TRANSPORTING MEGA-EVENTS TO SUSTAINABILITY:

Assessing Behaviors and Attitudes of Tourists and Residents to Promote Sustainable Mobility for 2014 Fifa World Cup

Dissertation

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ABSTRACT

The opportunity to host a sport mega-event such as the FIFA World Cup raises the opportunity to prosper Brazil, in particular the city of Manaus, in three ways. Firstly, there is the planning phase which involves preparatory activities to receive the FWC such as infrastructure improvement; secondly, the legacy phase which accounts for long-term benefits; for instance the faster development and improvement of an efficient public transport system that is likely to benefit daily travellers and the economy in the years following the event; and finally, the FWC not only can have the impetus to promote a behavioural change in the residents and tourists, but also can change the host country/city´s perception worldwide, benefiting Brazil´s and Manaus´ potential for tourism. However, research integrating mobility, mega-events and travel behavior is still in its infancy and there is a lack of baseline data and quantitative studies. To address this shortfall, this study uses surveys of tourists and residents during the 2010 FWC (South Africa) and pre 2014 FWC (Brazil) to investigate travel attitudes and behaviours. The findings suggest the perception of ´travel time` and ´convenience` are important factors in influencing attitudes and posteriorly contributing to travel behavior change. Additionally, information and habit were also found to be significant determinants of attitudes. These results highlight the importance of providing good access to clearly targeted information on sustainable travel options. Based on these results it is argued that the successful development of sustainable mobility for mega-events must involve a culturally aligned combination of physical and behavioural measures.

RESUMO

A oportunidade de sediar um mega-evento esportivo, como a Copa do Mundo, tem a aptidão de prosperar o Brasil, em particular a cidade de Manaus, de três maneiras principais. Primeiramente há a fase de planejamento, o qual envolve as atividades de preparação para receber a Copa de 2014, tais como melhoria em infra-estrutura. Secundariamente, a fase do legado, a qual esta relacionada aos benefícios á longo prazo, como é o caso do desenvolvimento e aperfeiçoamento de um sistema de transporte público eficiente que irá certamente beneficiar os viajantes diários e a economia nos anos seguintes ao evento. Finalmente a Copa de 2014 não apenas terá o ímpeto de promover uma mudança de comportamento dos residentes e turistas, mas também mudará a percepção da cidade e/ou do país sede mundialmente, beneficiando o grande potencial para o turismo no Brasil e Manaus. No entanto, pesquisa integrando mobilidade, mega-eventos e comportamento dos usuários de transporte ainda está em sua infância e há uma escassez de dados básicos e estudos quantitativos. No intuito de solucionar este défice, este estudo se utiliza-se, principalmente, de pesquisas quantitativas atráves da aplicação de questionários á turistas e moradores durante a Copa de 2010 (África do Sul) e pré Copa de 2014 (Brasil), para investigar as atitudes e comportamentos de viagens. Os resultados sugerem que a percepção de 'tempo de viagem' e 'conveniência' são fatores importantes que influenciam atitudes e posteriormente contribuem para a mudança de comportamento dos viajantes. Além disso, ´informação` (ou a falta da mesma) e ´hábito` também foram avaliados como determinantes significativos de atitudes. Estes resultados destacam a importância de fornecer um eficiente e eficaz acesso à informação claramente orientada para as opções de viagens sustentáveis. Com base nesses resultados, conclue-se que o desenvolvimento bem sucedido de uma mobilidade sustentável para mega-eventos deve envolver uma combinação de medidas físicas e comportamentais.

ZUSAMMENFASSUNG

Die Chance, eine Sport Mega-Veranstaltung wie die FIFA Weltmeisterschaft (WM) durchzuführen, bietet für Brasilien, besonders für die Stadt Manaus, drei mögliche Wege, zu wachsen. Erstens gibt es die Planungsphase, die vorbereitende Aktivitäten einschließt, wie z.B. infrastrukturelle Verbesserungen, um die FIFA WM durchführen zu können; zweitens die Phase nach der Veranstaltung, die von Langzeit Vorteilen begleitet ist; wie bei einer schnellen Entwicklung und Verbesserung eines effizienten öffentlichen Verkehrssystems es der Fall ist, das voraussichtlich den Pendlern und der Wirtschaft in den der Veranstaltung folgenden Jahren zu Gute kommt; und zuletzt kann die FIFA WM nicht nur den Anstoß haben, eine Änderung der Verhaltensweise der Bewohner und Touristen herbei zu führen sondern kann auch das Ansehen des Gastgeberlandes und der Gastgeberstadt weltweit verändern, was dem Potenzial Brasiliens und von Manaus für den Tourismus zu Gute kommt. Jedoch steckt die Forschung, die die Mobilität, Mega-Veranstaltungen und das Reiseverhalten kombiniert, noch in den Kinderschuhen, es fehlt noch an Grunddaten und quantitativen Studien. Um dieses Defizit zu berücksichtigen, nutzt diese Studie Erhebungen von Touristen und Bewohnern während der WM 2010 in Südafrika und vor der WM 2014 in Brasilien, um die Gewohnheiten und das Verhalten bei Reisen zu untersuchen. Die Ergebnisse zeigen, dass die Wahrnehmung von „Reisezeit“ und „Komfort“ wichtige Faktoren sind, die die Gewohnheiten beeinflussen und in Folge zu einer Veränderung des Reiseverhaltens beitragen. Zusätzlich wurden Informationen und Verhalten als signifikante Einflussgrößen auf die Gewohnheiten erkannt. Diese Ergebnisse veranschaulichen, dass es wichtig ist, guten Zugang zu gezielten Informationen über zukunftsfähige Reiseoptionen anzubieten. Auf Grund dieser Ergebnisse wird dargelegt, dass die erfolgreiche Entwicklung einer nachhaltigen Mobilität bei Mega-Veranstaltung eine an der Kultur ausgerichtete Kombination von physikalischen und verhaltensbasierten Kenngrößen einbeziehen muss.

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ACRONYMS & ABBREVIATIONS

ANTP	Associação Nacional de Transportes Públicos (National's Public Transport Agency)
BR	Brazil
BRT	Bus Rapid Transit
CEC	Commission of the European Communities
DBSA	Development Bank of Southern Africa
DEA	Department of Environmental Affairs
DEAT	Department of Environment and Tourism
DENATRAN	Department Nacional de Transito
DfT	Department for Transport UK
DOT	Department of Transport SA
ECMT	European Conference of Ministers of Transport
EPA	Environmental Protection Agency US
EC	European Commission
EU	European Union
FIFA	Fédération Internationale de Football Association
FHWA	Federal Highway Administration
FWC	FIFA World Cup
GEIPOT	Empresa Brasileira de Planejamento de Transportes (Brazilian's Transport Agency)
GDP	Gross Domestic Product
GHG	Greenhouse Gas
HOV	High Occupancy Vehicles
IBGE	Instituto Brasileiro de Geografia e Estátistica (Brazilian's Geography and Statistics Institute)
IEA	International Energy Agency
IMTT	Municipal Institute of Traffic and Transportation
INPA	Instituto Nacional de Pesquisa da Amazonia (National Research Institute of Amazonia)
IPCC	Intergovernmental Panel on Climate Change
IPEA	Instituto de Pesquisa Economica Aplicada (Research Institute of Applied Economic)
ITS	Innovation Transport Solutions (ITS Engineers)
KAS	Konrad Adenauer-Stiftung

LRT	Light Rail Train
LOCOG	London Organising Committee of the Olympic and Paralympic Games
ME	Mega-Event
MIT	Motorized Individual Transport
MM	Mobility Management
MTur	Ministério do Turismo (Ministry of Tourism)
NMT	Non-Motorised Transport
NOA	Needs Opportunities Abilities model
OC	Organizing Committee
ODA	Olympic Delivery Authority
OECD	Organization of Economic Coordinator and Development
ONS	Office for National Statistics
PIMS	Political Information & Monitoring Service
PT	Public Transport
SA	South Africa
SEPLAN	Secretária de Estado de Planejamento e Desenvolvimento Economico (State`s Planning and Economic Development Secretary)
SIPS	Sistema de Indicadores de Percepcao Social (Indicators' System of Social Perception)
SM	Sustainable Mobility
SPSS	Social Package for Social Science
SWOT	Strength, Weakness, Opportunities, Threats
TIB	Theory of Interpersonal Behaviour
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
TRB	Transport Research Board
UN-Habitat	United Nations Human Settlements Programme
UNEP	United Nations Environment Programme
VTPI	Victoria Transport Policy Institute
WECD	World Commission on Environment and Development
WM	Weltmeisterschaft (World Cup)
WTO	World Tourism Organization

THIS WORK IS DEDICATED TO THE HANDS OF MY LIFE. THE HANDS WHICH EMBRACE AND GUIDE ME THROUGH THIS LIFE'S JOURNEY.

I might not know where the life's journey will end up,

but walking (a very sustainable way) with all of you

has made me a better and stronger person.

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INTRODUCTION

1. INTRODUCTION

1.1 Problem Statement

As described by Funk and Bruun (2007: 806), sport-tourism is “one of the fastest growing niche markets in the tourism industry”. Roche (1994: 1) describes mega events as “short-term events with long-term consequences”. This delineation identifies the ephemeral character of mega-events, often lasting for a few days or weeks as compared to the long-term consequences which can last for many years, affecting different actors positively and/or negatively. It is important to ensure that this type of tourism is not only economically profitable, but also minimizes negative social, cultural and environmental impacts.

Attaining such a balance is by no means simple. On one side, event planners are obliged to respect certain environmental criteria, and since this gives them an educational role in this area, mega-events actually contribute to further sustainable development. Conversely, the increasing frequency of these events generates high local concentrations of traffic flows intensifying the already existing traffic problems in most host cities. According to the Brazilian’s transport agency (Empresa Brasileira de Planejamento de Transportes [Geipot], 2001), the habitant/vehicle rate can reach 2.5 in the main metropolitan regions of Brazil, which include some of those cities hosting the FIFA Football World Cup (henceforth referred to in this study by the acronym FWC). Thus, the planning and management of mobility for the 2014 FWC is an essential task, not only in justifying immediate measures to minimize these impacts, but especially in finding solutions for the persistent mobility problems which already affect major metropolises in Brazil. Regarding the challenge of growing rates of motorized individual transport, a study developed by Lopes (2005) indicated that the motorization rate in Brazil will have risen by about 50% within the next 10 years.

Beyond the growth of traffic problems, the relationship between environmental issues and the planning process of tourism events in Brazil has received little attention from researchers so far (Pereira, 2007). There is also a clear lack of research in the field of mobility and tourist’s preferences and attitudes. There are huge gaps in the mobility and tourism literature with respect to travel choice and attitudes (Kelly et al., 2007). More research specifically addressing these challenges is needed if these topics are to be integrated within a holistic approach of mega-event planning.

Investment in transport infrastructure is known to generate direct benefits, mostly in the short-term, as it creates jobs and facilitates coupling peak travel demand during mega-events. This would be an important benefit of the 2014 FWC for the host city of Manaus. However, when looking at it from a longer term perspective, other strategies with a focus on mobility management, such as restrictive measures on car use and encouraging the use of public transport (PT), should be implemented and/or promoted as well to also ensure the long-term benefit and sustainability of mobility patterns.

According to Silva et al. (2008), mobility problems are not merely a consequence of physical constraints of transport modes, but are closely related to environmental, economic, social and behavioral aspects.

1.2 Research Questions

Restating the problem statement, it appears that there is a lack of research regarding the relationship and mutual influences among mega-events, mobility and behavior. As a result, this opens up a series of research questions regarding mega-events and transport, particularly in relation to the promotion of sustainable mobility for the 2014 FWC in Brazil. For example:

- Which behavioral theories and models would better encompass the travel behavior change induced in the framework of a mega-event?
- How can the travel behavior of tourists and residents be changed in the framework of a mega-event in order to promote more sustainable mobility behavior?
- Which facilitating conditions are most effective in promoting sustainable mobility among car users and which are the obstructive factors for increased use of sustainable modes?
- What are the possible and effective strategies to promote sustainable mobility for the 2014 World Cup?
- How do tourists and residents respond in terms of perception and expected behavior to these transport strategy options? How do the responses of car users and non-car users vary?
- How effective is the provision of information in promoting sustainable mobility?
- What are the expected outcomes of sustainable mobility aims for the 2014 FIFA World Cup and for their long-term applicability?

1.3 Research Purpose and Objectives

A challenge of this study is to show ways to transfer mobility related know-how from one host city to another. As defended by Rothfuss (2005, 2006, 2007), transnational cooperation among municipalities can be used as an instrument to sustain joint learning and exchange processes. The ultimate purpose of this study is, then, to examine the attitudes and potential behavior of tourists and residents in reference to strategies (measures, policies and incentives). These strategies are specifically associated with attempts to shift residents' and tourists' trips from private to public transport. The following specific objectives guide the study:

- To select certain aspects of special interest from the last two FWC approaches in mobility, and to evaluate in which ways and to what extent these aspects can be transferred and adapted to the Brazilian context in general;
- To assess different ways in which tourists and residents can be motivated to use sustainable transport during the 2014 FWC in Manaus;
- To facilitate the exchange of knowledge and information concerning the best practices in mobility from the 2006 FWC/Germany and 2010 FWC/South Africa;
- To contribute to research and keep the promotion of best practices available in sustainable transport and mobility for mega-events;
- To strengthen the concept of sustainable mobility in Brazil in the preparation phase, during and after the 2014 FWC in Manaus;
- To evaluate how far environmental considerations influence the attitudes and behavior of tourists and society concerning mobility;
- To link the sustainable development of tourism-events to the general planning and management of sustainable mobility, including possible opportunities and threats for the 2014 FWC in Manaus.

1.4 Theoretical Framework

The theoretical framework and conceptual context of the research is articulated with an extensive literature and documentation review. The literature review comprises 6 chapters. The first two chapters present pertinent background information and definitions for sustainability, mega-events, tourism and transport, as well as a discussion of related topics and mutual influences among them. Further, behavior theories are examined, presenting models that may respond to travel behavior change processes. In addition, behavior theories and models (e.g. Theory of Planned Behavior [TPB], Theory of Reasoned Action [TRA], and Needs-Opportunities-Abilities model [NOA]) are briefly presented. Later on, the chapters ´2006 FIFA World Cup` and ´2010 FIFA World Cup` introduce the mobility and transport management strategies adopted in the last two Football World Cups (Germany 2006 and South Africa 2010) as well as identify good practices that could be applied in Brazil. The last chapter provides a description of urban mobility in Brazil and specifically for Manaus. Lastly, the literature review presents a conclusion of its chapters with important findings that guide the study and case-studies in outlining the appropriate and effective strategies, measures and/or incentives to promote sustainable mobility for mega-events with long-term benefits to the host city.

For the strategies and measures identified and outlined in this thesis to succeed it is not only important to employ technological solutions and invest in infrastructure, but also to promote mobility management that encourages changes in modal choices. Any strategy and policy in sustainable mobility during a mega-event will not be a success if the policy makers do not understand and effectively take into account traveler's behavior and attitudes. Therefore, a behavioral approach is a promising research method to inform planners and to create a true culture of sustainable mobility in mega-events.

1.5 Thesis overview

This thesis is divided into 13 chapters:

1. Introduction

The ´Introduction` chapter presents an explanation of the research problem, the research questions, the research purpose and objectives as well as the theoretical framework and conceptual context to provide a pertinent basis to the study.

2. Methodology

The ´Methodology` chapter describes the methods used in the study. The phases which guide the research process are outlined. The study sample, population and design of the two case-studies are delineated. The instruments and approaches used to collect the data are described, as well as the description of how the attributes and influences are derived to ground the study.

3. Sustainable Development & Sustainable Transport

The chapter ´Sustainable Development & Sustainable Transport` is part of the literature review and aims at reviewing different aspects of sustainability and transport, starting with an overview of concepts and continuing with a brief discussion of the various impacts that transport may have on the goal of achieving sustainable development.

4. Mega-Events

The ´Mega-Events` chapter is part of the literature review that intents to conceptualize mega-events, starting with an overview of definitions and continuing with a discussion on the linkages that mega-events may have on sustainability, tourism, transport, knowledge exchange and behavioral change.

5. Behavioral Change – Theories and Models

The ´Behavioral Change` chapter is part of the literature review aiming at making a refinement in models of behavior and theories of change; to expose the different applications and uses of models and theories embodied in behavioral change. This chapter includes models and theories focusing mainly on social-psychological factors. A few of the most popular behavior change theories and models linked to travel behavior are also summarized.

6. Germany 2006 FIFA World Cup

This chapter is part of the literature and documentation review of the 2006 FIFA World Cup and highlights the main three phases of the mega-event: The planning phase (pre World Cup), the management phase (during the World Cup) and the legacy (based on the ´Green Goal Legacy Report – 2006`). It serves also as a background for constructing the questionnaires which have been designed for the case-studies.

7. South Africa 2010 FIFA World Cup

This chapter, also part of the literature and documentation review, turns to the 2010 FIFA World Cup. Additionally to the description of the three main phases of the mega-event, it includes the author's observations made of the World Cup. As the city of Johannesburg is also one of the case-studies of this study, a brief profile of the city and its transport sector is presented. This documentation review as well as the data analyzed from this case-study assisted the development of the final survey applied in Brazil.

8. Brazil 2014 FIFA World Cup

This last chapter of the literature review primarily presents a profile of urban mobility in Brazil and posteriorly involves transport development and the FWC. The main case-study refers to the forthcoming 2014 FWC. The city of Manaus is used as groundwork and a basis for data collection. A profile of the city as well as the urban mobility characteristics of the Northern region of Brazil (Manaus) are also outlined in this chapter.

