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IMPACT OF "FREE" PUBLIC TRANSPORT ON TRAVEL BEHAVIOUR: A CASE STUDY

T. STEENBERGHEN, P. LANNOY, C. MACHARIS

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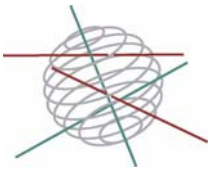

Part 1:
Sustainable production and consumption patterns

FINAL REPORT

Impact of "Free" Public Transport on Travel Behaviour: a Case Study

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Introduction

0.1 Objective and methodology of the project

The objective of the project is the analysis of the effect of the introduction of the third payer system for students in Brussels from a psycho-social, economical and geographical viewpoint. The multidisciplinary approach allows an analysis of the range of effects that free public transport and, in general, price policies can entail. The analysis has been performed through a case study, in particular the free urban public transport for students at Dutch-speaking universities and colleges in Brussels.

0.2 Terminology used

An aspect to be clarified is the use of the term *"free"* in free public transport. Public transport is never free, since there is always someone who pays for the costs. The expression "free" public transport means a generalised application of the third payer system in which the state pays the personal contribution of the traveller and puts it in this way at the charge of the tax payer.

Secondly, in the text the terms *Dutch-* and *French-speaking students* are used as an abbreviation for the students studying respectively at Dutch- and French-speaking institutions of higher education (colleges and universities).

0.3 Structure of the report

First we put the measure in Brussels into perspective by referring to international and Belgian initiatives with free or nearly free public transport (chapter 1). In the second chapter different mode choice theories are discussed and the mobility and motility scheme of Kaufmann is further elaborated as a theoretical framework for the project. Important concepts used in the spatial analysis, such as mental maps and activity spaces, are also discussed in this chapter. In the third chapter research questions are formulated. Then it is discussed how data were collected and processed (chapter 4). In the fifth chapter the mobility profile of students and their use of the measure is discussed. Chapters 6 to 8 contain the results of the spatial analyses (chapter 6), the psycho-social analysis (chapter 7) and the social cost-benefit analysis (chapter 8). In the final chapter (chapter 9) conclusions, recommendations and suggestions for further research are formulated.

Chapter 1 National and International cases

Free public transport policy does not appear as a new political initiative. Different towns and regions throughout the world (e.g. Commerce (U.S. - California) in 1962; Rome (Italy) in 1971-1972, Châteauroux (France) from 2002 onwards and Hasselt (Belgium) from 1997 onwards attempted to implement such a policy.

These experiences were implemented as a part of a "left-wing" city governance scheme aiming at improving the area environment quality and/or giving a renewed role to the city centre (Kemp, 1974; Werz, 1976). Because of their very nature, their target group was defined as the whole travelling and commuting population of the area – without any consideration of age, gender, occupation or revenues.

A discussion of initiatives outside Belgium is followed by an overview of the Belgian state of play.

1.1 International cases

Unlimited Access in United States

This arrangement between universities and public transport agencies provides fare-free transit service for all students. Typically, the university pays the transit agency an annual sum based on the expected students ridership. Students are then allowed to ride "free" on the transit network, only by showing their student identification card. The expense is mainly financed by parking revenues, charged on many American university sites. This arrangement has been adopted by more than 50 American colleges and universities and provides fare-free transit for over 800.000 people (Brown et al., 2001, 2003). An increase in transit ridership was reported varying from 71% to 200% during the first year Unlimited Access was introduced. Furthermore, it has been proved that the Unlimited Access experiments increase mobility while at the same time reduce vehicle trips among the students population (Brown et al., 2001).

U-Pass or Reduced Fare Ticket in Canada and Germany

Experiments have been conducted in Canada and Germany in which an additional sum is added to the tuition fee of all university students at enrolment. In counterpart, they may ride "free" on all public transport lines involved in the agreement. This does not mean a fully "free" transport service, but represents a drastic price reduction and, furthermore, decreases stop times because it is no longer necessary for students to purchase a bus ticket. In Germany, one third of the 1,9 million German students benefit from such arrangements and in Canada at least 5 universities have implemented U-Pass programs before 2002 (Bamberg et al., 1999; Bamberg & Schmidt, 2001; Gifford & Heath, 2002; Bamberg et al., 2003). The measure resulted in an increase of public transport ridership with around 50%. By the measure more favourable appreciations of public transport services are significantly developed among students using the transit network. The opportunity to ride free or at a reduced cost seems to enhance positive attitudes towards public transport, which in turn reinforces the willingness and the actual decision to use the public transport facilities.

"OV Jaarkaart" (Public transport year card) in the Netherlands

Since 1991 the system of the "Jaarkaart" is in place. The system entitled the free use of all public transport 24 hours on all weekdays. About 800.000 students could benefit. The effects were a strong increase in the number of public transport trips with 75% without an increase in the total number of trips, a mode shift mainly from bike to public transport and a higher percentage of students staying at home instead of renting a room (De Jong et al., 2002). However, bike and car retained a share of more than 50%. In 1994 the measure was adapted to the current system of week and weekend pass. This implied that the students had to choose between a week-pass (free public transport use during the week with reduction on weekends and full price in July and August) and a weekend-pass (free during weekend, reduction on weekdays in off-peak periods). The effects of the change were limited (a small decrease in the share of public transport and a slight increase of the number of public transport trips).

We can conclude from these foreign experiments that:

- The ways students evaluate potential global effects of such measures as free- or reduced-fare transit are not linked to the effectiveness of the measures as such, but to pre-existing cognitive frames through which they evaluate the measure and its expected consequences. Moreover, these frames are not empirically correlated with actual mode choices (e.g. some car-using students are favourable to car-use restrictions or pro-public transport measures, and inversely) (Bamberg et al., 1999);
- The opportunity to ride free increases transit ridership and enhances positive attitudes towards public transport services (Bamberg et al., 2003);
- Actual mode choices depend on objective and subjective conditions – qualitative research methods being particularly well suited to catch the latter (Hay, 2000);
- At a theoretical level, these studies show that favourable or unfavourable attitudes toward the studied behaviour – i.e. using the bus to go to the campus – (behavioural belief), the perceived social pressure (normative belief), and the perceived ease or difficulty to performing the behaviour (control belief) were raised due to the introduction of a free fare measure, strengthening intentions to travel by bus and so effectively affecting the considered behaviour (Bamberg et al., 2003).

Châteauroux

Châteauroux is a French agglomeration community which has introduced on the 1st January 2002 a free access to urban public transport. In 2003, the frequentation of the network had risen with 79% in comparison with previous years. This policy resulted above all in more users during peak hours. Young people were also more numerous using public transport. No survey has been conducted to assess the opinion of users, but a change in mentality in a negative way with regard to public transport has been observed. Several indicators have confirmed this observation, such as a growing number of incivilities (vandalized seats, for example) and a different attitude of public transport users (more demanding, arrogant; not respecting foreseen stops when getting off). Bus drivers considered themselves as discredited, since they did not possess any power related to the purchase and control of tickets (Viennet, 2003).

The free public policy in Châteauroux is still in place now. This case shows that negative consequences in terms of incivilities, behaviour and attitudes can result from the implementation of a free public transport policy.

Leiden – The Hague

In the Netherlands an experiment with free public transport was started in 2004. Two bus lines between Leiden and The Hague were made free of charge for travellers. The measure resulted in a strong increase in public transport ridership and a substantial part of this increase was due to former car drivers who made the shift to public transport. Also the Park & Ride infrastructure was used more frequently. However, the main goal of the project, the reduction of congestion on the A44/N44, was not achieved, although the measure was a success in terms of public transport use. This is due to the fact that the traffic volume on a particular road is the result of numerous factors, of which the free public transport is only one. The fact that the main objective has not been achieved, but the project objectives have, leads to different interpretations with regard to the success of the measure (Egeter & Versteegt, 2004). It was decided in advance that the measure would end the 1st January 2005. No re-introduction of the measure is planned.

London transport policy

During the last 5 years (2000-2005) Transport for London patronage increased with 40% after a long period of decreasing patronage (Long & Turton, 2005). A new fares strategy has played a significant role in enabling this growth, together with quality improvements.

Elements of this fares strategy include a freezing of bus fares (resulting in a reduction of the average bus fare), free travel for target groups (-16 years old, + 60 years old), eventually with time restrictions, flat fares or a simple ticketing structure and a multimodal smartcard ('Oyster pass'), enabling easy transfers between modes. On the other side push factors on car travel are being applied, such as congestion charge and a strict parking policy.

Imagine'R in Île de France

In the Île de France region the Imagine'R project has been launched in 1998. The project encompasses a cheap tariff structure for young people (half of the full price, free travel during weekends and holidays), but goes further. The Imagine'R aims at extending the public transport pass to a complete youth pass, which is used both for public transport as for leisure purposes. The initiative has led to a steady increase in the number of card holders, less fraud and more mobility. But equally important is that Imagine'R is perceived as a strong brand, binding adolescents to public transport and improving its image (Spitzmüller, 2005).

1.2 The third payer system and "free" public transport

The concept of the "third payer system" was elaborated by the Flemish government in collaboration with the Flemish public transport company, De Lijn. This concept implies that the price of public transport is not paid by the user or provider, but partially or completely by a third party. Other groups, such as local authorities, other public organisations and private organisations can enter into similar agreements with the public transport company and become a "third party", which pays for public transport for a specific target group in a specific area. Since 2000 two important target groups benefit from "free" public transport on the Flemish network: seniors (65+) and children (-12). At the end of 2003 more than 20% of the 308 local communes in Flanders had entered into a "third party" system. As far as students are concerned, the Catholic University of Leuven and the city of Leuven concluded an agreement in 2001, granting students free access to public transport in the city of Leuven. The system was not only increasingly applied in Flanders, but also introduced in Brussels for seniors on January 2003. They can freely use the metro, bus and tram system after 9am (unlimited since May 2005). The Brussels Capital Region pays the Brussels Public Transport Authority a fixed sum based on the estimated number of travels (11,9 million Euro for seniors and 2,2 million Euro for children (-12) in 2004). Since July 2004, employees of federal administrations and autonomous public organisations are also given the opportunity to be repaid for their train and Brussels' public transport season ticket. From May 2005 on, people with minimum wages also benefit from this measure and plans are being made to extend the measure to the under 18s. For the train, seniors pay a fixed fee of 2,5 Euro for a single journey. Since January 2005, also private companies can conclude a third payer agreement to let their employees commute for free. The government pays 20% of the cost, the company 80%.

1.2.1 65+ Card in Flanders

In January 2000, the Flemish government introduced "free" public transport for Flemish people older than 65 in cooperation with De Lijn. An evaluation survey was carried out in 2001 among 15.500 Flemish seniors, which led to the following conclusions (De Lijn, 2001):

- More than 80% of the respondents said that they had already used their "free" public transport card;
- These seniors travelled more often by bus (De Lijn) than before the introduction of the measure;
- Their main motives for using De Lijn were 'running errands', 'making excursions' and 'visiting people';
- This "free" public transport had also generated a (limited) mode shift: 67,7% of the respondents pointed out that they had switched from the car to public transport for certain trips.

1.2.2 "Free" public transport in Hasselt

In 1997, De Lijn and the Flemish government initiated a reorganisation of public transport in the city of Hasselt. The reorganisation included an extension of the served area, an increase in frequency and "free" bus use. To evaluate the measures, a survey among the travellers was conducted. The main outcomes were (Ministerie van de Vlaamse Gemeenschap, 1998):

- About half of all travellers were residents of Hasselt. Most others came from neighbouring communes.
- Most important travel motives were school, work, shopping and services.
- About half of the respondents visited Hasselt more often than before the introduction of the measures. 7 out of 10 respondents made more use of the public transport, especially younger people.
- The main reason why people used the public transport was the lack of access to private transport. Also, a number of pedestrians and bikers switched to public transport.

1.3 The case study of Brussels

In Brussels a "free" public transport initiative started in the 2003-2004 academic year for students at Dutch-speaking colleges and universities. Conditions are that students are younger than 25 years (except for medical students) and are registered for a first degree – in other words a first registration. The Flemish Government ("Vlaamse Gemeenschapscommissie") took the initiative for the measure. The "Brusselsfonds" (Brussels fund) of the Flemish Government invested 1,2 million Euro in the project. The repayment was organised by the non-profit organisation Quartier Latin, which aims at promoting Flemish student life in Brussels. Different season tickets are proposed by the Brussels' public transport agency, the MIVB/STIB. One of those is called "School Season Ticket" and is available for students who are less than 25 years old. This season ticket is the one that is proposed to students. The School Season Ticket is valid during one year, week-ends and holidays included. The initial price of this kind of season ticket is based on the number of children in the family and on the number of season tickets already possessed by other members of the family. Table 1 gives an overview of the current prices for season tickets for students. Students older than 24 years pay 360 euros for a season ticket.

Number of season tickets within the family		**Number of children within the family**	
		1 or 2 children	3 children or more
	1st	200 euros	160 euros
	2d	120 euros	80 euros
	3d	---	80 euros
	4th and +	---	free

Table 1 Overview of prices of season tickets (Source: http://www.stib.irisnet.be/FR/22000F.htm or http://www.stib.irisnet.be/NL/22091aN.htm#B)

At the start of the 2003-2004 academic year, an administrative fee of € 10 was required. The next academic year, this fee was raised to € 25. During the first year more than 8.000 students applied for a "free" public transport ticket. The second year only 5.100 students applied for the card. The third year the administrative fee of € 25 was retained but the students did not have to apply for a refund anymore. The number of applicants was higher than the 7.000 available cards (students registering too late still obtained a 20% reduction on their public transport card).

The main objective of the Flemish government with the "free" public transport initiative is to help students to discover Brussels by promoting their mobility. Related to this are the

objectives to promote subscriptions at Dutch-speaking colleges and universities in Brussels, to stimulate students to participate at social, cultural, sports and other activities in Brussels, to convince Flemish students to come and live in Brussels and to improve the city's image for students and subsequently the entire Flemish population. Contributing to a sustainable mobility is also an aim of the project. The measure is intended to contribute to this goal by improving the image of public transport, inducing habit forming, ensuring access to mobility and reducing car mobility with students.

Chapter 2 Theoretical framework

2.1 Theories of mode choice

2.1.1 Rationalist approach

Developed in the sixties but still largely referred to, rationalist models are based on a postulate of economic rationality in the mind of transport users. Discrete choice theory, based on random utility theory (McFadden, 1973), has been proven very useful since the 1970s for mode choice simulations. The starting point of this theory is that an individual, confronted with a number of alternatives, will assign an utility to each alternative. The individual acts rationally and will choose the alternative with the highest utility. The utility of an alternative cannot be measured directly, but can indirectly by a number of factors such as travel cost and time, which are supposed to influence the utility of an alternative. Discrete choice theory has been the basis for travel demand models (Ben Akiva & Lerman, 1985). Specifications of the logit model (multinomial, binary, nested, hierarchical) are used to describe the decision process for a discrete number of choices, using utility maximisation as a basic principle (see for an overview Timmermans et al., 2002). This approach postulates indeed that the choice of a transport mode results from a comparison of several available alternatives. The chosen alternative is thus assumed to generate the maximum utility. Models of generalised costs of transports convert quantitatively the factors taken into account in the mode choice.

Gradually, a number of alterations have been made, mainly correcting the fact that individuals do not always behave rationally. Alterations include the concept of bounded rationality (Simon, 1955), routinized decision behaviour and simplified decision rules (heuristics). Recent approaches start from the activity schedule of individuals or households to explain mode choice (Bhat & Singh, 2000; Cirillo & Toint, 2001; Axhausen & Garling, 1992; Gliebe & Koppelman, 2005). Travel is considered as a demand to pursue activities distributed in space and time. Not the individual trip, but a sequence of activity behaviour, for the whole day or longer periods of time, is the study unit. The availability of travel and activity diary data allowed researchers to examine particular facets of activity-travel patterns such as trip-chaining, departure time decisions and time allocation (Timmermans et al., 2002).

2.1.2 Psychological approach

The attitudinal approach has been developed in order to understand the mobility behaviour of individuals. It aims at explaining mode choice by the study of attitudes of individuals with regard to available transport means. Important elements are the concept of habit, based on cognitive dissonance theory (Bassand et Kaufmann, 1994), attitudes with regard to transport means and intention, which refers to the probability an individual would adopt a certain behaviour. Several kinds of theories can be distinguished. The theory of planned behaviour postulates that the attitude towards behaviour, the attitudes of the persons or of the important institutions (a normative aspect appears here) and the perceived situational and behavioural control are determining factors for travel behaviour. The intentions and habits entertain then an opposition relation: for example, the stronger the habits are, the weaker the determining intention will be.

Much experimentation – notably in the field of transport – has been conducted in order to measure the strength of habits in mode practices and in order to observe change in mode practices, once habits had been modified. These were called real-life social dilemmas

experiments (Brown, Werner & Kim, 2003; Fujii, Gärling & Kitamura, 2001; Fujii & Kitamura, 2003; Heath & Gifford, 2002). An approach based on the differentiation of two levels of mode choice – objective and subjective ones – has been developed (Frenay, 1994). The main criticisms addressed to this kind of approach were linked to the fact that the urban context of studied mobility is seldom taken into account, as well as the ways of life of individuals. The perspective only allows a description and quite mechanic explanation of mode practices. During the 1990s more collaboration originated between psychologists and geographers with a focus on spatial cognition, integrating the psychological and socio-geographical approach (see for example Gärling & Golledge, 1993; Portugali, 1996).

2.1.3 Socio-geographical approach

Mode choice research is related to the problems of spatial decision-making and choice behaviour which have a long-standing tradition in geographic research. Various approaches have been advocated, ranging from social physics to behavioural and time geography (Timmermans et al., 2002). Behavioural geography became an important part of geographic research during the 1960s and 1970s. An overview of addressed research topics is given in Mark et al. (1999). Time geography led to a stream of theoretical and analytical studies, and some innovative models in the 1970s and 1980s (Hägerstrand, 1970; Pred, 1981). The 1990s saw a rapid increase of interest in activity-based analysis. However, the interest in geography for the theme somewhat faded and a lot of the research is currently done by civil engineers (Timmermans et al., 2002).

The sociological interest for mobility is quite new. The trip-based and activity-based approaches have recently been widened to the analysis of life patterns, events and life cycles. The approach of activity space-time pays attention to the daily mobility practices by analysing the different activities an individual is involved in his daily life (Kaufmann, 2000). A more recent approach has been developed around the notions of daily life and life conduct. In his daily life an individual has to manage a certain number of activities, often corresponding to differentiated locations and thus to travel necessities. The notion of life conduct pays attention to this management (Flamm, 2004a). Several sociological studies have indeed highlighted that the relations to time and space influence the type of life conduct adopted by the individuals (Juan et al., 1997). This approach tries to study mobility in a general context of individual daily life arrangements by showing how the mobility practices are correlated not only with a geographical context and a social position but also with daily life organisation modes, individual representations and more generally with personal life conceptions (Flamm, 2004a). Recent process modelling efforts, based on rule-based systems that predict activity patterns from choice heuristics and activity diary data, such as ALBATROSS, try to incorporate the effects of daily life constraints and commitments into mode choice modelling (Arentze & Timmermans, 2004).

2.2 Kaufmann's conceptualisation of mobility and motility

2.2.1 Concepts of Mobility and Motility

Kaufmann (2002) has analysed mobility as a broad phenomenon, in which making trips depends on the fulfilment of several factors, considered as potential factors allowing understanding why a particular journey has or has not been undertaken. These factors constitute the individual's "motility", i.e. the travel potential of an individual. The factors included in an individual's motility can be grouped into three types: access, skills and appropriation.

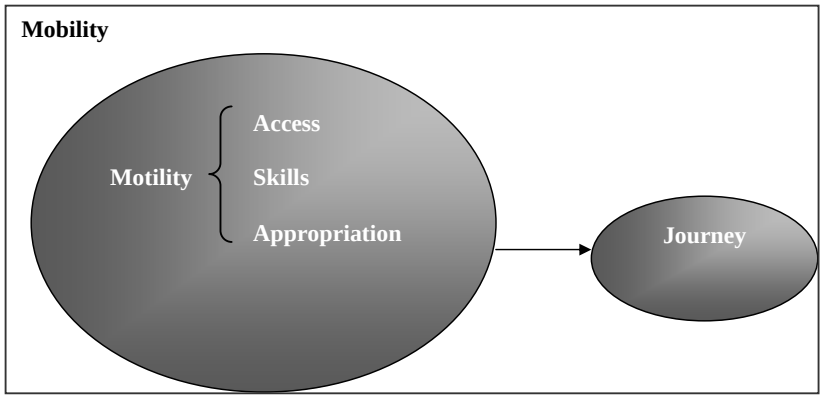


Figure 1 Mobility and motility concept (Kaufmann, 2002)

This analysis grid has the advantage not to focus on one explanatory factor of travel behaviour. Quantitative and qualitative approaches may help to understand mobility behaviour, corresponding to the various explanatory factors. In our research we have been focusing our analysis on the following factors:

Access	Skills	Appropriation
Modes' availability	Knowledge of the city	City image
Residential situation		Perception public transport and car
Price	Activity patterns	Values
Supply		Habits

Figure 2 Motility scheme of Kaufmann with factors analysed in this research

There is a wide range of factors that influence the demand for public transport. There is plenty of empirical evidence as to what the relevant factors are, and which of them may be more important than others, in different circumstances (Balcombe et al., 2004). The motility concept groups them into three main categories.

2.2.2 Access

Access factors are linked to the disposal of different "options", or means of travel. Access is "conditioned" by the location and accessibility of the various origins and destination points to transportation networks (Flamm, 2004a). Also, the price and schedule offered by transportation networks and by budget and time available for users are access factors.

The supply of transport comprises the availability of a car and the number of cars in a household, the number of bicycles available and the supply of public transport, both in terms of available connections as in terms of frequencies and quality. The supply of public transport is generally measured by the distance to public transport stops of a certain quality level or time it takes to reach a certain destination by public transport.

The prices of a travel mode and consequently the budget that has to be spent for travel, is difficult to assess at a theoretical level (Frenay, 1994; Flamm, 2004a). The price of transport services consists of several components. Empirical research confirms that consumers are

sensitive for changes in price/costs, but the extent depends on several factors, for example the purpose of the trip (Dijst & Van Wee, 2002; Balcombe et al., 2004). Another aspect is the time horizon. It is important to distinguish between short-run and long-run elasticity values. In general, the demand for transport is more price-elastic in the long run than in the short run (Button, 1993). Also, studies indicate that the cost of transport; assessed by individuals, often tends to be biased: costs of a car are minimized in comparison to the price of public transport for the same journey (Hine & Scott, 2000; Frenay, 1994).

The long-term cross price-elasticity between using the car and using public transport is rather low, namely 0,14 (Van Der Waart, 1990). This means that an increase in costs for travelling by car will not really stimulate a switch to public transport and vice versa.

In general, transport is considered to be a normal good in the sense that more is demanded at higher levels of income. This generalisation does not apply to all modes of transport or to all situations. There is a positive relationship with car use and an inverse relationship with public transport use. As incomes rise, people will buy more cars, and at the same time lower their demand for public transport. As a consequence, cars are considered to be superior goods, whereas public transport has in many situations proved to be an inferior good. The only exception is the train, which is considered as a superior good (Dijst & Van Wee, 2002).

2.2.3 Skills

Skills are developed by individuals relative to mobility and to the different means of travel. These skills can be physical, acquired or organisational. Acquired skills are linked to the knowledge users have developed of the various means of travel at their disposal and of the space in which mobility takes place. These skills facilitate the use of the considered means of travel. Skills may also result from organisational abilities developed by an individual with regard to time and space arrangements and to budget management. Examples are the ability to collect and use travel information.

2.2.3.1 Activity Space

The concept of the activity space was developed in the late 1960s and aims to represent the space which contains the places frequented by an individual over a period of time. The concept is based on the idea of space-time theory. An activity space can be defined as a two-dimensional form which is constituted by the spatial distribution of those locations a traveller has personal experience with (Schönfelder & Axhausen, 2002). In comparison, mental maps are defined in a broader sense and comprise also those locations of which a person has second hand experience.

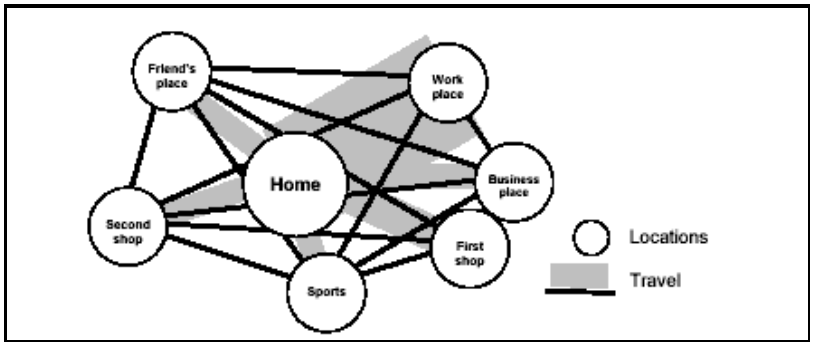


Figure 3 Representation of the activity space (Schönfelder & Axhausen, 2003)

Daily travel behaviour, which can be seen as the engine behind activity spaces, is influenced by two groups of constraints: the position of the person in the life cycle and by her/his life-style choices (Axhausen et al., 2001). The position in the life cycle is seen as given and not influenced by the service levels of the transport system. Certainly in our research – all respondents are students and hence they are generally at the same position in the life cycle – we can minimize the influence of this constraint. The influence of the second constraint, life-style choices, is expected to bring about measurable effects in the activity spaces of the students. Some general life-style choices are (Axhausen et al., 2001):

- Residential location (urban, rural, city centre, urban fringe etc.)
- Workplace/school location, hours worked/studied
- Driving licence
- Car availability
- Public transport season tickets and discount card ownership

2.2.3.2 Mental maps

Traditionally maps were regarded as abstractions of reality and as representations of objective information. The concept of "mental maps" was developed in the 1960s by Lynch (1960) within the behaviourist movement, as a reaction on the dominant positivism reflected by amongst others central place theory, assuming that people dispose of complete and perfect knowledge of their environment. Behaviourism no longer considers people as objective units but as individuals who receive environmental messages and process information, resulting in a transformed mental image of the spatial environment. These environmental images come from a wide range of formal and informal sources. The image of the environment consists of a transformation of distances, times, areas, a selective knowledge of points, lines and surfaces and an appreciation of connections, modes etc (Golledge & Stimson, 1997; Gould & White, 1986). Mental maps account for the element that people do not dispose of perfect knowledge and that this influences their spatial behaviour. Mental maps are currently embedded in the research field of spatial cognition, which studies the knowledge, experience and perception of the environment. It is a research area in the periphery of various disciplines, notably geography, urban planning, psychology and computer science.

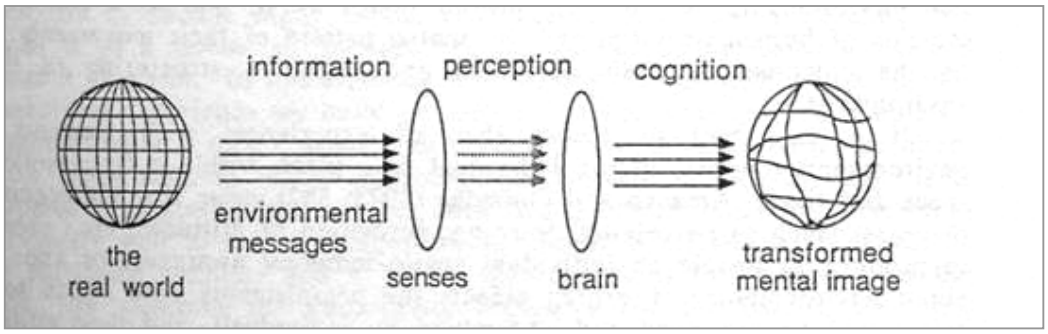


Figure 4 The formation of images (Golledge & Stimson, 1987)

Various definitions of mental maps exist. A broad definition is that of Downs and Stea (1973), who define a mental map as the organized representation by a person of a part of his spatial environment. Lynch (1960) identified five basic elements of mental maps: paths, boundaries, districts, nodes and landmarks. A history of the research in spatial cognition can be found in Mark et al.(1999) and Foreman and Gillet (1997).

