visitors visit Breda 2 or 3 hours.

Paying for inner city parking is vehicle based, also on the P&R facility more people should be allowed to travel on one ticket, as happened in most cities examined. The

survey showed that around 90% of the car using visitors has a group size of 3 or less people. A ticket for 3 people would thus be in most cases sufficient.

Time:

To make P&R possible for as much as possible visitors minimal two locations should be developed, one at the A16 side and one at the A27 side of Breda. A possible location west of Breda is the Ettensebaan, on the Volans-axis which could be used for the public transport connection between P&R and inner city. East of Breda a location close to the crossing of Claudius Prinsenlaan and Franklin Rooseveltlaan is possible (development of Amphibia hospital)

Effort:

Good road signage is important and is part of the accessibility of the facility. To inform visitors about the advantages of P&R, information signs with the price of P&R compared to inner city parking should be located on the route towards centre and P&R facility.

Functional Value:

To make the P&R facility attractive for commuters parking facilities for bikes should be provided. This make use of the facility also possible for them who have a destination not served by the public transport connection between P&R and centre.

Furthermore it is needed to make people aware of P&R:

To make visitors familiar with P&R and make them aware of the benefits that P&R can offer them, marketing is needed. A good option is to distribute free tickets among visitors in the centre of Breda, this temporary structural measure enables visitors to try P&R for free.

It is preferable to develop a similar P&R concept as in 's-Hertogenbosch. This make it possible to share the marketing of P&R together with this city and with the province of Noord-Brabant.

Research

When P&R is developed in Breda a survey should be held among users to see what the differences are with this research, for example how many people are really using P&R compared to them saying that they are willing to use it. This will also make clear what the share of P&R is in the modal split.

Not much literature is available on the topic of (habitual) travel behaviour of tourists, research should make clear what the role of habit is among these groups because this has consequences for the instruments to change their travel behaviour.

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Appendix 1

Survey visitors inner city Breda

1. What is the reason of this visit?
 - a. Shopping
 - b. Leisure
 - c. Work
 - d. Study
 - e. Else
2. With which frequency do you visit Breda for the same reason?
 - a. Several times a week
 - b. About once a week
 - c. About once a month
 - d. Several times a year
 - e. Less
3. Could you give an indication of the length of your visit, in hours?
4. Which mode of transport did you use for this visit?
 - a. Car
 - b. Bike
 - c. Bus
 - d. Train
 - e. On foot
5. Do you own a car?
6. What is the main reason to use this mode of transport?
 - a. Cheap
 - b. Fast
 - c. Comfortable/easy
 - d. Other reason
7. With how many persons do you visit Breda?
8. When P&R is developed in Breda, will you use it?
 - a. Yes
 - b. Yes, if inner city parking is more expensive
 - c. Yes, if inner city parking is restricted and become more difficult
 - d. No
9. Are you willing to pay for P&R?
 - a. Yes
 - b. Yes, if inner city parking is more expensive
 - c. Yes, if inner city parking takes more time
 - d. No
10. Choose out of four characteristics of P&R the one you see as the most important?
 - a. Good waiting rooms
 - b. Safety
 - c. Bike lockers or bike rental
 - d. Extensive opening hours
11. What is your home location?
 - a. Netherlands, zip code:
 - b. Belgium
 - c. Other

Appendix 2

2.1 Regression analysis on impact of travel mode on length of visit

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.366(a)	.134	.126	1.657

a Predictors: (Constant), dummy4, dummy3, dummy2, dummy1

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	172.995	4	43.249	15.757	.000(a)
	Residual	1117.110	407	2.745		
	Total	1290.104	411			

a Predictors: (Constant), dummy4, dummy3, dummy2, dummy1

b Dependent Variable: Kunt u een indicatie geven van de lengte van uw bezoek aan de binnenstad? In aantal uren:

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	B	Std. Error
1	(Constant)	3.634	.111		32.828	.000
	Car vs. Bike	-1.113	.226	-.237	-4.932	.000
	Car vs. Bus	-.418	.294	-.067	-1.421	.156
	Car vs. Train	.922	.297	.147	3.098	.002
	Car vs. On foot	-1.384	.273	-.242	-5.066	.000