9. Case-study South Africa - Hypothesis

This chapter is an attempt to call into question the relationship between some variables (influences and attributes) and its feasibility with regards to the 2010 FWC response of tourists and residents.

10. Case-study Brazil - Hypothesis

This chapter challenges the influences that behavior theories and model may have in the achievement of sustainable mobility for the 2014 FWC. Through the hypothesis it is possible to test some of the variables (influences and attributes) and some of the research questions can be answered directly.

11. Results and Discussions

The ´Results and Discussions` chapter presents three subchapters: ´Discussion case-study South Africa` presents results of the South Africa survey conducted in Johannesburg during the 2010 FIFA World Cup; ´Discussion case-study Brazil` presents the findings of a survey performed in the city of Manaus pre 2014 FIFA World Cup; and ´Discussion about patterns between South Africa and Brazil` presents patterns and divergences between the two case-studies.

12. Final interpretations and Frameworks

The ´Final interpretation and Proposed Framework` chapter presents the ultimate interpretations of the data analyzed in the case-studies and develops two frameworks to cope with urban mobility for mega-events, one aiming at short-term consequences (usually only during the event itself) and the other aiming at travel behavioral change (long-term benefit).

13. Conclusion

The last chapter reaffirms some of the important arguments of the thesis and identifies central conclusions to answer the research questions. Additionally, a SWOT (Strength, Weakness, Opportunities and Threats) analysis is raised to give potential and practical solutions to cope with urban mobility during the 2014 FIFA World Cup.

Appendices

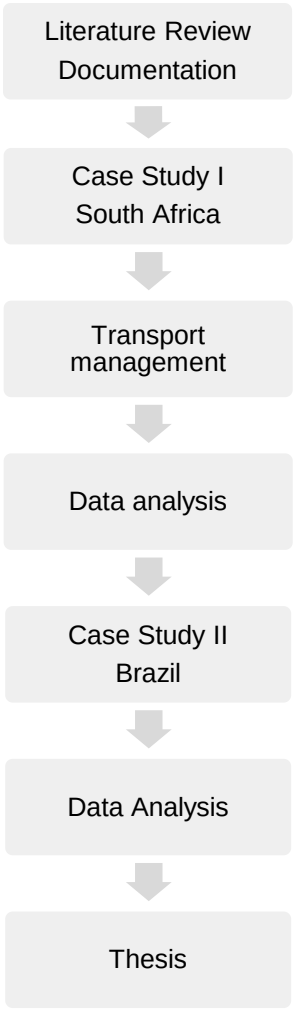
An appendix is included providing additional information of secondary importance on a variety of topics covered in this thesis. A technical appendix is also included providing details of the hypotheses and the analysis approach.

METHODOLOGY

2. METHODOLOGY

This chapter describes the research methodology and a brief profile of the two surveys: Johannesburg (South Africa) and Manaus (Brazil), a broader introduction of the cities is given in the chapters 7 and 8, respectively. The objective is to outline each step in the empirical data collection including the design of the quantitative research. Arguments are presented that justify why the chosen research method is most suitable for this study.

A seven phase research process guides the study.



A literature review is carried out to describe the concepts of the object studied: Mobility, mega-events, tourism and sustainability. The literature review informs the creation of the research model and identifies the key elements to be addressed: Perception, behavior change, and attitudes.

Case-studies in South Africa and Brazil have been conducted using data from face-to-face surveys to investigate tourists' and residents' responses to a range of sociodemographic, attitudinal and behavioral questions. These options relate to perception, preference, and modal choice during the 2010 FWC and intended modal choice for the 2014 FWC.

Data analysis procedures are used to estimate tourists' and residents' travel behavior, acceptance and preference between car users and non-car users.

2.1 Study Sample

Case-study research

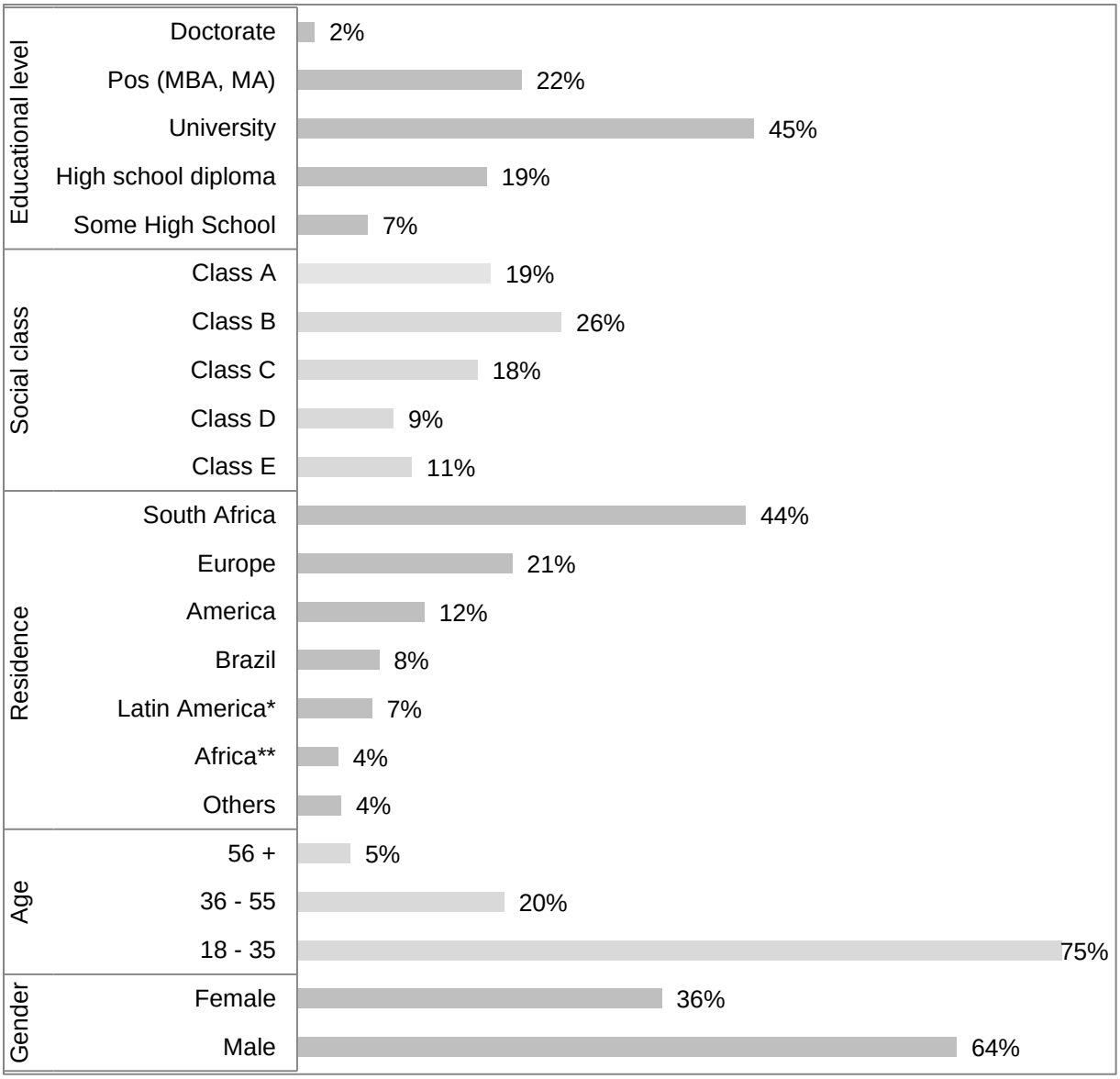
Yin (1994: 13) defines a case-study as “an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident … it relies on multiple sources of evidence.” Case-studies frequently are based on two or more methods of data collection such as interviews, observation, questionnaires and document analyses. Creswell (1998) adds that a case-study can be either a single case or a case bounded by time and place. Leedy and Ormrod (2001: 149) suggest that a case-study is valuable to learn “more about a little know or poorly understood situation”. Case-studies have a considerable ability “to provide answers to ´why` and ´how` questions” (Rowley, 2002: 16). Given that this study aims at ´how to promote sustainable mobility for mega-event`, the selection of case-studies seemed appropriate. Thus, it was considerable suitable to carry out case-studies using a triangulation of different methods for this study.

2.1.1 Case-study: South Africa

The first case-study was performed in Johannesburg/South Africa during the 2010 FWC and lasted about 15 days (from mid-June to early July - 2010). A total of 292 surveys were conducted in total; nonetheless 59 surveys were invalid (e.g., not filled up completely) and removed from the database. The sample consisted of 233 individuals of whom 64% were male and 36% female. The age distribution of the sample showed that 75% belong to the age group 18-35 years.

Concerning educational level, the groups were divided into some high school (7%), high school certificate (19%), university diploma - ´bachelors` (45%), advanced studies - ´masters` (22%) and doctorate (2%). The place of residence of the sample was grouped by continent to give a better overview: South African (44%, being 40% residents from Johannesburg), European (21%), American (12%), Latin American (15%, being 8% Brazilians), African 4% and others (4%).

Figure 1 Characteristics of Respondents from the Case Study in South Africa



* Excluding Brazil

** Excluding South Africa

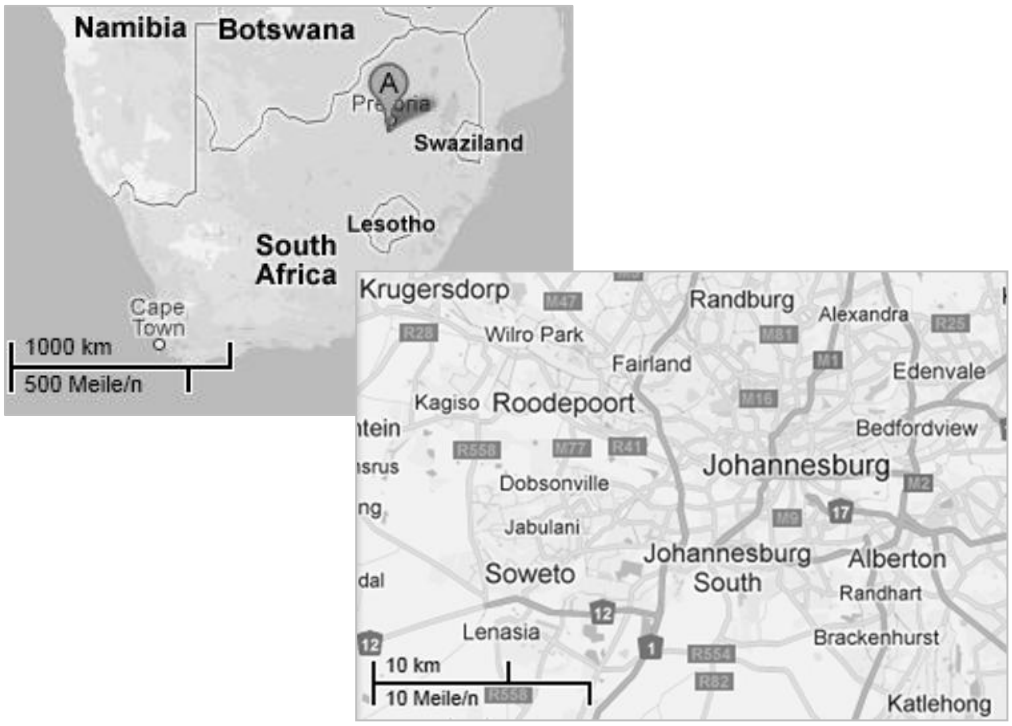
[1]See footnote

The study area

The city of Johannesburg, also known as Jozi or Joburg, has a population of 3,8 million according to the 2007 statistical records of the government of South Africa. The municipal city's land area is very large; listed as 1,645 Km^2 (Metropolis, 1998).

[1] The individual net monthly income was distributed as follows: 11% earn less than U$500, 9% earns between U$500-1.000, 18% earn between U$1.000-2.000, 26% earn between U$2.000-5.000 and 19% earn more than U$5.000. This net monthly income was posteriorly grouped into social class categories for the purpose of comparison.

Map 1 Map of the Study Area - Johannesburg



Source: Google Maps, 2012

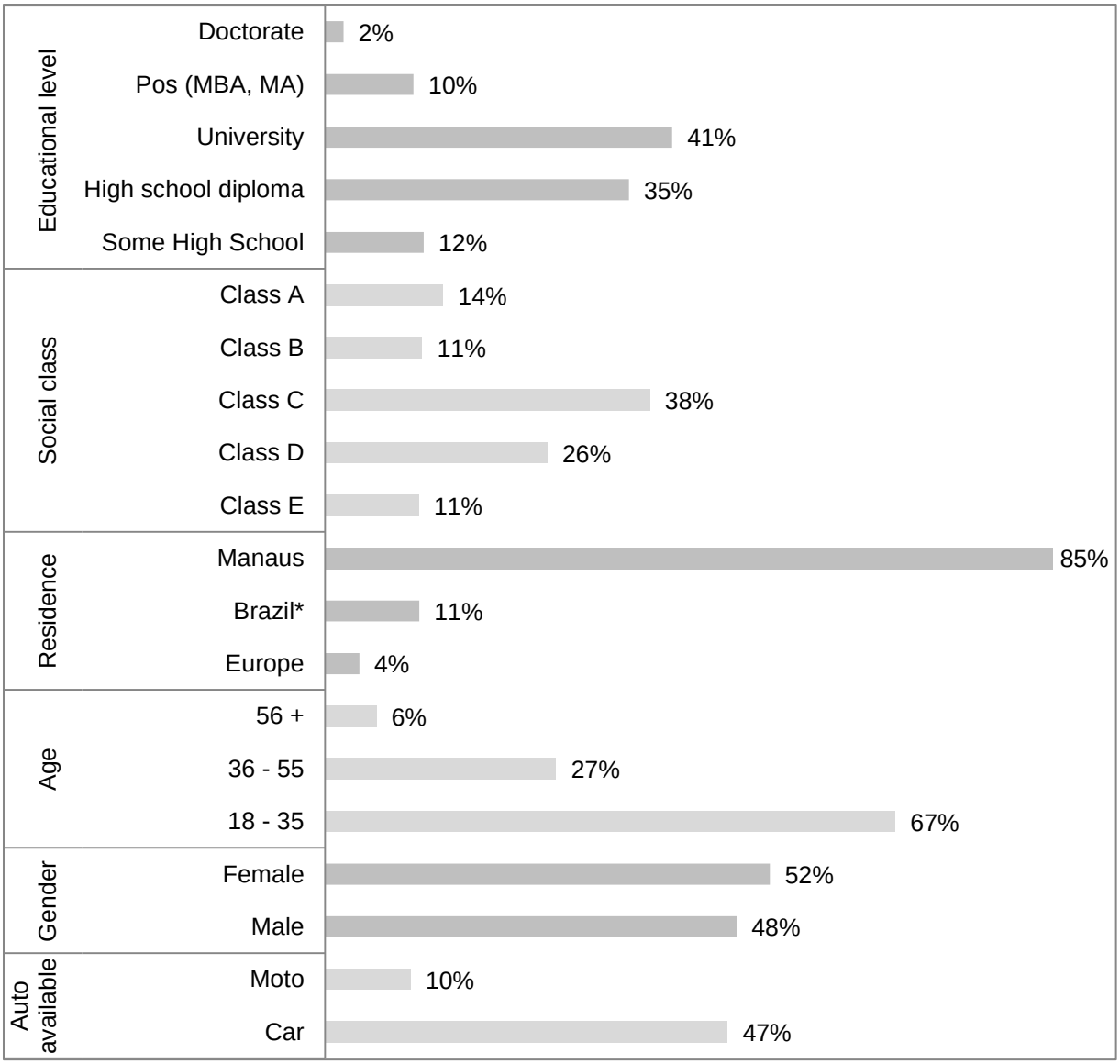
2.1.2 Main case-study: Brazil

The second case-study, considered as the principal case-study, was conducted in Manaus, Brazil. The questionnaire survey lasted about 25 days (from mid-November to mid-December 2011). 565 surveys were conducted in total, of which 48 turned out to be invalid. The sample consisted of 517 individuals of whom 48% were male and 52% were female.

The individual net monthly income has been used to define social classes: class E (< R$751[2]): 11%, class D (R$751-1.200[3]): 26%, class C (R$1.200-5.174[4]): 38%, class B (R$5.174-6.745[5]): 11% and class A (> R$6.745[6]): 14%. This social class division is based on the official Brazilian Institute for Geography and Statistics - IBGE (Instituto Brasileiro de Geografia e Estátistica).

[2] < US$370
[3] US$370-592
[4] US$592-2.550
[5] US$2.550-3.326
[6] > US$3.326

Figure 2 Characteristics of Respondents from the Case Study in Brazil



* Excluding the residents of Manaus
[7] See footnote

More than half of the respondents were set in the lower social classes; this percentage considerably decreases nevertheless when considering only the cluster tourists.

Regarding educational level it is worth saying that the respondents were slightly well-educated. Whilst many of them possess a high school certificate or Bachelors degrees, the majority still belongs to the younger age group where a higher educational level would be unrealistic. Most of the respondents are residents in Manaus. Only one sixth of this sample are tourists (national and international). The percentage difference fits with this study, since

[7] The age distribution of the sample showed that 67% belong to the age group 18-35 years, 27% to the age group 36-55 years and 6% to the age group older than 56 years.

residents can give better inputs about the urban mobility than tourists once they experience daily the use of local transport. For those interviewed in this sample, more than half (around 57%) possesses a car or motorcycle.

The study area

The city of Manaus is located in the middle of the Amazon forest, on the north bank of the Rio Negro, 18 km upstream of the rivers´ confluence with the Rio Solimões. Manaus is 1,450 km inland from the Atlantic Ocean.