The notion that people's everyday spatial behaviour is based on the world as they believe it to be is central in understanding mental maps. This implies a mutual influence of a person's mental map and his mobility behaviour. People use their mental map of an area to estimate the distance, travel time and to appreciate the different travel modes and decisions are wholly or partially based on the information stored in their mental map. Conversely, the mode someone uses influences the notion of the spatial environment a person has, since people observe the environment during their trip and new elements from the environment are ordered and related to each other (Van Beynen De Hoog, 2003, Weston, 2004). Currently a lot of research is being done to integrate human behavioural characteristics into transportation models in order to obtain more realistic and thus more adequate predictions of travel patterns (Janssens et al., 2003).

2.2.4 Appropriation

Appropriation is developed by taking into consideration the user's experiences, habits, perceptions and values linked to the travel modes and to space. This affects the way individuals appreciate their own access and skills to the different travel modes. (Fujii & Kitamura, 2003; Heath & Gifford, 2002). Representation of the different travel modes have been studied to understand the travel decisions taken by individuals. Users often contrast car and public transport. Cars are often perceived quite positively, so that a dependence on the car and a car-oriented mind seems to arise. Public transport is then more negatively assessed (Flamm, 2004a; Kaufmann, 2000; Petit, 2002; Bassand & Kaufmann, 1996). The way users have experienced travel modes will lead them to appreciate a particular travel means. This is why some studies proposed to give users experiences of a real-life situation, an experience that could potentially lead to modify mode decisions (Brown et al. 2003; Fujii et al., 2001; Fujii & Kitamura, 2003; Heath & Gifford, 2002).

2.3 Mobility profile of students

2.3.1 Particularities of the student population

Students are assumed to have already experience linked with mobility, as they had to travel to school, family or leisure facilities. Secondly, students are acknowledged to be in a transition period between youth and adulthood, in which habits, opinions and behaviour are formed. Students are therefore more prone to behavioural changes than other segments of the population (Costes, 2002). Moreover school transport is a very important segment for public transport and students belong in fact to the only age category where public transport scores importantly (Toint, 2004).

Particular elements in the mobility profile of students are:

- The educational establishments in Brussels are managed differently according to the linguistic community funding and managing the educational institution. Dutch-speaking higher institutions are less numerous in Brussels than French-speaking ones. More precisely, the number of universities in Brussels does not vary from one linguistic community to the other, but there are some more French-speaking higher colleges. However, French-speaking universities in Brussels attract far more students than Dutch-speaking ones. There are about twice as many French-speaking students as Dutch-speaking ones in Brussels..
- People in Belgium are allowed to get their driving licence from the age of 18 years. Sociologists (Bassand & Kaufmann, 1996) analyse the obtaining of the driving licence

as highly symbolic, as a passage rite towards adulthood. Driving a car could then reveal to be quite attractive for young people like university students. But some other studies (Büttner & Grübler, 1995; Sandqvist, 2002) show that a generation gap exists between adults and younger people, the latter being generally more concerned by the environmental drawbacks of car use and less eager to obtain a driving licence.

- Studies have shown that persons with lower incomes – young and older ones – are more concerned by price of public transport and may be lead to modify their mobility behaviour according to this criterion (e.g. Hine & Mitchell, 2001; Jemelin, 2004). Fares of public transport are then adapted to these categories of population. This is why students can benefit from a special fare in Brussels (School Season ticket).
- The advanced training students are following may be considered as a sample bias, as it is expected that their way of thinking and behaving is influenced by their particular occupational environment. The higher education they are following may also be the cause of a specificity as to their attitudes and behaviour (Costes, 2002).
- Empirical research indicates that young people travel more than older persons (Hubert & Toint, 2002). As for their everyday mobility, it may be expected that four kinds of activity spheres will push students for travelling: the study sphere; the involvement sphere; the domestic sphere and the spare time sphere (Kaufmann, 2000). Daily journeys allow linking these different spheres between them, as those spheres are often spatially differentiated (Flamm, 2004a; Juan et al., 1997). However, many students may have one or more of their spheres located outside Brussels, in their domestic environment (Félonneau, 1997).
- Studies on travel behaviour of students have shown that the mobility profile of students had to be linked with spatial conditions and transport supply, but also with socio-cultural factors, such as their incomes, their social sphere and their judgements and representations on the future social integration (Costes, 2002).

2.3.2 Key figures of the student population in Brussels

Education in Belgium is the competence of linguistic communities. As far as the French-speaking community is concerned, two universities and one faculty are settled in Brussels (Université Libre de Bruxelles, Facultés Universitaires Saint Louis and Faculté Universitaire de Théologie Protestante). The number of university institutions linked to the Flemish community is about equal (Vrije Universiteit Brussel and Katholieke Universiteit Brussel). Higher education non university institutions are more numerous: 9 colleges depend on the Flemish community and 18 on the French-speaking community. Two military establishments of university type and bilingual high school (the Université Royale Militaire and the Ecole Royale Militaire) also exist but have not been taken into account here.

Reference linguistic community / Type of higher education	French-speaking community	Dutch-speaking community	Total
Non university higher education	27 785	15 188	42 973
-Short type (1 cycle)	16 935	6 314	23 249
-Long type (2 cycles)	10 850	8 874	19 157
University higher education	19 664	7 123	26 787
Total	**47 449**	**22 311**	**69 760**

Table 2 Number of students in higher educational institutions in Brussels for the academic year 2002-2003. (Source: Statistics service of the French-speaking community – see website: http://www.statistiques.cfwb.be and Ministry of Flemish community, education department, Brussels, statistical brochure)

Table 2 shows the number of students at various institutions in Brussels. Although figures for the academic years under research were not available, the figures give a reliable indication of the ratios between the types of education. The data show that the number of students registered in the French-speaking higher educational establishments more than doubles their Dutch-speaking counterparts.

Chapter 3 Research questions

3.1 General objective

"Free" public transport policies are expected to have an impact on different aspects of the mobility system. Distinction can be made between generative effects (extra trips), temporal effects (shifts in the time period trips are made), route effects (changes in the route choice), distributive effects (effects on the distribution of wealth) and substitutive effects (changes in modal split). Besides mobility effects, this type of measure also has social, economic and spatio-temporal consequences. Examples mentioned in the discussion of other "free" public transport initiatives are a changing attitude towards public transport, capacity problems during peak-hours or a diminishing number of "paying" travellers.

Several ex-ante studies were conducted to examine the effect of the pricing measure (a.o. Ubillos & Sainz, 2004; Proost et al., 2002, Van Vuuren, 2002). Because the introduction of "free" public transport is usually combined with changes to the supply and/or with an evolution of the demand, these studies raise much debate about the real impact of the pricing measure. The problem is to assess the effect of "free" use of public transport on travel behaviour independently of other changes in the environment.

The introduction of the measure in Brussels created a situation where the effect of the introduction of "free" public transport can be analysed since one group benefits from the measure and a similar group in the same area does not. The price of public transport is in fact the only difference in the transport supply between the two groups. Using this "laboratory" situation, it will be analysed if this free access causes changes in the mobility behaviour of students. The general objective of the project is thus the analysis of the effect of the third payer system from a pycho-sociological, geographical and economical viewpoint.

3.2 Economic approach

The measure has costs like the cost for the Flemish government to pay for the tickets, an eventual decrease in the number of paying passengers and costs due to potential capacity problems during peak hours (Steegen, 2003). Probable benefits include higher occupancy rates and an increased use of public transport by students. In order to understand the economic impact, the total costs and benefits need to be considered.

The expected results of the social cost-benefit analysis of "free" public transport aim at getting an idea on how "free" public transport is. It will show if society as a whole will benefit from this transport policy.

3.3 Spatial approach

This analysis aims at examining potential effects of the measure on the spatial behaviour. These include the number of trips made, their origins and destinations, the spatial pattern of the origin and destination points and the perception of the spatial environment. These effects evaluate one of the main objectives of the measure, i.e. to stimulate students to explore Brussels. Research questions are:

- Do students visit other places after the introduction of the measure?

- Is there a change in the frequency places are visited after the introduction of the measure?

- Do students visit places in a wider area and do they come in new areas after the introduction of the measure?

Secondly, it is examined how spatial elements help to explain the observed differences in mobility behaviour between the two student groups, i.e. the Dutch- and French-speaking students. Research questions are:

- What are the differences in the perception of places in Brussels between Dutch- and French-speaking students?

- What are the differences in the knowledge of places in Brussels between Dutch- and French-speaking students?

- How do the eventual differences explain the observed differences in mobility behaviour?

Finally, the supply of public transport in Brussels is investigated, addressing the following research questions:

- Does spatial variation in the supply of public transport explains the observed differences in mobility behaviour between Dutch- and French-speaking students?

- What are the areas in Brussels that are less well served by public transport?

- Does the spatial variation in the supply of public transport explain the observed activity patterns?

3.4 Psycho-social approach

The measure may change the students' perception of public transport and their attitude towards mobility in general. Understanding this perception is essential in order to understand the behavioural response to this price measure.

The expected results of the sociological analysis of the implementation of "free" public transport on target groups are the identification and the characterisation of attitudes towards operational and "virtual" free public transport. Also, it is important to gain insight in the social perception of prices and in the social acceptability of the "free" public transport measure and to obtain deeper knowledge of actual rationales guiding mode choices and behaviour.

The expected outcomes can be summarised as:

- Knowledge on the costs and benefits of the "free public transport measure".
- Detailed evaluation of the use of the "free public transport" measure.
- Insight in the relation between public transport accessibility, activity patterns and public transport use.
- Evaluation of changes in activity patterns due to the implementation of the measure.
- Insight in the relation between students' mental maps and public transport use.
- Insight in social perception of prices and in the social acceptability of the "free" public transport measure.
- Deeper knowledge of actual rationales guiding mode choices and behaviour.

Chapter 4 Data collection & methodology

4.1 Survey

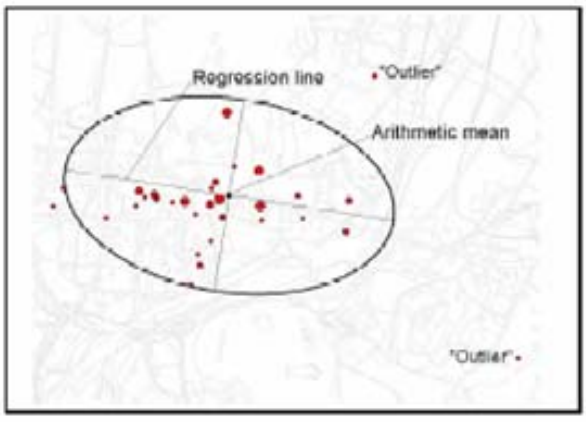
The population for the representative survey consisted of students from Dutch-speaking universities and colleges on the one hand and students from French-speaking universities and colleges on the other hand. 3162 surveys were collected: 1618 (51,2%) from students at Dutch -speaking institutions and 1544 (48,83%) from students at French-speaking universities and colleges. The number of surveys was determined according to school size. The sample was selected according to the principle of the quota sample (De Pelsmacker & Van Kenhove, 2002). The survey was first tested among fifty VUB-students by means of pilot testing.

The survey also served as data collection for the construction of activity spaces. All locations regularly visited by the respondents are needed as input for the activity spaces measurement. Therefore the quality and the time frame for which data were collected are important. In the survey people were asked which locations they frequently visited. Various techniques are possible for measuring activity spaces, such as confidence ellipse, kernel density and minimum spanning tree (Figure 5) (Schönfelder & Axhausen, 2002). Each of these captures different aspects of the activity space.

The confidence ellipse represents the smallest possible area in which a specified proportion of all visited places is located. The size of the ellipse is an indicator for the dispersion of the locations visited.

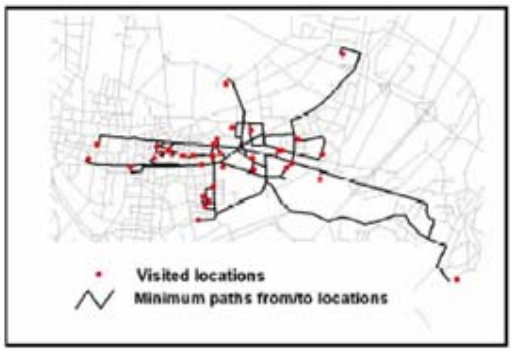
The kernel density technique transforms the point locations to a continuous, smooth raster representing the density of the places visited. This technique allows exploring the combined effect of location choice and the frequency of visit. Two measures can be derived from this technique: one measures the extent of the space used, the other measures the intensity of the space used. Furthermore, local peaks can be identified on the map as sub-centres.

The "minimum spanning tree" is based on the idea that the transport network structure shapes our perception and knowledge of space and activity locations. Thus, by incorporating the path chosen by travellers in the calculations, we can come to a measure which approximates the perception of space.



Confidence ellipse

Kernel density



Minimum spanning tree

Figure 5 Methods to construct activity spaces

4.2 Mental map interviews

4.2.1 Questioning of mental maps

300 students from French-speaking and Dutch-speaking institutions filled in a questionnaire on mental maps, complementary with the survey. They were selected proportionally to the school size. Different methods were tested on a test group, and four questions were withheld. First, the students were asked to give a score to a set of neighbourhoods, allowing ranking their place preferences (Gould & White, 1986). Second, they were also asked to list the names of neighbourhoods, streets and buildings they frequently visited or knew very well, allowing to map the number of times a certain place is mentioned. Third, they were asked to give the place they preferably would go to live, shop and go out, without taking into account financial or other constraints. This question provided more information on their preferences. Finally, students were asked to draw within a limited time period (about 5 to 10 minutes) a map of Brussels with given borders and directions to neighbouring cities. This question provided information on their knowledge of Brussels and the elements they consider significant in Brussels, like certain landmarks, edges, nodes and areas. A number of criteria have been developed to assess the quality of a mental map (Lynch, 1960; Dorling and Fairbairn, 1997). Combined, these questions provide a wide range of information on the students' knowledge and appreciation of places in Brussels.

4.2.2 Ranking place preferences

Students were asked to evaluate each neighbourhood on a seven-point scale, running from +3 for places they liked very much, through 0 for places they regarded with indifference to -3 for places they disliked strongly. The type of scaling procedure used does not make a significant difference in results when constructing mental maps (Gould & White, 1986). An advantage of using ordinal data is that when we have ordinal data for a large group of people, these data closely approximate the more precise metric measures of the interval scale**.**

Mental maps can be constructed from ordinal measurements using principal components analysis. The method is described in detail in Gould & White (1986). Below, a short summary is given.

Starting from a data matrix with place preferences of students, their agreement can be measured by calculating the correlation coefficients between all possible pairs of people. Students having high correlations will have similar place preferences. Each of the n correlation coefficients can be represented as a vector in an n-dimensional space with the cosines of the angles between the vectors as the correlation coefficients. The vectors of students having similar preferences will lie more or less in the same position resulting in a small angle (thus a

high cosine). The overall thrust of the vectors can be captured by finding a line or axis through their common origin so that the projection of these vectors on this axis (or the cosine) is maximized. This axis represents the most general overall viewpoint and the cosine of each individual vector. The cosines are called loadings. A principal component analysis is an automated way to find the axis where the sum of the squared loadings is maximized. Moreover, since the loadings of each vector measure the correlation, or agreement, of each person with the most typical view, these can be used as weights to combine the original rank values into overall scores for each of the regions. During the last step the calculated scores can be rescaled to a 0 to 1 range, with the best-liked regions having the highest scores. Also the values can be rescaled taking into account missing values.
This method allows finding the overall structure in the student's responses, better than merely taking average scores. Each observation is taken into account according to its compliance to the overall structure. It enables to detect outliers and, to a lesser degree, to take their preferences into account. (Gould & White, 1986).

4.2.3 Processing of mental map information

4.2.3.1 From drawn maps to georeferenced digital information

A relational database was built containing for each student the place names listed and/or drawn. Only features that were drawn more or less on the right location were included. A set of geocoding operations were then carried out to georeference the information:

- buildings on address or street level using UrbisSpW geocoding software (automatic match: 68%; interactive match: 11%; own digitizing: 21%);

- bus stops on address level using ArcGIS geocoding;

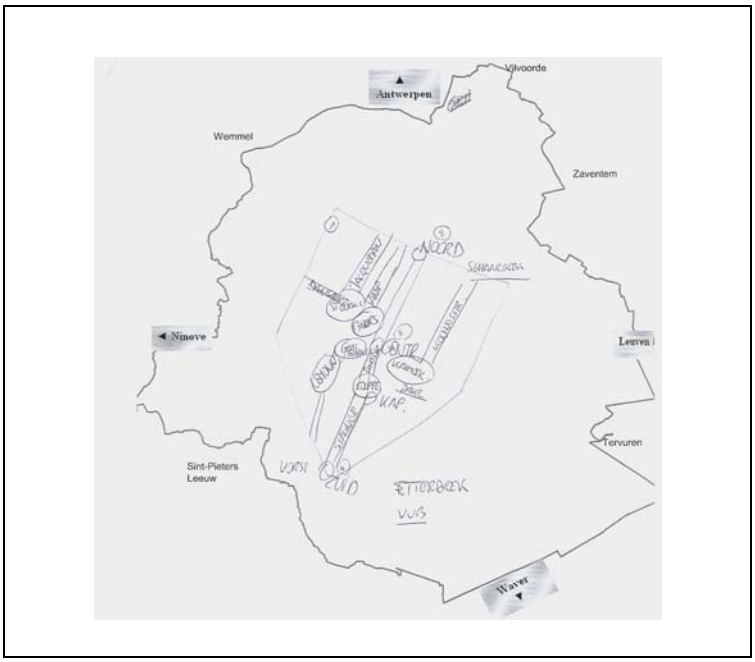
- streets on street level using UrbisSpW software;

- neighbourhoods and communities on statistical sector level using ArcGIS geocoding.

After geocoding place names on the most detailed level possible, all information was reclassified to statistical sector level. This means that each building, street or commune was assigned to the statistical sector(s) it lied within or contained. Since it was asked to draw place names as detailed as possible, it was assumed that listed buildings or streets indicated a better knowledge of the area than when only the commune name was listed. Secondly, when creating digital mental maps, both listed communes, streets and buildings had to be distinguishable on the map. Therefore, buildings (5 units) and streets (3 units) were weighted more than communes (1 unit). Large streets are assigned to the statistical sectors they cross, according to the percentage of the length of the street that lies in that sector. For example, when a street crosses two sectors in about an equal share, both sectors get a 1,5 score. However, it needs to be kept in mind that the listing of places inevitably is subject to some inaccuracy because of the gap between the connotation of a place with the student and the location of this place on a map. For example, when mentioning or drawing the Louisa Avenue, many students only associate it with the first (shopping) part, while in fact it is a very long street. Addressing this type of error would require in-depth interviews and specific questions, such as way-finding questions.

The results are mental maps on statistical sector level, indicating for each student or group of students which places are familiar. For further processing the maps were converted to raster format.

A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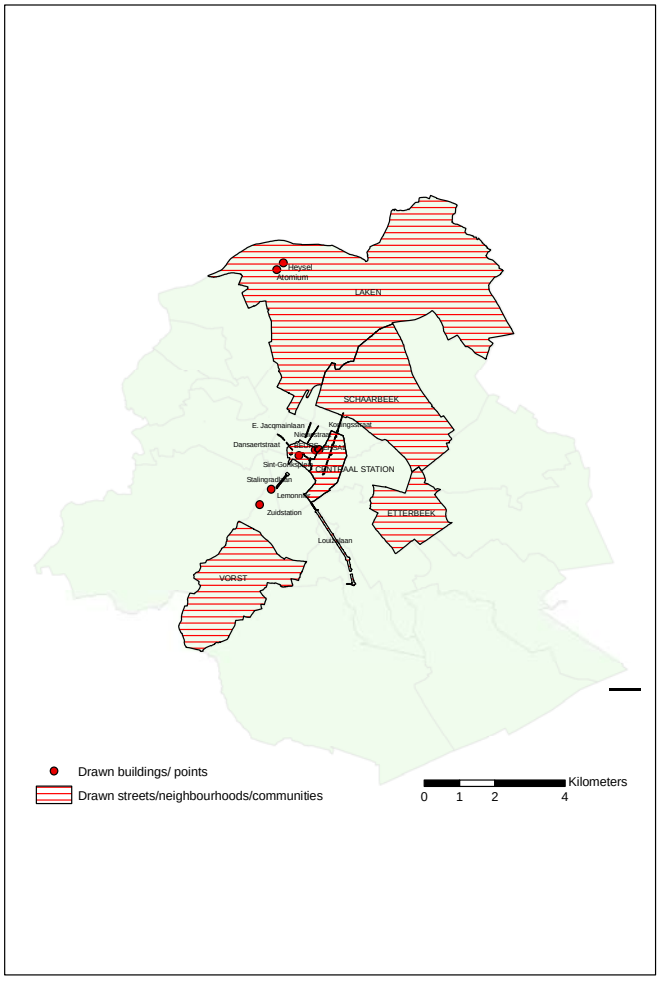
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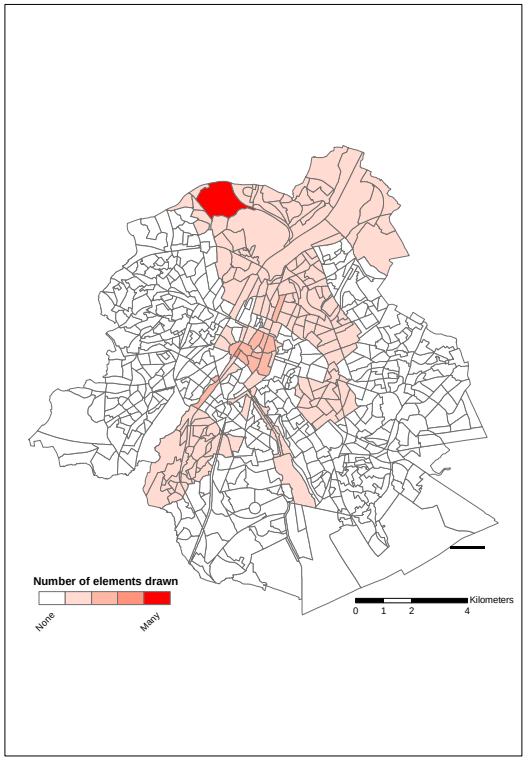

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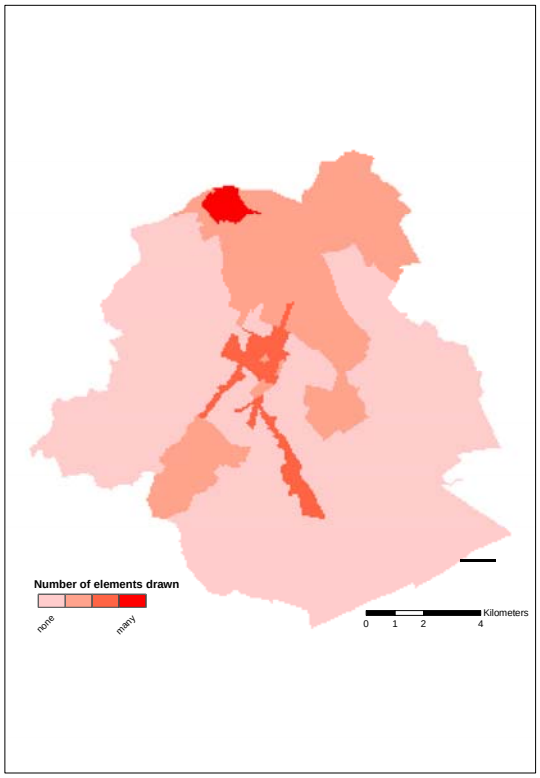


Figure 6 Processing of mental maps

4.2.3.2 Comparing individual mental maps

The first part of the analysis uses pre-defined groups, based on characteristics such as the language of the institution and the residence situation of the student. This type of analysis offers however no real insight in the factors that are determinate for the quality of a mental map. This can be achieved by comparing individual mental maps on their spatial characteristics, so that groups of similar mental maps can be formed.

For most purposes visual, human comparison still outperforms automated procedures. When comparing maps the human observer takes many aspects into account without deliberately trying. Map comparison methods performed by software usually capture one of these aspects, but overlook the others. However, there are situations where automated map comparison is preferred to visual comparison. Except for the aspects of time and human effort, the automated procedures are explicitly defined and therefore repeatable (Hagen, 2003a). The need for adequate map comparison methods is recognized and has growing interest among researchers (Metternicht 1999, Monserud and Leemans 1992, Pontius 2000, Power, Simms and White 2001, Winter 2000, Hagen 2003a and 2003b).

The Map Comparison Kit (MCK) is a software tool for the comparison of raster maps. The tool has been developed by the Research Institute for Knowledge Systems (RISK) in the Netherlands with the purpose of evaluating the output of dynamic spatial models. The tool has been applied mainly for the comparison of land use and vegetation maps. It contains a range of algorithms for the comparison of raster maps, including 'classical' methods such as Kappa and the percentage of agreement, as well as some 'state of the art' methods, such as Fuzzy Set Map Comparison. This method is a combination of Kappa statistic and Fuzzy Set theory and takes proximity relations and similarity between legend categories into account in order to obtain a nuanced view on map similarity.

In this context, fuzziness means a level of uncertainty and vagueness of a map. This fuzziness is not inherently present in the map, but follows from an observer's interpretation. For the comparison of maps, two sources of fuzziness are considered: fuzziness of location and fuzziness of category. With fuzziness of location is meant that the spatial specification found in a categorical map is not always as precise as appears; a category that in the map is positioned at a specific location may be interpreted as being present somewhere in the proximity of that location. This fuzziness is taken into account by letting the fuzzy representation of a cell be partly defined by the cells found in the proximity. Similarly, the definition of categories in maps is often imprecise, especially if the categories have an ordinal definition. The main purpose of the Fuzzy Kappa map comparison is to take into account that there are grades of similarity between pairs of cells in two maps.

The Kappa statistic allows expressing the level of agreement between two maps in a single number. The essence of this statistic is that the fraction of agreement (number of equal cells) is corrected for the fraction of agreement statistically expected from random relocating of all cells in the map. Pontius (2000) introduced two statistics to separately consider similarity of location and similarity of quantity, which was transformed by Hagen to Khisto. Kappa is defined as the product of Klocation, the measure for the similarity of spatial allocation of categories of two compared maps, and Khisto, which is a measure for the quantitative similarity of the two compared maps. A detailed specification of the method is given in Hagen (2003a and 2003b).

The raster files of the individual mental maps were converted to Ascii files and automatically entered and processed in the MCK (batch mode). The processing consisted of a two-by-two comparison of all maps, resulting in a 288*288 cells matrix for each indicator (Klocation, Khisto and Kappa) which was automatically written to a Statistica (Access) database.

4.2.3.3 Cluster analysis

The purpose of this step is to define groups of similar mental maps based on their spatial characteristics. To achieve this, the Kappa values from the previous step are used.

The term cluster analysis actually encompasses a number of different classification algorithms. The most common methods of clustering are Joining (Tree Clustering), Two-way Joining and K-means clustering. The large number of cases made the output of tree clustering methods difficult to interpret. In Two-way Joining, both cases and variables are clustered, which is not appropriate in our research.

K-means clustering methods start from a fixed number k of clusters. The method will produce exactly k different clusters of greatest possible distinction. The program will start with k random clusters, and then move objects between those clusters with the goal to (1) minimize variability within the clusters and (2) maximize variability between the clusters. The means for each cluster indicate how distinct the clusters are. The magnitude of the F values from the analysis of variance is another indication of how well the respective dimension discriminates between clusters. Analyzing the distances of each object from their respective cluster mean allows identifying potential "bad" cluster members, that is, objects that are very distant from the cluster center, yet do not belong to any other cluster.

The data did not yield a clear set of clusters. Best results were obtained with 7 clusters, taking into account a maximum distance between cluster centres and a reasonable number of elements within each cluster (higher numbers of clusters tend to result in more one-element clusters, putting outliers in a separate cluster). Euclidean distances from each case to the cluster centre helped to separate "good" cluster members from those far from the cluster centre. These "good" cluster members enabled to characterise the clusters.

4.2.3.4 General Discriminant Analysis

A discriminant analysis allows determining which socio-economical and mobility variables help to explain group membership. It is used to determine which variables discriminate between two or more groups, in this case groups of similar mental maps. A model is built that best predicts to which group a case belongs.

Traditional discriminant analysis can only be applied with continuous predictor variables. General Discriminant Analysis (GDA) is an extension that allows the use of categorical predictor variables (www.statsoft.com). The method is called 'general' because it applies the methods of the general linear model to the discriminant function analysis problem. GDA does not impose any particular restrictions on the type of predictor variable that can be used. Like Discriminant Analysis, GDA allows performing standard and stepwise discriminant analyses. Every output of traditional discriminant analysis can also be obtained with general discriminant analysis.