2.2 Regression analysis on impact of homelocation on length of visit

Kunt u een indicatie geven van de lengte van uw bezoek aan de binnenstad? In aantal uren:

postcodedummy	Mean	N	Std. Deviation
0.00	3.88	250	1.857
1.00	2.50	162	1.232
Total	3.34	412	1.772

Group with dummy 0 are non-inhabitants of Breda, group 1 are inhabitants of Breda

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.381(a)	.145	.143	1.640

a Predictors: (Constant), postcodedummy

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.880	.104		37.405	.000
	Inhabitant Breda	-1.380	.165	-.381	-8.342	.000

a Dependent Variable: Kunt u een indicatie geven van de lengte van uw bezoek aan de binnenstad? In aantal uren:

2.3 Regression analysis on impact of homelocation on frequency of visit

SAMENVATTING UITVOER	
<i>Gegevens voor de regressie</i>	
Meervoudige correlatiecoëfficiënt R	0,52093863
R-kwadraat	0,271377056
Aangepaste kleinste kwadraat	0,269564562
Standaardfout	0,419807348
Waarnemingen	404

VARIANTIE-ANALYSE						
	Vrijheids graden	Kwadraten-som	Gemiddelde kwadraten	F	Significantie F	
Regressie	1	26,38738839	26,38738839	149,7257	1,74985E-29	
Storing	402	70,84776013	0,176238209			
Totaal	403	97,23514851				
	Coëfficiënten	Standaard-fout	T- statistische gegevens	P-waarde	Laagste 95%	Hoogste 95,0%
Snijpunt	1,033197	0,055541146	18,60236213	3,59205E-56	0,924009131	1,142384
Niet-Bredanaar vs. Bredanaar	-0,215420	0,017605099	-12,23624514	1,74985E-29	-0,250029869	-0,18081

2.4 Regression analysis on impact of travel mode on frequency of visit

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.537(a)	.288	.281	1.018

a Predictors: (Constant), dummy4, dummy3, dummy2, dummy1

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	171.303	4	42.826	41.325	.000(a)
	Residual	422.822	408	1.036		
	Total	594.126	412			

a Predictors: (Constant), dummy4, dummy3, dummy2, dummy1

b Dependent Variable: Met welke frequentie bezoekt u, voor diezelfde reden, de binnenstad van Breda?

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	B	Std. Error
1	(Constant)	3.406	.068		50.079	.000
	Car vs. bike	-1.156	.138	-.366	-8.384	.000
	Car vs. bus	-.920	.181	-.219	-5.091	.000
	Car vs. train	.149	.183	.035	.817	.415
	Car vs. on foot	-1.702	.168	-.438	-10.137	.000

a Dependent Variable: Met welke frequentie bezoekt u, voor diezelfde reden, de binnenstad van Breda?

2.5 Regression analysis on impact of frequency of visit on willingness to use

P&R

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.537(a)	.288	.281	1.018

a Predictors: (Constant), dummy4, dummy3, dummy2, dummy1

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	171.303	4	42.826	41.325	.000(a)
	Residual	422.822	408	1.036		
	Total	594.126	412			

a Predictors: (Constant), dummy4, dummy3, dummy2, dummy1

b Dependent Variable: Met welke frequentie bezoekt u, voor diezelfde reden, de binnenstad van Breda?

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	B	Std. Error
1	(Constant)	3.406	.068		50.079	.000
	Sev. week vs once a week	-1.156	.138	-.366	-8.384	.000
	Sev. week vs once a month	-.920	.181	-.219	-5.091	.000
	Sev. week vs sev. year	.149	.183	.035	.817	.415
	Sev. Week vs. less	-1.702	.168	-.438	-10.137	.000

a Dependent Variable: Met welke frequentie bezoekt u, voor diezelfde reden, de binnenstad van Breda?