Manaus is the Amazon's largest city, covering an area of 11,401 $km^{2,}$ and has an estimated population of 1,802,525 habitants, 87% of which are concentrated in the urban area (IBGE, 2011).

Map 2 Map of the Study Area – Manaus

Source: Google Maps, 2012

2.2 Survey Structure

This research aims at improving the management of mobility for residents and tourists during the 2014 FWC in Brazil. In this context, the survey description and data are focused, unless otherwise stated, on the second case-study in Manaus/Brazil. The first case-study is primarily used to provide baseline data for the second survey. Thus, new questions were added to the Manaus survey to ensure that the survey comprehensively covered all the relevant issues that had been identified as key in the South African survey. Likewise, some of the questions from the South African survey were deleted from the Brazilian survey because they were either directly connected with 2010 FWC or they would not provide relevant information.

The survey was composed of 11 main question groups which relate to the 26 responses in table 1.

Table 1 Attributes, Characteristics and Influences of the Chosen Transport Mode in Manaus

Attributes, characteristics & influences	**Transport modes in Manaus (chosen): Public Transport, Non-motorized transport, Motorized Individual Transport**
Travel characteristics	Travel purpose Travel time Travel distance Reason for modal choice Modal frequency
Environmental Importance	Likert scale ranging from ´very important` to ´not at all important`
Behavior reasons (only car users)	Preventing factors for sustainable mobility Facilitating conditions for PT use
Modal Satisfaction	Likert scale ranging from ´very satisfied` to ´not at all satisfied`
Acceptability of strategies/ measures to be implemented to 2014 FWC	Likert scale ranging from ´totally agree` to ´totally disagree`
Implementation of cycling lanes for 2014 FWC	Likert scale ranging from ´totally agree` to ´totally disagree` Bicycle use frequency as transport and leisure Facilitating measures for non-motorized transport use
Implementation of new modes for 2014 FWC (only residents)	Modal preference Reasons for modal preference
Modal choice at your city of residence (only for tourists)	Public transport, non-motorized transport, motorized individual transport Reason for modal choice
Modal intention to be used during the FWC	Public transport, non-motorized transport, motorized individual transport
Sociodemographic questions	Gender, age group, place of residence, net monthly income, educational level and auto availability

The complete questionnaires applied in both case-studies can be found in appendix A and B.

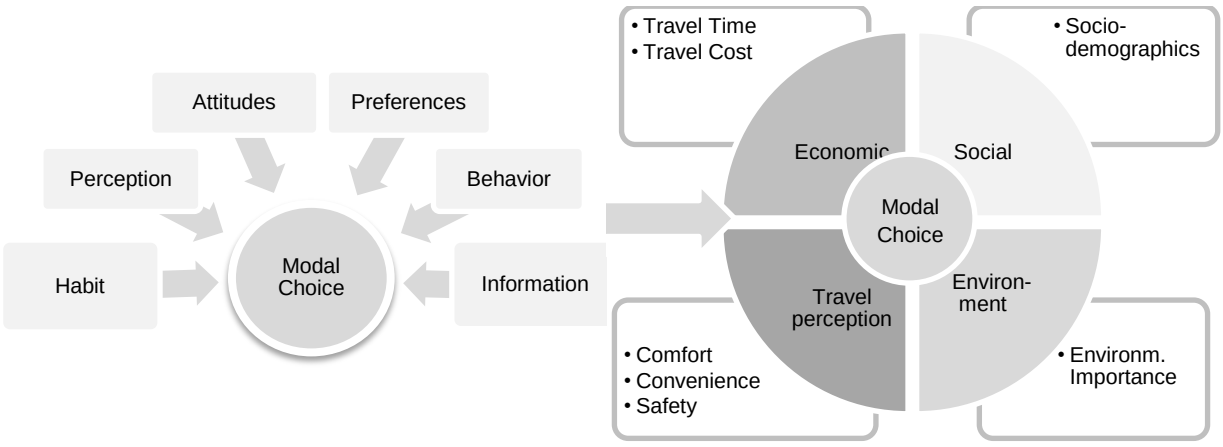
Pre-testing the Survey

Prior to the development of the final questionnaires, a small group - of 4 people for the South African's survey and 9 people for the Brazilian's survey - were recruited to complete the pre-testing questionnaires; they provided inputs on their understanding of the questions and their ability and the time constraints to complete it. The pre-testing questionnaires were important to identify any term, abbreviation or word which was not familiar, to verify the clarity of the questions and finally to measure the time required to complete it. Additionally, the pre-testing questioners personally asked and discussed relevant questions which could bring useful feedback to improve the quality of the questionnaire. Due to changes in the questionnaires, both pre-testing samples were not included in the data tabulation.

Development of attributes and assessment of influences

Each of the travel mode choices selected (PT, NMT [Non-Motorized Transport] and MIT [Motorized Individual Transport]) was analyzed further in terms of key attributes (travel time, reason etc.). Consequently, these modes were separated into two clusters: car-users and non-car users. These attributes have been analyzed in the context of their relevance to influence modal choice for mega-events (see figure 3). The final attributes were mainly defined through the literature review, analyses of past mega-events and the results of the previous case-study (South Africa). The influences mentioned were derived from the main determinants of the behavioral theories analyzed in the scope of the complete study.

Figure 3 Main Attributes and Influences to Modal Choice

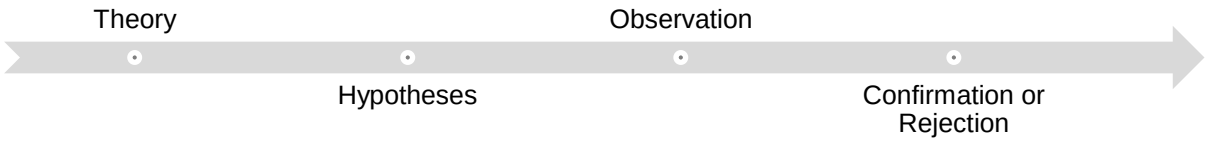


Source: Thesis' author

2.3 Data Approach

In general terms, there are two main approaches to undertake research: deductive and inductive (DePoy & Gitlin, 2005). A deductive approach takes existing theories and concepts to use as a ´start`. The empirical findings are then used to test this theory, after this the researcher can alter the theory to better reflect reality as confirmed through empirical data. It begins with constructing a suitable theory about the topic of interest. This is narrowed down into more specific hypotheses that can be tested. It is then narrowed down even further in order to collect observations to address the hypotheses. This ultimately allows the researcher to test the hypotheses with specific data and support, or not, the original theory.

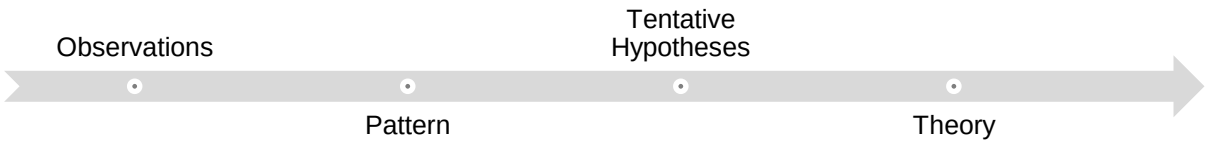
Figure 4 Deductive Research Approach



Source: Adapted from Trochim, 2001

An inductive approach is used when the researcher uses empirical data as a starting point. The data is then used to formulate a new theory. It commences with specific observations and measures, from which patterns and regularities are detected. Hypotheses can then be formulated, finally leading to some general conclusions and a theory or model.

Figure 5 Inductive Research Approach



Source: Adapted from Trochim, 2001

The most suitable approach for this type of research would normally be a deductive approach based on existing theories, frameworks and models. However, there is virtually no published research in the travel behavior field linked with mega-events - most of the travel behavior theories apply to daily mobility. Thus, the best strategy for the present research would be to combine the two approaches; where theory leads to observations which in turn lead to identification of new patterns which lead to the development of a new model. Some variables were identified through the literature review (pre-existing theories and models), and other variables were identified through the case-studies (respondents). As a final outcome an alternative theoretical framework is presented, but is also based on the adaptation of existing theories.

2.4 Data Collection

Qualitative versus quantitative data

The basic instruments for qualitative or quantitative research are related to data collection methods which can be case-studies, surveys or interviews (Simon & Burstein, 1985). Quantitative research methods focus on statistical approaches and qualitative methods are based on content analysis, comparative analysis, and interpretation (Strauss & Corbin, 1990). Graziano and Raulin (2004) refer to qualitative research methods as a low-constraint method, meaning that qualitative methods strongly depend on how the researcher perceives his data to be. Holloway (1997) says that qualitative research is about making inquiries that lead researchers to understand how people behave and interact in their environments. Quantitative methods are described by Creswell (2009: 4) as: "...a means for testing objective theories by examining the relationship among variables", meaning that quantitative methods seek numerical values; obtaining quantitative data, which can then be statistically analyzed and interpreted. Horna (1994) adds that quantitative research designs are characterized by the assumption that human behavior can be explained by social facts which can be investigated by methodologies that utilize the deductive logic of the natural sciences. For this study, a quantitative data approach is adopted. The quantitative data of the research within this study consists of two surveys. Note that although the research is based on quantitative data, the survey answers also provide qualitative information. A growing number of travel surveys for example, now collect attitudinal issues. These surveys usually present a series of attitudinal questions in which respondents are asked whether they agree or disagree on a 5 or 7 point scale (Likert scale). Attitudinal questions, here outlined by attitude theories (TPB, TRA, TIB [Theory of Interpersonal Behavior]), provide a means for measuring qualitative factors important in travel behavior. Analyses of these surveys consistently show that at least some attitudinal factors are significant predictors of travel behavior and are often more significant than traditional demographic variables (Puuri et al., 2010).

Moreover, economics theories of travel behavior - here articulated as expected utility and rational choice - are widely used in the development of quantitative models. They can also provide a guiding framework for qualitative research.

Primary and secondary data

Data collected can be obtained by two different sources: primary and secondary data (see table 2). Primary data refers to data that was collected by the researcher. Here, the researcher was guiding the research which led to the creation of the data (Burns, 2000).

Secondary data (sometimes referred to as meta-data) refers to information that was not specifically collected for the particular study in question, for example the data extracted from company websites, annual reports or statistical databases (Burns, 2000).

The research's primary data consisted of two surveys that represent the base of the empirical material. In addition, qualitative data collected through some open questions (only in the first survey) are used to further gain an in-depth and nuanced understanding of the results of the empirical surveys. The secondary data used in this study is presented mainly in the context of the literature review.

Table 2 Comparison of Primary and Secondary Data

	Primary	**Secondary**
Definition	Data that the researcher has collected himself	Existing data from other sources
Sources	A primary source contains first-hand information about a topic	Secondary sources offer an interpretation of information gathered from primary sources
Source examples	• Interviews • Surveys • Observations	• Scientific literature • Studies and meta-studies • Statistical databases
Advantages/ disadvantages	Offers tailored information but tends to be expensive to conduct and takes a long time to process	Usually inexpensive to obtain and analyzed rapidly; need for sorting out the relevant information for the respective research

Source: Adapted from Burns, 2010

The advantage of surveys is their cost in relation to the large amount of data that can be collected. The disadvantage is that written surveys don't allow respondents to clarify a confusing question and to explain a specific answer, which could bring qualitative inputs to the research. Additionally, the survey provides a uniqueness in gathering information not available from other sources. Through surveys, the same information can be collected from each respondent (standardization of measurement); and they can be adjusted to the research needs or to complement existing data from secondary sources. To provide valid results, the sample should represent the population fairly (unbiased).

The two surveys were designed as cross-sectional surveys, meaning that the data have been collected at one point in time from a sample selected to represent a larger population. The surveys were administered through personal (face-to-face) interviewing, where respondents had a written questionnaire to answer closed and open questions, which declined refusal rates. Additionally, the respondents could take advantage of interviewer presence in case of uncertainties.

2.5 Data Analysis

The quantitative data analysis, performed with the Statistical Package for Social Science (SPSS) version 19.0, provides two types of statistics: descriptive and inferential statistics.

Descriptive statistical analysis was used to analyze demographic characteristics. The population was defined; each member having been assessed and an estimated worth (mean, standard deviation etc.) given, based on those values. The resulting average was assumed as a parameter.

Inferential statistics were used to make inferences about the population from the information contained in the samples. There are two types of tests conducted through inferential statistics in this study:

- Tests of group differences were carried out, mainly related to cluster I (tourists and residents) and cluster II (car users and non-car users) and the differences (within the cluster) to their mean scores on some response variables.
- Tests on association between selected variables (e.g., environmental concern and education level) were made to find out whether there is, or not, a relationship between them within the population.

Similarities and differences between clusters were explored using inferential statistics: Mann-Whitney U Test (non-parametric test), independent and dependent samples t-tests (to compare means) and chi-square tests (for categorical data). The statistical tests were used to compare and contrast the different cluster's responses and to answer the hypotheses designed in table 3.

Clustering according to certain respondent characteristics is a simple and effective way to investigate heterogeneity within a single sample. It also allows the researcher to highlight the differences between groups. Socio-demographic characteristics are consistently cited as a major source of heterogeneity. Some researchers suggest that perception, past experiences and attitudes may also be valuable grouping variables (Boxall & Adamowiccz, 2002).

The hypotheses are constructed here, not to transpose the research question, but to provide statistical reinforcement to support the research questions.

The method of analyzing data through ´hypothesis testing` is appropriate to this study as one of the research questions and/or research objectives is to determine whether or not sample data support the behavior theories and models concerning the population.

Table 3 Hypothesis from Case-Studies: South Africa and Brazil

Hypothesis Case-Study South Africa	**Statistical analysis**
H1SA: Satisfaction (Cluster 1)	Regression
H2SA: Modal choice (Holiday vs. Daily)	Contingency Coefficient
H3SA: Information evaluation (Cluster 1)	Pearson Correlation
H4SA: Possible reasons for modal choice	Regression Independent Samples Test
Hypothesis Case-Study Brazil	**Statistical analysis**
H1BR: Satisfaction (Cluster 2)	Mann-Whitney-U-Test Independent Samples Test
H2BR: Non-motorized transport (Cluster 2)	Mann-Whitney-U-Test
H3BR: Modal choice vs. modal intention	Independent Samples Test Chi-Square Tests
H4BR: Strategies and acceptability (Cluster 2)	Mann-Whitney-U-Test Independent Samples Test
H5BR: Possible reasons for modal choice	Cross-tabulation
H6BR: Aspects preventing PT use	Paired Samples Test
H7BR: Facilitating measures for PT use	Cross-tabulation
H8BR: Reasons for modal choice at home and on holidays	Contingency Coefficient

Regarding their statistical significance, the results were analyzed at a confidence level of 95%. i.e., unless otherwise stated, the findings are statistically significant at $p<0,05$.

2.6 Validity and Reliability

According to Saunders and Thornhill (2003) ´validity` deals with the extent in which research findings are really what they appear to be. Reliability however, assess whether the measures yield the same results on other occasions, whether similar results will be reached by other observers and if there is a transparency in how sense was made from data. One could define valid and reliable knowledge as the aim all science strives for (Lafaille & Wildeboer, 1995: 17).

Validity refers to the truthfulness of a measurement; encompassing therefore the degree to which data provides relevant information for the research.

Internal validity refers to the validity with which "statements can be made about whether there is a causal relationship between one variable and another with regards the form in which the variables are manipulated or measured" (Cook & Campbell, 1979: 38), in other words it relates to the extent to which the observations reflect the phenomenon and variables investigated in the study. To assure internal validity, the respondents were informed prior to the survey's fulfillment about the purpose of the study, and that resulted in more congruent answers and a reduced chance of misinterpretations.

External validity refers to the "approximate validity with which we can infer that the presumed causal relationship can be generalized to and across alternative measures of the cause and effect as well as across different types of persons, settings, and times" (Cook & Campbell, 1979: 37). This means the extent to which the results can provide guidance in what will happen in another situation. The outcomes of this study relate to the answers of respondents with different socio-demographic profiles on travel behavior and attitudes on a daily basis and in mega-events; this means that the results are general and could be useful to provide insights and elucidate cases at other host cities.

Finally, validity was also ensured through extensive literature and documentary review, generous scientific discussion and testing of hypotheses.

Reliability is a means to examine the observations' degree of consistency and stability (Rosenthal & Rosnow, 1984). Reliability refers to the degree in which data are truthful and the extent to which results are replicable. The goal of reliability is to minimize the errors and biases in a study. The objective is to be assured that if later on another researcher conducts the same study, the researcher will arrive at the same findings and conclusions (Yin, 1994). To ensure a high reliability, a framework of questions also based on literature reviews was pre-designed in the surveys.

In human sciences reliability means observation without systematic bias, meaning that repeated application of a research instrument upon identical persons should show identical results. In this study reliability was also tested through asking the same question with slightly different wording in different parts of the survey. This ensued as a consequence of deriving data from multi-resources. Additionally, reliability was attested by conducting a pre-test on a small sample of individuals (pilot study).

Reliability and validity ensure credibility and trustworthiness of research findings (Saunders & Thornhill, 2003); therefore, validity and reliability were crucial in the development of an adequate methodology for this study.

2.7 Scope and Limitations of the Study

This dissertation´s research scope is the study of promoting sustainable mobility for 2014 FIFA World Cup at the host city Manaus. The study covers some behavioral theories and models to outline possible travel behavior at mega-events. The outcomes are likely to provide reliable insights for traffic management at other host cities; however this study restrains itself to a final recommendation, through a SWOT analysis designed particularly for the city of Manaus.

Additionally, the study considers only the local mobility management of a particular host city and does not consider the mobility between the host cities with a higher impact on their environment than urban mobility.