A stepwise model approach allows selecting those variables that discriminate most between the cluster groups. Those variables with a very low tolerance (extreme multicollinearity) will be excluded from the model. With a forward stepwise model, the model starts with zero variables and variables are added when a certain F-value (F to Enter) and minimum p-value (p to Enter) are reached. Each step, the model is evaluated and variables can be added or removed. Only main effects were taken into account, so not combinations (products) of different variables.

4.3 Analysis of the public transport supply

The purpose of the analysis of the public transport supply is to have an image of the well and less well served areas in Brussels Capital Region in order to ease the interpretation of the activity patterns and mental maps. Perhaps certain places aren't visited because the transport supply is insufficient. Secondly, the analysis of the transport supply is important to balance the effect of price measures versus investments in the transport supply. Three sources or methods have been used to analyse the public transport supply:

- Data sources readily available at the MIVB/STIB have been used, such as the Vision 2020 document that contains information on the public transport offer.

- For all public transport stops the number of passing vehicles (bus, tram, metro) per hour has been calculated for a selected time frame (morning and late evening). The result is a map with isolines that indicates the number of passing vehicles per hour. A buffer distance of 400 meters was used, corresponding approximately with a maximum walking distance of 500m.

- Originally, the aim was to calculate travel times by public transport from the 30 most frequented places by students (schools, shopping areas, leisure etc.) to (the centre of) each statistical sector. However, this could not be done. The calculation of travel times had to be done using the software and resources from the MIVB/STIB. The dataset of travel times that had to be calculated was extensive and technical capacity problems were encountered to process such a large number of records. Therefore it turned out to be a very time consuming process. Simplification of the dataset lowered the added value of the analysis. However, the first two data sources provide sufficient information on the public transport supply in Brussels.

4.4 In-depth interviews

4.4.1 Hypotheses

In order to guide us in the beginning of the research, we defined three hypotheses which could be likely to highlight the mode choices made by individuals. The understanding of those choices would allow us to get the importance of financial type factors in the reasoning held by individuals and to result later on in the "free" public transport problematic.

A first proposed hypothesis was that of lived experiences – as potentially carrying sense and so participating in a privileged way in the mode choices made by individuals. The second hypothesis suggested that «mobility diaries» could influence mode choice. Finally socialization – as it would create mode use habits – appeared also as a factor influencing the attraction and/or the use of some means of transport. These hypotheses were used to create the interview guide and to direct the qualitative analysis.

4.4.2 Methodology

The methodology can be defined as inductive and comprehensive. Inductive methodologies start from particular elements to come to generalization and theorization of the results. The comprehensive approach (Kaufmann, 1997; Petit, 2002) focuses on the justifications used, rather than on the description of behaviour (for more detailed explanation, see references). In this case study, the comprehensive approach will be aimed at understanding, as a whole, the elements that influence logics of action followed in the everyday mobility and to understand the significance that an actor gives them.

Qualitative methods correspond in a more obvious way with such a comprehensive approach, as these data collecting methods allow the individuals to freely express themselves relatively to their logics of action. It becomes then possible to avoid immediate answers and to go deeper in the attitudes, representations, perceptions and feelings of a person (Hay, 2000).

Since the point is rather to look for diversity of profiles, reaching a representative sample is not considered as a relevant epistemological criterion. Data collecting is stopped when no new information is found with additional interviews. Qualitative interviews are carried out in a semi-structured way. This means that open questions are asked to respondents who answer freely. Most of the questions asked are listed in an interview guide which is composed of about fifty questions gathered to more general topics (Annex 4). The search for respondents was conducted through personal acquaintances of the researchers, organizations linked with the student life and the phone number and e-mail address of respondents to the quantitative research who accepted being contacted again for deeper survey. Difficulties were experienced to find respondents.

40 interviews were achieved (20 French- and 20 Dutch-speaking students), one could not be transcribed because of its poor audible quality. A complete transcription of the interviews was carried out (annex 3). With those transcriptions, we have sketched an analysis of the materials. The method used was based on the structural method, which considers the talk of the respondent as being structured in a particular and systematic way. The main goal is then to identify and to analyse sets of themes and lines of arguments followed by students (Hiernaux, 1995; Piret et al., 1996).

Given the fruitfulness of the data collected, a first step was to get the global elements of the interviews and their relations. In order to come to sharper results, a second step allowed us to raise particular logics of some respondents concerning sets of themes linked more particularly to financial, economic aspects. This work has allowed us to examine whether different types of respondents – which arise from quite close lines of arguments – could be described. These two analysis levels have then allowed us to get the dynamics emanating on a global and particular scale within the interviews. Finally, encoding of the data has been carried out, on the basis of the previous results. The Nvivo software has therefore been used.

Through these analyses, we have grasped some elements allowing understanding to which extend free public transit policies may contribute to sustainable urban policy. The Flemish Community's policy was however not presented in the first place as a sustainable transport oriented policy, but we have focused the analysis on the effects of the measure as such. The point is here to analyse a particular kind of policy and to analyse the daily rationales of individuals with reference to this policy.

	Men	Women	Total
Dutch-speaking	8	11	19
French-speaking	12	8	20
Total	20	19	39

Table 3 Number of respondents according to linguistic community of origin and gender.

4.5 Social Cost Benefit Analysis

4.5.1 Introduction

The Social Cost-Benefit Analysis (SCBA) model is based on the theory of welfare economics, according to which the welfare of a society depends on the aggregate individual utility levels of all members of that society. The aim of the SCBA is to produce an evaluation in terms of a general objective, which takes into account the interests of all actors who will be affected by the decision. Therefore it is a suitable method for evaluating governmental investments. In this

case, the goal of the SCBA is to determine whether the society as a whole benefits from the execution of the "free" public transport project or not.

The SCBA has three main characteristics. The most important characteristic is that it adopts the position of the society as a whole. It does not only take financial costs and benefits into account, but it also tries to capture the societal effects, such as environmental pollution and traffic safety. Another key feature of the SCBA is that it converts all the effects involved into a common unit, namely the monetary unit. The third aspect of the SCBA, is that it calculates the balance of the monetarized effects. If the balance is positive, the society as a whole benefits from executing the project. If the balance is negative, it means that the costs for the society are higher than the benefits generated by the project. (Immers & Stada, 2004; De Brucker et al., 1998).

4.5.2 The SCBA model

In order to assess the socio-economic output of an investment, one usually uses a reference alternative and a project alternative. The reference or zero alternative reflects the situation before and the project alternative describes the situation after the initiation of the "free" STIB subscription. The differences between both alternatives represent the effects of the introduction of "free" public transport. These effects can be positive (net-benefits) or negative (net-costs) for the society. Table 4 gives an overview of the dimensions taken into account for the evaluation of the "free" public transport project. On the left side are the costs of the measure, on the right side the benefits.

Costs	Benefits
1. Direct costs	***1. Direct benefits***
- Government Subsidy	Increase Consumer Surplus
- Exploitation Costs	
- Costs related to capacity and punctuality problems	
	2. Indirect benefits (Pro Memory)
	- Improvement city image and attractiveness
	- Basic mobility access
	- Familiarisation of public transport
2. External costs	***3. External benefits***
- Congestion	- Congestion
- Pollution	- Pollution
- Accidents	- Accidents
- Noise	- Noise

Table 4 The SCBA Model

4.5.2.1 Costs

The costs can be divided into direct costs and external costs. In general, the direct costs are borne by the supplying agency. External costs can be defined as costs that are not directly borne by those generating them. These external costs occur when the activities of one group affects the welfare of another group in a negative way, without compensating for their loss (Button, 1993).

The direct costs of this project are directly related to the introduction of the "free" public transport measure. It concerns the government subsidy, the exploitation costs and the costs of capacity and punctuality problems generated by the project.

In June 2003 the Flemish Government granted a subsidy of 1.200.000 euros to the non-profit organisation Quartier Latin. Students could get their purchase of the public transport subscription refunded. However, the "free" public transport turned out to be a big success and the provided budget could not cover all costs. The government decided to grant an additional subsidy of 246.293 euros, in order to be able to refund all 8077 students. This brings the investment of the Flemish Government to a total of 1.446.293 euros (Somers, 2004).

The other direct costs are directly borne by the supplying agency, in this case the Brussels Public Transport Network Managing Company (STIB). However, the company states that the "free" public transport measure did not generate any additional costs. There were no extra exploitation costs, since supply and service frequency were kept at the same level. Some public transport lines have to deal with capacity and punctuality problems, but according to the STIB, these problems are not related to the "free" public transport. Consequently, the government subsidy is the only direct cost.

Since there has not been an increase of the transport supply, there is no supplementary external cost of increased congestion, pollution, accidents and noise. The external costs are the same in the reference and project alternative. Thus, there is no need to include and monetarize additional external costs caused by public transport.

4.5.2.2 Benefits

The introduction of the project does not only generate costs for the society, there are also benefits related to it. The benefits taken into account for the SCBA are direct benefits, indirect benefits and external benefits.

The direct benefits are the positive effects the users of public transport experience as a result of the introduction of "free" public transport. These positive effects can be measured by looking at the difference in consumer surpluses with and without the project. The consumer surplus (CS) can be defined as the difference between what a person would be willing to pay and what he actually has to pay to buy a certain amount of a good. Graphically, it is the area below the demand curve and above the price level (Figure 7)

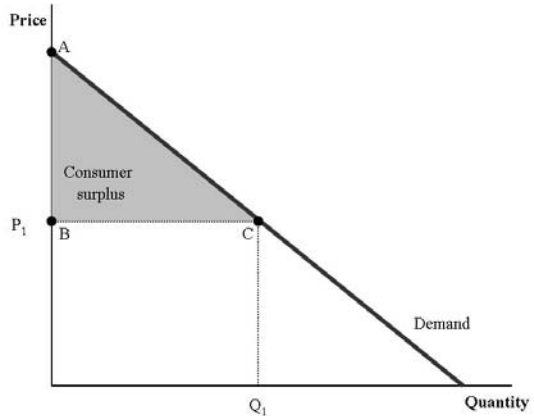


Figure 7 Graphical representation of the consumer surplus

In this particular case, executing the project means that the price of public transport for the students decreases from on average 185€ to 10€ (administrative cost). This means that students saved on average 175€ (Somers, 2004). In order to calculate the increase in consumer surplus, and thus the direct benefits, the CS from the reference alternative has to be compared to the CS of the project alternative.

Indirect benefits result from the direct benefits and are for instance effects on employment, economical growth and on the image of a city or region. In the case of "free" public transport,

the indirect benefits can occur on the short run, like the insurance of basic mobility access, but they can also arise in the future. The "free" subscriptions might induce habit forming and stimulate students to keep using public transport in their future life. Also, the measure can improve the attractiveness of the city, not only as a place for studying, but also as a place for living and socialising. However, these benefits are not easy to monetarize. Although they will not be included in the actual cost-benefit analysis, it is important to keep in mind that they exist. They are taken into account pro memory (Spit et al., 2004).

As a result of the modal shift from private vehicle use to public transport use, the number of private vehicle kilometres decreases. This way, the "free" public transport project reduces external effects caused by private vehicles, such as congestion, emissions, noise and accidents. These effects will be monetarized using key numbers from a study conducted by INFRAS/IWW (2004) and Mayeres et al. (1997).

Chapter 5 Mobility profile of the students

5.1 Public transport use

Almost half (46,79%) of the students of Dutch-speaking universities and high schools bought the annual MIVB-ticket and have requested a refund by Quartier Latin. But have they really used their ticket, or did they obtain it just because it is for free? To find out, we asked students about their current and previous use of MIVB public transport (tram, bus and metro).

5.1.1 Public transport after introduction of the measure (2003-2004 academic year)

89% of all students who requested the "free" ticket have regularly used the tram, bus or metro provided by the MIVB. This means that only 11% of the students have not exploited their "free" access to public transport. Table 3 compares the average number of trips per week by paying students and students travelling 'for free'.

	free travelling Dutch speaking students	Paying Dutch speaking students	Paying French speaking students
Mean number of trips per week tram	7,15	6,01	10,31
Mean number of trips per week underground	6,86	3,98	9,28
Mean number of trips per week bus	6,68	4,31	8,24

Table 5 Comparison of the average use of tram, metro and bus between "free" travelling and paying students

The averages of "free" travelling Dutch-speaking students are higher for each mode than the averages of paying Dutch-speaking students. However, in comparison with the paying French-speaking students, the averages are lower. Even though French-speaking students in Brussels have to pay for their public transport use, they use it more frequently than the "free" travelling Dutch-speaking students!

5.1.2 Public transport before the introduction of the measure

In the previous section we used a cross-sectional analysis to compare the travel behaviour of different groups, namely paying and "free" travelling students. Here, we describe the results of a longitudinal analysis. The current use of public transport was compared to the use of public transport in the previous year, prior to the introduction of the "free" public transport measure (table 4).

Public transport use compared to the previous year	Tram	Underground	Bus
New user	17,55%	11,08%	13,69%
Existing higher user	37,75%	36,32%	34,52%
Total higher use	**55,30%**	**47,40%**	**48,21%**
Equal use	**41,06%**	**44,58%**	**44,05%**
Lower use	**3,64%**	**7,78%**	**7,74%**

Table 6 Current public transport use of "free" travelling Dutch-speaking students compared to their previous use

These percentages were derived from Dutch-speaking-students who use the "free" annual MIVB-ticket and have been studying in Brussels for more than one year. "New" users are students who have been going to a high school, a college or a university in Brussels for more than one year, but they have never used MIVB public transport until now. The percentage of new users has been added up to the percentage of existing users with higher public transport use. This results in the category 'total higher use'. This category has the highest percentage for each public transport mode. This means that the majority of students from our sample indicate that they use Brussels' public transport more than before, when they had to pay.

5.1.3 Additional effects

Changes in price of a certain travel mode can have an effect on the demand for that particular travel mode (own price-elasticity), but it can also influence the demand for other travel modes (cross price-elasticity). The first type of elasticity can lead to generation effects, whereas the cross elasticity can generate substitution effects (De Brucker et al., 1998).

Since these data could not be derived from the quantitative survey, we conducted a smaller survey in addition by phone. This sample consists of students who own a "free" annual MIVB-ticket and who pointed out that they use the MIVB public transport more than before. Taking into account some non-responses, the additional data were collected from 57 respondents.

Generation effects

In this context, generation effects appear when students are stimulated to use public transport as a consequence of a reduction in its price. Generation effects occur among 26% of our selected students. These include new trips with public transport (it concerns trips that they did not make before with other transport modes) as well as trips they already made before with MIVB public transport vehicles, but not as often as they do now. On average these students make 1,7 additional trips per week. The number of students with whom generation effects occur, consist for 25% of students who have made new trips as a result of the measure, for 45% of students who made additional, but already existing, trips and for 30% of students who have made both.

Substitution effects

Substitution effects occur when students are stimulated to switch over between different transport modes as a result of a price reduction in public transport. In this case, there are 3 possible substitution effects. First, it is possible that students switch over from using their car to using public transport. Second, it is also possible that students change over from other public transport modes, such as the train and De Lijn, to MIVB public transport. Finally, some students now take the tram, underground or bus instead of going by bike or on foot.

To obtain the percentages for substitution from car use to MIVB use, we used an even smaller sample (N = 32), because we needed to exclude the students who cannot dispose of a car. We use the term car disposal, and not car ownership, because we do not only want to take students who own a car into account, but also student who can ride along with someone, or even borrow a car. 66% of the selected students admit that they sometimes choose public transport over car use, because the first alternative is cheaper. On a weekly basis, this substitution effect results in a decrease of on average 82,4 km per student.

Another possible substitution effect is the one where students switch over between public transport modes. 14% of the students who were interviewed by phone said that they switched over from train to MIVB public transport and 3% changed over from De Lijn to MIVB. Finally, it is also possible that students take the tram, underground or bus, instead of going by bike or on foot. Obviously, this measure never intended to stimulate or even create this kind of substitution. 21% of the selected students admit that they sometimes take public transport for a stop or two, whereas they used to cover that distance on foot. Besides that, there are also students who switched over from using their bike to using "free" public transport (5%).

5.2 Profile analysis

Within our sample of students, we can distinguish different profiles. We analysed the possible differences or similarities in travel behaviour between Dutch- and French-speaking students, male and female students, students who stay on campus and students who do not, and finally students living in Brussels and students living outside Brussels.

The differences between Dutch- and French-speaking students are similar to the differences between students living outside Brussels and students living in Brussels. A possible explanation is that 62,7% of the French-speaking students are living in Brussels, whereas only 9,4% of the Dutch-speaking students have their place of residence in Brussels.

French-speaking students who use public transport more often and more frequently. Dutch-speaking students use the train for most of their trips in Brussels. The main reasons why both groups travel around in Brussels are the same: commuting to school, going out in the evening, visiting family and friends and shopping. There are only remarkable differences with regard to the travelling motives of the train. The main motive for Dutch-speaking students to use the train is for the trip to school, while French-speaking students rather use the train for the trip to their student room.

These mode choices and travel motives influence the way students pay for their trips. Most of the students travelling by MIVB public transport have an annual ticket. In case of the Dutch-speaking students most of these tickets are for free. For the trips made by train, the payment mode depends on the travel motive and frequency. Dutch-speaking students use the train mainly for commuting to school. It concerns trips they do almost every (school) day; consequently they own a train subscription. French-speaking students use the train for commuting to their student room, which happens twice a week. These students rather use train tickets or a Go pass.

Concerning their perception of Brussels public transport in general (tram, underground and bus of MIVB, train and de Lijn), Dutch-speaking students tend to be more positive in their overall appreciation than French-speaking students, especially when it comes to the MIVB public transport. A possible explanation is that French-speaking students, having to pay for their trips, are more critical because they expect a certain service in return.

There were no remarkable differences in travel behaviour between male and female students. Students who stay on campus and students, who go home every day, do have different travel

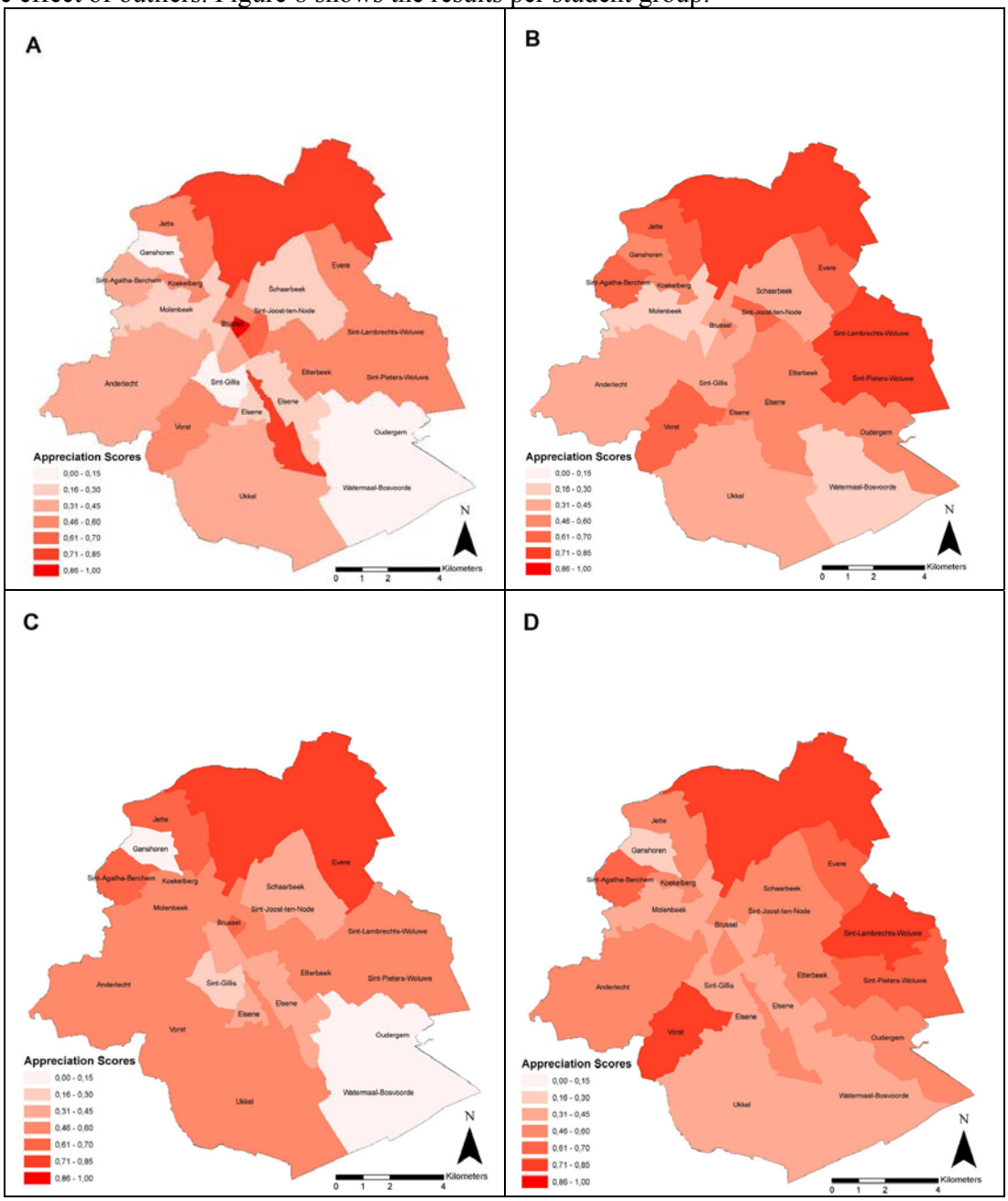
behaviour. In general both groups of students choose the same travelling modes: underground, train and tram. But, the percentages are higher for the students who stay on campus, whereas students who go home every evening use these modes more frequently. Here also, the 4 main travel motives are the same (commuting to school, going out in the evening, visiting family or friends and shopping). The biggest difference lies in the motives for taking the train. Students staying on campus commute to their student room, while the other students commute to school. Consequently, the first group of students uses train tickets and Go passes to pay for their trips, and the second group owns train subscriptions. There are no major differences concerning their perception of Brussels public transport in general.

Chapter 6 Spatial analysis

6.1 Analysis of mental maps

6.1.1 Mapping of ranked preferences

The analysis of the appreciation scores allowed identifying patterns in the data and minimizing the effect of outliers. Figure 8 shows the results per student group.



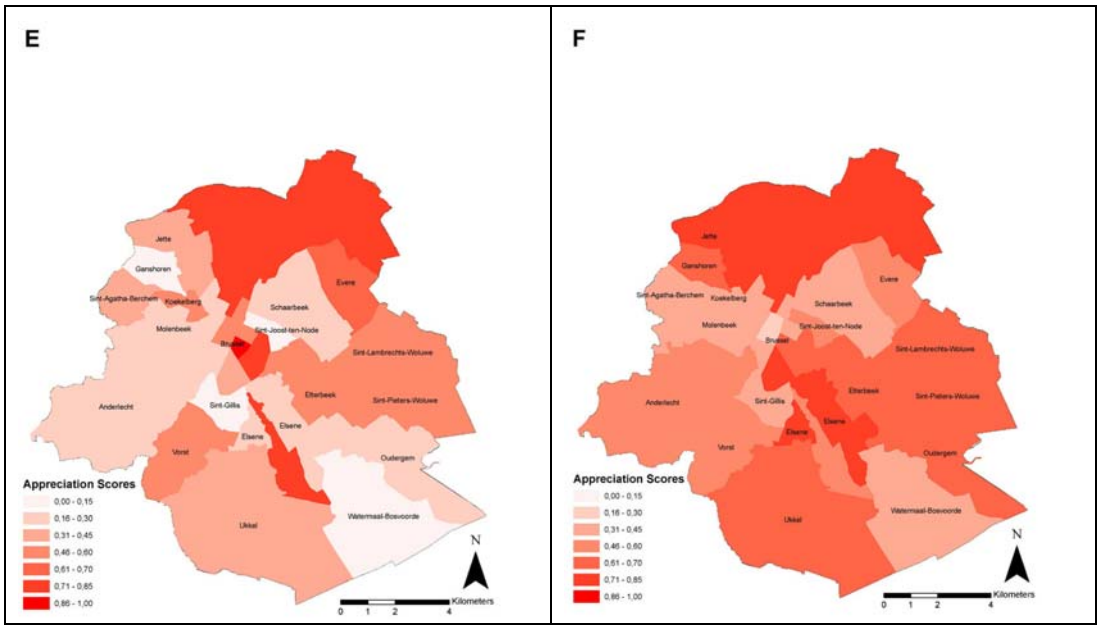


Figure 8 Normalised appreciation scores per neighbourhood for Dutch-speaking students (A), French-speaking students (B), Dutch-speaking students with a student residence (C), French-speaking students with a student residence (D), commuting Dutch-speaking students (E), commuting French-speaking students (F).

Observations from the maps with appreciation scores are that:

- Dutch-speaking students in general have a more negative image of Brussels than their French-speaking counterparts.
- The areas with a generally positive image are for Dutch-speaking students limited to the city centre (exception Anneessens), the neighbourhood of the Louisa Avenue and the neighbourhoods Schuman and Etterbeek (location of V.U.B. is important). Also Jette and Koekelberg have a reasonably positive image, due to the location of Dutch-speaking schools. Areas with a very negative image are Sint-Gillis, Ganshoren, Oudergem and Watermaal-Bosvoorde.
- Students with a student residence have a slightly better image of their city than the commuters, but the pattern is similar. Dutch-speaking students with a student residence have a more positive image of Sint-Gillis and Vorst. Commuters generally have a rather negative image of their city with exception for the neighbourhoods Beurs and Louisa. This group is relatively the most important, counting for 70% of the students at Dutch-speaking institutions.
- The image the French-speaking students have of their city is generally more positive. The difference is the biggest in the south (Elsene and Ukkel) and southeast (Sint-Pieters Woluwe and Sint-Lambrechts Woluwe). Exceptions are Ganshoren and Sint-Agatha Berchem which suffer from a very negative image.
- In general students living permanently in Brussels have a more positive image. There is a difference between those at Dutch-speaking and those at French-speaking institutions, but this is smaller than for the other categories.

6.1.2 Mapping of frequencies of drawn places

Synthesis maps with the frequencies places were mentioned by student group were made. These enable to compare the appreciation scores with the spatial knowledge of the students.

Figure 9 represents the frequencies public transport stops were mentioned by the students. Names with a double meaning as public transport stop and an ordinary place name were not taken into account, unless there was an indication that the intention of the student was to draw a public transport stop (for example, if the line was also drawn, or a symbol used).

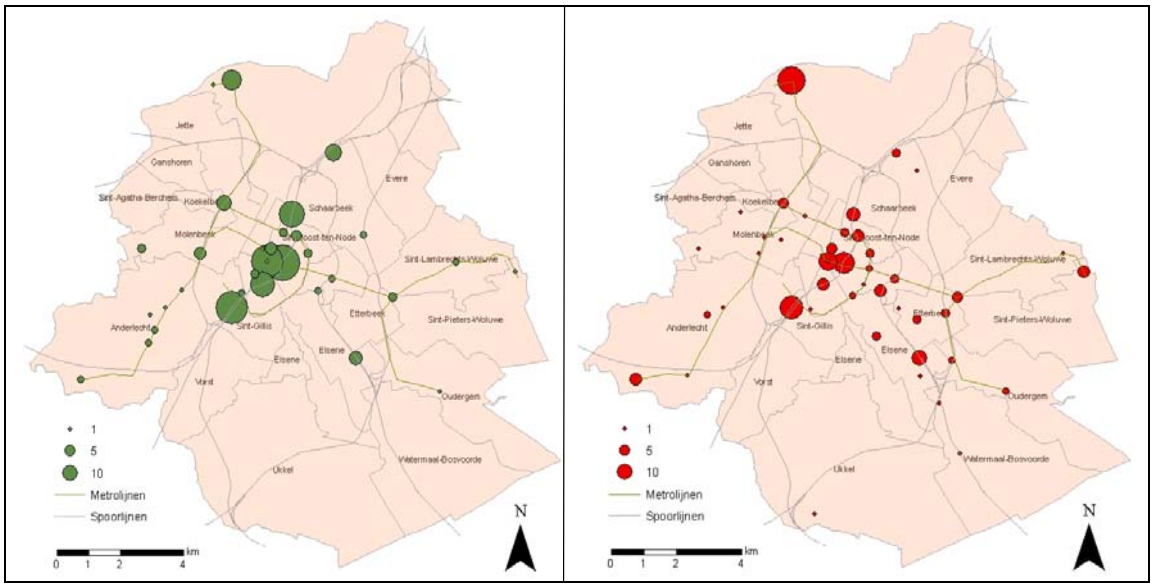


Figure 9 Frequency that public transport stops were drawn Dutch- (left) and French- (right) speaking students"

Table 7 summarizes the results of a comparison of the mental maps between the main student groups. Variables of the map's quality such as the number of places drawn, the correctness, the presence of connections and the level of detail were combined into an overall indicator of mental map quality

Group 1	Group 2	t-test statistic	p-value
students Dutch	students French	-2.40	0.02
commuters	temporary inhabitants	0.15	0.88
commuters	permanent inhabitants	1.05	0.30
permanent inhabitants	temporary inhabitants	-0.78	0.44
commuters Dutch	commuters French	-3.10	0.00
temporary inhabitants Dutch	temporary inhabitants French	0.71	0.48
permanent inhabitants Dutch	permanent inhabitants French	-0.42	0.67

Table 7 Comparison of mental map quality between main student groups- Results T-test of means. Table 6 in annex 5 lists the sample sizes, sample means and standard deviation of the groups.