2.6 Regression analysis on impact of travel mode on visit size

<i>Gegevens voor de regressie</i>	
Meervoudige correlatiecoëfficiënt R	0,364579355
R-kwadraat	0,132918106
Aangepaste kleinste kwadraat	0,12426891
Standaardfout	0,81558806
Waarnemingen	406

Variantie-analyse					
	<i>Vrijheidsgraden</i>	<i>Kwadratensom</i>	<i>Gemiddelde kwadraten</i>	<i>F</i>	<i>Significantie F</i>
Regressie	4	40,88934164	10,22233541	15,36768354	1,05378E-11
Storing	401	266,7387372	0,665183883		
Totaal	405	307,6280788			

	<i>Coëfficiënten</i>	<i>Standaardfout</i>	<i>T- statistische gegevens</i>	<i>P-waarde</i>
Snijpunt	2,351598174	0,055112334	42,66918154	3,6704E-151
Auto vs. Fiets	-0,698820396	0,110797267	-6,307198857	7,51491E-10
Auto vs bus	-0,665883888	0,148467583	-4,48504566	9,53193E-06
Auto vs trein	-0,129375951	0,146678899	-0,882035195	0,378286179
Auto vs te voet	-0,624325446	0,134741177	-4,633516337	4,86805E-06

2.7 Regression analysis on home location on visit size

<i>Gegevens voor de regressie</i>	
Meervoudige correlatiecoëfficiënt R	0,206965968
R-kwadraat	0,042834912
Aangepaste kleinste kwadraat	0,040465691
Standaardfout	0,853720537
Waarnemingen	406

Variantie-analyse

	<i>Vrijheidsgraden</i>	<i>Kwadratensom</i>	<i>Gemiddelde kwadraten</i>	<i>F</i>	<i>Significantie F</i>
Regressie	1	13,17722169	13,17722169	18,07974891	2,63418E-05
Storing	404	294,4508571	0,728838755		
Totaal	405	307,6280788			

	<i>Coëfficiënten</i>	<i>Standaardfout</i>	<i>T- statistische gegevens</i>	<i>P-waarde</i>
Snijpunt	2,238683128	0,054766198	40,87709591	1,2569E-145
Niet inwoner vs inwoner breda	-0,367517483	0,086433442	-4,252028799	2,63418E-05

2.8 Chi square test on relation between travel mode and willingness to use P&R

		Welk vervoersmiddel heeft u vandaag gebruikt voor het bezoek aan de binnenstad van Breda?1	Stel dat er in Breda een transferium gebouwd zou worden, zou u dat dan gebruiken?
Welk vervoersmiddel heeft u vandaag gebruikt voor het bezoek aan de binnenstad van Breda?1	Pearson Correlation	1	.228
	Sig. (2-tailed)		.000
	N	409	393
Stel dat er in Breda een transferium gebouwd zou worden, zou u dat dan gebruiken?	Pearson Correlation	.228	1
	Sig. (2-tailed)	.000	
	N	393	393

2.9 Regression analysis on impact of travel mode on willingness to use P&R

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.270(a)	.073	.064	1.388

a Predictors: (Constant), dummy4, dummy3, dummy2, dummy1

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	59.610	4	14.903	7.731	.000(a)
	Residual	755.659	392	1.928		
	Total	815.270	396			

a Predictors: (Constant), dummy4, dummy3, dummy2, dummy1

b Dependent Variable: Stel dat er in Breda een transferium gebouwd zou worden, zou u dat dan gebruiken?

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	B	Std. Error
1	(Constant)	2.384	.093		25.698	.000
	Car vs. bike	.686	.188	.184	3.645	.000
	Car vs. bus	.434	.259	.084	1.677	.094
	Car vs. train	.385	.288	.067	1.339	.181
	Car vs. on foot	1.116	.233	.240	4.781	.000

a Dependent Variable: Stel dat er in Breda een transferium gebouwd zou worden, zou u dat dan gebruiken?

2.10 Regression analysis on impact motivation for travel mode on willingness to use P&R

Variables Entered/Removed^b

Model	Variables Entered	Variables Removed	Method
1	snel, goedkoop ^a	.	Enter

a. All requested variables entered.

b. Dependent Variable: Stel dat er in Breda een transferium gebouwd zou worden, zou u dat dan gebruiken?

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.077 ^a	.006	.001	1.434

a. Predictors: (Constant), snel, goedkoop

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.868	2	2.434	1.183	.307 ^a
	Residual	810.401	394	2.057		
	Total	815.270	396			

a. Predictors: (Constant), snel, goedkoop

b. Dependent Variable: Stel dat er in Breda een transferium gebouwd zou worden, zou u dat dan gebruiken?

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.612	.088		29.815	.000
	goedkoop	.188	.231	.042	.814	.416
	snel	.257	.179	.073	1.434	.152

a. Dependent Variable: Stel dat er in Breda een transferium gebouwd zou worden, zou u dat dan gebruiken