Some of the limitations encountered during the study include:

- Financial constraints: the quantity of data collected was limited by monetary budget, the timeframe for surveying individuals in Johannesburg/South Africa as well as in Manaus/Brazil was constrained by financial issues;
- Time constraints: this study has a limited time to present the results and outcomes, since the next FIFA World Cup will happen in 2014, and if strategies and interventions are to be implemented they should be planned and applied as soon as possible to guarantee efficient results and transport-planners response in a viable timeframe;
- Data constraints: there was a complete lack of data resources for comparisons in this study specifically concerning travel behavior at mega-events.

3. SUSTAINABILITY & TRANSPORT

3.1 Sustainable Development

"Sustainability is equity and harmony extended into the future, a careful journey without an endpoint, a continuous striving for the harmonious co-evolution of environmental, economic and socio-cultural goals" (Mega & Pedersen, 1998: 2)

"[…] sustainability is not about threat analysis; sustainability is about systems analysis. Specifically, it is about how environmental, economic, and social systems interact to their mutual advantage or disadvantage at various space-based scales of operation" (Transportation Research Board [TRB], 1997)

Sustainability has a multidisciplinary nature, which explains why it has a wide variety of definitions. Given the variety of disciplines and concerns represented under this concept, and given the different interests that certain stakeholders in politics, economy and society lay in the term, it was inevitable that numerous interpretations and definitions arose. Despite the multiplicity of definitions, it is common sense among scholars that they should address some aspect of welfare and needs of current and future generations and take into consideration the limitations on natural resource use and the challenge of environmental degradation.

Even though there are a huge number of definitions for sustainable development, one of the most widely used is probably the one given by the World Commission on Environment and Development in the report entitled ´Our Common Future`:

Sustainable development is development that meets the needs of the present without compromising the needs of future generations to meet their own needs (World Commission on Environment and Development [WECD], 1987).

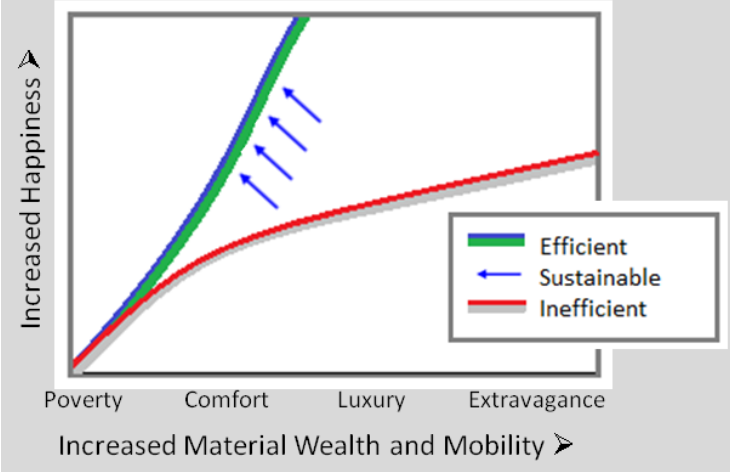
Sustainability is sometimes defined more narrowly, focusing on a few specific problems like environmental and/or resource degradation. However, limited concepts of sustainability can inadequately overlook connections between issues and opportunities for integrated solutions, missing a more comprehensive analysis that may help to identify optimal strategies that achieve multiple planning objectives (Victoria Transport Policy Institute [VTPI], 2005).

The field of sustainability can be conceptually split into three main dimensions: environmental protection, economic sustainability, and social equity; those dimensions are usually presented interlinked and, in practice, they interlace considerably. For example, mobility is an

environmental concern which also affects equity - a social concern - and tourism industries; an economic concern (Litman, 2006). The concept of sustainable development acknowledges that economic and social development has to be integrated with environmental sustainability (Wijkman, 1999), and that genuinely sustainable solutions therefore require an integrated approach.

According to Litman (2006), sustainability requires a conservation ethic that strives to maximize resource efficiency; in contrast to the conventional consumption ethic (ranging from poverty to extravagance), which strives to maximize the amount of resources (including transport/mobility) that people can consume. Figure 6 shows that sustainable development maximizes the efficiency with which material wealth provides happiness.

Figure 6 Sustainable Development



Source: Litman, 2006a

One of the most powerful global trends in sustainable development is to handle the increasing urbanization process and consequences on mobility and resource efficiency. The United Nations Human Settlement Programme estimates that by 2050 some 70% of the world population will live in cities (United Nations Human Settlements Programme [UN-Habitat], 2008). Thus, sustainable development must not only deal with the multi-dimensional concept (economic, social and environmental), but also pay high consideration to the expanding needs of a growing world population with drastically changing consumption patterns. There is a growing interest in sustainability and its implications for transport planning (Litman & Burwell, 2006); indeed, sustainable transport can be viewed as an expression of sustainable development in the transport sector.

3.2 Sustainable Transport

"Environmentally Sustainable Transportation (EST) is: Transportation that does not endanger public health or ecosystems and meets needs for access consistent with (a) use of renewable resources at below their rates of regeneration, and (b) use of non-renewable resources at below the rates of development of renewable substitutes".
(Organization of Economic Coordinator and Development [OECD], 1998)

"A sustainable urban transport and land use system provides access to goods and services in an efficient way for all inhabitants of the urban area, protects the environment, cultural heritage and ecosystems for the present generation, and does not endanger the opportunities of future generations to reach at least the same welfare level as those living now, including the welfare they derive from their natural environment and cultural heritage"
(Black et al., 2002: 186)

"A transport system and transport patterns that can provide the means and opportunities to meet economic, environmental and social needs efficiently and equitably, while minimizing avoidable or unnecessary adverse impacts and their associated costs, over relevant space and time scales" (European Commission [EC], 2001)

A great number of authors and institutions have provided definitions for sustainable transport (see quotes). These definitions are reasonably broad ranging, although they all include an acknowledgement of the fundamental need to ensure mobility and accessibility for current and future generations while mitigating the negative externalities.

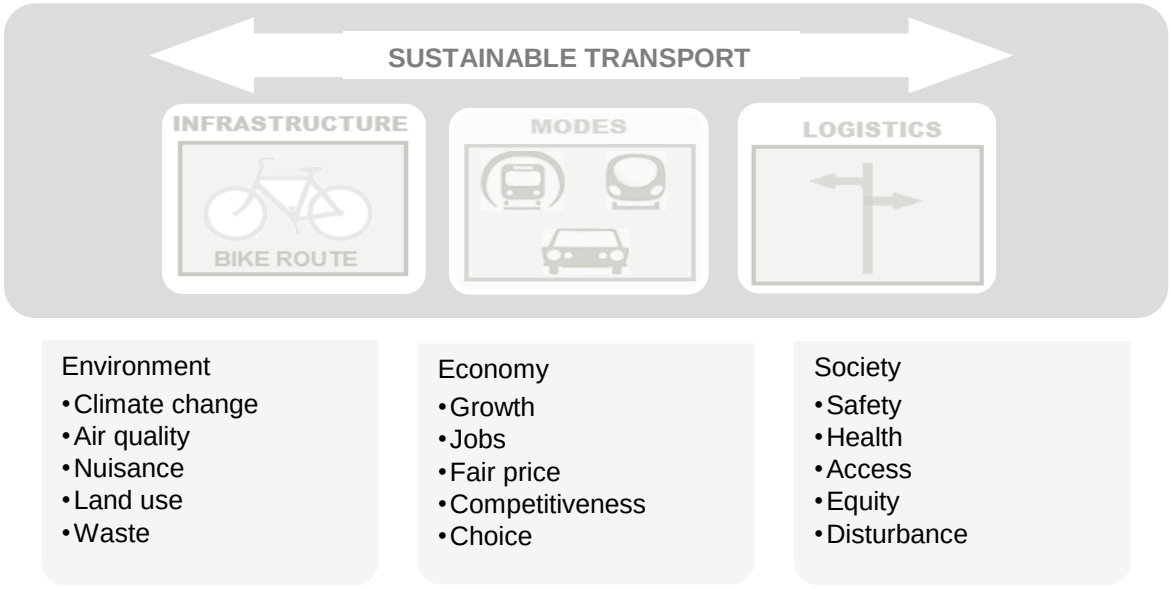
From the various definitions of sustainable transport, the one adopted by the European Union's Ministers of Transport (Council of the European Union, 2001) is perhaps most comprehensive. This definition states that a sustainable transport system is one that:

- Allows the basic access and development needs of individuals, companies and societies to be met safely and in a manner consistent with human and ecosystem health, and promises equity within and between successive generations;
- Is affordable, operates fairly and efficiently, offers choice of transport mode, and supports a competitive economy, as well as balanced regional development;
- Limits emissions and waste within the planet's ability to absorb them, uses renewable resources at or below their rates of generation, and, uses non-renewable resources at or below the rates of development of renewable substitutes while minimizing the impact on land and the generation of noise.

This definition is preferred by many experts, because it highlights that sustainable transportation must proportionally address the economic, social and environmental dimensions of sustainability. It considers both the individual's and society's interests while takes into account human and ecosystem health.

Sustainable transport (as defined in figure 7), describes the modes, systems and planning of transport (infrastructure and logistics) following the principles of sustainability. It is important to note that genuine sustainability can only be achieved if all three dimensions of sustainability (as previously outlined) are addressed simultaneously.

Figure 7 Sustainable Transport and its Dimensions

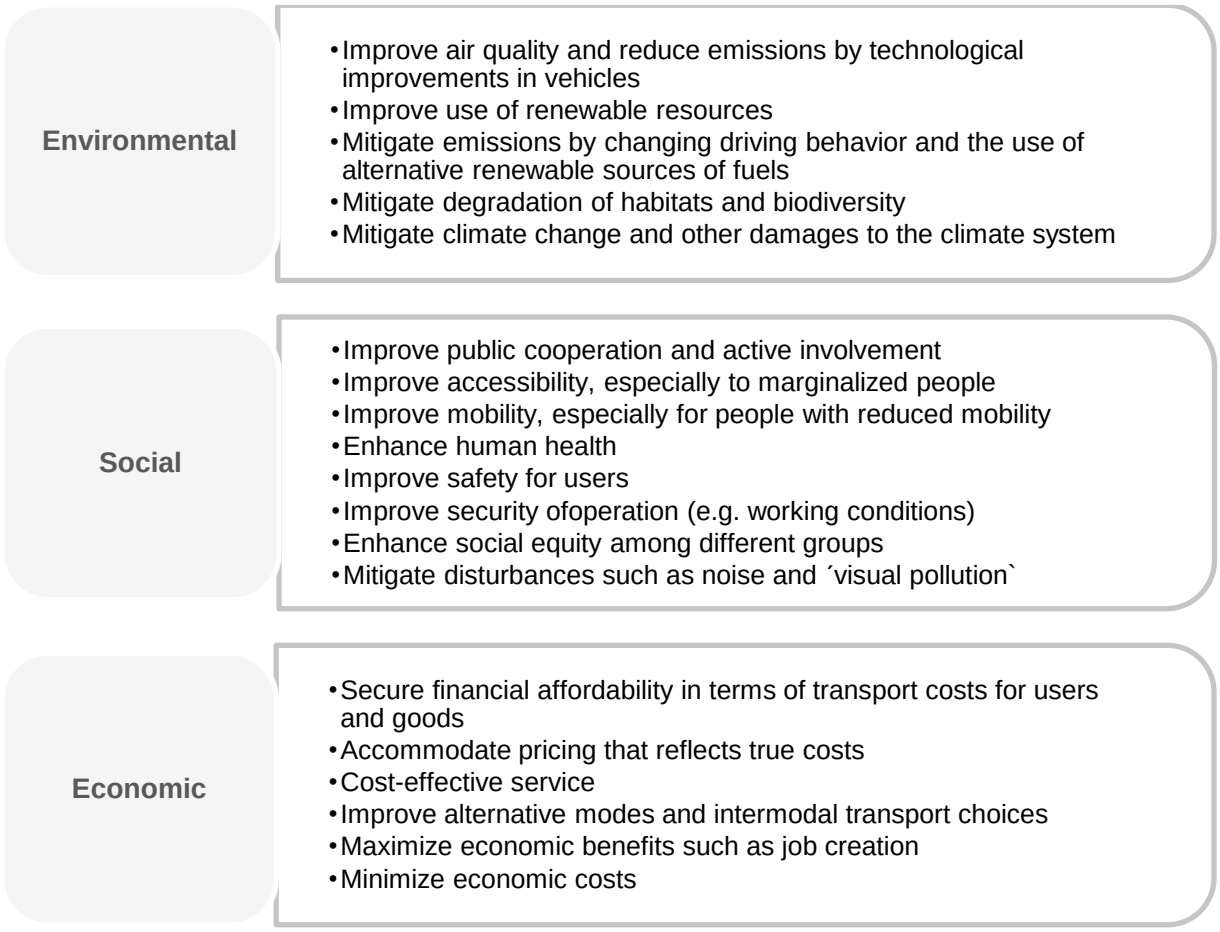


Source: Adapted from UK Department of the Environment, Transport and the Regions, 1999 (Rodrigue et al., 2009)

Transport currently plays a key role in the global economy and arguably faces the greatest challenges in terms of sustainable development. Current and future transport development is an important factor in sustaining the world's limited resources and capacity.

There is an increasing requirement for transport and greater mobility in society. Transport systems exist to provide social and economic connections, and people quickly take up the opportunities offered by increased mobility (Schafer, 1998). However, the advantages of increased mobility need to be balanced against the environmental, social and economic disadvantages of transport on the welfare of present and future generations. Figure 8 illustrates how these conflicting desires can be accommodated by balancing the positive (improve, enhance, maximize) and negative (mitigate, minimize) impacts of transport.

Figure 8 Potential Solutions for Achieving Sustainable Transport



Source: Thesis' author (adapted from different authors)

The main challenge in achieving sustainable transport is to manage economic growth, and social demands for mobility, with the environmental costs of the transport sector. The goal is to aggregate these driving forces, such as (based on European Commission Extra project, 2001a):

- A change in people's travel behavior through reducing travelling needs, promoting NMT and changing other choices of consumption to mitigate environmental impacts among other benefits;
- Technological development and improvements, especially in vehicles (e.g., particle filters, engine controls to save fuel, etc.), to advance efficiency/effectiveness while reducing environmental impacts, the ´know-how` exchange plays a key role in this driving force;
- A pricing system which incorporates social and environmental costs of travelling, thereby influencing the overall consumption of transport services (cost-effective service) and promoting more environmentally-friendly modes such as NMT and PT;

- An effort into equity, accessibility, intermodality and mobility management, to meet transport needs with the most efficient transport demand and patterns, while respecting quality and other social goals such as human health and security.

Environmental impacts of transport

The transport sector has significant impact on the environment, consuming a huge amount of natural, mostly non-renewable, energy resources; currently 95% of energy comes from petroleum (Intergovernmental Panel on Climate Change [IPCC], 2007). In terms of energy sources, transport accounts for between 20% and 25% of world energy consumption and carbon dioxide emissions (World Energy Council, 2007). Greenhouse gas emissions from transport are increasing at a faster rate than any other energy using sector, with about three quarters coming from road vehicles (IPCC, 2007). Road transport is also a major contributor to local air pollution (Environmental Protection Agency [EPA], 2002).

The central issue with natural resources such as petroleum is that they are being consumed at a far higher level than is sustainable. At the present rate of consumption future generations will be left with far fewer natural resources than currently exist (Wackernagel & Rees, 1996). Therefore, at least from the point of view of sustainability, the key challenges for making transport more sustainable are addressing the enormous consumption of renewable and non-renewable resources while simultaneously reducing environmental impacts.

The mitigation of the environmental impacts of transport is therefore one of the key strategies for sustainability. Transport significantly contributes to climate change and air pollution, low water quality, low soil quality and land take:

- Climate change and air pollution. The transport sector plays a crucial and growing role in world emissions of GHGs (IPCC, 2007). In 2004, transport energy use amounted to 26% of total world energy use and the transport sector was responsible for about 23% of world energy-related GHG emissions (International Energy Agency [IEA], 2006). Additionally, the transport emissions are one of the major sources of air pollution in urban areas.
- Water quality. Transport affects water quality and aquatic ecosystems in a variety of ways. Water pollution refers to harmful substances released into surface or ground water, either directly or indirectly (e.g., oil drips and disposal). Hydrological impacts refer to changes in surface -streams and rivers- and groundwater flows, for example

the increased flooding and loss of wetlands (Arnold & Gibbons, 1996; EPA, 1999; Forman et al., 2002).

- Soil quality. Fuel, particles emissions and other hazardous materials discarded from vehicle use or operations can contaminate soil, land and vegetation (Rodrigue et al., 2009).
- Land take. “Transport infrastructure has a permanent and often irreversible impact on the environment in terms of land use and land intrusion” (Commission of the European Communities [CEC], 1992: 25). Major transport infrastructure can affect the quality of life by creating physical barriers, reducing urban aesthetics and affecting the built heritage (Rodrigue et al., 2009).

Social impacts of transport

The transport sector plays a major role in the social dimension. It generates substantial employment, assists development, and provides access to all kinds of services, leisure activities and job opportunities (EC, 2001b). Therefore, the transport sector is socially dimensioned as enabling mobility, and thus cultural exchange, information flow, business opportunities, scientific development, and innovations etc.

Social impacts relate to impacts on individuals and society and include the effects on characteristics of communities such as cohesion, stability and services, way of life, environment (such as the quality of air), health and wellbeing, and personal fears and sense of security (Department for Transport [DfT], 2010).