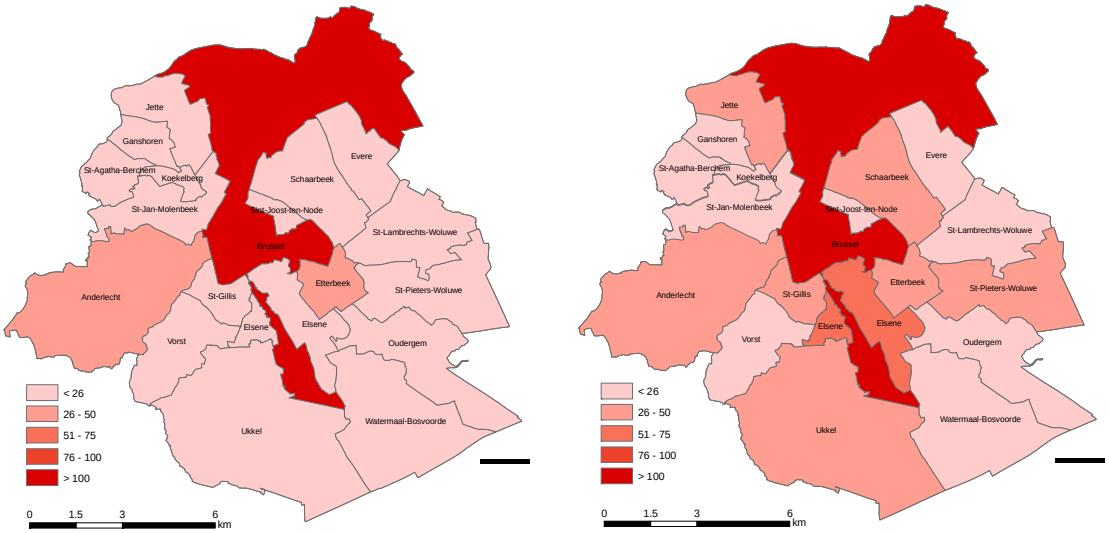


Figure 10 Frequency places are drawn per commune or neighbourhood by Dutch- (left) and French- (right) speaking students

The maps indicate in general a strong correspondence between the appreciation and the knowledge of an area, confirming the expression 'unknown, unloved'. In particular it is found that:

- Dutch-speaking students and especially the commuters are almost exclusively oriented toward the city centre. Locations in other communes are rarely mentioned, unless in Anderlecht and Etterbeek. This is due to the presence of colleges, universities and the related student facilities. Also the Dutch-speaking students living permanently in Brussels draw much fewer items in the peripheral communities as their French-speaking counterparts. French-speaking students mention more places in communities as Ukkel, Elsene, Sint-Lambrechts Woluwe and Sint-Pieters Woluwe (Figure 10).

- Dutch-speaking students on average draw more public transport stops, but with less variation (36 versus 47 different stops). About 60% of the stops drawn by this group are taken by the three big train stations and the stops "Beurs" and "Kapellekerk". Especially the majority of commuting students only uses the above-mentioned stops.

- The difference in mental map quality between Dutch- and French-speaking students is exclusively caused by differences in the commuter subgroup (Table 7). French-speaking commuting students have a significantly better mental map than their Dutch-speaking equivalents. Differences between Dutch- and French-speaking students with a student residence or between those living in Brussels are not significant.

6.1.3 Individualised mental map analysis

Maps were compared two-by-two for their similarity by means of Kappa scores. These scores were the input for a cluster analysis. K-means clustering resulted in 7 groups with a reasonable number of maps in each group and a maximum distance between cluster centres (Table 1 in Annex 5). Interpretation of the groups was done by ordering the maps by group and visually inspecting the maps, in particular those with a small distance to the cluster centre. Figure 1 to Figure 8 in Annex 5 show for each cluster a representative map with a small distance-to-centre. Maps with a high distance to the cluster centre are outliers that are assigned to the closest cluster.

The groups can be characterized as follows:

- Group 1: Maps highlighting the city centre (Beurs), the Kinepolis complex and the communities on the eastern side (Woluwe Saint-Pierre, Woluwe Saint-Lambert). Maps from this group also have a high average score on the mental map quality indicator.
- Group 2: Maps highlighting the city centre (Beurs), Kinepolis, VUB/ULB Campus and eventually a few neighbourhoods in the west of Brussels (Anderlecht, Koekelberg, Molenbeek)
- Group 3: Diverse group with both maps with communities in the east and west of Brussels, always highlighting the centre and the VUB/ ULB campus
- Group 4: Diffuse group; Neighbourhoods in centre (Marollen, Centraal Station), Heyzel and neighbourhoods in the south and west of Brussels;
- Group 5: Specific for this group are the axes Louisalaan, Leuvense Steenweg, Wetstraat (Jubelpark) that are highlighted; Maps are more extended than in group 6. This group also has the highest average mental map quality indicator value.
- Group 6: Louisa and central neighbourhoods;
- Group 7: Diffuse group. Minimal maps with few isolated places. Maps have on average lowest values on mental map quality indicator.

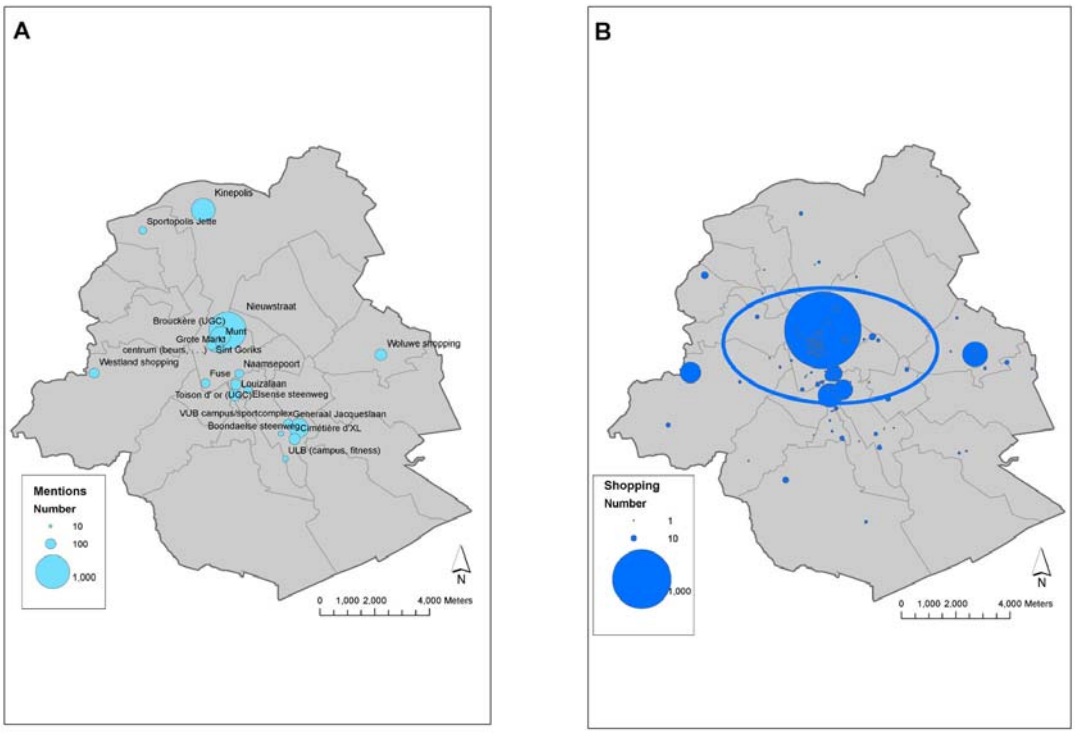
Next, the clusters were linked with socio-economic and mobility variables from the survey. Table 9 in annex 5 lists the variables in the analysis. Various models with different combinations of variables were tested, in order to find the most explicative model and to test the robustness of the models. Tables 9 to 12 in annex 5 summarize the results of the GDA. Five variables were included in the final discriminant model, using a forward stepwise analysis (5 steps) with a p-value of 0.10. The five variables that were estimated significant in explaining the differences between the clusters were the college or university, sex, whether the student has a residence in Brussels or not, the appreciation of the city centre and the appreciation of Brussels in general (all neighbourhoods and communities). Mobility variables such as "Regular walker", "Regular metro user" and "Regular bike user" also produced some significance (p-values around 0.2). There is a tendency that regular walkers and metro users (often with the network as framework of the mental map) produce better mental maps.

A first observation is the importance of the institution. Whatever model is chosen, the college or university is a very significant variable. Interesting is that it is not the language of the institution that explains differences in mental maps ($p = 0.84$). Differences in the mental map between Dutch- and French-speaking students are mainly due to differences in the residential situation between the two groups and differences between the commuting students. The French-speaking commuting students have a more extensive mental map. The psycho-social analysis offers potential explanations for this observation. Other factors related to the school, such as the location (in the centre versus the periphery) and eventual mobility related policies of the school seem more important. Not surprisingly the mental map is strongly related to the appreciation students have of both the centre and the periphery. Thirdly, the fact of having a temporary student residence in Brussels is significant for the mental map. Finally, sex turned out to be significant for student's mental maps. Also interesting are the variables that are not significant in the model. Variables with very little explaining value are the language of the institution (p-value = 0.84) and the number of years of studying in Brussels (p-value =0.93). The latter is often referred to as playing an important role in mental map composition (Félonneau, 1997). In Brussels the quality of the mental map does not improve automatically

with the study period in Brussels. Also the possession of a free public transport card does not have a direct impact on the knowledge of Brussels.

6.2 Analysis of activity patterns

Figure 11(A) shows the 20 most frequented locations by students. 16 of these 20 locations are in the centre or in the zone between the centre and the VUB/ULB campus in Elsene. The 4 other locations are big recreation (Kinepolis, Sportopolis) and shopping (Westland shopping, Woluwe shopping) centres. figure 11(B to D) show the overall activity patterns per motive. For sports the activity patterns is characterised by a spread of locations and some concentration points (Sportopolis, VUB Sport, ADEPS, Terkamerenbos). For shopping the activity pattern is formed by the axis Westland shopping centre, centre, Naamsepoort and Woluwe Shopping Centre. For going out the axis is north-south oriented with the Kinepolis complex in the north, the centre (Fuse), Naamsepoort and Elsene (Cimetière).



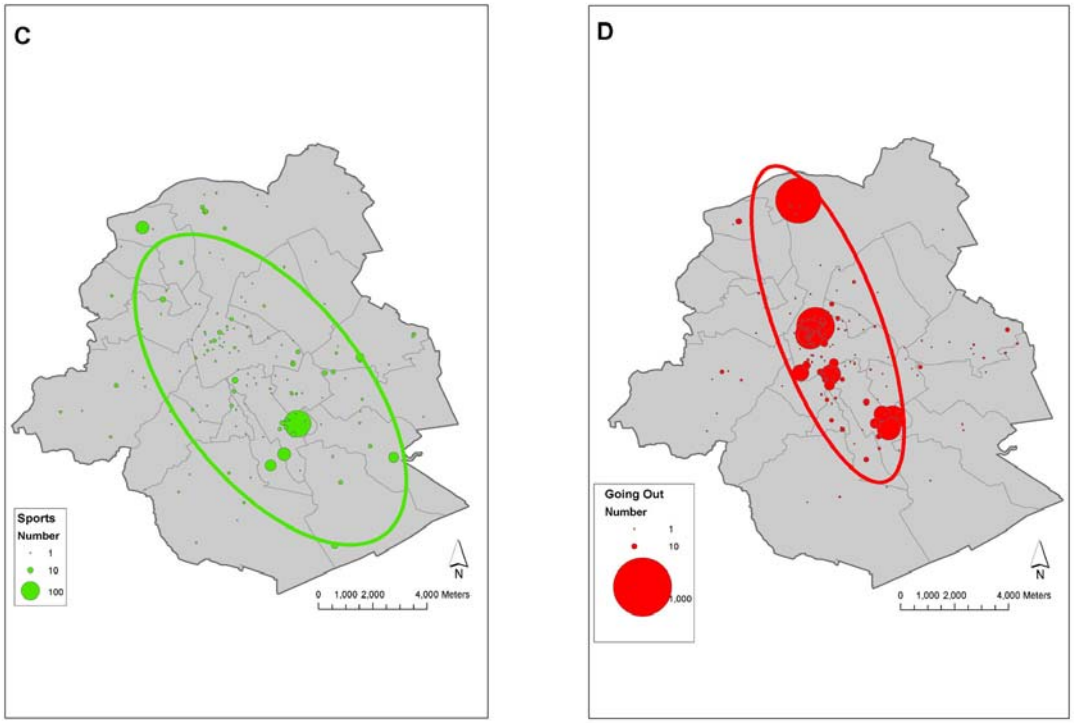


Figure 11 Twenty most frequented locations by students in Brussels (A), activity patterns from student population for motives shopping (B), Sports (C) and going out (D)

Due to the high importance of the school location, activity spaces need to be compared for the same school location (Figure 12 A). Clusters of schools are formed to get a sufficiently high number of observations per group. Groups are composed based on proximity and the shape of the ellipses. 4 groups were made: Centre, South, West and East (the school in Anderlecht does not belong to any group, due to its isolation and the eccentricity of the ellipse) (Figure 12 B). For each school group the activity pattern is mainly shaped by the three poles Kinepolis, the city centre and the school. Only the centre and south groups count a sufficiently high number of observations for analysis.

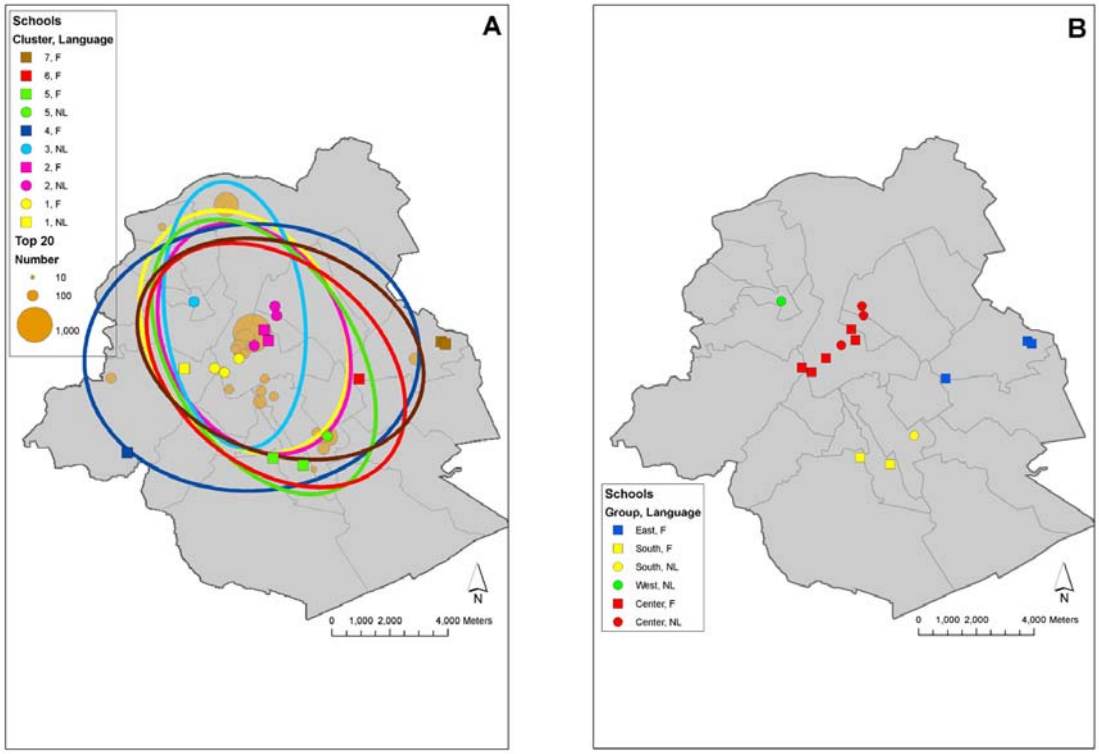


Figure 12 Activity patterns of schools (A) and clustering of schools to school groups (B)

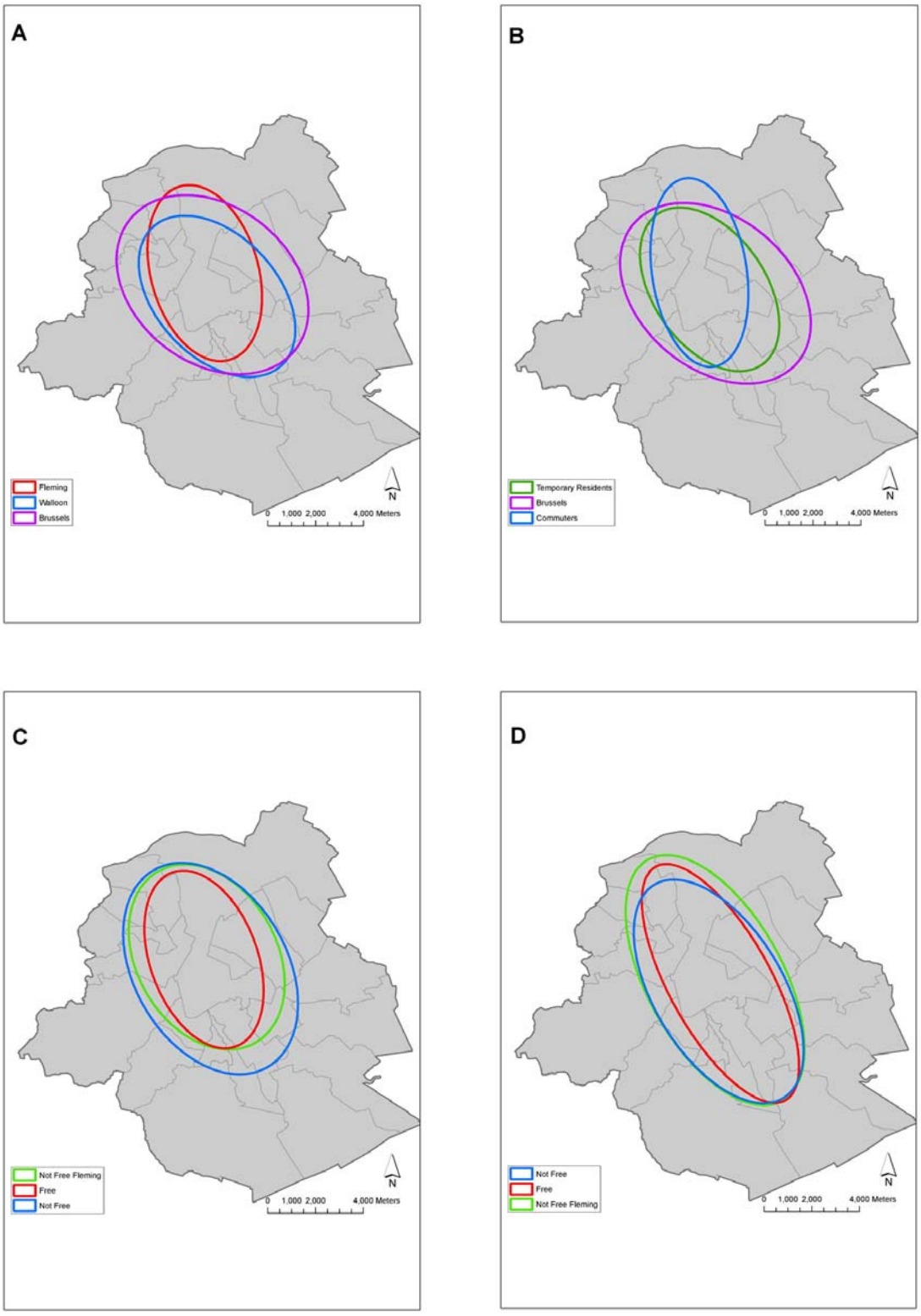


Figure 13 Activity patterns by regional origin in centre group(A), commuting behaviour in centre group (B), use of free public transport in centre group (C) and south group (D)

Figure 13A shows the differences in activity patterns according to regional origin for the centre group. The pattern for the south group is similar. The activity pattern for the Flemish group is small and limited to the centre and Kinepolis. Only a few other locations are mentioned. The Walloon group has a bigger activity space, which is also less focused on the axis centre – Kinepolis and has more variation in the frequented locations. Students from Brussels have the biggest activity space, comprising both the 'classical' (centre, Kinepolis, shopping centres) locations and other locations. The activity patterns according to commuting behaviour are similar (Figure 13 B). The pattern from the commuters is a typical 'Flemish' activity space: very limited, oriented towards a few isolated poles. Flemish people account for an important percentage in this group, but also students from the other groups have this kind of activity pattern. The students with a student residence have a larger activity space with more variation and small locations. This activity space corresponds with the 'Walloon' activity space. An effect of the location of the student residence was not found. Most of the student residences are located in the centre, the VUB/ULB campus and to a lesser extent in Schaarbeek.

The difference in activity space between students with and without free public transport is logical and due to the presence of students from Walloon and Brussels. Interesting is the difference within the Flemish group between users and non-users of the free public transport tickets. The non-users appear to have a wider activity space than the users. This pattern is similar in the south group of schools. Sportopolis in Jette is significantly more present in the activity space of the free public transport users. On the other hand, the non-users are somewhat less oriented on the city centre and frequent more spread out locations outside the 2nd ring way (periphery).

Free public transport	Respondents	Locations	Unique locations
Yes	754	1633	112
No	754	1521	146

Figure 14 Number of visited locations by random selection of students using/not using free public transport

Free public transport	Respondents	Locations	Unique locations
Yes	178	295	46
No	178	204	47

*Figure 15 Number of visited locations by random selection of **Dutch-speaking students** using/not using free public transport from **centre school group***

Free public transport	Respondents	Locations	Unique locations
Yes	302	750	61
No	302	570	60

*Figure 16 Number of visited locations by random selection of **Dutch-speaking students** using/not using free public transport from **south school group***

Users of free public transport mention in total more locations than non-users. However, they visit fewer unique locations (112 vs. 146). The maps already showed that this group is strongly oriented towards the centre and Kinepolis. The observation is confirmed when only Dutch-speaking students are concerned (Figure15 and Figure 16). In both groups the students mention the same number of locations, but users of the free public transport measure visit between 30% and 45% more locations than their paying equivalents. The figures suggest that the effect of

the introduction is, if any, a larger number of trips, but to the same locations. The aim to stimulate students to explore the city seems not to be achieved.

6.3 Analysis of transport supply

6.3.1 Coverage of the public transport network

The service comprises three modes: three metro lines, 24 tramway lines and 76 bus lines. The total exploitation length is 683,6 km and 220.400.000 trips are made each year (MIVB, 2004).

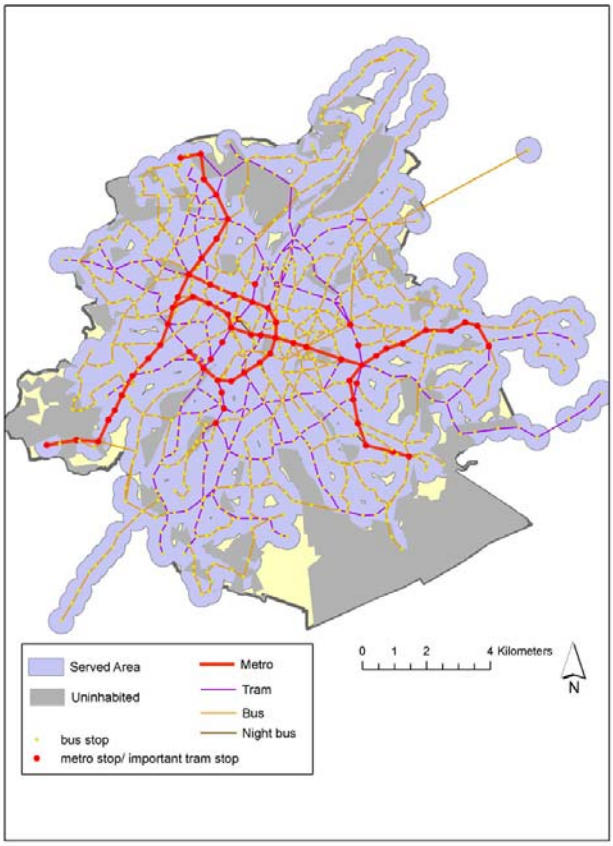


Figure 17 Area in Brussels Capital Region within 400m of a public transport stop

Figure 17 shows that only a very small part of the Brussels Capital Region is not within a 400m distance of a public transport stop. This corresponds more or less to a walking distance of 500m. The supply is particularly dense in the centre (Vijfhoek) and around Schuman. It can be concluded that the region is sufficiently covered by public transport. This provides of course no information about the frequency, time frame and quality of the supply.

6.3.2 Public transport supply

Figure 19 gives an indication of the frequency of the public transport supply. In the morning the city centre and the Montgomery quarter have the best accessibility with more than 100 trips per hour. Zones that are less well served are situated at the city's edge, notably Zoniënwoud, Evere, domein van Laken and Tour and Taxis. The analysis in the MIVB's Vision 2020 document largely confirms these findings (Figure 20). Areas in the urban periphery where important developments are happening, are well less served by an offer that is

not yet completely adapted to the urban dynamics. The evening offer is limited. However, a night bus is available and connects the main attraction points. The student survey indicates that this service is perceived very positively, but the evening offer remains for the students one of the main drawbacks. Vorst Nationaal in the south of Brussels is the attraction point that is the least well served in the evening offer (Figure 19).