Socially, an important requirement for the transport sector is that it should deliver its services equally to different regions, interest groups and also, across generations. Unfortunately, this is often not the case; marginal groups and disadvantaged people may not have services available to them, the prices may not be affordable for people with low incomes, and certain areas are frequently better serviced than others (Donald & Pickup, 1991; Lee & Murie, 1999; Tyrell, 2000). This may lead to social exclusion from the activities of society and, rather than supporting the well-being of individuals, it hinders them. It has been suggested that there are seven categories of sources of social exclusion connected to transport: physical exclusion, geographical inaccessibility, exclusion from facilities, economic barriers, time-based barriers, fear-based exclusion and space exclusion (Church et al., 1999).

Current trends in transport are critical from the perspective of sustainability. For example, increasing levels of car dependency are driving social exclusion of people dependent on

public transport, while liberalization of transport services is affecting employment and working conditions. In this content, policy actions have to attain a balance between, usually detrimental, economic, environmental and social objectives (EC, 2001b).

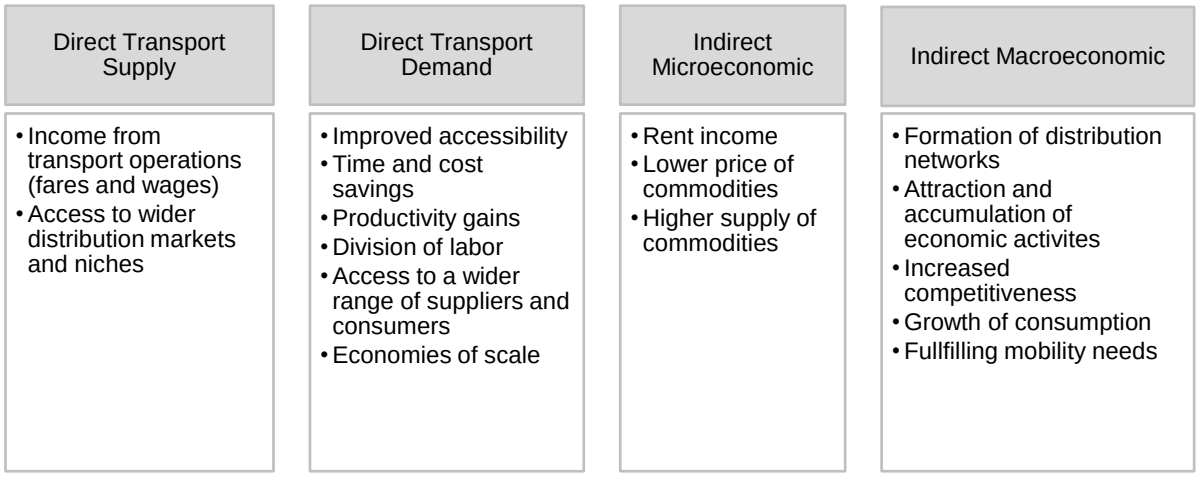
Economic impacts of transport

The transport sector is a major component of the economy; it significantly contributes to economic growth and development of cities and nations. The transport sector provides mobility for goods and people, employs millions of workers, generates business opportunities and revenues and, finally allows information flows and scientific development. Moreover, over the past 50 years transport has been the quickest growing sector in many industrialized countries (United Nations Environment Programme [UNEP], 2001).

However, such growth cannot continue indefinitely due to the many unsustainable impacts of transport. It is even possible that further growth will create greater economic inefficiency than add net value to the economy. Thus one of the key foci in terms of the welfare of society is the decoupling of economic growth and transport growth (EC, 2001).

As illustrated in figure 9, there are a wide range of potential economic benefits created by the transport sector. Some of these are direct (income related) and some indirect (accessibility related), impacting transport supply and demand. The more challenging issue is assessing the extent of economic benefits for specific modes and locations (Rodrigue et al., 2009).

Figure 9 Economic Benefits of the Transport Sector



Source: Adapted from European Conference of Ministers of Transport (Rodrigue et al., 2009)

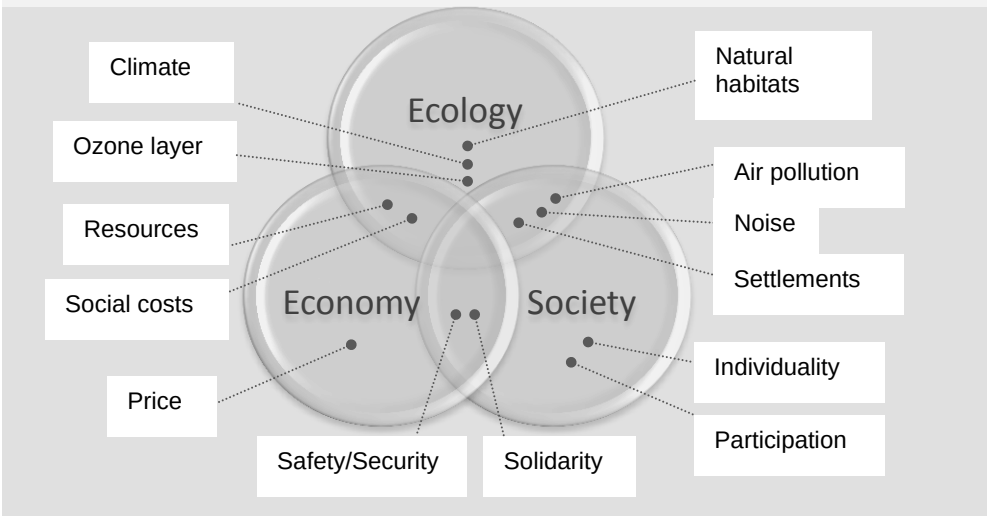
A sustainable transport strategy would also need to commit to, as its core objective, the goal of efficiently using transport for the purpose of growth and benefiting society. Transport should also provide a fair pricing strategy, meaning that users are bearing the full costs (economic, social and environmental ones). A transport system where competition is fair and open is likely to promote a more sustainable modal choice and efficiency (Rodrigue et al., 2009).

Transport is clearly essential in the operation of economy, but much still needs to be understood about the ways in which an efficient transport sector can improve economic productivity (Eberts, 2000). By its nature, the transport sector depends on the resources and services provided by the earth's natural systems (the environment); and those resources are critical for the functioning of the transport sector and offered infrastructure (social dimension). Thus, without incorporating a strong social and environmental dimension, the economic dimension cannot be productive in the longer term.

Sustainable Mobility

The Swiss study on sustainable mobility, entitled ´Criteria for sustainable mobility`, has proposed a set of indicators based on three aspects of sustainability: economic, environmental and social. The economic perspective was defined as the optimal use of resources, efficient markets and improved general well-being. The environmental perspective, on the other hand, considers the limits of natural resources and the carrying capacity of ecosystems, thus imposing limits for economic development. The social perspective emphasizes the distribution of wealth and therefore discusses equal opportunities, basic needs and rights. The figure below illustrates the range of criteria that were identified as being relevant to the transport sector within the three aspects of sustainability. The indicators that have been proposed (see figure 10) are structured following this criterion.

Figure 10 Sustainability Criteria for the Transport Sector



Source: Basler and Partner AG, 1998

4. MEGA-EVENTS

4.1 Definitions

"[…] put the country (or city) on the map, providing significant international exposure [and discuss the possibility that events] can also be seen as political events that serve to showcase the economic, political, and cultural power […] or as a signal that a country has arrived as a major figure on the international scene"
(Matheson & Baade 2004: 108)

The single word "event" has been extensively defined and broadly explained by a number of authors. For example, Getz (2005: 21) defined events as "themed public celebrations" while Van der Wagen and Carlos (2005: 15) acknowledge that "the most common events are community related". Both of these definitions highlight the involvement and/or participation of society in the event.

Considering that a FIFA Football World Cup is a world-class sport event, these definitions can be expanded to take into consideration the global aspect. The following definition offered by Getz (2005: 18), encompassing not only the global nature of the FWC and other major sports events but also incorporating the tourism significance of such events, is well suited to this study:

"Global events, by way of their size or significance, are those that yield extraordinarily high levels of tourism, media coverage, prestige, or economic impact for the host community, venue or organization".

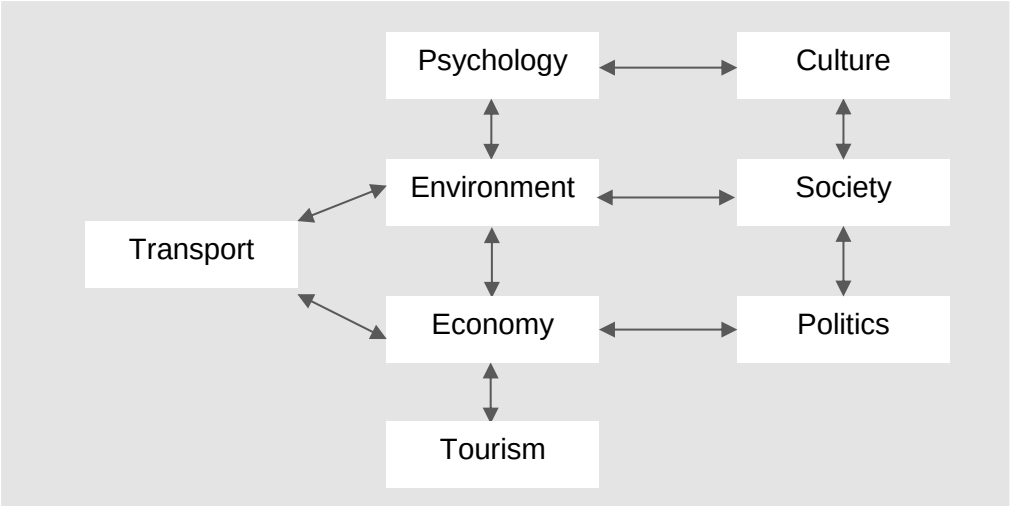
This global aspect of events has been considered by various authors (Dolles & Soderman, 2008; Matheson & Baade, 2004), especially in the context that such mega-sporting events allow instantaneous access to a global market of (TV) spectators from which the host city/country can transmit images and knowledge of its culture, landscape and society to others nations.

Mega-events, according to Roche (2000: 1) are "large-scale cultural (including commercial and sporting) events, which have a dramatic character, mass popular appeal and international significance". These events are characterized by significant alterations to the host city/country (also in terms of tourism) and attract substantial media coverage and (TV)

spectators from a large number of countries. Such a definition identifies the key role that these events may have in tourism in destination development and image building.

Mega-sport events can have wide-ranging effects (see Figure 11) on various aspects of society: economic, political, commercial, physical, socio-cultural, and psychological.

Figure 11 Systems Thinking – Overview Map



Source: Adapted from Dodouras and James, 2004.

Mega-events have the aptitude to generate benefits and impact a host city economically, socially and environmentally. Economically, these mega-events contribute to job creation, increase in tourism demand and revenue, urban development and infrastructure improvement. Matheson and Baade (2004) suggest that hosting a mega-event leads to significant costs as well as large benefits. Socially, a mega-event generates an intense period of ´identity` formation and patriotism for the host residents and contributes to boosting the country/cities global image thereby generating further opportunities. In other words, as Bovy et al. (2003) succinctly state, mega-events put the respective city or region ´on the world map` (i.e. make them visible worldwide). Environmentally, mega-events that are well-conducted can act synergistically with other initiatives to produce behavioral change in favor of the environment, improve urban development in a sustainable way and cooperate with other organizations and institutions to reduce the emission of greenhouse gases by transport and venues. As Bovy et al. (2003) clearly identify, mega-events are obliged to respect certain environmental criteria and thus play an educational role in this area, which contributes to furthering sustainable development.

Mega-events also attract considerable incentives from governments at local, state and national levels to push forward structural reforms and upgrade infrastructure. For example,

Black and Westhuizen (2004) state that the opportunity to host a mega-event incites the governments to invest ponderously in urban renewal and infrastructure upgrades. Thus, mega-events produce a visible transformation of many cities with the infrastructure upgrade such as stadia, convention centers, and associated accommodation, cultural and leisure facilities to host visitors and residents (Hall, 2012). Nevertheless, these infrastructure upgrades often benefit only a small portion of the city/region, and in many cases the most marginalized elements of the population are those that reap the least benefits from such events (Pillay & Bass, 2008).

Given these shortcomings, there has been significant debate in the literature (e.g., Lee & Taylor, 2005; Kasimati, 2003) regarding the true value of mega-events in terms of their economic impact and caution, and the necessity of analyzing the economic ´winners` and ´losers` that may arise from hosting a mega-event. The literature on mega-events usually focuses on the potential of the event to create an economic boom for the host city/country (Fourie & Santana-Gallego, 2010). However, this strict economic focus may be misleading. Gratton et al. (2005: 234) note that “sports events are increasingly seen as part of a broader tourism strategy aimed at raising the profile of a city, and therefore success cannot be judged on simply a profit and loss basis”. Indeed, recent research has been somewhat more realistic about the possible returns for countries/cities based on a careful examination of pre- and post-event data.

4.2 Mega-Events & Sustainability

"With increasing concern regarding global climate change, there is a growing need to ensure responsible management practices for mega events that take cognisance of the reality and challenges regarding this phenomenon. […] appropriate environmental management strategies and guidelines ensure that operations are conducted in a sustainable manner" (Otto & Heath, 2009: 169)

Mega-sports events are widely recognized as having environmental impacts and, despite recent research on the potential contributions of mega-events to environmental impacts, most studies have focused on the economic perspective. An apparent reason for this bias is that the assessment of environmental impacts of mega-events is a complex and, typically, an arduous task. Indeed, it is exceedingly difficult to measure the benefits of mega-events using only verifiable economic instruments such as cost and revenue (Dodouras & James, 2004).

Environmental aspects, as an issue to be taken into consideration in planning or development of mega-events, is a relatively recent focus of research and practice, but has become increasingly integrated into the hosting of mega-events (Dredge & Whitford, 2010); punctually the first showcase for ´green` event management occurred in 1994 at the Lillehammer Winter Olympic Games in Norway. In 2006, Germany was the first country to incorporate sustainable practices into the planning and development of a Football World Cup. In 2010, the South African government and the ´Fédération Internationale de Football Association` (FIFA) created the Football for Hope program with the objective of producing a unique and global movement that uses the power of football to achieve sustainable social development (FIFA, 2010).

Mega-events inevitably produce both negative and positive benefits depending upon the focus of the research. On the one hand, a mega-event can offer benefits for the host city/country in terms of improved transport infrastructure and tourism growth (Saunders, 2010). On the other hand, the hosting of a mega-event creates intense tension on the urban infrastructure and services related to transport, water consumption or waste treatment and can have significant negative consequences. For example, the "infrastructure projects and the presence of a high number of tourists and spectators cause a significant increase in greenhouse gas emissions during the event" (Konrad Adenauer-Stiftung [KAS], 2011: 25). Moreover, the sector that predominantly contributes to GHG emissions is transport. Therefore, a well-developed transport plan for mega-events is fundamental to determine an efficient system and to mitigate these problems (Department of Environment and Tourism [DEAT], 2008).

Legacies as long-term impacts of mega-events

Legacy is the principal factor in deciding to host a mega-event. Therefore, a mega-event concept has to consider conditions outlined such as long-term legacy (Bovy, 2006a). Mega-events play a growing role in policies of development, land-use planning, and mobility for leisure activities and tourism (Bovy et al., 2003). The legacies – whether tangible or intangible – are the greatest attraction but also form part of the "known unknowns", of sports mega-events (Horne & Manzenreiter, 2006: 9).

The tangible legacy of a mega-event can, for example, originate in new or improved transport systems and other infrastructures of the host city and region (Guala & Turco, 2009). Kearney (2005) gives a broader portrait of the intangible benefits that mega-events can have in building a legacy (see figure 12).

Figure 12 Building a Positive Legacy from Mega-Events

Those host cities/countries that think beyond the costs vs. benefits of mega-event will most likely achieve also the less tangible and more emotional legacy aspects that such events should stimulate. To achieve greater success the host cities/countries need to strive for a positive legacy in three areas: society, sports and the environment (Kearney, 2005).

Source: Kearney, 2005 (reprinted with permission)

In the sense of tourism, to maximize benefits of the event legacy, leveraging strategies have to be considered in the policy and planning procedures from the beginning (Ritchie, 2000; Chalip, 2004). While there is a growing interest into the role of event legacy and its potential for acting as a catalyst for tourism development, there is a lack of information and knowledge in academic research to support successful event leveraging strategies (Ritchie, 2000).

4.3 Mega-Events & Tourism

"Sports, mega-events, and business tourism are the sleeping giants of our tourism market, which hold huge potential and which we will exploit further to grow our industry"
(Minister of Tourism of South Africa, Schalkwyk, 2010)

Tourism is assumed to be one of the leading growth industries and responsible for boosting the local and national economy of many nations (Ritchie, 1984; Roche, 1992; Roche, 2000; Miller, 2000; Proenca & Souzakis, 2005; Sinclair & Stabler, 1997). Tourism has grown by around 25% in the past 10 years. It now accounts for around 10% of the world's economic activity and is one of the main generators of employment globally (World Tourism Organization [WTO], 2005).

Numerous factors influence tourism growth, one of the appreciable contributors is believed to be mega-events. The linkages between tourism and sports mega-events are enormous and not yet fully explored; there is considerable evidence that the tourism potential of sports mega-events is a major factor in encouraging cities/countries to bid for hosting such events (Deery et al., 2004; Hall, 2001).

Mega-events generate economic activity on a major scale during the preparation phase, the event itself and even afterwards, in terms of inward investment and tourism generation (Ward, 1998; Hiller, 2000). Tourism also stimulates national and local industry in all phases of the event and introduces immediate revenue into the local economy.

Longer term benefits of tourism can be achieved with the long-term use of the facilities created for a particular mega-event; for example, other sporting events, concerts, conferences etc. (Brown & Massey, 2001). Further, Kartakoullis et al. (2003) describe a number of tourism based infrastructural benefits from the hosting of mega-events (table 4).

Table 4 Tourism Related Benefits from Mega-Events

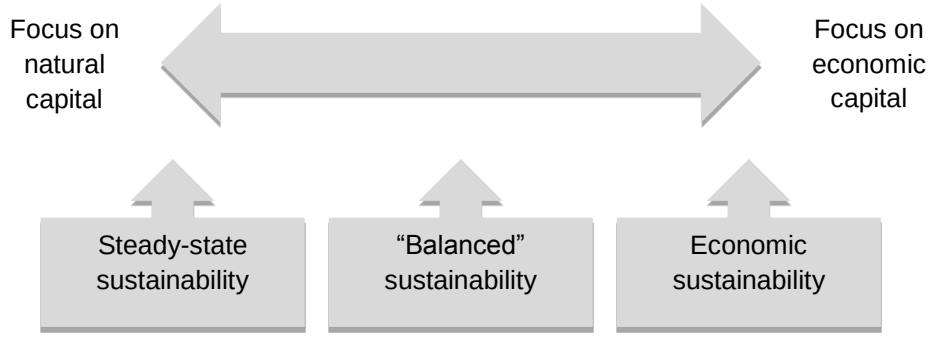
Income	Infrastructure	Country image	Work skills
The attraction of high income tourists and the creation of a new generation of tourists	The creation and modernization of the tourism infrastructure	The opportunity to create a favorable tourist image and to use international media to send out positives advertisement of the host city/country to the rest of the world	The creation of a skilled workforce in the organization and management with a special emphasis on hosting special (tourism) events

Source: Adapted from Kartakoullis et al., 2003

Mega-events can also contribute negatively to the tourism industry; however, as Chalip (2002) states, the main problem of measuring the impact of mega-events on tourism is that most studies focus on the economic benefits and much less research has been done on intangible impacts.

Hall (2011) has recently argued that there are three main articulations of sustainable tourism development: economic sustainability, balanced sustainability and steady-state sustainability (set up in ecological economics). These articulations can be conceived as occurring on a continuum that, at one end, focuses on natural capital as the economic foundation of human society - a steady-state perspective on sustainability, while the other end of the continuum focuses on the dominance of economic capital - an economic sustainability approach (see Figure 13). The three articulations of sustainability and their application to mega-events are outlined in appendix C.

Figure 13 The Continuum of Sustainability and the Focus on Different Forms of Capital



Source: Hall, 2011

Sustainability has also been "becoming a part of the discourse of events, especially with regards to the policy context within which they operate and how events contribute towards regional development" (Hall, 2010: 1). Nevertheless, in environmental terms, tourism is recognized as generally showing sustainability deficits with respect to climate change, GHG emissions, energy use, resource use and contributing to environmental challenges (Gössling & Hall, 2006; Hall & Lew, 2009; Hall, 2011).

As part of efforts to more comprehensively assess the impacts of the tourism industry on the environment and climate change some estimates of GHG emissions have tentatively been produced (e.g., Peeters, 2007). The embedded message in these assessments shows that tourism cannot necessarily be regarded as an ´environmentally friendly` industry and, in some cases, may even be worse than other industries with respect to the overall level of environmental impact and the provision of sustainable alternatives (Martens & Spaargaren, 2005).

4.4 Mega-Events & Transport

"Transport is either the clear impediment to a major event's success, or the fundamental, ´invisible` enabling factor" (Department of Transport [DOT], 2006)

As already known, most of the host cities have problematic transport systems, mostly, due to a massive population, lack of urban planning and excessive use of private single-occupancy transport. Thus transport functionality for mega-events is an agonizing task since it implies considerable additional traffic on top of often already overloaded transport systems (Bovy, 2006a). Additionally, it is essential to mention that the tourism industry is also a product of the transport sector; and despite tourism's high contribution of congestion/traffic, the use of environmentally friendly mobility within the sector is rather low (Kagermeier, 2003; Gronau & Kagermeier, 2007).

Transport for mega-events not only involves mobility for fans/residents attending the games but also mobility for tourists visiting attractions, reaching accommodations and a range of facilities. This reinforces the transport challenge for the host cities, requiring the development of strategic and operational measures (Bovy, 2006; European Conference of Ministers of Transport [ECMT], 2003) and in the case of mega-events the transport must be operationally beyond ideal (Kassens, 2009). To have an idea of the importance of transport for mega-events, Curnow (2000: 62) states that "Olympic cities are judged as much on the quality of the transport services as on their sporting facilities".

Contrary to the past perception of mega-events, transport is mostly considered as being a serious major operational risk; the mentality nowadays has changed and "transport and traffic policies developed for mega-events have shown to be strong catalysts for accelerating public transport projects and for promoting more sustainable urban and regional mobility developments" (Bovy, 2006: 34).

Mega-events generate high concentrations of traffic flows over significant space and time (ECMT, 2003; Federal Highway Administration [FHWA], 2005; Robbins et al., 2007). To evaluate the expected transport demand by a mega-event with the maximum capacity of the available PT system (transport supply) it is fundamental to acknowledge insufficient capacity and the prospect of barriers. Assessing these gaps effectively, which implies the application of a number of measures and strategies will probably not bring daily traffic to a chaotic situation and ensure that the city will still remain operational during the mega-event (ECMT, 2003). Robbins et al. (2007: 304) also affirm that the "basic problem that planners face" is mainly related to "the provision of additional capacity to meet peak levels demand".

For these reasons, there is an urge to promote a modal split with a high proportion of public transport (Meyer, 2001) and non-motorized transport during mega-events. In order to promote PT use and ensure efficient travel demand management that respects the needs of the local resident population a number of measures and strategies can be applied (Bovy et al., 2003) such as reducing transport costs by providing ticket discounts or combined tickets which increase the attractiveness of public transport, and relieving the burden on parking (ECMT, 2003) and road space.

The problem is that predicting mega-events´ traffic flows may be a dilemma, since they are affected by different tourist behavior patterns influenced by external factors such as information, or above all, the lack of it. Visitor's travel demands are much more difficult to predict and assess than those related to daily travel (Bovy et al., 2003).

Robbins et al. (2007: 304) also argued that transport infrastructure improvements and upgrades developed for mega-events can, post-event, "result in the underutilization of that capacity" and ultimately realize that it was "economically unviable". Therefore, a strategic decision is needed on the capacity of the transport infrastructure. This may mean adapting the infrastructure to the event or rather adapting the event to the available infrastructure (ECMT, 2003). According to Hiller (2006: 331) after the event, the use of facilities needs to be "re-evaluated and integrated into the fabric of urban life and the needs of its residents".

In 2008 the Department of Environmental Affairs (DEA) of South Africa released a number of good practices and strategies in transport for the greening of large sports events with a focus on the FIFA World Cup, some of these objectives and the recommended strategies can be visualized in appendix D. Through investigation of these strategies, it is evident that to achieve sustainable transport at mega-events, it is important to consider the following aspects: safety/security, flexibility, reliability, short travel times, effectiveness and attractiveness and finally, sustainable mobility legacy.

There is no doubt that transport is one of the tangible legacies that can potentially stimulate the change in the way people behave in daily travel. These mega-events frequently lead to innovations in transport systems and mobility management programs which can provide powerful groundwork for creating new user attitudes and for changing habits (Bovy, 2006a; Brown & Massey, 2001; Murphy & Bauman, 2007; Preuss, 2004; Rose, 2003; Rose & Ampt, 2003). Other benefits that such improvements can bring for the host city/country are: better quality of life, less congestion, better air, and more attractive travel (Brajer & Mead, 2003; Getz, 1999; Matsudo et al., 2004).

4.5 Mega-Events & Knowledge Exchange

"A challenge for economic policymakers and planners is to translate the academic work into useful policy making to maximize the benefits of these events" (Baade et al., 2010)

Host cities face a range of challenges such as dealing with the sociodemographic characteristics of tourists and residents, differing travel motives, infrastructure changes, the provision of quality services, safety and so on. Preparing for assessing all these expectations is a very demanding task; however, lessons learnt from other host cities/countries are an important basis for enlightenment and guidance.

Assessment, monitoring and reflection are key activities that offer recommendations from previous mega-events and such efforts need to be coordinated to enrich and inform policy-makers as well as to avoid the repetition of errors. Know-how exchange is the most beneficial approach in learning from best and worst practices from others mega-events. According to Bovy (2008) learning from past mega-events is essential; it avoids the necessity to ´reinvent the wheel` for each new mega-event. For example, following the successful pattern of the inter-governmental initiative ´Germany 2006 & South Africa 2010: Partnership with a Kick`, now it is time for Brazil to strengthen the ties. The Program ´World Cup Brazil 2014 & Germany 2006/2011: Partners for Sustainable Urban Development` facilitates know-how exchange between the cities hosting the 2014 World Cup in Brazil and the German cities that hosted the competition in 2006 and 2011 (2011 FIFA Women's World Cup)**.** According to the Service Agency Communities in One World (2011), the project aims to support the Brazilian host cities to build capacities for sustainable development, to strengthen German-Brazilian relations and to promote the development of information and education.

The 2014 FIFA World Cup must take advantage of other FWC experiences and attempt to adapt, always taking into consideration the respective cities'/countries' peculiarities, the best practices in the management of transport and mobility. Mega-events are a real scale transport laboratory for new mobility concept testing – including behavioral changes (Bovy, 2006a). These efforts converge on the transfer of knowledge which is a valuable and essential assessment in the mega-event learning process. A review of transport management from mega-events can provide lessons, approaches and measure that may guide and help the success of other mega-events. The Department of Transport (DOT) has developed for the 2010 FWC a range of those lessons (see appendix E). Fortunately, technical documentation on mega-event transport problem solving is becoming worldwide propagated.

4.6 Mega-Events & Behavior

"Major events provide a perfect opportunity to change how people think and behave, for example, in the environmental and green area" (Deloitte, 2010: 8)

A mega-event can influence positively the attitudes, perception and finally the behavior of residents and tourists, foremost, in two ways. First, it has been proved that mega-events increase the prime and self-image from the local to the international dimension (Getz, 1989; Hall 1992; Roche 1994). For example, the 2006 FIFA World Cup, which under the marketing ´time to make friends` showed the world that Germany is a hospitable country, and by expressing this atmosphere during the World Cup quite appropriately, for the first time in many years Germans had the opportunity to show a renewed pride in their country. Second, mega-events can be seen as unique opportunities to model new behavior and change residents', tourists' and society's perception and attitudes in favor of more sustainable ways of life (Pellegrino & Hancock, 2010). For example, the London 2012 Sustainability Plan embraced a strategy of using the Games' inspirational power to influence behavior change through the ´Active Spectator Programme` to encourage NMT (London Organising Committee of the Olympic and Paralympic Games [LOCOG], 2007).

The change of attitudes and, ultimately, behavior is likely to rely on post-event initiatives as it will also demand changes in the social and physical environment. In the same way National Public Health Partnership reports (2001: 25) on ´Promoting Active Transport` state that "comprehensive, long-term strategies are essential when attempting to change transport modes across all settings, and to achieve behavioral change there is a need to focus on policy and environmental changes in addition to individual change strategies".

The economic influences which underlie behavior change have been acutely discussed by Jago (1997: 98), in his study on ´Special Event related consumer behaviour`, "once demand for a product is exceeded by supply, producers are forced to focus more of their attention on the needs and interests of the consumer" .It is imperative that event planners develop a profound understanding of the host city, its residents and tourists, to ensure that events that satisfy the needs of the society are developed and these events are promoted in a highly effective way. Engel et al. (1995: 12) remind "understanding and adapting to consumer motivation and behaviour is not an option - it is an absolute necessity for competitive survival".

4.7 Conclusion

As highlighted by renowned researches, mega-events have the power to transform to some extent a host city economically, socially and environmentally. Economically, mega-events are seen as accelerators of national economies (Clark, 2010), stimulators of local economies (French & Disher, 1997), and an investment catalyst (Law, 1992). Socially, a mega-event represents a singular occasion to mobilize behavioral change in society in favor of more sustainable attitudes (Bovy, 2001). Environmentally, a mega-event can display a certain potential to promote environmental responsibility through engaging residents and tourists and ensuring that a culture of ecological attitude is promoted (Otto & Heath, 2009).

However, it is important to evaluate the benefits arising from hosting a mega-event with a large degree of caution as recent research suggests that they are in many cases overly optimistic and may, in certain cases, even be illusory.

As Dimmer (2011) states, the FWC is still a window to harness that kind of energy and thus meet one of the greatest challenges of hosting the tournament: how to achieve sustainable development and mobility for the country and its people. The challenge of sustainability can be considered in both the long and short term. As stated by Dodouras and James (2004: 7) “major changes in attitudes, in society and in the operation of economies are required in the long term”. In short-term it is indispensable to proceed with small steps towards sustainability and reduce unsustainable practices, design careful policies and mechanisms (European Union [EU], 1998) and finally, identify a set of resident’ and tourists’ needs and expectations. With that, the whole effort will bring positive consequences to the respective city or even country, to its residents and to tourists.

5. BEHAVIORAL CHANGE - THEORIES AND MODELS

THEORETICAL FOUNDATIONS

This chapter will describe the theoretical foundations of the research area in order to identify, particularize and finally explain the principles that constitute the core theoretical framework of this study. Some assumptions are further suggested to better specify the concept of travel behavior and its influence on a mega-event. Table 5 shows the most popular behavioral change theories and models linked to travel behavior which serve as a theoretical foundation for the empirical research of this study.

Table 5 Model and Theories of Behavioral Change

Influences	Models &Theories	Reference
Economics	Expected Utility Theory	Neumann and Morgenstern, 1944
Role of Information	The Value-Action Gap	Blake, 1999
Values, Beliefs and Attitudes	Theory of Reasoned Action (TRA)	Fishbein and Ajzen, 1975
	Theory of Planned Behavior (TPB)	Ajzen, 1986
Agency and Efficacy	Model of Pro-Environmental Behavior	Kollmuss and Agyeman, 2002
Habit	Theory of Interpersonal Behavior (TIB)	Triandis, 1977
External Factors	Needs, Opportunities Abilities (NOA) model	Vlek et al., 1997

According to Lanzerdorf (2003), the understanding of how the changes on travel behavior is presented by individuals play a pivotal role when assessing the impact of policies and measures designed to affect the travel of people.

5.1 Economic and Behavioral Economics

Economic theory is an important instrument to model and understand many aspects of individual behavior (Collier et al., 2010). It has been widely used to explain how individuals make decisions when faced with varying options, considering the perceived costs and benefits of choice. For example, as Sammer and Wüstenhagen (2006: 188) pointed out "humans make decisions that maximize their utility".

Behavioral economics can be used by researchers interested in achieving deeper psychological insights into the analysis of economic issues. The connection between economic theory and behavioral economics was described by the economist Herbert Simon in the early 1950s. Simon developed the concept of ´bounded rationality` to explain how the individual decision-making processes are bounded by psychological and environmental constraints (Wilson & Dowlatabadi, 2007). Additionally, Collier et al. (2010: 6) suggest that "behavioural economics can encompass the wider influences of society and group effects and bring together economics and social research more explicitly".

5.1.1 Expected-Utility Theory

Expected Utility models, often known as rational choice models, are the foundation of Consumer Preference Theory (Jackson, 2005). The theory assumes that an individual's preference of choice is based on the principle of maximum utilization, where utility can be represented as the level of satisfaction (Heath, 1976) and personal advantage (Friedman, 1953). To better explain how human behavior conforms to rational choice theory, economists often make the following assumptions:

- Individuals have clear and constant preferences, specific decision criteria are constant, and the weights assigned to them are stable over time;
- Individuals have plenty of information to identify all relevant criteria and viable alternatives (no time or cost constraints).

However, these assumptions are frequently not upheld, providing ammunition for critics of the theory. For Harford (2008: 9), rational choice theory is viewed as "a rigorously simplified view of the world", where an individual acts rationally most of the time. Kollmuss and Agyeman (2002: 249) add that economic concepts are very important in planning new strategies to motivate behavior change; however, "predicting people's behavior on purely

economic grounds will not reveal the whole picture. Economic factors are intertwined with social, infrastructural, and psychological factors".

Rational-choice model in travel behavior

These models are adopted in several fields of research to analyze a range of choices bounded by mutually exclusive alternatives such as transport modes. A behavioral change is, within this theoretical framework, a change in determinants (e.g., travel costs, travel time) leading to different modal choices. For instance, in order to explain travel mode choice for a daily trip modal attributes, as well as sociodemographic characteristics, have to be considered (Train, 1978).

In this context, for a mobility management (MM) measure that changes travel options, it would be possible to forecast changes in choices. If people change their attitudes and thus their modal choices (e.g., a different weighting of mode attributes), an accurate forecast would no longer be possible. Here, attitudes and values are considered as irrelevant (Umweltbundesamt, 2002). The internal processes of preference formation and the role of factors that are not directly observable, such as attitudes, continue to be incomprehensible. In order to fill this gap, discrete choice theories are being extended, using latent variables representing attitudes or values in the travel choice process.

A number of studies have confirmed the rational-choice approach, showing that travel time and costs are crucial for the decision. For example, Keuchel (1995) studied travel mode choice by commuters and revealed that four modal attributes – fare, total travel time, additional walk and convenience – are sufficient, to describe both the psychological decision-making process and the actual travel behavior in an adequate way.

Economically speaking, the theory assumes that when information is provided to commuters/non-commuters they will behave in such a way as to maximize personal benefit and minimize costs. In this way, the model could be useful to explain individual utility maximization. Nevertheless, it does not adequately consider psychological parameters such as perception of travel costs and travel time.