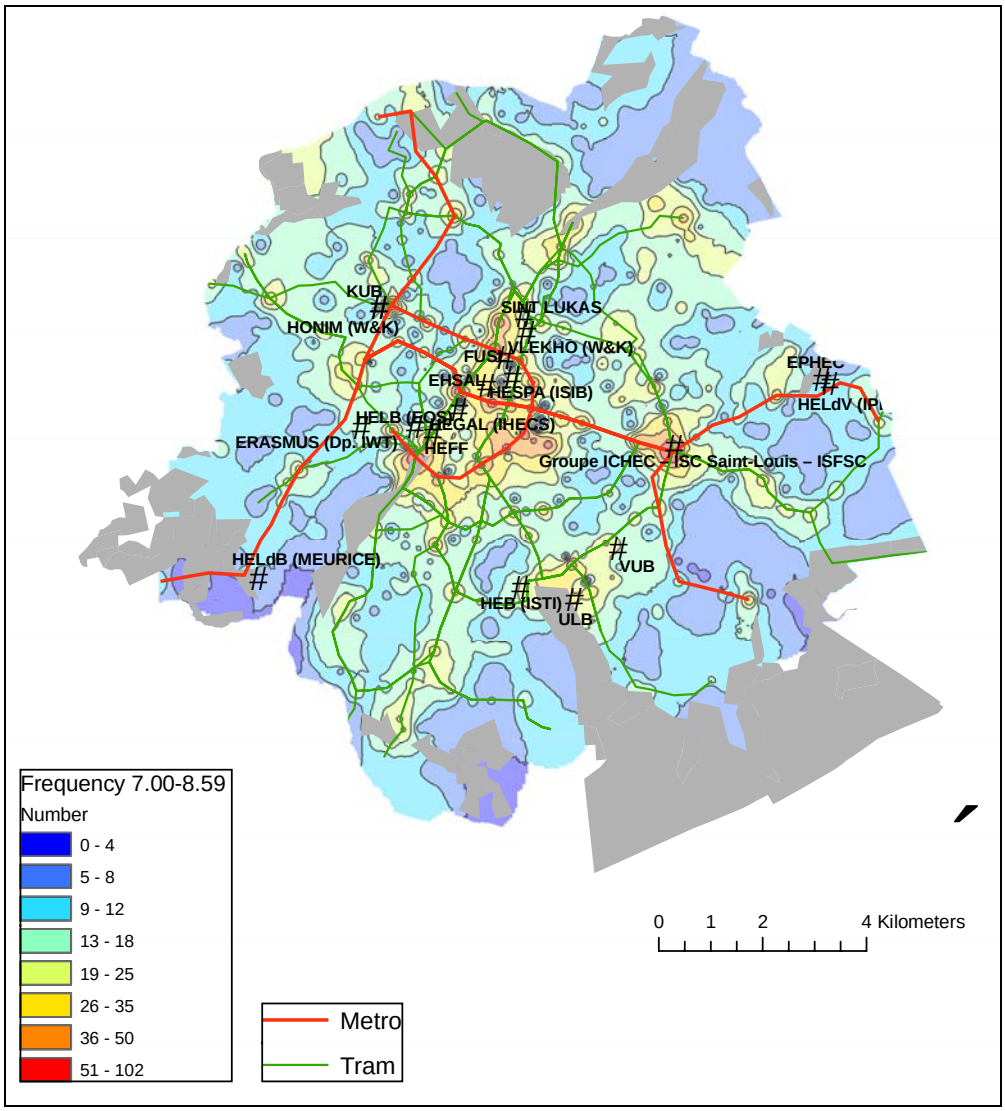


Figure 18 Frequency of public transport trips between 7-8h59

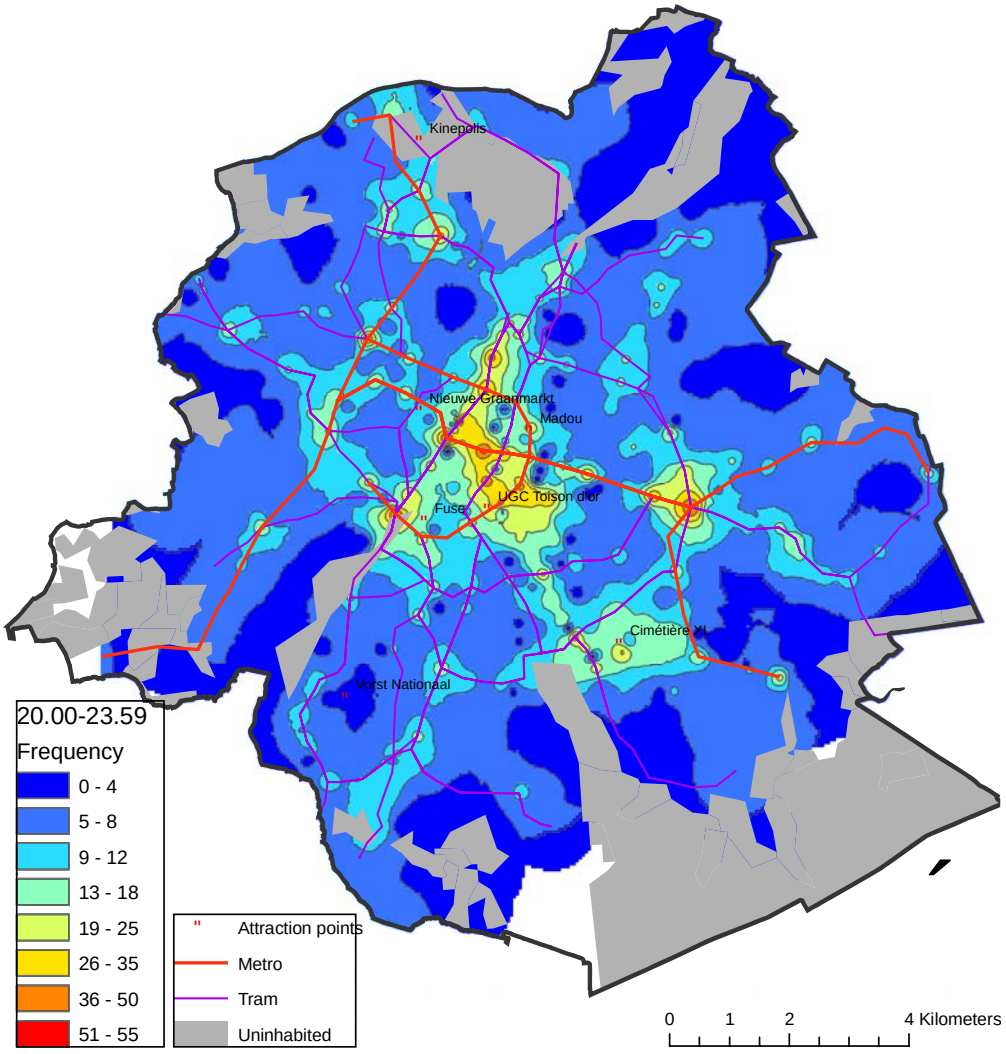


Figure 19 Frequency of public transport trips between 22-23h59

Figure 18 and Figure 19 represent the frequency of the public transport supply. In the morning the city centre and the Montgomery quarter have the best accessibility with more than 100 trips per hour. Zones that are less well served are situated at the city's edge, notably Zoniënwoud, Evere, Domein van Laken and Tour and Taxis. The analysis in the MIVB's Vision 2020 document largely confirms these findings (Figure 20). Areas in the urban periphery where important developments are happening, are less well served by an offer that is not yet completely adapted to the urban dynamics. However, a night bus is available and connects the main attraction points. The student survey indicates that the evening offer remains one of the main drawbacks. The night bus is perceived very positively, but some attraction points are less well served, such as Vorst Nationaal in the south of Brussels (Figure 19).

Currently 12 of the 18 colleges and universities have a good accessibility by public transport: the 8 schools in the centre, the three schools in Etterbeek and one near Montgomery. The other 6 schools are situated in moderately to weakly accessible locations. KUB and HONIM are located eccentrically but are at the crossroads of two metro lines. Erasmus lies in a low frequency zone, but is still rather close to the city centre. HeldB, HeldV and Ephec lie eccentrically in a low frequency zone. They are located near the terminus of a metro line.

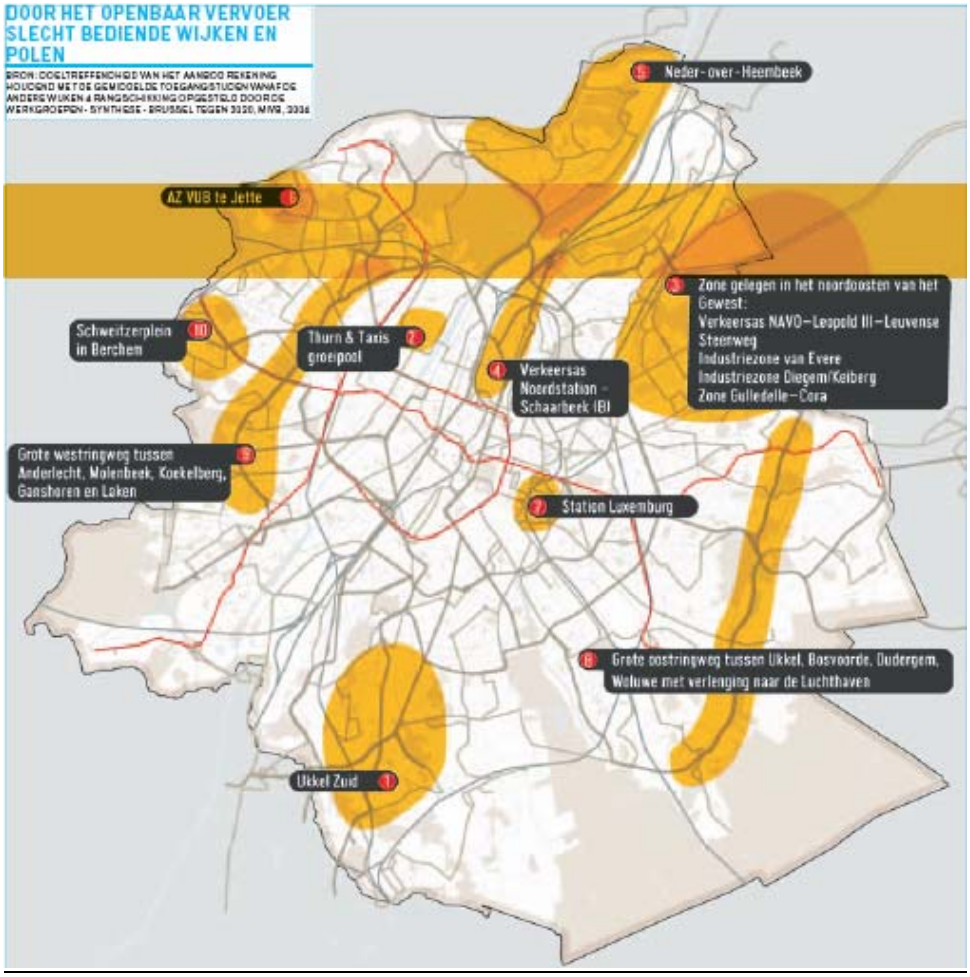


Figure 20 Areas within the Brussels Capital Region that are badly served by public transport (Source: MIVB, 2004)

6.4 Conclusions

- Analysis of the ***mental maps*** learns that:

Considerable differences exist among students in the knowledge and appreciation of neighbourhoods in Brussels. Important factors that determine the composition and quality of the mental map are the school (its location, mobility related measures), the possession of a student residence in Brussels and the general appreciation of the city. The number of years that the student is in Brussels was not significant. The latter is surprising and in contradiction with other studies (e.g. Félonneau, 1997). It seems that students do not enlarge their mental map *automatically* with the time spent in Brussels.
There is a strong mutual relation between the mental map and mobility behaviour. Public transport stops, train stations or arterial roads and highways are important structural elements. The composition of the mental map provides a lot of information about the mobility behaviour.
The mental map of many students at Dutch-speaking institutions is very small. It is limited to the school and its immediate environment and a few orientation points (Atomium, Grote Markt). The (train) station of entrance in Brussels acts as an important landmark. In some cases locations related to going out (Beurs, Elsene Cimetière, Kinepolis), shopping (Louisa Avenue, Woluwe Shopping Centre, Nieuwstraat) and sports (Sportopolis, Ter Kameren Bos)

are included in the mental map. However, for many students Brussels is only associated with studies and other activities are fulfilled outside Brussels.
In general the appreciation for Brussels is significantly lower with Dutch-speaking students. In general they only have a positive image of the centre and a few neighbourhoods (around school). The image is more positive with French-speaking students. The difference in residential situation – a smaller percentage of Dutch-speaking students lives in Brussels – only partly explains the difference.

- Analysis of the ***activity patterns*** learns that:

In general activity patterns of students are characterised by a few isolated locations from each other. This means that the area between the attraction points is not part of the activity pattern. For going out the activity pattern is a north-south axis, with the Kinepolis complex in the north, the city centre and the VUB-campus in the south. For shopping the activity pattern is an east-west axis formed by the Westland Shopping centre (west), Naamsepoort and the Woluwe Shopping Centre. For sports the activity pattern is characterised by a spread of locations and some concentration points (Sportopolis, ADEPS, VUB Sport, Ter Kameren Bos). The location of the school is determining for the activity pattern. For each school the activity pattern is mainly shaped by the three poles Kinepolis, the city centre and the school.
The activity pattern of commuting students is strongly related to the pattern of the Flemish students: very limited, oriented towards a few isolated poles. Interesting is the difference within the Flemish group between users and non-users of the free public transport tickets, with the latter having a wider activity space.
Students benefiting from the free public transport measure visit the same set of locations but visit those 30 to 45 % more frequently than their paying equivalents. These figures suggest that the effect of the introduction is an increase in the number of trips, but to the same locations. However, a longitudinal analysis would be needed to confirm this observation.

- Analysis of the ***public transport supply*** shows that:

Only a small proportion of the built area in the Brussels Capital Region is not within a 400m distance of a public transport stop.
Areas in the urban periphery where important developments are happening are well less served by public transport. Especially for students, the evening and night offer is limited. The night that is running is assessed very positively.
2 of the 18 institutions for higher education have a good accessibility by public transport. The other schools are still located close to the centre (Erasmus Hogeschool), are located eccentrically but near a metro node (KUB and HONIM) or near the terminus of a metro line (HeldB, HeldV, Ephec).

Chapter 7 Psycho-social analysis

In order to examine qualitative aspects linked to the students' modal decisions and behaviour in general and linked to the implementation of a free public transport policy, the role of price concerns in those decisions and behaviour seemed important to analyse, as a free public transport policy was intended to control the effect of this variable (§1). Secondly, environmental values' impact on the students' travel decisions and behaviour has been observed (§2). Other aspects relating to the social experience of travelling have also appeared to be crucial to understand travel decisions and behaviour (§3). The following paragraph tackles the free public transport measure implemented for students in Brussels, by highlighting the students' assessment of this policy and the impact of the measure on the travel behaviour of the interviewees (§4). Finally, a typology of attitudes and behaviour of students is proposed and allows to link all observations made before to show that various rationales relating to travel decisions and behaviour can be differentiated (§5).

7.1 The role of price concerns

In this section it will be described how transport prices are perceived among students and how students manage their budget. This will thus highlight the weight of financial considerations in the rationales of interviewed students, in the perspective of getting information on the relevance of a free public transport measure on their travel behaviour.

7.1.1 The price perception of public transport and car

The way students reason about prices of means of travel seems strongly to depend on the context in which the considered journey takes place. Moreover, the assessed prices do generally not include all real costs into consideration (Hine & Scott, 2000; Frenay, 1994). Modal choice takes thus place by referring to criteria which, even if they can look similar from a theoretical point of view, take in concrete terms very diverse weights according to the considered respondents.

Assessment of the costs of a car is often based on variable costs, such as fuel (10 students out of 39 mentioned it this way explicitly); sometimes insurance of a car is also taken into consideration. But other assessment criteria are also sometimes joined to the fuel price, such as the financial situation of the user, the size of the car, the number of users for the same journey, the distance to cover…

> Enfin, pour une petite, pas une grosse parce que sinon l'essence, ça coûte cher quoi mais… déjà une petite voiture là, y a moyen […] de pas trop consommer d'essence… C'est bien facile quoi. (12Jonathan, §12)

> Et au niveau coût, c'est vrai qu'entre prendre un billet de train jusque Namur et prendre la voiture, la voiture coûte quand même moins cher. (13Renaud, §16)

But some students (who do often not valorise the car) however think about the price of the car by involving almost all costs linked to the use of a car.

> En ook wel financieel. Want ik denk… ja, op het ogenblik zou ik zelfs geen auto kunnen kopen… dat is gewoon *geen issue*. En ook al dat ge doe spreekt mij niet aan om zo… onderhoud, te letten op uw auto, te zien waar ge hem parkeert, risico op diefstal. Ja, het is zo nog een extra zorg, lijkt het mij, om een auto te hebben. (38Jorn, §44)

Regarding public transport, evaluation of price is based on the type of ticket used, on the perceived service quality and on the user's financial situation. In other words, price is perceived in a different way according to the fact of travelling with a season ticket – which is expensive at the beginning but which can be profitable if regularly used – or a travel ticket –

which is often perceived as expensive. Reductions to some public transport are also taken into account (21 interviewees).

> Maar nu … is dat nog gemakkelijk omdat we nog een Go Pass hebben en dat maakt niet uit. Maar Go Pass blijft pas… maar tot uw zesentwintigste geldig, of zoiets, en dan betaalt ge de volle prijs en dan vind ik sommige dingen wel te duur. (29Bram, §66)

Train is especially perceived as an expensive means of transport by Belgian students in Brussels (13 students).

> Et le train, j'ai une carte famille nombreuse, donc ça va aussi. Mais le train, quand c'est une longue distance et que les gens n'ont pas de réductions, je trouve ça cher quand même, quoi. Pour aller à la mer, c'est plus de vingt-cinq euros, etc. Ca, c'est cher. (2Marie-Line, §136)

The perceived quality of service also plays an important role, as this perception works as a justification or not of the price asked (15 respondents).

> Je trouve ça cher, oui, je trouve ça cher mais en même temps c'est normal, ils ont beaucoup de frais, ils ont de l'entretien à faire, ils ont du personnel à payer et voilà. Il faut… investir. Leur matériel s'use. Je trouve ça cher mais la vie est chère quoi en général, donc c'est normal que ça augmente chaque année aussi. (36Joachim, §78)

Students also insist on the fact that prices are differently perceived according to the financial abilities of the user (30 students).

> Dans mes stages d'assistante sociale, parfois j'ai quand même vu que les gens, payer un abonnement, c'était quand même une dépense, quoi, assez conséquente. Tandis que pour un Belge moyen, entre guillemets, ça va, c'est une dépense plus ou moins normale, tandis que pour un Belge qui a un peu moins de facilité financière, ça va être quand même une grosse dépense. Donc, je trouve que le prix est bien mais qu'il pourrait quand même être moins cher. (11Julie, §94)

Price of tickets is also often compared with the price of other services that are frequently used or that are similar without always being connected to mobility matters. The perception of prices appears here to be very practical and relative, some same criteria leading to different evaluations and judgements of prices. Comparison processes are then a quite usual way of basing the price assessment and judgement, and may be considered as a pragmatic calculation process (22 students).

> C'est peut-être un petit peu cher mais c'est pas excessif non plus. C'est jamais qu'1euro 40 mais quand on fait la comparaison avec le prix d'un sandwich, forcément, ça aide à penser que c'est cher. (13Renaud, §82)

Giving a global assessment of the price of means of transport proves thus to be unsuitable. Costs are perceived as relative, depending on the assessment criteria used, which are closely linked to the context of use.

7.1.2 The students' financial budget and its management

The students find themselves in a particular stage of life, in which they are yet often financially dependent on their parents. Their financial means are therefore often quite limited and few students are working during the academic year (2 students out of 39 were full-time students who also had a student job and 2 others were evening students who worked during the day).

When the transport modes are considered, car often appears as a few accessible transport mode, financially speaking. More precisely, few students from our sample actually possess their own car (3 respondents, from which 1 moped) or borrow or share a car very regularly (3 students). A total of 6 students out of 35 are then often using a car in Brussels. It has then to be noticed that the use of the car induces a more important financial involvement of the student in order to pay the cost.

Many students are then using public transport or «soft» transport modes to travel in Brussels (35 interviewees). In these cases, the parents are often funding the student's access to these travel modes, in order that this kind of expense has not to be deducted from the student's

pocket money. Some older students (some of them also have a fixed job) or students benefiting from a university grant are however more likely to pay for their travels.

> Maar van mijn beurs. Dus… Ik krijg een beurs en daar betaal ik mijn abonnement van. (27Ryfka, §146)

The management of the payment of the travels are often differentiated following the purpose for travelling. When travels are considered to be involved in school expenses, the parents are often funding the travels, whereas when it has to do with leisure, the student will have to pay.

> Ce qui est scolaire passe - entre guillemets - sur mes parents qui me payent ça. Tout ce qui est extra-scolaire, c'est moi. Sauf à la rigueur, quand j'ai parfois l'auto à prêter, là, on oublie de compter le plein et bon… je fais pas non plus des trajets à l'excès. Je rends également des services […] A la rigueur, parfois, je fais aussi un plein à l'auto, donc… (17Sébastien, §108)

The management of daily mobility budget appears then to be negotiated with the parents, who are inclined to intervene to a greater extend when public transport is used by the student. The particular situation of the student is however also taken into consideration when defining the way of paying for transport.

But the very financial situation of the student can maybe contribute to increase his/her sensitivity to price considerations when travelling (Hine & Mitchell, 2001; Jemelin *in* Kaufmann & Montulet, 2004). This sensitivity can manifest itself in the fact that students will first privilege transport modes in which an «investment» has been made (purchase and maintenance of a car or of a bike; purchase of a season ticket) – in order to maximise this investment. But when no real «investment» has been undertaken, the student can try to reduce the journeys that would involve several payments (for example, by concentrating activities so that only one journey ticket would be used, by walking or by fare-dodging). In both cases, additional costs, such as paying parking or first class seats are avoided. But it has to be noticed that practical considerations also contribute to dull the payment when no investment has been made (find a ticket office or machine, eventually have the right amount of money, buy a ticket, tick off etc.) and that these circumstances will facilitate fare-dodging practices.

> C'est vrai que parfois je réfléchis, parce que j'essaye de rassembler tout ce que je dois faire, le rassembler dans un même lieu ou bien à un même moment pour que je rentabilise ma carte, pour ne pas que je doive repointer. Je limite parfois mes trajets pour ne pas devoir payer. (15Charlotte, §116)

> Même souvent maintenant, le bus, je me dis : «J'ai la voiture, l'essence est payée», je me dis : «Je vais pas prendre le bus, encore et tout ça». (18Monique, §40)

> Ze zeggen: «Ja, ik heb daarjuist al eens betaald. Euh … nu ga ik niet betalen. En daarna, als ik de volgende tram neem, zal ik terug betalen. Gewoon om de kosten een beetje te drukken.» (25Koenraad, §181)

> […] quand tu dois prendre un ticket tous les jours tu sens quand même la différence. Et tu vois aussi la différence dans le cas où tu as acheté un abonnement au début de l'année, au début du mois, où tu paies une fois pour toute, et tu sais que l'affaire est réglée, quoi. Je crois que psychologiquement, c'est plus difficile de devoir rembourser (débourser) un 1,40 euros tous les jours […] c'est différent parce qu'il faut toujours prévoir de l'argent. C'est pas très pratique. C'est un petit peu dissuasif. (33Christian, §50)

We have also interested ourselves in the fare-dodging practices of students, in order to see if avoiding paying the ticket could reveal a quite expensive perception of prices. The fraud – or «fare dodging» – problematic shows above all that even if price – assessed as being quite or too expensive – may be considered as a significant reason to fare dodge, other reasons are also put forward. But the fact of avoiding paying for a ticket is felt as an unpleasant situation: students are thus aware of the rules and feel uncomfortable being out of norms and likely to be publicly uncovered. This is linked to a psychological and moral discomfort. Many laudable reasons are then put forward to justify oneself and to prove one's sincerity. This confirms a cognitive dissonance process (Festinger, 1957) caused by fare dodging, dissonance that students try to reduce by mentioning various «understandable» motives to dodge fares. Various kinds of calculations and strategies are also used to avoid controls.

We can thus learn from this aspect that the price can be considered by several students as a justification to fare-dodge but that payment is considered as a quite normal condition – revealing that these students agree with the idea of a private company. Some students however also link their practices with their disagreement with this idea and think that public transport should operate as a public service, that nobody would have to pay for (similar ideas developed in Réseau pour l'Abolition des Transports payants, 2002).

> […] ik vind het enigszins stom, ik zou liever hebben dat iedereen mooi betaalt, dat zou veel rendabeler zijn en er zou uiteindelijk een beter openbaar vervoer zijn maar anderszijds, als je effectief een euro en half vraagt, kan ik het begrijpen dat heel veel mensen niet betalen. (16Wouter, §101)

> Je crois que souvent, on a peut-être un euro ou deux euros ou cinq euros en poche et qu'on n'a pas envie de donner 1,40 euros pour aller à l'endroit qui va nous permettre d'employer l'argent qu'on a en poche. Et que si on va boire un verre, qu'on va au cinéma ou qu'on va manger ou n'importe, on se dit: «Bon, c'est toujours ça de parti». On a l'impression de gagner de l'argent qu'en ne le dépensant pas pour le transport. En fait, c'est ça. C'est une forme de radinerie… enfin oui. […] C'est jouir de quelque chose en sachant bien qu'on y a gagné quoi. C'est humain quoi. (39Dimitri, §176)

> J'ai déjà entendu des gens qui disaient que ça devrait être gratuit en tant que service public et je suis assez d'accord. Bon, en tout cas que le prix soit beaucoup plus démocratique. (8Antoine, §120)

The sociological data show that the price factor can influence the mobility behaviour of students, in a way that has also to be related to their particular financial situation and management. The students are therefore maybe more sensitive to this factor, which has been ranked in the 1st (Dutch-speaking students) and 2nd position (French-speaking ones) of the most important factors to use public transport in the survey. Free public transport can thus be expected to be a quite attracting measure for students, allowing sparing some money without having to leave some of their expenses. But assessment of prices also results from quite relative processes, which influence the way students react to the free public transport measure. However the social experience of transport is broader and other factors play also important roles in their behaviour.

We will now focus on the place of environmental concerns in the lines of arguments of students. More precisely our point will be to define the role of environmental values on the mobility behaviour of students and the emphasis placed on this kind of concern when assessing the free public transport measure.

7.2 Impact of environmental values

In general, environmental values do not seem to be clearly relevant in the lines of arguments of all respondents. This is opposed to what some authors are arguing (Büttner & Grübler, 1995; Sandqvist, 2002). Moreover, when those arguments appear, they are not mentioned with reference to the free character of the measure implemented, but are rather linked to the valuation of means of travel. More precisely, these arguments are mentioned when questions which have to do with the advantages of «soft» means of travel and disadvantages of the car are asked.

Even if about half of the interviewees have referred to environmental arguments (19 students out of 39), few students really developed a whole reasoning about environmental concerns linked to their modal decisions and behaviour. About 9 students showed great concern about environmental values and really seemed to integrate this factor in their mobility decisions and behaviour (DW_7,10,11,29,32,33,36,38,39). These students enter in the «plastic» or in the «city oriented» types (cf. typology below). This is quite logic as some «plastic» students may consider that environmental repercussions are part of the offer and as some «city oriented» students pay attention to the pollution of the city that could result from the use of one or another transport mode.

> Maar ik denk toch dat als ik later bijvoorbeeld werk heb, dat als ik met het openbaar vervoer kán gaan, dat ik daar toch echt wel zou over nadenken. Ook dat ik daar over nadenk dat ik denk van: «Als iedereen dat nu zou doen, dan zouden er geen files zijn en minder vervuiling zijn.» Terwijl dat dat … ook een beetje een illusie is. Want of ik nu met de auto ga, ik als individu kan daar heel weinig aan veranderen. Maar dat ik toch probeer met die dingen rekening te houden. (29Bram, §92)

The remaining 10 students rather made allusions to environmental concerns, but rather like if they were aware it is important but without really considering this aspect as very relevant in their mind. In these cases, modal changes with reference to environmental concerns do not appear to be likely to happen. And finally, 20 students did not even mention any arguments linked to environmental issues.

> Donc, c'est plus intelligent […] parce qu'il y a moins de circulation […] dans les embouteillages, parce qu'il faut, parce que c'est plus écologique etc. (2Marie-Line, §126)

> Allez, ergens zou het opbrengen als je ziet welke voordelen ten opzichte van het milieu en ten opzichte van tijd en zo gewonnen wordt. Maar anderzijds, ja, die drempel om dan toch zo veel te geven, gaat ge denken: «Foert, milieu, ik zal toch maar met den auto gaan. » (24Barbara, §105)

As a hypothesis, we could think that environmental concerns linked to mobility are well-known and that these are considered as obvious in the students' mind. The fact that some students do not consider this aspect as being of primary importance maybe leads them not to mention it. It has also to be noticed that no explicit question related to this aspect has been asked to interviewees.

Another way of understanding the poor existence of environmental arguments could be found in the fact that more practical logics seem to be at work if free public transport and advantages of such a policy are tackled, such as the opportunity to «jump» on any public transport service when needed or to save money (see the point about behavioural changes due to the free public transport measure).

Finally, the absence of link between this free public policy and sustainable, environmental aims in students' interviews are maybe also due to the very context of the measure analysed. Repaid season tickets were indeed proposed by Flemish institutions in Brussels to mainly reach other goals than environmental ones. Environmental aims of the policy appeared thus maybe not very clearly in this case. This may possibly explain why students seldom mention environmental arguments as being an asset of the measure.

It has also to be noticed that environmental arguments mentioned relate either to health problems and noise pollution, either to traffic conditions, as many people commute every day to Brussels for their job – this situation resulting into many cars with a single person and into the existence of many company cars. More widely, quality of life in Brussels is also linked with environmental concerns. This concern is particularly shared among the students from the «city-oriented» type.

> Et puis je suis pas spécialement pour les voitures en ville, je trouve que ça pourri un peu la ville, donc je serais plus transports en commun. (10Fanny, §71)

> Ik denk dat er veel minder stress zou zijn, veel minder vervuiling,[…] veel minder lawaai […]. Het zou ongelooflijk veel stress weghalen eigenlijk. Ik bedoel: ik denk dat ik met minder stress leef bijvoorbeeld dan mijn gemiddelde automobilist. (32Benedikt, §20)

> […] c'est vrai que quand je vois une personne par bagnole et que je vois une file où c'est que ça, c'est un peu con quoi. […] Cette voiture est un très bon témoin de beaucoup d'absurdités dans notre système. Que ça soit de l'autodestruction par la pollution, que ça soit se stresser la vie pour soi-disant faire plus alors que finalement, peut-être que si on n'avait pas de voiture, on ferait moins mais peut-être qu'on ferait mieux aussi et qu'on ne se tuerait pas à petit feu surtout quoi. (39Dimitri, §126)

Environmental concerns appear thus to be crucial in a minority of interviews when tackling personal mobility behaviour or the free public transport measure, even if those arguments are now and then mentioned. Some particular circumstances may possibly explain this observation.

From particular kinds of values (environmental ones), we will focus in a broader way on several sensorial and sensational factors taken into consideration when talking about transport preferences and even about travel behaviour.

7.3 Students' social experience of travelling

The social experience of mobility (Flamm, 2004a; Petit, 2002) is also made out of less objective factors, such as those transmitted by senses or lived through sensations and representations. It appears that those factors do not so directly influence modal decisions and behaviour, as time efficiency and spatial accessibility would do. These sensorial and sensational dimensions are however regularly mentioned in the talk of the respondents and may lead in some circumstances to have an impact on the travel behaviour of the respondents. More precisely, these dimensions are not directly crucial in the travel behaviour but contribute to reinforce the assessments of transport modes and mobility behaviour, and in some circumstances determine the privileged mobility behaviour. Even if these considerations can appear as trivial ones, they are however in touch with deeper sensitivities which also have to be analysed

The following example can show the complexity of the aspects of social experience at stake when talking about modal preferences.

> [Dans les trains] il n'y a pas ces trucs de ça pue, de tout le monde se compresse […] enfin, si, tout le monde se compresse aux heures de pointe mais ça va encore. Il y a le fait qu'il est quand même sympa parce que malgré tout, moi, quand je prenais le train tous les jours, je voyais les mêmes personnes et à la fin, c'est «bonjour», on s'assied, y a le contrôleur qui passe qu'y a pas dans le métro. Y a ce côté un petit peu plus convivial, un peu plus sympa de tout le monde va au travail et ça, c'est encre assez sympa comme ambiance. […] [ce que j'aime] moins dans les métros, c'est que ça pue, quoi. [Franchement], le matin quand je prends le métro, c'est vraiment désagréable, je trouve… qu'il n'y a pas dans le train, par exemple où, oui, c'est les gens qui vont travailler et […] c'est beaucoup plus sécurisant aussi; donc, ça dépend des [jours] mais les trains, moi, je n'ai jamais eu peur… Jamais. Dans le métro, le soir, à minuit, quand il n'y a personne, on n'est pas très à l'aise… (11Julie, §46)

Different kinds of sensorial and sensational factors can be identified in the interviews. The following paragraphs will be dedicated to go deeper into the analysis of the sensorial, sensational, representations and socialization aspects.

7.3.1 Sensorial dimensions

The medium through which these dimensions are felt is the human body. We will see all senses (smell, hearing, sight, touch) are quite often mobilized using transport infrastructures.

A bad **smell** is often mentioned when talking about public transport. This discomfort is often described in very strong terms and can be linked with a fresh, cleanliness or dirty feeling (see the «cleanliness» paragraph).

> Parce que souvent, quand t'arrives dans le métro vers quatre-cinq heures, ça sent vraiment la rage dans le métro. C'est affreux. C'est assez épouvantable parce qu'on est obligé d'ouvrir les fenêtres pour que l'odeur passe. (12Jonathan, §144)

> C'est si je prends les moyens de transports et qu'à l'intérieur il y a vraiment une sale odeur. Ca c'est vraiment désagréable. […] On a vite envie de descendre, quoi. (19Myriam, §68)

The painful character of the smell has however also to do with the valuation or not of the transport mode. As the following example can show, this student who is rather in favour of «soft» travel modes in Brussels describes the car as being a source of bad smell in town.

> Ja, hier zijn er te veel auto's; da's duidelijk. Het stinkt altijd ongeloofelijk […] (16Wouter, §22)

Smell can exacerbate the assessment of transport modes, as hearing perceptions also do. **Hearing** is also part of what respondents often qualify as comfort. Music is one component

that can enhance travel times if it can be chosen. It is part of intimacy and so more strongly linked to the car. Car radio appears as an important component of a car.

> Dans ta voiture, t'as ta musique, t'es dans ton monde. (10Fanny, §73)

> J'écoute la musique. J'adore ça, d'ailleurs. […] Ca, je me dis souvent le matin: «Tiens, chouette, je vais prendre ma voiture et je vais écouter tel ou tel CD» […] fumer dans ma voiture en écoutant de la musique [rires], ça, c'est un de mes plaisirs… J'aime bien, voilà. […] Chanter dans ma voiture ou… Non, je ne saurais pas faire ça dans les transports en commun! [rires] (3Céline, §28-30)

If music is not chosen, it can however turn out to be intrusive if it is not the kind of music the student is listening to or if it is not played very well.

> Un autre inconvénient de la STIB, oui j'y pense, c'est tous ces joueurs d'accordéon [rires]. Bon, une fois de temps en temps, je dois avouer, ça détend le trajet, c'est très agréable. […] mais quand c'est tout le temps tout le temps, ça devient pénible […], il faut aussi le dire, il y en a qui jouent vraiment très très mal. (36Joachim, §66)

> Avant, ils mettaient de la musique infernale dans les stations de métro. On se demandait ce qu'ils cherchaient à faire quoi. C'était sensé calmer mais je crois que ça calmait une personne sur dix et que les neuf autres se sentaient agacées [rires]. Mais maintenant, ils passent genre les années 80. Je trouve ça chouette. (39Dimitri, §152)

Shouts, noise can also be felt as unpleasant or even aggressive, intrusive when travelling with public transport. Once again however it can be noticed that noise are perceived differently following the experience of the user and his/her valuation of transport modes.

> Les enfants hurlent. Ca énerve les gens. (7Dominique, §18)

> Quelques jeunes qui crient un petit peu des fois… enfin, tant que c'est pas trop, c'est encore supportable [rires]. (34Michèle, §74)

> […] le bus, ça fait toujours un bruit épouvantable avec ce bête moteur, là. (12Jonathan, §24)

Visual aspects of transport are often mentioned and relate also to sensations which will be described later on (cleanliness, insecurity, occupation of travel times).

> […] plezante trams, da's toch iets dat iedereen blij maakt en ik vind ook netjes, […] ik vind het belangrijk en ik vind dat de metro goed onderhouden is […]. Ik vind de kunst een tof initiatief eigenlijk (20Gilberte, §34)

Visual attractiveness has often been linked in the interviews to the light in metro stations, particularly. A lack of light can induce a feeling of sickness. The fact that no direct sight on the town is allowed by this transport mode is another reason why some students may be led to avoid using the underground.

> Ca peut rendre mal à l'aise. Le fait d'avoir la lumière très sombre, très tamisée, moi j'aime pas. (12Jonathan, §158)

> Ce que j'aime bien, c'est emprunter un transport où on peut voir dehors [petit rire]… où il y a plus de luminosité (2Marie-Line, §80)

Colours are also mentioned as factors which can enhance the pleasant feeling in public transport (colours and newness of the vehicles or art in underground stations).

> On le voit aussi même aux trams qui ont encore un de ces trams moderne, tout neuf, tout beau, tout brillant. Et je sais bien qu'il y a des coins où les trams qui circulent sont beaucoup moins sympathiques de vue (8Antoine, §112)

> Et alors, les couleurs… enfin, moi, je trouve, cet orange de la STIB… enfin, je sais pas, je trouve [c'est pas] beau comme couleur. Ces sièges, ça le fait pas. (11Julie, §88)

> Allez, sommige metro's zijn ook wel mooi ingericht, maar … […] en muurschilderingen en zo, dat is wel tof, maar … neen, dat moet niet per se, dat moet niet overal zo zijn. (37Geertrui, §130)

The **touch** sense is very often perturbed when using especially public transport. Students often describe themselves as being invaded by the other users when interpersonal distances can not be respected (crowding): everybody is «tightly packed» and knocked against. Moreover moving in the vehicle is also becoming more difficult. This is a very uncomfortable feeling for almost all respondents and some of them feel even sick in those circumstances (difficulties to breathe, feeling of breathlessness or of fainting). This is why several students reported to

modify their mobility behaviour in those circumstances, in order to avoid these uncomfortable feelings.

> J'aime bien avoir mon petit espace [rires] autour de moi et donc quand il y a trop de monde… […] Et heu… quand on est serrés comme ça, qu'on étouffe presque, […] tout le monde qui se met… […] En fait, je n'ai qu'à veiller à ne pas prendre un métro en heure de pointe. (34Michèle, §66)

The availability of seats is also often mentioned as a source of satisfaction, of comfort. This can be considered as another way of finding a «vital space», an occasional territory. Being able to sit is perceived as a pleasant way to travel, by opposition to stand (in particular when the traveller is tired). What is more, being «well seated» in a decent seat with sufficient space for legs (in order to avoid body contact with other users) increases satisfaction. These elements are thus considered as main assets of the car.

> Moi, je suis quelqu'un qui a ses petites habitudes. Si j'ai pas un endroit où m'asseoir dans le tram ou quoi, ça m'irrite un peu quoi. Si je vois de la place dans un tram, je me dis: « A l'aise, je vais pouvoir m'asseoir et tout». Et je suis content. C'est le manque de place quoi… enfin, dans ma situation actuelle, ce serait le manque de place du point de vue du confort [qui me gêne le plus]. (40Gilles, §67)

The way some public transport drivers drive is also pointed out. The brutal driving of some drivers – who «cart» passengers – is perceived as uncomfortable, or even disrespectful.

> En ik zit wel graag in de bus als het een goeie chauffeur is. Want ik heb zo al chauffeurs gehad dat ik…het traject van hier naar het Noordstation, dat ik mij eigenlijk niet goed voelde in die bus. Rijden, vlug… vlug remmen […]. Ik heb al chauffeurs gehad en ik heb dat ook gezegd tegen die meneer: «Er zouden meer chauffeurs als u moeten zijn». Wachten totdat de mensen neerzitten, een beetje respect voor oudere mensen, totdat die toch zeker gaan neerzitten zijn. (24Barbara, §38)

Another touch perception often mentioned relates to ventilation and temperature. Having to wait in the cold, to travel in an overheated or very warm transport can also influence mobility behaviour of the students.

> Personnellement, bon, parfois quand il y a tellement de monde, je ferais bien une chose: c'est reprendre le métro pour rentrer ici et prendre une douche, tellement il fait chaud dans ces métros. C'est un peu… c'est insupportable… Mais on n'y peut rien. […] On fait avec. Ou alors on prend un métro plus tard ou plus tôt suivant ce qu'on peut avoir... (1Arnaud, §101)

> Parce que parfois, c'est dissuasif de prendre les transports en commun l'été, quoi. On préfère encore marcher un quart d'heure, plutôt que d'aller se retrouver dans la fournaise, quoi, dans les bus et les trams. Et puis, bon, les gens transpirent, bon ça sent pas toujours très bon (7Dominique, §80)

These touch perceptions are however also felt as more or less supportable according to the mobility types of the students: some consider these perceptions as really difficult to overcome, whereas others cope with it. But if the situation can be avoided most of them will do so.

> Als de bussen echt overvol zitten, dat vind ik dat ook niet fijn maar bon… iemand soms die naast jou zit en die vies ruikt en dat is niet plezant maar dat is niet daarvoor dat ik ga zeggen dat ik niet meer de bus neem, ja. (5Laura, §80)

> Vele klagen dat ze vol zitten, dat ze dat niet leuk vinden, een ding die ik vaak hoor: neem een auto, om elke ochtend in de bus gaan staan. […]ik zou ook niet, elke dag elke ochtend, in de bus naar het centrum willen gaan. Jij bent drie kwartiers onderweg, maar normaal 20 minuten duurt tot zo, om recht staan in een overvolle, overhete bus die mee in de files staat, ja. (16Wouter, §89)

Senses appear thus as media that give information on the travel context. Sensitivity to sensorial perceptions and so their influence on travel decisions and behaviour seems however to vary from respondent to respondent, which probably means that those perceptions have to be analysed in relation to other dimensions. This is why we will also pay attention to sensations that are expressed relative to mobility and to travel modes.

7.3.2 Sensational dimensions

Respondents also often refer to sensations they have when using public transport or when driving (Flamm, 2004a). Students often experience stress, irritation or on the contrary, calmness, quietness. These feelings can result from various circumstances. But it appears quite

clearly that the students who willingly use public transport highlight the **physio-psychological** troubles of using a car, in particular in Brussels, when car-favourable students rather point out the physio-psychological troubles due to the use of public transport. In the first case, attention when driving and travel times that can not be profitable are highlighted whereas planning perturbations, uncomfortable touch feelings are referred to in the second case.

> […] le temps que ça prend, l'énervement, le stress. […] Parce que ça avance pas, c'est assez énervant, quoi. Et alors oui, toutes les places de parking et alors la police qui est en bagnole, moi ça m'énerve. Les amendes pour stationnement […] Moi c'est tout ça qui m'énerve à la bagnole. C'est tous ces tracas, quoi. (39Dimitri, §122)

> Dus ik vind dat inderdaad heel ontspannend. Dat is ook een aanloop voor wakker te worden, zo. En u stand maar rustig, niet haasten dat een trein, en die trein is te laat of zo. Nee, gewoon rustig in de auto stappen, rustig doorrijden. Ik vind dat heel ontspannend. (4Femke, §26)

The person's tiredness also plays an important role in the acceptance degree of sensorial troubles using public transport, and especially having to do with touch perceptions, as already pointed out.

> Moi ça ne me dérange pas tellement, sauf quand je suis fatiguée; c'est vrai que rester debout dans le train, c'est pas toujours amusant. (15Charlotte, §54)

Another kind of physio-psychological factor that influence travel preferences is the pleasure which can be experimented when driving. Some students report not to like driving (in general or in Brussels given the urban traffic conditions they are not used to or they do not like), whereas some others envisage driving as a pleasure, or even as something they could not do without any more.

> Ca, au niveau matériel, je pourrais me passer d'une voiture mais c'est vrai que ça m'ennuierait parfois de pas pouvoir ne fut-ce que rouler parce qu'une fois qu'on y a pris goût, c'est vrai que c'est difficile de s'en passer. (13Renaud, §34)

Social dimensions of transport are also often part of the interviews. If car is reckoned as an individual travel mode (the image of the car is often associated with the «being alone» aspect), public transport is confronted with a paradox: if some students appreciate its social, cultural aspect (as this is also a way to discover the realities of the town), some others point out that the users behave like if they did not want any social contact and wanted to isolate themselves from the other users. Some students find this situation quite normal (they have integrated that norm) but some others denounce this «mass depression» (28Bruno) situation. Finally some students do not appreciate this social dimension at all.

> […] dans le train, là, c'est beaucoup plus froid, les gens écoutent soit de la musique, soit… enfin, moi d'ailleurs, c'est ce que je fais aussi. […] Les gens sont contents de rentrer au boulot, ils pensent déjà à ce qu'ils vont faire chez eux. Ou bien c'est le matin, ils sont pas très réveillés et ils ont pas spécialement envie de parler avec n'importe qui. […] je préfère avoir l'occasion de discuter avec quelqu'un […] C'est surtout pour le fait de rencontrer un peu des gens comme ça [que je fais du stop], ne fut-ce que pendant vingt minutes, et d'échanger certains points de vue. C'est toujours plus intéressant. (13Renaud, §10)

> [Ce que j'entends le plus souvent par rapport aux transports publics, c'est] Ils font chier, les Arabes [rires]. […] c'est surtout à cause des gens, en fait, qu'on n'aime pas ça. Parce qu'on se sent un peu envahi, quoi. J'espère que je te choque pas en disant ça mais c'est comme ça qu'on le ressent ici donc… (12Jonathan, §120)

Public transport is also a place where users have to «live together» for a certain period and paying attention to each other seems sometimes to be difficult to implement. Some students are deceived that this good-citizenship («respect») attitude is not shared by all users and drivers. Linguistic difficulties were also pointed out by some students.

> Dat is soms schrijndom te zien, echt heel zielig; dat de mensen hier in Brussel dat ze zo'n beetje respect niet hebben om plaats te maken, dat valt me heel erg op. Het valt me heel erg op. Probeer je een plaats maar er is geen plaats. Als je jezelf opstapt, is er geen persoon die het voorbeeld geeft. Dat vind ik erg. (16Wouter, §71)

> Some social situations have also been evoked as pleasant: travelling with friends, meeting friends, speaking with a pleasant driver. But annoying persons, persons who listen to conversations, who stare at the user, tramps and beggars were associated to negative social experiences.

Travel mode preferences are often largely related to **time** concerns. Some travel modes are experienced by the user as rapid or as slow. A real comparison of travel times between the different alternatives for the same journey has however not been often reported by the respondents. This is why it is often spoken about slow or rapid «feeling» or «impression» (Dus liefst de metro dan; je hebt den indruk dat het het snelst al gaat. (21An, §42)) But waiting times are also taken into consideration, often particularly by students who are quite favourable to the car. These times are perceived as quite hard, especially since no explanation is given when a delay is announced.

> […] sinon aussi, ce qui peut m'énerver parfois, c'est les retards… surtout les bus et les trams. Et bizarrement, les métros aussi ; il suffit qu'ils aient trois minutes de retard et là, c'est beaucoup trop parce qu'ils nous ont habitués à être à l'heure, donc c'est un peu l'effet pervers. […] quand on est dans des endroits en petit peu en périphérie, et qu'on sait que l'on va mettre du temps pour arriver d'un endroit à un autre, et que les transports traînent en plus, c'est énervant parfois. […] Oui, le pire c'est quand tu attends ton bus et qu'après vingt minutes, enfin il arrive et qu'il y en a un juste après, qu'ils se suivent. Ah ça, c'est horrible. (33Christian, §66)

As sociologists have shown (Kaufmann, 2002; Flamm, 2004b) it is also important to take the occupation (quality) of time into consideration. When driving the scope of activities that can be undertaken at the same time as travelling is quite restricted (driving is the main activity) but when using public transport, the scope of activities can become larger, ranging from reading, speaking to looking, resting, relaxing. The public transport favourable students highlight this aspect as an asset of public transport and are aware they can benefit from it.

> Ja, dat ge terwijl dat ge u verplaatst iets anders kunt doen dan u eigenlijk verplaatsen. In de auto zit ge gewoon vast. Zeker op het spitsuur zit ge gewoon vast en kunt ge eigenlijk niks anders doen dan in de wagen te zitten. Hoogstens misschien naar muziek luisteren. / Als ik pendelde naar… Antwerpen met de trein dan was dat voor mij eigenlijk echt de tijd dat ik nodig had… heen en terug had ik de krant gelezen. Dan was ik perfect op de hoogte van de actualiteit. […] of in momenten van examens dan… kon ik beginnen aan mijn verbeterwerk. […] Ge kunt heel veel dingen doen gewoon, ge zijt niet gebonden aan uw stuur en de tijd die ge gebruikt is niet zomaar versmeten tijd. Ge kunt het gebruiken. (32Benedikt, §68)

More broadly, planning possibilities of travel modes are also taken into consideration in the privileged travel modes, but students having a quite tight schedule pay logically especially attention to this aspect. But the «value of time» is not always the same. When time can «be lost» some student reported using other travel modes, even if they knew that travel times would be longer.

> Soms hebt ge meer zin om snel hier te zijn en dan pak je de metro, omdat… dat gaat het snelste. En soms hebt ge zin om een beetje aan site-seeing te doen en dan… pak je de tram of de bus. Boven de grond. Da's wel gezellig. (23Marijn, §8)

The **security** feelings appear also clearly within the interviews, as well as in the survey (3rd position in the most important factors relating to the public transport use). These feelings are often close from fears: from fearing for oneself to fearing the others. The question of morality of the users is here asked. Even if insecurity seems to be more experienced when using public transport, some students feel insecure when driving, particularly in Brussels (urban traffic conditions, risks of accidents, bad driving of other drivers). Insecurity feelings when travelling by public transport arise above all in the case of a girl travelling alone at night in an unfrequented environment. Places where people are roaming are also felt as insecure. Some neighbourhoods in Brussels (e.g. around the South Station) are especially pointed out and more generally Dutch-speaking students who were not living in Brussels before their studies tend to feel more insecure in Brussels than others. Some students reported to avoid these situations. Thefts are another source of insecurity in public transport. Some students have thus mentioned they tried to stay alert when travelling.

> Als het donker is, neem ik het openbaar vervoer niet. Da 's ook voor een stuk omdat dat in Brussel is. […] In de zomer is dat geen probleem… 't is lang klaar. En de metro… daar kun je niet onderuit, daar loopt altijd volk die je minder betrouwt.

> Dat is gewoon zo met openbare plaatsen. Maar dat kan niemand wegnemen, dat onveiligheidsgevoel, maar dat is daar wel. (24Barbara, §76)

Several underground stations in particular are perceived as insecure ones. Links are made between this feeling and controls, cleanliness, lighting and more generally to the urban context. One interviewee has also spoken about terrorism as dissuasive to use public transport. But if this insecurity feeling appears in many interviews, it has also to be noticed that several users of public transport consider this transport mode as a secure one and rather attribute this feeling to rumours.

> Ja zo geruchten zo van ja… dat het gevaarlijk is 's avonds. […] Maar dat is niet alleen het openbaar vervoer, dat is in 't algemeen. Gewoon 's avonds in de straten, als het donker is durven de meesten niet meer echt alleen over het straat gaan lopen. Dat hoort ge wel vaak. En over het openbaar vervoer ja… ja in de metrostations dat er wel eens… hier en daar… relletjes zijn, of zo. / En… dat het vuil is of zo. […] Maar ge hoort dat van mensen die eigenlijk niet vaak het openbaar vervoer gebruiken. Maar die zeggen dat gewoon… omdat ze dat horen, dat zijn zo geruchten. (23Marijn, §78)

Cleanliness is often referred to in the interviews but this sensation has to do with several sensorial factors mentioned above: smell, sight, touch and with insecurity feelings. Some of the users consider cleanliness in public transport spaces as bad (hygiene) whereas some others do not seem to be bothered by this aspect. In fact, cleanliness does not appear as a crucial factor determining modal decisions and preferences but contributes to the attractiveness of the transport. As far as the car is concerned, it becomes possible to control cleanliness in the travel space.

> Daar is het echt vies en niet alleen 's avonds maar ook overdag; […] t'is maar een indruk en die telt. Ik heb de indruk dat het tussen twee plooien valt; ik heb zo een stuk station [Zuid station], zeer proper, heel veel security, dat ziet er goed uit en daarna de stuk waar die gaan stoppen en t'is daar dat het vuil en vies is en het stinkt en donker is, ja, daar ze rondhangen, hé. Dat geeft duidelijk een onveilig gevoel daar. (16Wouter, §68)

7.3.3 Through Representations

All these perceptions participate in the development of a global image and of values linked to transport modes. Car gives rise to the strongest image, which is described almost in the same way by the respondents. This image seems thus to be socially shared. As other studies have shown (Kaufmann & Bassand, 1996; Kaufmann, 2002), the car is indeed considered as a cocoon, an extension of the house – which is owned, intimate and protected. It offers thus several ways of controlling the environment in which the individual evolves and it is felt by the majority of respondents – even those who normally privilege public transport – as if this control is greater using the car than when travelling by public transport (if traffic conditions are disregarded; only the «absolute» image of the car is questioned). Frequenting public transport requires thus in a certain way a greater effort by less controlling the travel environment. In addition to this, car is also pointed out as being a sign of social status, which can appear regarding the brand of the car, its size, its inside and outside equipping etc. Car would thus also give some significance to the individual's identity and position on the social ladder.

> Beh, la voiture, on s'y sent comme chez soi finalement puisqu'on… C'est généralement notre voiture, donc on est tranquille avec sa petite radio, isolé du monde, bien au chaud […] et au sec. (8Antoine, §84)

> Quand on est dans une voiture, dans sa voiture, on est un peu comme chez soi. […] Donc si on a une auto radio, on peut avoir sa musique, on peut prendre ses aises… Oui, finalement, on est chez soi, on n'est pas dans un bus qu'on partage… Je crois que la voiture, c'est une extension de la maison, sauf qu'elle a des roues et qu'elle peut se déplacer d'un point à un autre. (36Joachim, §32)

This latter observation may also to some extent be applied to other travel modes. Using «soft» travel modes can thus give information about the individual's position on the social ladder (public transport is said by some interviewees to be rather the travel mode of women, older or young people, immigrants; in other words, of poorer categories of the population) or about the

individual's convictions. Even according to the type of public transport used, some respondents expressed that the image could vary, giving other significance to their use.

> Ik bedoel, de wagen is voor mij eerst en vooral een statussymbool. Het is heel sterk… Ook weer en nog maar is: het is niet voor niks dat heel veel van die migranten… ook gewoon met veel te zware wagens rondrijden eigenlijk, die ze misschien moeilijk kunnen betalen. […] [om] gewoon zichzelf een identiteit te kunnen aanschaffen. […] Een wagen is veel meer dan een vervoermiddel hé: het is ook een statement dat ge maakt. De fiets is uiteindelijk ook een statement op de een of andere manier. Het zijn allemaal statements. Uiteindelijk drukken we ons allemaal uit hé. (32Benedikt, §64)

Respondents refer also several values they associate with mobility. These values are however attributed and interpreted to one travel mode or another according to the respondent's valuation of the mode. First, independence and autonomy are very usual values linked to mobility. Some students think that the implementation of these values is linked to the use of a car, some others of public transport or other «soft» travel means. Secondly, as already pointed out, values of responsibility and control exist when using the car but arguments and strategies may also be found out in this way for «soft» travel modes (as far as responsibility in public transport is concerned, it is rather the absence of responsibility which can there be valorised). Finally, freedom is considered as an important value when travelling. Car offers flexibility – and so a form of freedom – whereas «soft» travel modes rather offer the facility linked to a service.

> Oui, c'est plus autonome, quoi. […] T'es pas dépendant de l'heure, de l'endroit… des retards, etc. Enfin, c'est ta voiture. T'as des bouchons, tu sais prendre à la limite des détours. Enfin, t'es plus responsable du truc. Au moins, la responsabilité, c'est sur toi et pas sur les transports en commun. Bon, je préfère ça. (2Marie-Line, §106)

> […] eigenlijk een beetje vrijheid zonder auto […] Maar [de voordelen van het openbaar vervoer zijn] vrij zijn en overal terecht komen. (30Vanessa, §67)

The same kind of modal representations has led Kaufmann (2002) to the conclusion that "a cultural predisposition to the use of the car" seems to exist. These images and values, and so valuations, linked to mobility and travel modes result from broader processes that have for a great deal to be found in the biographical reference frame of the students interviewed.

7.3.4 Through the biographical reference frame

Appropriation of travelling also results from a process which is linked to the biography of the student. In this way, past and abroad experiences play a significant role. Past experiences are often linked to socialization, through peers or family. These first experiences of mobility and travel modes lead indeed to a learning process and to an appropriation that can be determining in future attitudes and behaviour of interviewees.

> Ik ging vroeger naar school met het openbaar vervoer en daar deed ik heel lang over. Dan was ik van thuis onderweg naar school soms een uur kwijt of van school onderweg naar huis terug één uur en [eigenlijk als je dat beziet kun je het met een auto op een kwartier doen. Dus wat dat ik van het openbaar vervoer, ik was maar helemaal niet blij want uiteindelijk vond ik dat een puur verlies van tijd, ook als het zo druk is, je kunt niet rustig een boek lezen […], of je kunt niet al je test leren omdat ja… iedereen praat rond U en ik nee… Ik vond dat helemaal niet aangenaam. (4Femke, §28)

These processes also appear to have a social nature. Some students are indeed quite close to their parents' way of travelling, whereas others are not so much. When interviewed about their peers' habits for travelling, most students however reported that their circle of friends travels in the same way as they do. Even if mobility and modes' use is often said as being few discussed with friends, it could be deducted that valorisation of certain travel modes, mobility and more broadly ways of life can be conveyed through these circles, influencing to a certain extend attitudes and behaviour of the students.