5.2 The Role of Information (Value-Action Gap)

The gap that can occur when the values or attitudes of an individual do not correspond with their actions is named the ´value-action gap` (or occasionally the ´attitude-behavior gap`) and is characterized as the differences between what individuals say they are going to do and what they actually do (Kolmuss & Agyeman, 2002). This inconsistency between attitudes and behavior can be understood in terms of the lack of information on certain issues and has been addressed by a number of authors:

- Dickson (2001) suggests an effective means to overcome the value-action gap is by increasing information which offers a recommendation to individuals to act pro-environmentally through building concern about environment;
- Blake (1999) observes that, in models of behavior, information generates knowledge which then shapes attitudes, ultimately leading to behavior;
- Burgess et al. (1998) developed the ´information deficit model` of behavior change, which postulates that providing knowledge about the consequences of certain actions, would lead to behavior change;
- Gale (2008) argues that education and new knowledge is a key element to fulfill the value-action gap with information and may contribute towards a behavior change;
- Owens (2000) suggests that the people who have more information about environmental risks act more ethically in reference to the environment.

Nevertheless, the effect of information on behavioral change is still being seen as controversial. Many authors argue that the provision of information is not sufficient to change behavior:

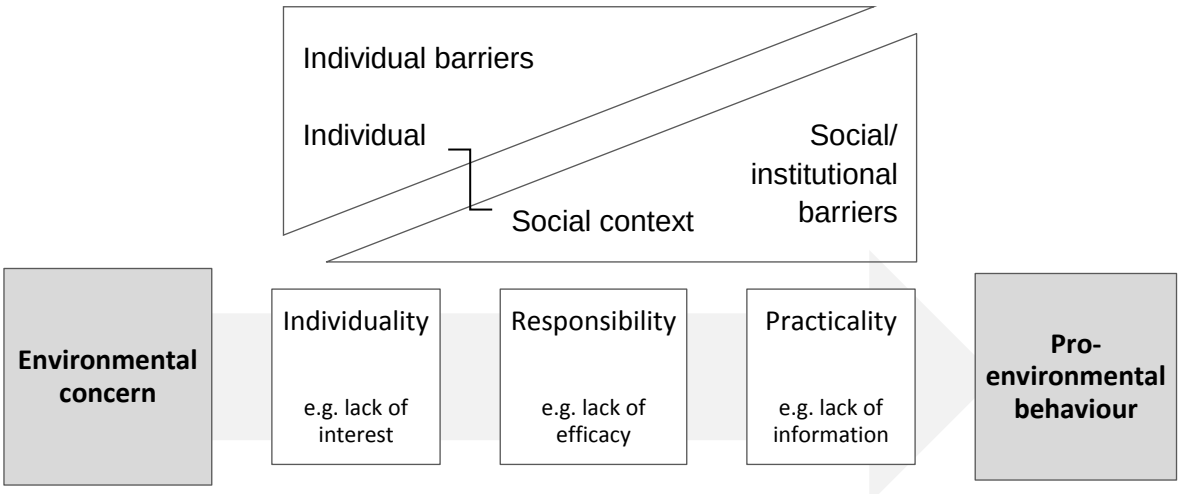
- Myers and Macnaghten (1998) suggest that the response and interpretation of the same information can be given in an infinite number of ways by different people, and sometimes it is interpreted in the opposite way to what is expected;
- Barr and Gilg (2002) argue that increasing information will not lead to a behavioral change which, in isolation, would close this gap; and information-intensive campaigns alone are likely to be ineffective;
- Sammer and Wüstenhagen (2006) maintain that while people may be aware of environmental issues, this does not necessarily mean that these will have a direct influence on their behavior.

As stated by Blake (1999: 270) a number of research studies “suggest that the ´value-action gap` cannot be overcome simply by using an ´information deficit` model of individual participation”. According to Kolmuss and Agyeman (2002) inaction does not only occur

because of lack of information, but is rather influenced by other factors and thus relates to a number of obstacles. Therefore, it is important that policy makers develop comprehensive and effective strategies to tackle these obstacles and not just provide more information. Blake (1999) identifies three categories of obstacles that exist between a value (here described as environmental concern) and an action (see figure 14):

- Individuality is an obstacle linked with attitudes and feelings. It is especially influential on individuals who do not have a strong environmental concern. However, even a strong environmental concern can be overcome by stronger desires and needs. For example, the convenience of taking a flight even when it is possible to take the train overrides the environmental concern of climate change. Moreover, individuals may perceive themselves as the wrong type of person to carry out environmental actions or have a lack of interest in environmental issues;
- Responsibility is an obstacle close to the psychologist's notion of ´locus of control`. Individuals who don't act pro-environmentally believe that they cannot influence the situation or should not take responsibility for it. For example, a lack of trust in institutions often makes individuals desist from acting pro-environmentally. This is acknowledged as a social dilemma where individuals do not see effective results in acting on their own as it would not make measurable difference. They perceive that their actions would lack efficacy within the greater context;
- Often they are the practical constraints that prevent individuals from adopting pro-environmental action, regardless of their attitudes or intentions. These constraints include a lack of information, time, money, physical inadequacy, encouragement and pro-environmental facilities such as adequate PT service. Some individuals may also be physically unable to carry out some environmental actions as e.g. cycling.

Figure 14 Barriers between Environmental Concern and Action



Source: Blake, 1999

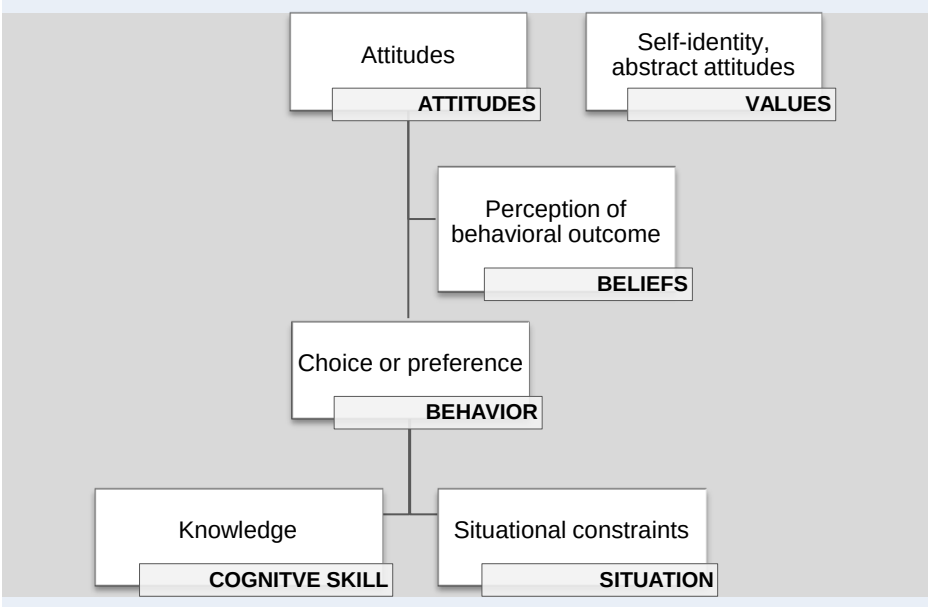
5.3 Attitude Theories

Psychologists and social scientists recognize the term attitude as a hypothetical construct that represents an individual's like or dislike for an object and refers to a relatively stable evaluative response (Eagly & Chaiken, 1993). Attitudes evolve as a result of direct (first-hand) experience with an object or through mediated information about it – the former tending to result in stronger and more consistent attitudes than the latter (Fazio & Zanna, 1981). However, as defended by some authors (e.g., Hogg & Vaughan, 2005) attitudes are not frequently predictive of behavior.

Value, beliefs and attitudes in travel behavior

Despite the fact that changes in travel behavior is the stated aim of many policies and strategies; the method frequently adopted is to try to change beliefs, attitudes and values. The argumentation is that, except for being enforced by social, monetary, legal or physical restrictions, a change in travel behavior is determined by a change in beliefs, attitudes and values (Fishbein & Ajzen, 1975). Some authors (e.g., Golob, 2001; Fuji et al., 2001) defend that an enforced change of travel behavior causes a change in beliefs, attitudes and values. It is important to note that this is the case only for a positive outcome (Fuji & Gärling, 2006); otherwise the enforced change is anticipated to result in resistance (Deci et al., 1999).

Figure 15 How Behavior is Related to Beliefs, Attitudes and Values



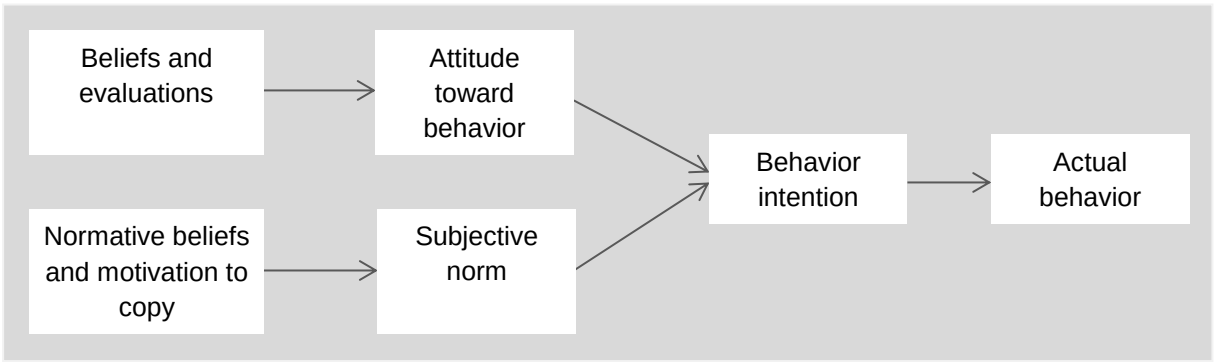
Source: Adapted from Fuji and Gärling, 2006

As illustrated in figure 15, habitual behaviors like daily travel are determined by cognitive skills, beliefs, choices and situational constraints. However, permanent behavioral change is induced by changes in attitudes which are expressed by values.

5.3.1 Theory of Reasoned Action

The theory of reasoned action was formulated in 1967 in an effort to decipher the relationship between behavior and attitudes (Fishbein & Ajzen, 1975; Werner, 2004) and it was applied very early in its development to travel behavior (Golob et al., 1979). The main aspect of the TRA is the concept of ´behavioral intention`. This concept states that an individual's motivation to engage in behavior is defined by the attitudes that influence the behavior (Fishbein & Ajzen, 1975). According to figure 16, behavior intention is dictated by attitudes and subjective norms (Fishbein & Ajzen, 1975). An attitude refers to an individual's perception (in favor or against) towards a specific behavior (Werner 2004). ´Subjective norm` refers to the individual's subjective judgment regarding others' preference and support for a behavior (Werner 2004).

Figure 16 Theory of Reasoned Action



Source: Fishbein and Ajzen, 1975

The model has been one of the most influential attitude-behavior model in social psychology, although it certainly has its limitations; for example, the underlying assumptions that people act rationally, make systematic use of information available, are not controlled by motives or influenced by desires and that their behavior is thoughtful (Fishbein & Ajzen, 1975). However, the model is useful as a heuristic framework because of its clarity and simplicity.

TRA has been largely disregarded due to the lack of an important determinant in influencing individual behavior in real life, for instance by social factors (Grandon et al., 2004; Werner, 2004). These include all the influences of the environment surrounding an individual (Ajzen,

1991). This deficiency of the TRA model was addressed by Ajzen (1991), who proposed an additional factor in determining individual behavior: ´Perceived Behavioral Control`. He referred to this new model as the theory of planned behavior.

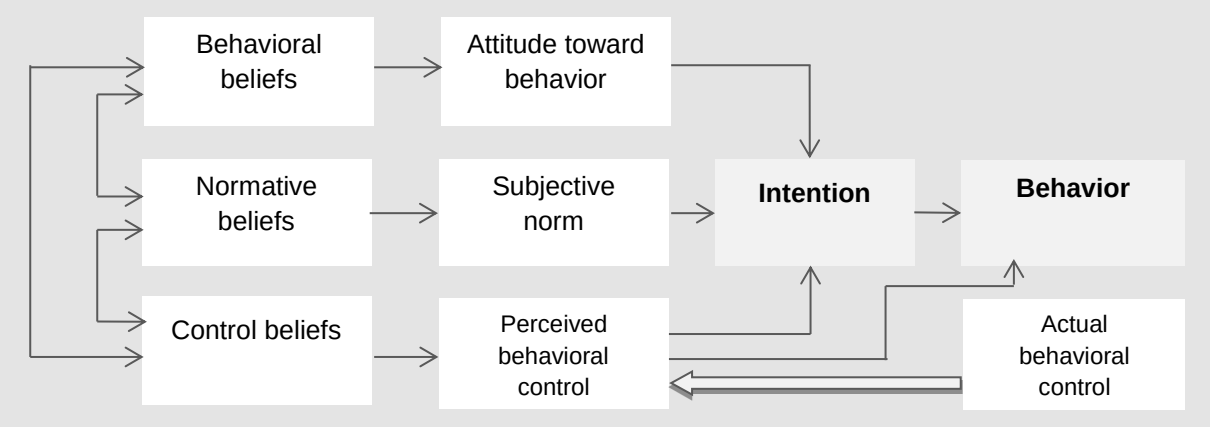
5.3.2 Theory of Planned Behavior

The theory of planned behavior, developed by Ajzen in 1991, explains how the intentions to perform a given behavior are formed. It is referred to as an expectancy-value theory (Darnton, 2008). According to the TPB model in figure 17, some assumptions can be made:

- Attitude towards behavior does not induce behavior directly, but intention is seen as leading to behavior;
- Attitudes are combined with social norms and perceived behavioral control as a fundamental premise of behavioral intention succeeding to influence behavior, mediated by actual control;
- Attitudes and social norms are sustained by beliefs and the evaluation of each belief.

These assumptions could also be an explanation of why attitudes do not always correspond closely to behavior with respect to travel behavior. Additionally, as described by Budeanu (2007), the TPB is based on three determinants: an individual's perception of a future behavior; the ´pressure` to act towards certain behavior; and the ability to perform a certain behavior, depending on whether the individual has the opportunity and resources. In the last determinant, some individuals tend to say that they are environmentally friendly but, ultimately, they do not choose environmental options; it can be the case where time and cost may restrict the individual's behavior of being environmentally friendly (Ajzen, 2005).

Figure 17 Theory of Planned Behavior



Source: Ajzen, 1991

A number of researches have successfully applied the TPB in the field of transport (see Heath & Gifford, 2002; Anable, 2005). For example, Bamberg et al. (2003) studied the impact of a pre-paid bus tickets on bus use by students at the University of Giessen, Germany. Analysis of bus use intention and actual use before (2 months) and after (8 months) the intervention showed that the intervention influenced attitudes, the subjective norm, perceived behavioral control, intentions and behavior towards bus use and supported the TPB as a legitimate model for explaining behavioral change.

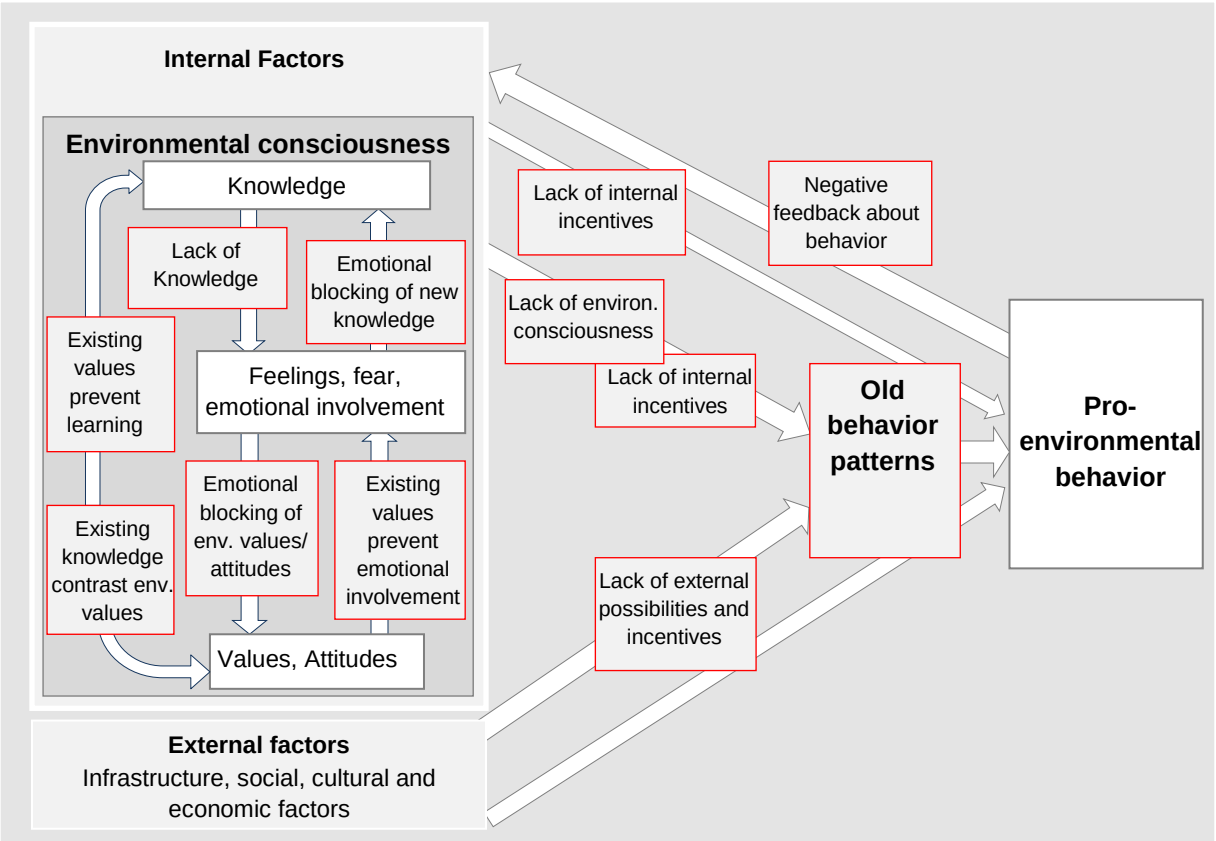
5.4 Agency and (Self) Efficacy

The individual's sense of performing an action and achieving the expected outcome is defined as ´agency`, also a feature of expectancy-value models. For the sociologist Giddens (1984), agency is simply the power of individuals to act; individuals are expected to play an active role in changing behavior. Bandura (1977: 193) defines self-efficacy as "the conviction that one can successfully execute behavior required to produce the outcome". According to Darnton (2008: 20), some premises can be made in self-efficacy: Firstly, it determines "the initiation and the continuation of behaviour"; secondly, it is based on "past behaviour (performance accomplishments)"; third, it is seen as the "product of a deliberative calculation" (how much effort to spend); and finally, it is not seen as determining behaviors alone, rather it requires "appropriate skills and adequate incentives" to endorse.