> Vu que je viens d'une ville où les transports en commun, bon beh c'est pas utile, il n'y a pas de problème de circulation. Je suis habitué à être en voiture aussi, donc je crois que c'est ça aussi qui fait que je préconiserais de prendre la voiture. (31Jean, §38)

Some major events in the biographical course (e.g. renting a student room in Brussels, moving, school change and access of these buildings to transport networks; birth of children) can also (or are thought to) alter attitudes and behaviour.

> Mais le reste de ma famille, avant, circulait presque exclusivement avec la voiture. C'était la voiture tout le temps, tout le temps. […] Mais petit à petit, les habitudes ont changé… premièrement de par le fait que les habitudes de déplacement se sont diversifiées. […] Et aussi de par le fait que la circulation en ville s'est améliorée avec le réseau de la STIB. Parce qu'avant, on voyait plus la STIB comme un moyen de transport dans le cas où la voiture n'est pas disponible alors que maintenant, les deux sont sur un même pied d'égalité […]. Mais la voiture, c'est pour faciliter la tâche […] on peut discuter, on ne doit pas beaucoup marcher. C'est juste pratique. Sinon, la règle générale pour se déplacer, c'est la STIB. (33Christian, §42-44)

Experiences abroad were also often mentioned by the respondents as these experiences could give them another reference to compare transport facilities, and in some cases had perturbed their ways of travelling and their usual reference frame with regard to transport and mobility.

> En fait, le métro, je trouve que c'est un des moins bons parce qu'en fait, moi, je suis partie en Erasmus à Madrid et quand on compare les métros de Madrid et les métros de Bruxelles… quand on rentre et on se dit: « Ces vieux métros…» Enfin […] ça pue, c'est pas hyper sécurisant. […] Et puis, il est pas si rapide que ça en tout cas à partir d'ici [Sint-Pieters-Leeuw]. (11Julie, §44)

Finally, habits (as cognitive schemas which mark out behaviour) can also result from the biographical reference frame and can in return shape it. Habits can thus restrain the knowledge of mobility possibilities and changes (Flamm, 2004a). This depends on the way these habits are lived: habits can suit the user (and so the habit is maintained and can even prevent the user to think of other behaviour) but habits may also been adopted by a process of elimination and the user can be willing to change them.

> Ik ken heel zo jongeren die thuis twee auto's hebben en die altijd overal met de auto naartoe gaan, die nooit een trein van binnen hebben gezien. Als ie dan zelf weg ga van thuis afgestudeerd, de eerste die doen is een auto gaan kopen; die weten van niet beter. Die denken dat die treinen een grote miserie is. (16Wouter, §105)

> Je vais à un arrêt plus loin et puis finalement, je vais à pied et du coup, j'ai tellement pris l'habitude de faire ça que maintenant, souvent, je pense même pas à prendre le transport, quoi. (39Dimitri, §6)

A biographical reference frame seems thus to exist and to shape the perceptions and behaviour developed as to mobility and transport. This biographical frame also includes values and valorisations from which the students seem to base their own ones, rejecting some and keeping some of them. The biographical reference frame appears like a resource to build a personal appropriation of mobility and travel modes. Deeper researches should however be carried out to understand why some elements of this biographical frame were or not selected in the personal frame of the interviewees.

> Si c'est en journée, oui, je crois que la ville je le ferais toujours en métro. Enfin, mes parents le font pas toujours en métro mais très souvent donc… à mon avis, je garderai cette habitude-là aussi. (36Joachim, §30)

This broad range of experiences, at the same time personal and shared, come thus into play in the development of the representations of travel modes and in the definition of modal preferences, in which cost only constitutes one dimension among others.

Let us now examine how the mobility behaviour of students would be affected/are affected if the financial factor – which is, as previously pointed out, important in the students' mind – is slightly modified, that is to say if students are proposed to ride for free within Brussels.

7.4 Free public transport policy in Brussels and its impact on travel behaviour

Two analysis levels have been defined: global and behavioural effects of such a measure. The first point allows indicating changes that occurred on a social, urban and mobility scale. The behavioural changes will point out the expected or observed effects on behaviour of the user

investigated and the perception of other users. As some students do benefit from the measure, whereas others do not, behavioural effects were differentiated according to expected or observed behavioural effects.

7.4.1 Global effects

At first sight, students react generally quite positively to the free public measure proposed for Dutch-speaking students. When exploring the topic in more detail, differences in opinion however appear. Some students who were first quite in favour of the measure changed their mind radically after having explored the details of the measure implemented in more depth.

One global negative effect often mentioned is that a free transport system policy could lead to a group advantage – referring to the group benefiting from the measure implemented (29 students out of 39 mentioned iniquity arguments). As far as the current free measure is concerned, students point out lots of potential or real kinds of iniquities : the advantage of the measure for Dutch-speaking students; for students who are less than 26 years old and following a degree for the first time (so not all Dutch-speaking students are aimed by the free public transport measure); for higher education students only; for students using the public transport system within Brussels (whereas other companies have to be used in the suburbs of the city); students studying in Brussels only. But the fact that the measure is directed to the student population, without any consideration of incomes is also questioned.

The reasons why the measure focuses on this particular population appeared thus not to be clear. The objectives of the institutions financing the measure were cautiously regarded. Several students feared this measure to hide other goals, such as to give a community advantage or an «age advantage» to Dutch-speaking students in order to attract this young population to the capital (which is mainly composed of French-speaking inhabitants but located on Flemish soils). This opinion is shared by all students, whatever their linguistic community of origin but asserts itself more forcefully and is the cause of more reactions amongst French-speaking students.

> Ja, ik vind dat een heel goede stap is gratis voor studenten maar, een grote «maar» t'is tot 26 jaar. Ik ben [nu] 31 jaar. […] hoewel ik student, voltijdse student ben, zelfs bij de Ocmw, […] moet ik vollepot betalen. Dat begrijp ik niet dat je plots na 26 jaar oud bent en voltijds gaat studeren, plots de financiele mogelijkheden zou hebben om openbaar vervoer te bekostigen. (16Wouter, §56)

> Ik vind ook eigenaardig dat de studenten die naar de hogescholen gaan wel kunnen maar niet de leerlingen die in het middelbaar zitten. Allez, ik vind het zo eigenaardig; ik snap het niet goed. (20Gilberte, §70)

> Het zou toch mooi zijn voor alle studenten dan, niet alleen voor diegenen die hier in Brussel zitten. (4Femke, §105)

> Oui, l'initiative est vraiment bien mais qu'elle doit être appliquée à tout le monde, alors, pas juste à une partie des étudiants parce que ça va créer des jalousies, ça va créer des problèmes. […] Donc, l'idée est bonne mais mal appliquée. (10Julie, §116)

So a question of justice and equity is raised when students consider the free public transport measure currently implemented. To explain this observation, it is referred to different financial means between both communities' institutions – the Dutch-speaking community being supposed to have more financial means at disposal.

Some global effects seem to divide students: varied meanings were expressed relative to the effects of a free transport system on the quality of service, on insecurity feelings. Students also question the financing of the measure.

Positive effects mentioned are those of the social equity regarding mobility and the improvement of traffic conditions. Social advantage as for mobility facilities has an important place in the lines of arguments. Free public transport would indeed allow the less well-off individuals to travel (23 students out of 39 referred to these kinds of arguments). A financial

aspect appears then clearly here: this kind of measure would allow these low-income persons to travel lawfully without being deprived of other goods. The students who pay attention to these categories of population assess the free public transport measure as a very good initiative for such social categories, especially since they are more likely to travel regularly by means of public transport within Brussels.

But social advantage of the measure by reference to the students' specific situation (described above) is also pointed out by the students (25 students have mentioned arguments in this way). Given their limited financial budgets, students consider this free public transport initiative as allowing them to spare some money and so, contributing to facilitate other kinds of expenses (purchase of office supplies and books, for example). One student has however questioned the indispensable character of the repaid season ticket, as few students (especially among Dutch-speaking students, who may benefit from the measure) really need to regularly use public transport within Brussels (the majority of students rents a room near the campuses and has activities in the neighbourhood). Even among the students, it is pointed out by two students that some could be needier than others.

> C'est un problème parce que c'est les parents qui payent à la base. Enfin, non, pas toujours parce qu'il y a des étudiants qui sont livrés à eux-même et qui doivent payer. Donc, c'est bien. / […] C'est des frais en moins à dépenser. (15Charlotte, §112)

> Je ne suis pas défavorisé […] J'aurais pas besoin mais évidemment, une réduction de 125 euros, c'est toujours ça de pris hein, donc je serais favorable évidemment mais à la base, c'est pas un besoin. (31Jean, § 126)

As more people would frequent public transport as it became free, several students also expect that traffic conditions would improve on a global scale within Brussels, that car use would be reduced (15 students have expressed themselves in this way).

> Donc une gratuité des transports pourrait certainement avoir un effet bénéfique sur la ville… diminuer l'encombrement vis-à-vis des voitures, mais il faudrait que ça suive. Je veux dire, pour les voitures, […] on a creusé des tunnels, on a amélioré le service, on a construit des grands boulevards aussi donc… pourquoi pas pour la STIB ? (33Christian, §126)

It has then to be noticed that few students (6 among the respondents) relate the free public measure to environmental benefits and to a sustainable transport policy. As already highlighted above, this observation can probably be partly explained by the political aims pursued by the political institutions that had implemented the measure in Brussels.

Several points have thus shown that these effects lead to the question of the relations between the individuals and institutions. But let us now examine how students perceive the travel behavioural change such a measure could induce, according to their current free or paid use of public transport.

7.4.2 Behavioural effects

In order to examine the possible behavioural change of the users due to a free public transport policy, we propose to differentiate two categories of students: those who benefit from the measure and those who do not, as their respective experience is different.

7.4.2.1 Non-beneficiary students

Students who are not benefiting from the measure (29 students from the sociological sample) often approach the potential behavioural effects according to two ways: some think that such a measure will not lead to any behavioural effect on a personal level (but are divided as for the behaviour of other users) and some consider that mobility behaviour (personal and of other users) would certainly change.

A great part of respondents (18 students out of 29) is not expecting any noticeable change in their own behaviour and expects to go on with one's usual travel habits. Users who possess a season ticket or a bike would not fundamentally change their current travel habits, in the same way as frequent car users. Personal mobility habits are indeed considered by some students as being few inclined to change, as these habits fit the current way of life of these students, as no other habit would be really viable. According to some of them, price does not constitute the main drawback of public transport. Other changes have to be brought about to public transport to observe a real modal transfer. The question of the quality of the service is here crucial towards the aim of «competing» the assets of the car, which are otherwise more important than those of public transport. The behaviour, and more precisely the attitudes, of those students should therefore not significantly vary. But a differentiation can still be made between respondents who think that little impact on the others' behaviour would be observed from other students who conceive that other persons could change their modal behaviour because of a free public transport policy (DW_1,2,3,4,5,7,12,13,17,19,20,28,31,33,34,36,38,40).

> Ah non, parce que l'abonnement aussi je le paye et après c'est considéré comme gratuit: j'utilise les moyens de transports gratuitement, c'est aussi considéré comme ça. Je vois pas de différence. (19Myriam, §119)

> Enfin, dans ma situation vu que je suis kotteur, ça ne changerait pas mes habitudes. Des autres, ça je sais pas mais il faut leur demander [rires]. Vu que je me déplace quand même déjà en bus… Peut-être que je prendrais alors le bus pour des distances plus courtes, style aller du campus à la plaine à l'univ'. C'est cinq minutes mais alors, je le ferais pas à pied. J'irais moins à pied. […] Si le bus est là, je le prends. Allez, j'ai mon abonnement. C'est des changements mineurs. (31Jean, §138-140)

Some of these students analyse the free transit policy measure from a more psychological perspective and question the behavioural effects it could still generate in the long run. These students think the measure could at the beginning of its implementation attract new users, because of a psychological attraction of the absence of payment. Behavioural effect would then occur, due to opportunist reactions: people want to benefit from it. Long-run effects of such a measure are however questioned.

A second part of interviewees (11 students) envisages the measure as attractive. This would involve modal changes for them and would appeal new users. A snowball effect would then occur, which would be beneficial for public transport. Only positive repercussions would arise (DW_8,9,10,11,(14,15),16,18,21,32,39).

> […] il me semble que ça améliorerait certainement l'ambiance qu'il y a à l'intérieur et donc, les gens iraient plus volontiers dans les transports en commun. Puis, ça leur ferait moins peur… Ils prendraient l'habitude simplement aussi, parce que les gens sont généralement attirés par ce qui est gratuit et la facilité. […] Enfin oui, je pense que ça aurait une sorte de réaction en chaîne comme ça. Et donc, les gens verraient ça [les transports publics] de mieux en mieux. (8Antoine, §162)

Free public transport measures are thus seen quite positively but are not always considered as being a solution, as for some price is not the main drawback of public transport, for others their own mobility habits are rooted in their mind – even if it does not exclude that modal change could appear for other users. Some other students, finally, are very optimistic as to the behavioural effects such a measure could lead to.

The following paragraph will then show that beneficiary students – who have then really experienced free public transport – assess in a quite different way the measure and its impact on travel behaviour.

7.4.2.2 Beneficiary students

On the other hand, students who are benefiting from the repaid season ticket measure (8 students from the sociological sample, to which we also join 2 students who received a free season ticket because relatives are working in transport companies) react differently, according to their previous way of travelling within Brussels.

A first group of beneficiary students has indeed observed a personal behavioural change as to their mobility in Brussels. It could be noticed that those students used to get travel tickets (DW_6,23,24,29). Indeed, a season ticket often corresponds to a change in the student's behaviour, as students benefiting from the free measure often reckon to travel more regularly to the centre of the town, even if this regularity appears to vary from student to student and even if this change is probably in most of the cases a slight one. Some students use public transport more regularly for "utility journeys" (to the centre, for example), but some others are really taking advantage from the ticket to stroll in the town and to learn using Brussels' public transport system.

> Ja, het heeft een heel grote invloed. Omdat vorig jaar… ik zou eerder geneigd zijn te voet te gaan. […] ik neem gewoon veel meer de bus. Nu ga ik wel twee keer per week of zo naar het centrum, terwijl ik vorig jaar bijna nooit ging. En ook overal waar je naartoe gaat, pakt je vlugger een bus of zo. Ook voor één halte of zo (23Marijn, §110)

It has then to be pointed out that in our case behavioural change appears more particularly because of the obtaining of a season ticket. The free aspect of it encourages getting a season ticket, but this free aspect in itself does not constitute the cause of behavioural changes. The possession of a season ticket also encourages these students to get used to public transport. But it could not be found out that the fact of possessing a season ticket had led to a more positive assessment of public transport.

A second group of students has however reported not having noticed any real change in their travel behaviour (DW_26,27,35,37) because they were already used to regularly choose the public transport system in Brussels. Even if they did not possess a season ticket before the repaid season ticket initiative, they were regularly using travel tickets to travel and so, their travel habits have not been modified due to the obtaining of a repaid season ticket. It is also noticeable that this category of students shares a lower appreciation of the measure implemented, which would result in little or no behavioural change, as if the fact of being used to use public transport more regularly was not leading to the same discoveries and so to the same satisfaction level.

> Ik had ook al de gewoonte van met het openbaar vervoer te gaan naar bepaalde plaatsen. En ik ben het gewoon blijven doen. Abonnement of geen abonnement. […] ik denk niet dat alleen dat element van een abonnement voldoende is om iemand in ene keer alle dagen met het openbaar vervoer te laten gaan. (35Kristel, §108)

Among the various positive consequences of the repaid season ticket, this latter seems often to lead to a spatial discovery. Having a season ticket allows the beneficiary students not to think about the availability of money, the payment of a ticket and about controls and so to jump in public transport, sometimes just to look at the town and to be able to link locations between them. This repaid season ticket then appears as a practical way of travelling within the town, as travels in Brussels are made more immediate and easy.

As far as the spatial investigation of Brussels it seems that language problems and a bad perception of Brussels, related to insecurity feelings, by Dutch-speaking persons can influence the behaviour of students. A free season ticket usually leads to an increase in the student's journeys, and then often also corresponds to a better spatial knowledge. One student (DW_6) has even reported planning to live in Brussels after his studies, because he could discover the town and appreciate it thanks to his free season ticket – this echoes the objectives of the institutions that launched the measure.

> Hadden ze dat nooit aangeboden, had ik nooit een abonnement gekocht, heb ik nooit gezien wat er allemaal te zien en te doen is. (6Hans, §150)

When beneficiary students were asked if they would still buy a season ticket if the repaid season ticket initiative was coming to an end, 4 beneficiary students out of 7 reported they would indeed buy a season ticket because of their frequent travels within Brussels and also because of the facility such a ticket provides (no regular purchase, no tick off…). We have also

observed that these respondents were more inclined to be former or current Brussels' inhabitants. This could also explain why they could consider a season ticket as useful. The remaining 3 beneficiary students reckoned they did not really need such a season ticket, because they did not ride enough within Brussels or because they privileged another means of transport, even if they found it very practical to possess one, since it allows them to move more freely and more regularly. The season ticket appears thus not to be indispensable for every students and is probably «under-used» (not made profitable) by some beneficiary students.

> Omdat ik er toch nog vrij vaak gebruik van maak en dat ik op een jaar uiteindelijk dat abonnement er wel uit zal hebben, hoop ik. […] Ja, ik denk wel dat ik een nieuwe zou kopen […] Ik blijf niet altijd hier in Etterbeek. (27Ryfka, §172)

> Ik kan zo'n kaart gemakkelijk missen. Ik ben er zeker van dat ik een Franstalige student veel gelukkiger kan maken met die kaart dan mezelf. […] Maar ik vind: het is handig om te hebben. (29Bram, §132)

The impact of such a measure has however to be questioned for French-speaking students as the economic and geographic survey of our research shows that these students use more regularly public transport within Brussels and that their knowledge of Brussels is better. It could then be expected that the behavioural change would be less important by French-speaking students for these reasons.

But non beneficiary students, as well as beneficiary ones however fear that a free access to public transport could, on the one hand, lead to a loss of customer status which would not allow any claim any more and on the other hand, to a loss of respect of the clients with regard to the transport they are using. A bad use or under-use of the season ticket could also be observed – some students reckon by themselves that they do not absolutely need a season ticket –, as well as the avoidance of using more «soft» transport modes for shorter trips. Finally, some students also regret that the free season ticket is only available for one transit agency (there are three main companies in Belgium) and also mention that public transport may be over-frequented if no adaptation of the supply is undertaken.

> […] quand les gens payent, ils respectent d'une certaine façon. Si les gens ne payent plus, je me dis que les métros vont peut-être être saccagés. […] Si c'est gratuit, on ne pourra plus faire aucune plainte, vu que c'est gratuit. […] Tandis que si c'est payant, on a encore notre pouvoir de client, de dire: «Je ne suis pas satisfait du service. Est-ce que c'est améliorable?» Gratuit, ce pouvoir-là, est perdu, quoi. (11Julie, §124)

> Donc, c'est pousser à la fraude et pousser les étudiants à commencer à bluffer et à essayer de s'arranger pour rester inscrit à l'école jusqu'à la fin de l'année, etc. Ca aussi dépend des contrôles qu'il y a, quoi. (17Sébastien, §114)

> Ik ken verschillende studenten die zelfs in twee jaar één keer in het centrum geweest zijn. Die blijven echt altijd hier. Maar zij hebben dan meestal geen abonnement. Of ze hebben dan misschien wel een abonnement, maar maken er maar weinig gebruik van in het algemeen. (23Marijn, §114)

In comparison with the non beneficiary students, beneficiary students appear to be less critical and suspicious as to the behavioural impact of free season tickets on their own travel behaviour, than non beneficiary students. But they do not appear to be as convinced as non beneficiary students that behavioural impact could be observed for other persons, if this kind of initiative had to be extended. These latter observations may be explained by the students' financial situation, by the particular situation of Dutch-speaking students in Brussels concerning mobility behaviour within the capital, but it has maybe also to do with the direct experience of free public transport.

It appears thus that the measure encourages students to travel more frequently with the public transport network. The effects in the long run are however difficult to explore within the framework of this research. The learning process of the public transport's network due to repaid season tickets and its impact on the travel habits in the long run should thus be studied in more depth.

In conclusion, on the one hand, some students seem to experience a personal change in mobility behaviour, notably regarding the frequentation of the centre of the town. These behavioural changes seem however not to have directly to do with the fact of using free public transport but with the fact of using a season ticket. The knowledge of the town is often improved. On the other hand however, the previous frequent use of public transport in Brussels did not lead to any remarkable behavioural change. Risks of bad or under-use of the free season tickets have however already been observed. Beneficiary students seem finally to be more positive as to the behavioural effects a free transit measure for students may generate.

The following point will be dedicated to describe some mobility types observed within the student population in Brussels. This will contribute to highlight the global assessment of the different travel modes at their disposal and to link them when possible to their assessment of a free public transport measure. The asset of this typology is thus to give a broader insight on the mobility decisions and behaviour, including every possible aspect described previously.

7.5 Students' mobility types

In order to clarify the students' mobility behaviour and modal preferences, we have sketched a typology of attitudes and behaviour. When possible, the types will also be linked with their attitudes towards the free public transport measure. We would like to draw the reader's attention to the fact that this typology has to be considered, according to sociological terms, as ideal types. This means that these types are considered as analytical constructs that the researcher uses in order to compare cases. These types result from the differentiation of the more marked, distinct points of view, positions of individuals. This means that some less marked cases can be closer to one type, even if they do not exactly correspond to the ideal-type.

In the case of the students' mobility attitudes and behaviour, we have identified a continuum of four ideal types (inspired by Kaufmann, 2000: 199-206). Two dimensions have been crossed: the sensitivity to supply allowed by the different travel modes and the effective modal commitment of the students with regard to the whole modal alternatives. Some students are indeed not sensitive to supply because they have become car-oriented, ignoring other modal possibilities, and prove to be very committed in their car choice: these students have been called «exclusive motorists» (T1). Some other students are «constrained to use public transport» (T2) without valorising this mode. They would rather like to drive a car. They are thus car minded, this is why they are not really sensitive to supply – they are forced to accept it – and so are also not really committed in their modal decisions and behaviour. A third category of students is sensitive to the supply – they valorise the efficiency of the mode – and so are not a priori committed to one means of travel or another. These are «plastic» students (T3). Finally, there remain students who share a strong modal commitment and still also a sensitivity to supply. These students were called «city oriented» ones. The continuum varies thus from car oriented students (T1&2) to «soft» travel modes students (T4). In the middle, «plastic» students have less clear-cut opinions. All these types share particular characteristics we will detail in the following paragraph.

Sensitivity to supply / *Effective modal commitment*	*Yes*	*No*
Yes	City oriented T4 *Favourable to public transport and «soft» modes*	Exclusive motorists T1 *Favourable to car*
No	Plastic T3 *Favourable to public transport and to car*	Constrained public transport users T2 *Unfavourable to public transport; favourable to car*

Table 8 Ideal types of the students' mobility attitudes and behaviour.

Students from the first type (T1) were not numerous (3 students) in the sociological sample. Budget considerations – see above – can easily explain this situation. These are car users for almost all their trips. These students do not really conceive and investigate other ways to travel. They valorise the car and do not valorise public transport nor other «soft» travel modes. A dissuasive past experience of these modes is often referred to, combined with family surroundings which valorise the car. One cause may be found in the fact that travel times are seen as an important data as they usually have busy activity diaries and public transport does not offer, according to them, a sufficient guarantee of arriving on time and faster (these modes are associated with an idea of uncertainty). This type of students also highlights the pleasantness of the car, whereas public transport is the utmost unpleasant travel mode. And this applies also to travel times which have not been lived very positively when using public transport. Car also allows intimate social contacts. Price is also taken into consideration, even if it is not always favourable to the car use. Finally free public transport is considered as not changing personal travel behaviour. This is logical as the car is strongly valorised.

> Moi, c'est principalement en voiture. Donc, depuis mes dix-huit ans, j'ai mon permis. Et depuis ce moment-là, je me déplace uniquement en voiture. Et à pied de temps en temps, quand j'ai le courage. (3Céline, §8)

In the "constrained to public transport use" (T2) case (9 students), the respondents feel forced to use other travel modes but actually valorise above all the car. The behaviour of this type of students may then be differentiated from their values as these students adopt behaviour that are not consistent with their attitudes. More precisely, these students use public transport in Brussels and assess them as efficient travel means to the centre of the town (especially during the week and during peak hours) but their global attitude is even so turned to car. The public transport network in Brussels is moreover seen as inefficient and these students long to drive their own car. Experience of public transport has thus been in those cases dissuasive or at least has not convinced to such an extend that attitudes and behaviour would change. Besides these students have lived in residential and family surroundings where car was valorised. But the image of the car plays here probably an important role. Comfort, price and travel times negatively perceived are particularly to notice. But no statement can be made relative to their assessment of the free public transport initiative, which has been diversely assessed among this category of students.

> C'est un besoin tout court, je dirais, le moyen de transport. Celui qui a pas de voiture, il va utiliser cela [transports publics], il a pas le choix. (15Charlotte, §85)

The "plastic" students –19 students – share the characteristic of having less cut-clear attitudes toward the various travel means. They tend to assess more broadly all types of available travel

modes and use the mode considered as the more efficient one for the travel in question. This means that car is not *a priori* excluded from the decision. What is more several students (6 students) have the possibility of using a car in Brussels when the opportunity presents itself. This opens thus the scope for their decisions. Students of this type often seem to travel by combining different means of travel – depending on the availability of these travel means, on the location of origins and destination, on the purpose of travelling, on the way activities have to be combined etc. However there seems often to be a «basic», prioritised kind of transport mode (which is regularly opted for). This type of students shows a particular sensitivity to practical considerations, to comfort and to security feelings. Some of them (4 students) also express their displeasure to drive and this can maybe keep them away from other types. Travel times are here rather positively invested. Finally, the free public transport measure is assessed quite variously but these students tend to think that the behaviour of other users is likely to change due to the implementation of such a measure. But an important observation in this type is that almost all students benefiting from the measure are part of this type. This is maybe a sign that this measure is likely to open the scope of mobility decisions and behaviour. It could thus be said that the facilitated access to public transport and their use – even if occasional – seems also to facilitate appreciating this service and to take this modal possibility into consideration, whereas students from the first and second type which see the price criterion as a crucial and justified argument allowing them to criticize public transport.

> […] je pourrais encore rester plusieurs années sans conduire. Ce ne serait pas vraiment un problème pour moi parce que je sais qu'il y a le réseau de la STIB et que je peux m'en contenter encore pendant un certain temps. […] je ne me déplace pas énormément avec la voiture, sauf […] quand on se déplace en famille et évidemment […], quand il y a des paquets à porter, ou par opportunité parce que bon, je sais que mon père va me déposer directement à l'endroit où je dois aller. C'est plus simple quoi. Mais je pourrais bien rester sans voiture encore quelques années, ce ne serait pas un problème. (33Christian, §68)

The fourth category ("city oriented") which groups 8 students gathers students who are sensitive to the quality of life in the town and to its enhancement, notably environmentally. They appreciate the urban environment. Moreover students from this type are the older ones and have residential strategies that allow them to conciliate their privileged travel modes and their principles. Their arguments refer to more collective concerns. This is why they valorise «soft» travel means into the town. So several convinced cyclists are part of this type. Car is also often depreciated by those students but they conceive that some stages of life could lead them to abandon this type (when children are born). Travel times in public transport are rather positively considered, as invested times and not as «dead times». And finally, a free public transport initiative is rather favourably examined.

> Hier in Brussel zijn er veel te veel auto's, vind ik, [die] staan in de files. Ja, nee, ik ben een voorstander van het openbaar vervoer als je in de stad woont. Alleen in het weekeind […] dat is het enigste moment dat we denken, iedere keer opnieuw, pff, hadden we nu maar een auto, dan konden we meestal op hun gemak naar huis gaan […] Vrienden gaan bezoeken anders in Belgïe […]; de verbinding van hieruit naar het station is slecht eigenlijk. Met …de bus, sta je goed in de file. (16Wouter, §22)

The attitudes and behaviour described here are often related to the particular situation of living in a town as a student. When the students think about the future and about other locations than the centre of Brussels and the closer neighbourhoods, they can also envisage other kinds of mobility behaviour than those they valorise otherwise (particularly in the T3 & T4 cases). Valorisation of the means of travel may also vary according to the considered period (it is especially referred to peak hours and to the night). In the long run and in other financial circumstances, it could be expected that those «soft» means of travel could be abandoned by the «non convinced» users. So valorisations of the means of travel are likely to change following the mobility situations.

This typology allows thus grasping the diversity of students' profiles as to mode preferences and mobility behaviour. Understanding the way qualitative elements analysed combine

themselves appears then to be essential to understand the "way of mobility" of these students and the reactions linked to the implementation of a free public transport measure among the student population. Even if when analysing a homogeneous population with regard to demographic criteria, huge differences can be observed as to the rationales developed in this population. This is why policies reveal also to have different kinds of impact on the students' behaviour.

Chapter 8 Social cost-benefit analysis

8.1 Calculation of the costs

As we mentioned before, the only societal cost that needs to be taken into account is the subsidy from the government. In total, the government granted a budget of **1.446.293€** to finance the "free" public transport project.

8.2 Calculation of the benefits

There are two types of benefits that need to be monetarized: the direct benefits and the external benefits. The indirect benefits are not included into the SCBA and are taken into account pro memory.

8.2.1 Monetarization of the direct benefits

These positive effects are reflected through the increase in consumer surplus as a result of the "free" public transport measure. To measure the increase, we look at the difference in consumer surplus with and without the project. Therefore, we need to construct a demand function.

Students can choose between tickets and subscriptions to pay for their public transport trips. Consequently we can assume that there are two markets: a market where students pay for their trips with tickets, and one where public transport trips are paid with subscriptions. On the ticket-market, the demand function reflects the demand for trips in function of the trip price. On the subscription-market, the demand function represents the demand for subscriptions in relation to the subscription price. Tickets and subscriptions are substitutes: if the price of the subscriptions diminishes, as is the case in this "free" public transport project, students will switch over from tickets to the cheaper subscriptions to pay for their trips. To avoid double-counting as a result from substitution between both markets (former ticket users switching over to subscriptions), it is sufficient to construct the demand function on the subscription-market.

In general, the demand function has a declining slope and we assume the function to be linear. This means that we can construct the demand function if we know two of its points. The first one can be found by analysing the current situation. We know that 8077 students applied for the "free" public transport. Considering that they had to pay an administrative cost of 10€, the first point on the demand curve is (8077, 10). The other point can be derived from the situation before introduction of "free" public transport, when subscription price was on average 185€. To this purpose we use the data from the survey.

27,51% of the students who applied for the "free" subscription, are entirely new public transport users. 72,49% did use Brussels public transport before. When we extrapolate these findings to the total amount of students who asked for "free" subscriptions, we obtain the number of new and already existing public transport users (table 8.2):

New users	8077*27,5% =	**2222**
Existing users	8077*72,5% =	**5855**
Total	**8077**	

Table 9 Amount of new and existing public transport users

Within the group of existing public transport users, we can further distinguish between students who formerly used tickets to pay for their trips and students who already used subscriptions before the introduction of the "free" public transport project. According to a survey conducted by Quartier Latin (2004), 2200 of the 8077 applications, or 27,24%, originated from students who already used public transport subscriptions before. We also know that 2222 students are new public transport users (27,51%). Subsequently, the remaining 3655 students (45,25%) formerly used tickets to pay for their public transport journeys. An overview (Table 10):

New users	**2222**
Existing ticket users	**3655**
Existing subscription users	**2200**
Total	**8077**

Table 10 Public transport user types

This means that 2200 students are willing to pay on average 185€ for a public transport subscription. Now we also know the second point of the demand function, which is (2200, 185), and thus we can construct the demand curve (figure 8.2).

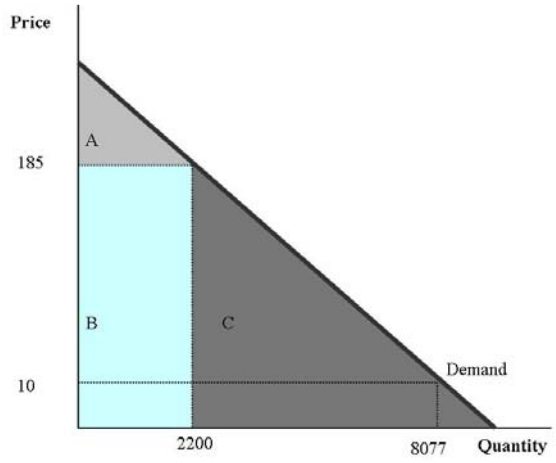


Figure 21 Increase in consumer surplus

Graphically, the consumer surplus is the area below the demand curve and above the price level. It can be divided into three parts:

A: the initial consumer surplus

B: the additional consumer surplus to the initial subscription users

C: the consumer surplus to new subscription users

Once the demand curve is constructed, we can calculate the increase in consumer surplus (part BC). For this we need to measure the CS of the reference alternative (part A) and deduct it from the CS of the project alternative (part ABC). The formula for calculating the increase in consumer surpluses is:

$$\Delta CS = \frac{q_0(p_0 - p_1) + (q_1 - q_0)(p_0 - p_1)}{2}$$

Where:

Δ CS = the increase in consumer surplus

p_0 = the subscription price before the project (p = 185€)

p_1 = the subscription price with the project (p = 10€)

q_0 = the amount of subscriptions before the project (q = 2200)

q_1 = the amount of subscriptions with the project (q = 8077)

$$\Delta CS = \frac{2200(185 - 10) + (8077 - 2200)(185 - 10)}{2}$$

$$\Delta CS = \frac{385000 + 1028475}{2}$$

$$\Delta CS = 706737{,}5$$

When we solve the equation, we find that the increase of consumer surplus resulting from the introduction of "free" public transport, equals **706.737,5€**.

8.2.2 Monetarization of the external benefits

The introduction of "free" public transport induced a (small) modal shift among students from car use towards public transport use. In order to calculate the reduction of external costs resulting from this shift, we need to have an idea of the number of substituted kilometres. For this we conducted a supplementary survey. Among the students who applied for "free" public transport, we selected those who:

- can possess of a car[1]
- use public transport more than before

[1] Having their own car or using someone else's car (e.g. their parents)

These two criteria applied to 143 of the questioned students. An additional survey by telephone was executed among these students and the response rate was 22,4% (N=32). There was a modal shift from car to public transport among 21 of these students (66%). The other 11 students (34%) were not encouraged to switch over from car use to public transport use. When we apply the percentages resulting from the survey to the effective amount of students who applied for "free" public transport (N=8077), we can extrapolate that 1048 students sometimes substitute their car for public transport. We know that 19,67% of the students benefiting from "free" public transport can posses of a car and use public transport more often than the previous year (N=1589). According to the survey by telephone, 66% of these students were motivated by the project to use public transport instead of the car for some of their trips (N=1048).

On a weekly average, the number of substituted kilometres turned out to be 76,26 km per student: 47,64 km during peak hours and 28,62 km in the off-peak period. To convert these data to a yearly basis, we multiply them by 40 weeks[2]. This results in the number of substituted kilometres per year and per student. When we multiply this with the amount of students from our survey who substituted car in favour of public transport (1048), we obtain the total of substituted kilometres per vehicle (Table 11).

	Peak	Off-peak	Total
vkm/week/student	47,64	28,62	
1000vkm/week/student	0,05	0,03	
1000vkm/year/student	1,91	1,14	
1000vkm/year	**1997,07**	**1199,75**	**3196,82**
Percentage	62%	38%	100%

Table 11 Number of substituted kilometres

Next to the number of substituted kilometres, valuation key numbers are needed to calculate the reduction in external costs. In order to attach a monetary value to each externality, we used the marginal external costs for accidents, noise and pollution, from a research conducted by INFRAS/IWW and published in 2004. The marginal external congestion costs were calculated by Mayeres et al. (1997). Since we are dealing with car trips made in Brussels, we focused on the key numbers for urban roads.

8.2.2.1 Accidents

Transport is a dangerous activity. Young people are considered to be a vulnerable group of car drivers, mainly because they lack driving experience and responsibility. Therefore, the reduction of accidents as a result from decreasing the number of car kilometres by means of the "free" public transport project is quite an important benefit. Besides the people involved in transport, accidents can also concern other parties. The marginal external costs are the costs induced by an additional vehicle kilometre. According to INFRAS/IWW (2004), these costs are influenced by the cost of an accident, the accident risk, the proportion of the cost already

[2] Due to holidays and closing exam sessions, there are 12 weeks without courses during the academic year. We assume that students do not travel to their universities or colleges during those weeks. Therefore, in our analysis one year consists of 40 weeks.

born by the user and the risk elasticity. The marginal external accident costs (MEAC) for cars on urban roads in Belgium are 122,6€/1000vkm when traffic flows are low, and 130,2€/1000vkm during high traffic flows. Multiplied with the average amount of substituted kilometres, this results in a reduction of external accident costs of 407.107,76€ (Table 12).

Accidents	MEAC (€/1000vkm)	# Substituted km (1000vkm/year)	Δ external accident costs (€/year)
Peak	130,20	1997,07	260.018,36
Off-peak	122,60	1199,75	147.089,40
Total			**407.107,76**

Table 12 Reduction external accident costs

8.2.2.2 Noise

Noise has several effects on health and well-being. It affects people physiologically and psychologically: noise levels above 40 dB LAeq[3] can influence well-being, with most people being moderately annoyed at 50 dB LAeq and seriously annoyed at 55 dB LAeq. Levels above 65 dB LAeq are detrimental to health (Berglund et al., 2000). The marginal noise cost is lower when traffic is dense, because the noise nuisance of an additional vehicle is lower when there is already a lot of traffic noise. According to INFRAS/IWW (2004) the marginal external noise cost (MENC) is 7,63€/1000vkm when traffic is dense, and 18,49€/1000vkm when traffic flows are thin. Subsequently, the diminution of external noise costs is 37.421,02€ (Table 13)

.

Noise	MENC (€/1000vkm)	# Substituted km (1000vkm/year)	Δ external noise costs (€/year)
Dense (Peak)	7,63	1997,07	15.237,63
Thin (Off-peak)	18,49	1199,75	22.183,38
Total			**37.421,02**

Table 13 Reduction of external noise costs

[3] LAeq is equivalent sound pressure level in dB(A)

8.2.2.3 Air pollution

Another important external cost related to transport is air or atmospheric pollution. Transport pollutes the environment locally, across borders and globally. Lead and carbon monoxide contribute to local air pollution, NO_x emissions have a cross-border effect and induce acid rain, and globally there are problems of global warming (caused by CO_2) and depletion of the upper ozone level (because of CFCs[4]) (Button, 1993). INFRAS/IWW (2004) differentiated the marginal external pollution costs (MEPC) according to the type of fuel: gasoline (9,54€/1000vkm) or diesel (74,74€/1000vkm).

Air pollution	MEPC (€/1000vkm)	# Substituted km (1000vkm/year)	Δ external pollution costs (€/year)
Gasoline (51,97%)	9,54	1661,39	15.849,63
Diesel (48,03%)	74,74	1535,43	114.758,21
Total			**130.607,84**

Table 14 Reduction external pollution costs

National statistic data (NIS, 2005) show that, if we do not include alternative fuels, 51,97% of the cars in Belgium are gasoline driven, and the other 48,03% uses diesel. Assuming that we can apply these percentages, we can calculate the reduction in external air pollution costs for the year the analysis applies to, which is 130.607,84€ (table 8.7).

8.2.2.4 Congestion

Finally, traffic also induces congestion. The past decades, the value of time has increased ('time is money'), subsequently cars stuck in traffic and the waste of time resulting from it have become an important, if not the most important, external effect. Congestion results when traffic demand approaches or exceeds the available capacity of the road system (Button, 1993). Mayeres et al. (1997) calculated the marginal external congestion cost (MECC) in urban areas by passenger cars: 1462,57€/1000vkm during peak hours and 4,21€/1000vkm in off-peak periods. Multiplied with the amount of substituted kilometres, we obtain the external congestion cost savings: 2.925.912,48€ (Table 15).

Congestion	MECC (€/1000vkm)	# Substituted km (1000vkm/year)	Δ external congestion costs (€/year)
Peak	1462,57	1997,07	2.920.856,50
Off-peak	4,21	1199,75	5.055,98
Total			**2.925.912,48**

Table 15 Reduction external congestion costs

[4] Chlorofluorocarbons

8.2.2.5 Actual reduction of external costs

The introduction of "free" public transport induced a modal shift among students from car use towards public transport use. In total this shift would induce a reduction in external costs of 3.501.049,09€. However, Blauwens et al. (2002) indicate that in high congested areas the space made available on the road system will attract new car users. As a result, the external benefits of the substitution are partly undermined. This reasoning is depicted in Figure 22.

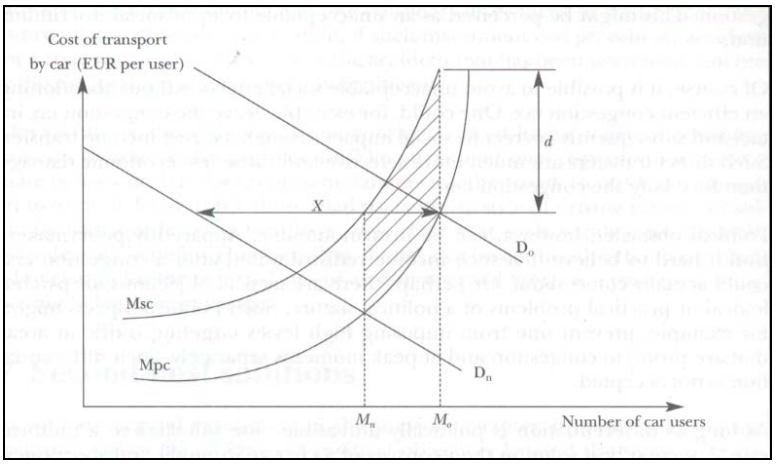


Figure 22 External benefit in road traffic (Blauwens et al., 2002)

The introduction of "free" public transport persuaded X passengers to switch over from car use to public transport. As a result, the demand for car use shifts from its original position D_0 to the left D_n. The market equilibrium will also shift to the left, decreasing the total number of car users from M_0 to M_n. The benefit is thus equal to the shaded area: the distortion *d*, applied to the number of car users that disappear. However, the net reduction (M_0 - M_n) is smaller than the number of passengers X who have shifted from car to public transport. The space made available on the road has attracted new car users filling up a part of it again. This undermines the benefit significantly and therefore we should consider in our calculations that the benefit does not apply for X passengers, but merely for a fraction (M_0 - M_n) of the number of passengers (Blauwens et al., 2002).

According to Blauwens et al. (2002), we can assume that the demand and cost curves are equally steep. Consequently, the net reduction in road traffic amounts to half the number of passengers X that have shifted towards public transport. We can also presume that this phenomenon of other car users being attracted to fill up the new available road space merely occurs during peak hours. In our case, this means that we should only take 50% of the external benefits resulting from substitution during peak hours into account. In order to do so, we already made a distinction between substituted kilometres during peak and off-peak hours for the external accident, noise and congestion cost (Table 12, Table 13, Table 15). For the external pollution costs we will use the percentages shown at the bottom of Table 11: 62% of the substitutions occur during peak hours, while 38% happen in the off-peak period. Table 16 gives an overview of the reduction in external costs without fill-up effects.

	Δ external costs (Peak) (€/year)	Δ external costs (Off-peak) (€/year)
Accidents	260.018,36	147.089,40
Noise	15.237,63	22.183,38
Pollution	81.591,36	114.758,21
Congestion	2.920.856,50	5.055,98
Total	**3.277.703,86**	**289.086,97**

Table 16 Reduction in external costs in peak and off-peak hours if space made available is not filled up

In order to calculate the actual reduction in external costs, we need to consider only 50% of the reduction in external cost during peak hours. Adding up the reductions in peak and off-peak hours results in an overall actual external cost saving of **1.927.938,90€** for the academic year of 2003-2004 (Table 16).

Actual reduction external costs (Peak)	1.638.851,93
Actual reduction external costs (Off-Peak)	289.086,97
Total actual reduction external costs	**1.927.938,90**

Table 17 Actual reduction in external costs

8.3 Discussion

The welfare implications of the project become apparent when we make up the balance of the benefits and costs induced by the "free" public transport. The total costs amount to 1.446.293€ and the total benefits are 2.634.676,40€. The benefits exceed the costs, mainly as a result of the encouraged modal shift from car use towards public transport use which leads to a significant reduction of external costs. When we deduct the costs from the benefits, we obtain a positive welfare result for the society as a whole of **1.188.383,40€** for the 2003-2004 academic year (Table 18).

Costs	Subsidy	- 1.446.293,00 €
Benefits	Δ Consumer surplus	+ 706.737,50 €
	External benefits	+ 1.927.938,90 €
Balance		**+ 1.188.383,40 €**

Table 18 Social cost-benefit analysis synthesis

We conducted an additional analysis to find out how sensitive this balance is to changes in the percentage of road being filled up by new car users. Since we have no information about the gradients of the cost and demand curves, we could assume that 50% of the space made available was filled up again. With a sensitivity analysis we wanted to observe how the balance would change if the fraction to witch the external benefit applies decreases as a result of more car users being attracted to the available space on the road. It appears that the project remains beneficial as long as no more than 86% of the space made available on the road is filled up by new car users (Table 19).

Amount of space filled up again	Balance
50,00%	1.188.383,40
60,00%	860.613,01
70,00%	532.842,62
80,00%	205.072,24
90,00%	-122.698,15

Table 19 Sensitivity analysis

Considering that the project may also lead to improvement of the city image and upgrading of the perception students have on public transport, the "free" public transport measure has the potential to increase the popularity of the city and to induce habit forming in favour of public transport. On the long run, this may motivate students to establish themselves in Brussels after graduation and to keep using public transport in their future live. It was not possible to take these indirect positive effects into account in the analysis, but it should be reminded that they might occur and make the project even more beneficial than it already is.

We can conclude from this social cost-benefit analysis that the "free" public transport project is a beneficial measure for the society as a whole. It does not only increase the welfare of the benefiting students, but it also has positive welfare implications for the other society members.

Chapter 9 Conclusions and recommendations

9.1 Conclusions

Introducing free public transport is 'hot' in Belgium. Third payer systems in which the government or an other partner pays for the public transport trips of a target population group have been introduced widely for various reasons: reducing congestion, generating a mode shift or for promoting the use of public transport. In Brussels the circumstances are somewhat particular. The measure is limited to the students of Dutch-speaking colleges and universities, their counterparts from French-speaking institutions do not benefit from the measure. The aim of the introduction has in fact been to stimulate students to discover Brussels, participate in city life and to improve the city's image towards students and subsequently towards the whole Flemish population. The limitation of the beneficiary group to the Dutch-speaking group has created a laboratory situation that allows analyzing the effect of the measure.

The first year of its implementation the measure has caused an increase in public transport use, 47% of the students had used the card. However, an increase in the number of public transport trips alone is not sufficient. Survey information reveals significant differences in mobility behaviour between Dutch- and French-speaking students. French-speaking students use public transport more frequently. More factors than the price of a ticket determine public transport use.

The ratio of commuters, students with a student residence and those living permanently in Brussels strongly differs between Dutch- and French-speaking students. Only 36% of the Flemish students live permanently or rent a room in Brussels, compared to 81% from the French-speaking students. The much higher share of commuters within the Flemish group causes a lower average knowledge of place names in Brussels. Differences in knowledge and appreciation of the city are important factors to explain differences in mobility behaviour between Dutch- and French-speaking students. Dutch-speaking students in general have a more negative image of Brussels, except for a few neighbourhoods such as the city centre (Beurs), Louisa and Etterbeek. Their *activity pattern* consists for each motive of a few isolated locations. The routes and attractions between these locations are virtually unknown, as indicated by the students' *mental maps*. Often a large part of their activity pattern is situated outside Brussels and they return home as soon as lessons have finished, leading a kind of "double life" in a "double space". When the activity pattern is limited and the appreciation of the city in general negative, the objective of the measure to explore the city will not be fulfilled. The increasing number of public transport trips consists of more trips to the same locations. However, differences in residential situation do not explain everything. French-speaking students use public transport more frequently, even when homogenous groups are compared, such as commuting students.

The analysis of the *accessibility* of the Brussels Capital Region by public transport shows a good overall accessibility of most places in the region, except for a few attraction points that are difficult to access in the evening. Frequency and the evening and night supply are perceived very important by students. Psychological barriers are more important for students than physical barriers. Analysis of the students' mental maps shows that the school and the possession of a student residence have the strongest impact on the perception of the city.

The *psycho-social analysis* has shown that prices are estimated and judged with common sense criteria that are relative. The way of reasoning about prices proves to be complex and has to do

with representations, experiences and situations in which users are involved. An awareness to environmental problems seems well to exist, but is considered as "standing to reason", obvious and is not really appropriated. The social experience also appeared as a key factor to understand daily mobility behaviour of students and their possible changes. Finally, the student also refers to the development of sensations, the representations linked to mobility and the biographical reference frame (past and abroad experiences and socialization to mobility) of the considered person and socialization to mobility), as it influences the respondent's decisions and behaviour. A perturbation in habits because of a major biographical event (e.g. moving, and especially for the students, renting a student room) or of an alternative experience (e.g. abroad experience) can encourage to modify travel behaviour and attitudes. The measure itself has been quite positively seen among students, above all at first sight. The main negative element could be that of group favouritism, whereas widely reckoned advantages are the social equity and the improvements of traffic conditions. As far as behavioural effects are concerned, being used or not to travel with the Brussels' public transport network appears to lead to a different assessment of the measure and experience of public transport. The students who were used to travel with the STIB/MIVB network before the free public transport measure observe indeed less behavioural changes and appear less enthusiastic as to the measure, whereas the opposite situation appears among students who were not used to travel by public transport.

In order to provide a global insight on the qualitative data and to grasp the diversity of profiles of students, a *typology of students*' attitudes and behaviour concerning mobility and travel modes has been proposed. Four types of students have been distinguished:

- "Exclusive motorists" who use their car for almost all their trips;

- Students who feel "constrained to the use of public transport"

- "Plastic" students who do not have clear-cut attitudes towards travel means;

- "City oriented" students, who valorise and are sensitive to the urban environment and its quality of life.

The *social cost-benefit analysis* shows that the "free" public transport project is a beneficial measure, not only for the students being able to travel for "free", but also for the society as a whole. The benefits generated by the project exceed the costs. There is a positive welfare result or gain for the society as a whole. This gain is mainly a result of the encouraged modal shift from car use towards public transport use which leads to a significant reduction of external accident, noise, pollution and congestion costs.

To what extent can the results be generalised to other population groups and other environments?

- *French-speaking students* use public transport more frequently than the Dutch-speaking students. A higher share of this group lives in Brussels. It is expected that the measure would have a bigger impact on this group.

- *Other population groups*: Students are a particular population segment. They often have a limited budget, implying that their price elasticity is higher. Car availability is low in this group resulting in a high share of public transport captive travellers. Price is relatively more important for students, comfort and frequency are somewhat less important. A typical element for students is that part of their activity pattern is located outside Brussels.

9.2 Recommendations

- Offering public transport for free does not mean that people leave their cars at home. Mode choice is also determined by many other factors, such as frequency, quality and accessibility. Pull factors that pull people towards public transport need to be *complemented by push factors*, pushing people away from their cars. Measures can include pricing measures, parking regulation, mobility management measures etc.

- Rent subsidies are a potential complementary instrument to attract students to Brussels and to stimulate them to explore the city.

- A negative image of large parts of the city hampers many students to settle in Brussels or to explore wider areas of the city. Initiatives such as neighbourhood walks, participation in community associations and common initiatives with neighbourhoods can improve the city's image towards students.

- Having an overview on the population's profiles helps understanding how they could react to a measure. Rationales followed by different types of students has led them to appreciate the free public transport measure according to their attitudes and sensitivities. A knowledge of the population's profiles would then help to adapt various measures to these different types of persons.

- It is important that these type of demand oriented measures is complemented by measures on the supply side, such as an extension of the evening and night supply, higher capacities on central tram and metro lines and higher frequencies. The rest capacity of Brussels public transport is limited. However, important modifications are to the network have been planned (MIVB Vision 2020 document).

- The net impact of the measure on the image of public transport is difficult to estimate. Free public transport leads to a better appreciation of public transport because of lower quality demands. There is also no indication that the measure leads to more vandalism. However, the exclusivity of the measure for Dutch-speaking students is perceived negatively by the French-speaking student population. Also capacity problems might negatively influence the image. The negative impact on the image should be neutralised as much as possible.

9.3 Further research

Not all questions have been answered. Time series research in particular would be complementary to this study and would provide more information, notably on the following questions:

- *Do students keep using public transport when they are working?*

One of the aims of the measure is to familiarize students with public transport. This assumes that students that are used to travelling by public transport will continue to do so when graduated. However, the Dutch experience with the OV card indicated that only a small percentage of the students keeps using public transport when the studies have been finished. It would be interesting to analyze the long term effects of the measure in Brussels on public transport use.

- What is the effect of the measure on the location of student residences?

The representative survey did not reveal a substantial effect of the measure on the location choice of a student residence, nor on the decision to rent or not to rent a student residence. However, these effects may have an important role on the longer term.

- Does the measure increase the attractiveness of Brussels among Flemish young adults?

One of the aims of the measure is to attract students to Brussels and to keep them in Brussels when they have finished their studies. This could not be analysed in our study.

- What would the effect of a price instrument on the use of road infrastructure be on the use public transport?

In this project we examined the effect of a reduction of the price of public transport. What would be the effect of an increase of price of car use on the use of public transport. Is this kind of push measure more effective than a pull measure ?

The integration of expertise from various domains in this study has allowed a wide and multidisciplinary analysis of the measure. The added value of this unique combination is the possibility to analyse the measure from different perspectives, i.e. economic, psycho-social and spatial, using different data collection techniques and methodologies.

9.4 Dissemination of results

The results of the study have been communicated on conferences, an international workshop organized by the project partners together with Polis and through publications:

9.4.1 Conferences

- DE WITTE, A., MACHARIS, C., LANNOY, P., POLAIN, C., STEENBERGHEN, T., VANDE WALLE, S., The Impact of "Free" Public Transport: the Case of Brussels, 8th NECTAR Conference, Las Palmas G.C. June 2-4, 2005.
- POLAIN, C. & LANNOY, P., Could sustainable transport policies lead to behavioural change? – A user's point of view, Presentation on eceee 2005 Summer Study, Mandelieu, may-june 2005.
- POLAIN, C., Free public transport policy: starting situation towards a comprehensive perspective on the user's modal behaviours, Presentation on the 7th European Sociological Association Conference, Torùn, September 2005.
- STEENBERGHEN, T., VANDE WALLE, S., DE WITTE, A., MACHARIS, C., POLAIN, C., Presentation Results of the project on Polis workshop: The impact of public transport pricing on travel behaviour, 30 September 2005.
- VANDE WALLE, S., STEENBERGHEN, T, WIJNANT, J., The Use of Mental Maps and Activity Spaces to Explain Changes in Mobility Behaviour after the Adoption of "Free" Public Transport, Presentation on Tweede Belgische Geografendag, 9 November 2005.
- VANDE WALLE, S., STEENBERGHEN, T., Gratis Openbaar Vervoer voor Studenten uit Brussel: Evaluatie van Ruimtelijke Effecten m.b.t. Mentale Kaarten, Presentation on 32th Colloquium Vervoersplanologisch Speurwerk, Antwerpen 24 November 2005.

9.4.2 Publications

- DE WITTE, A., MACHARIS, C., POLAIN, C., LANNOY, P., VANDE WALLE, S., STEENBERGHEN, T., "The Impact Of "Free" Public Transport: The Case Of Brussels", submitted for Transportation Research part A: Policy and Practice, Accepted for publication in December 2005.
- LANNOY, P., STEENBERGHEN, T., MACHARIS, C., POLAIN, C., VANDE WALLE, S., DE WITTE, A., 2005, Bruxelles, Laboratoire De La Mobilite, Science Connection, October 2005.

9.4.3 Press releases

- Alert 311 (BRAL), October 2005, Is gratis duurzaam?
- Belga. Gratis openbaar vervoer brengt op. In: De Morgen, 30 September 2005, p.5.
- Belga. Gratis openbaar vervoer brengt op. In: Het Laatste Nieuws, 30 September 2005.
- Belga. Les transports publics gratuits rapportent. In: La Dernière heure, 30 September 2005.
- Belga. Les transports publics gratuits rapportent. In: Le Soir, 30 September 2005, p.6.
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- Demeyer, (P.). Gratis bus brengt overheid geld op. Vlaanderen is koploper in Europa in het aanbieden van voordelig openbaar vervoer. In: Het Nieuwsblad, 30 September 2005, p.2.
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