5.4.1 Model of Pro-Environmental Behavior

The model of Pro-Environmental Behavior describes how different factors (internal and external) will ultimately prescribe a pro-environmental behavior and that there are many barriers to achieve such behavior – ´old behavior patterns` being the strongest of these.

Figure 18 Model of Pro-Environmental Behavior



Source: Kollmuss and Agyeman, 2002

5.5 Habit

Most contemporary social-psychological models of human behavior emphasize the conscious nature of behavior of choice (Aarts et al., 1998; Ajzen, 1991). It is argued, however, that repeated activities become a habit rather than a conscious and reasoned action (Aarts et al., 1997; Verplanken et al., 1998). In 1977, the scientist Triandis included ´habit` in his behavioral theory as a determinant factor in influencing behavior. Since then, many researchers have also been incorporating ´habit` as an important factor in prognosticating current or future behavior (Aarts et al., 1998, Ouelette & Wood, 1998; Verplanken et al., 1998).

In the context of behavior, change of habit also plays an important role. A number of authors (e.g., Fujii & Kitamura, 2003; Thogersen & Moller, 2008) have found that the habit of car use is an important factor, keeping individuals from changing to alternative travel modes. Moreover, behavioral intention, implementation intention and behavior are undermined by the habit of car use (Gärling et al., 2001; Ronis, 1989; Verplanken & Aarts, 1999).

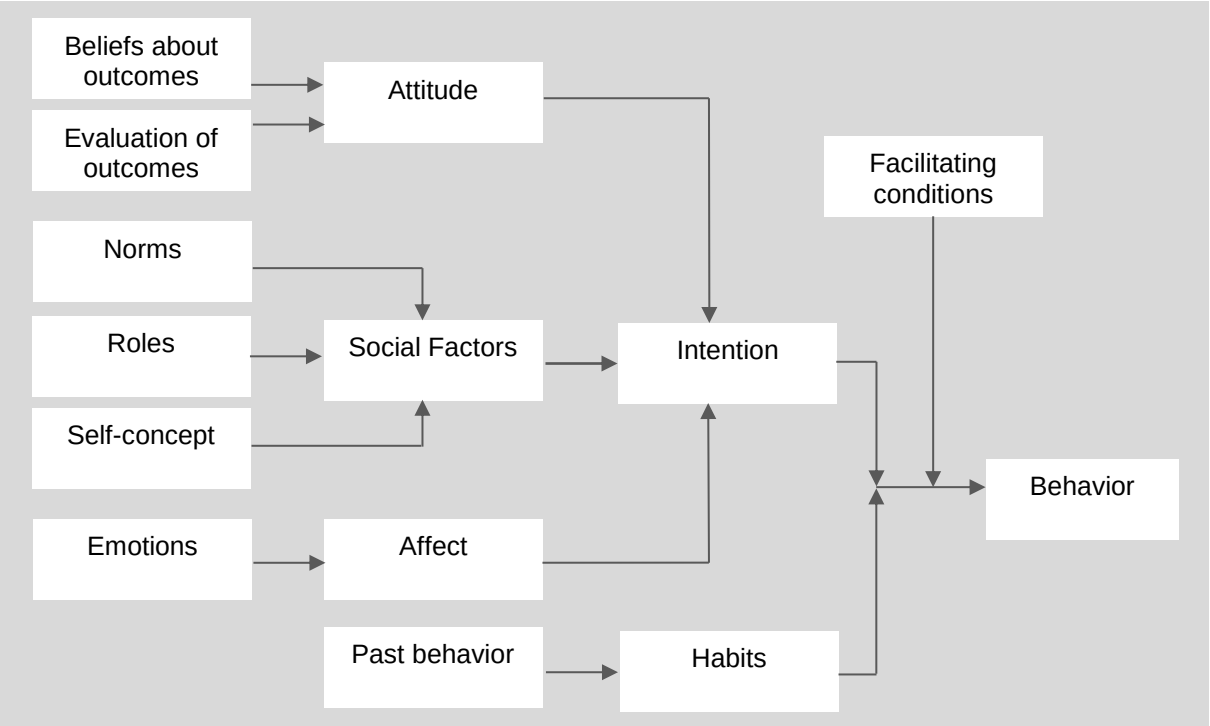
5.5.1 Theory of Interpersonal Behavior

The theory of Interpersonal Behavior, developed by Triandis in 1977, is an integrated theory that recognizes the role of habit (as the most influential factor), intention and facilitating conditions (environmental factors). Triandis also recognized that behavioral intention is influenced by social factors (social and personal norms, role belief and self-identity) and affect (emotional feelings about behavior), elements not included in the TPB.

The theory assumes that behavior is a result of conscious deliberation. It has been suggested that repeated behavior is habitual and involves no conscious deliberation (Aarts & Dijksterhuis, 2000). The influence of habit increases over time and, therefore, the influence of intention decreases. The more times that behavior is repeated, the more habitual and less deliberative (consciously controlled) it becomes. One example could be commuters who always use the same route to go work even if there are others possibilities.

Bamberg and Schmidt (2003) studied the car use of students in Germany and compared the predictive power of TPB and TIB in explaining behavior. It was found that habit as well as intention determines behavior – with attitude, behavioral control, subjective norm and role beliefs determining intention. Personal ´norm` was not statistically significant in explaining intention.

Figure 19 Triandis' Theory of Interpersonal Behavior



Source: Triandis, 1977

5.6 External and Situational Factors

Most of the theories/models contemplate internal determinants to explain individual behavior change and do not necessarily address some of the conditions out of the individual´s reach such as external and situational factors that may also have a significant influence on a person's capacity to change.

Indubitably, new behaviors can only be developed if the necessary conditions and options are provided (e.g., the use of public transport can only be made if there is a certain offer). As Triandis states "the presence or absence of facilitating conditions" influence behavioral choice. Researchers acknowledge that the external factors must be appropriate for behavioral change to take place. In this context, Gardner and Stern's principles expect that interventions address "the conditions beyond the individual" as well as "psychological" factors (Darnton, 2008: 26). McKenzie-Mohr and Smith (2000) go further in advising that if there are not sufficient resources available to remove the external barriers preventing behavior change, then the intervention should be abandoned. However, social-psychological theory reveals the dynamic to be more complex than a division between internal and external barriers.

5.6.1 Needs-Opportunities-Abilities Model

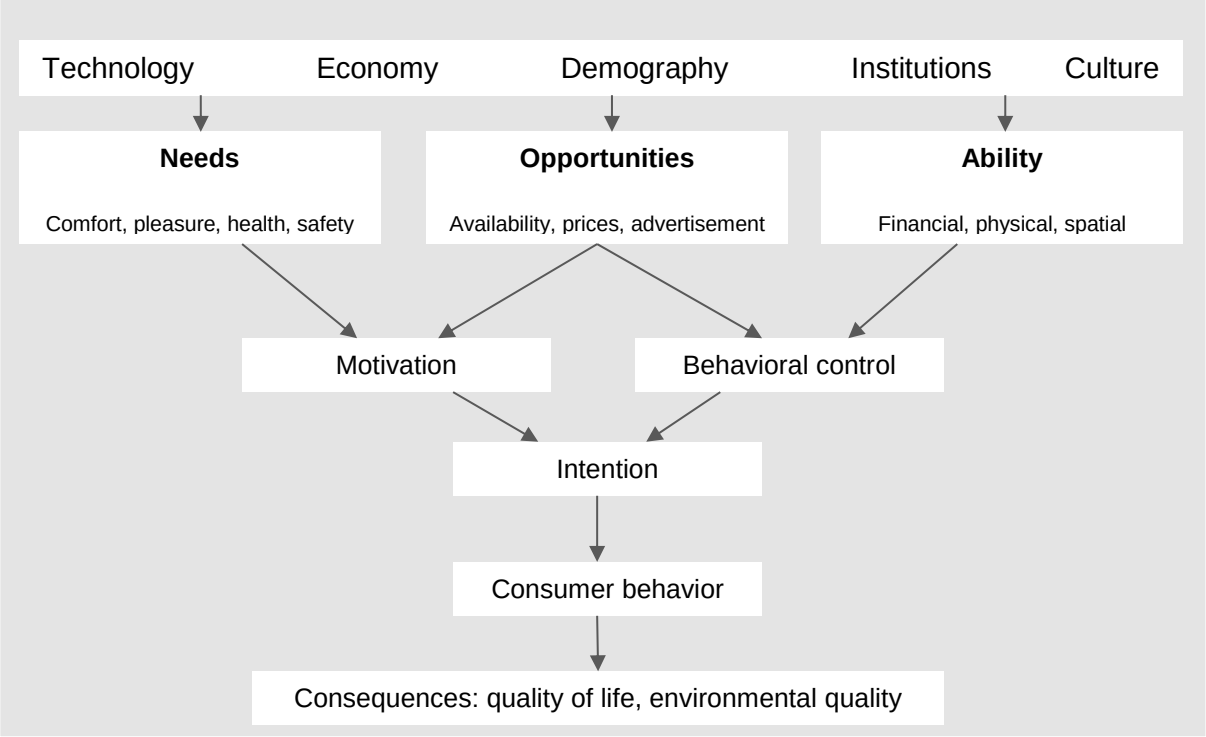
The Needs-Opportunities-Abilities (NOA) model was inspired by the Motivation, Opportunities, Abilities (MOA) model (Robben & Poiesz, 1992). According to Gatersleben and Vlek (1998), ´Needs` are related to fifteen indicators which reflect research into essential aspects of well-being; the term ´Opportunities` relates to those factors which are external to an individual, such as accessibility of services, cost, availability of information; ´Abilities` relate to the internal factors or internal capabilities such as income, time available, distance to relevant services, physical attributes (e.g., health, fitness, possession of licenses). However, these factors typically interact simultaneously. For example, cost span is a combination of price (opportunities) and available income (abilities).

The model assumes that action (or intention) is a result of needs and opportunities, and certain needs can only be achieved when the individual has both the ability and the opportunity. In the case that an ´opportunity` is given, individuals may then be motivated to act (e.g., buy a bicycle or use the subway). However, motivation alone is not sufficient to promote a behavior as opportunities and abilities also play key roles. Gatersleben and Vlek (1998) added that individual behavioral control is determined by opportunities and abilities.

For instance, an individual may be motivated to take a train to travel to a particular destination on holiday, but this also depends on whether train service and connection are available and whether the person has sufficient money available to buy the ticket.

All these processes, which will finally determine behavior, are influenced by five macro-level factors: technology, economy, demography, institutions and culture (Gatersleben & Vlek, 1998). Technology and economy have an effect on the diversification of available goods and services, as well as their price and increasing/decreasing affordability. Cultural norms have an impact on the individual sense of well-being which is believed to depend on earnings and possessions. This, in turn, influences trends of possession and use. Demographic characteristics like age, gender, and place of residence have many impacts on factors that influence behavior. The institutions create the legal and social cores which regulate how goods and services can be owned and used.

Figure 20 The Needs-Opportunity-Ability Model of Consumer Behavior



Source: Vlek et al., 1997 (Gatersleben and Vlek, 1998)

The NOA emphatically shows the interaction between the individual and society, and demonstrates the need for interventions to work on multiple scales (Darnton, 2008). For example, when promoting mobility management, not only travel purpose and the characteristics of different modes need to be considered, but also the way that choice is influenced by the capacity to fulfill certain well-being factors, the opportunities that exist in alternative modes of transportation and an individual's ability to access those opportunities.

6. GERMANY 2006 FIFA WORLD CUP

"The first FIFA World Cup with a greening agenda was Germany 2006, where the Green Goal Programme was carried out in order to reduce to the greatest possible extent the adverse effects on the environment associated with organising the World Cup. ´Green Goal` was an integrated part of the planning and organising of the tournament and a contribution towards the ´sustainable legacy` of the World Cup" (Öko-Institut, 2006: 26)

6.1 The Planning Phase: Pre World Cup

The 2006 FIFA World Cup was held from 9 June until 9 July in Germany, hosting 12 cities and, despite transport infrastructure being one of the best in the world, the government had still invested around four billion euros in improvements and traffic management. "We want to organize mobility in such a way it satisfies the highest requirements", said Federal Minister of the Interior Otto Schily. Additionally, there were complementary projects with a high level of importance in residents' involvement and sustainability such as the ´Green Goal`.

The Green Goal emerged from the need to account for the environment and reduce the impacts of mega-events on it. The scope of Green Goal, with the participation and support of different institutions (i.e. Öko-Institut, WWF Germany, the Federal Ministry of Environment, and the Federal German Environment Foundation) tackled four main areas: water, waste, energy and transport. Since climate protection is the major concern of environmental policy nowadays, the four environmental areas were coordinated towards this climate priority. Through research and expertise, guidelines were provided for the four environmental areas and climate protection. For the purpose of this thesis, in the scope of ´Green Goal`, only the transport field is being further described.

According to the guiding principle for transport, mobility during the 2006 FIFA World Cup should be environmentally favorable and efficient. Activities should be focused on the avoidance of unnecessary transport and a shift towards public transport, as well as on the efficient and ecological design of existing transport systems. For this purpose two main goals were laid down: an increase in the share of PT by 50% (with regards to those people attending matches in the stadiums) and a reduction of the effects on climate by transport by 20%. Table 6 and 7 present the measures implemented to reach these objectives.

Table 6 Measures to Increased Share of Local Public Transport

Increased share of local PT
Improvements of connections to stadiums – PT services were amplified to increase capacity; new metro routes were constructed to increase capacity and efficiency; improved bus/tram stops to accommodate longer trams and also to facilitate the use of wheelchairs. In total, around 50 infrastructural projects were carried out in host cities to improve PT;
More frequent and extended services – the frequency of PT services was hugely increased on match days; metro/trains had longer operating times; timing co-ordination of regular PT replacement with the FWC also avoided the unnecessary purchase of additional vehicles, in this way foregoing huge investments for short-term benefit;
Guidance for local PT – information about PT use and route was made through self-explanatory system of signs which users could easily identify and understand;
Travel Information for PT – all ticket-holders received with their tickets an information leaflet with travel information on ´kombi-tickets` and environment-friendly journeys. Additionally a virtual travel center provided targeted information on PT in four languages;
Passenger Information – every railway station had a ´Welcome Desk` where information was provided in different languages, specially trained employees were engaged for; announcements at stations and on trains and key PT stops were made in several languages.

Source: Adapted from Öko-Institut, 2006

Table 7 Measures to Reduce Climate Effects of Transport

Reduction in environmental pollution
Resident protection zones and special traffic zones – protected areas were arranged in residential areas near to stadiums to avoid nuisance from traffic;
Parking Management – park & ride facilities were abundantly provided; a traffic-control system directed car users to designed parking areas; parking facilities were also provided for coaches as near as possible to stadiums and the cities applied a registration system to plan effectively;
Bus shuttle service – a shuttle bus service was provided for VIPs, personnel and journalists to main hotels, railway stations and airports to reduce travel by cars to stadiums;
Promotion of travel by bicycle – bicycle parking facilities were provided at stadiums;
Environment friendly vehicle concepts – some buses with hydrogen-powered engines were used; others buses, with different engines, emitted less pollutants because they complied with the Euro IV emission regulations; some PT companies used the opportunity to refit their vehicle fleets with particulate filters.

Source: Adapted from Öko-Institut, 2006

The general transport aim for 2006 ´Green Goal` was to be as sustainable as possible. A number of measures, like those listed in tables 6 and 7, aimed at the provision of efficient travel and passenger information combined with an excellent supply of services, contributed exceptionally to discourage the use of cars during mega-events. The use of public transport, walking or cycling to the stadium was in many ways strongly encouraged. The use of aircraft was discouraged; inter-city mobility during the 2006 FWC was instead accomplished through the use of high-speed trains (ICE), a travel mode very popular in Germany. Deutsche Bahn (DB) developed and marketed special offers to attract as many visitors as possible to rail travel, these included ´World Champion Ticket`, the ´World Champion Pass` and ´World Champion Surf & Rail`. The use of trains collaborated greatly in attenuating the environmental impacts which would have been induced by the use of aircraft. With the combination of appropriate measures and a singular transport infrastructure, the 2006 FWC had a chance to be as environmentally-friendly as possible. It is important to highlight that the accomplishment of transport measures was only possible because of active participation of all relevant parties.

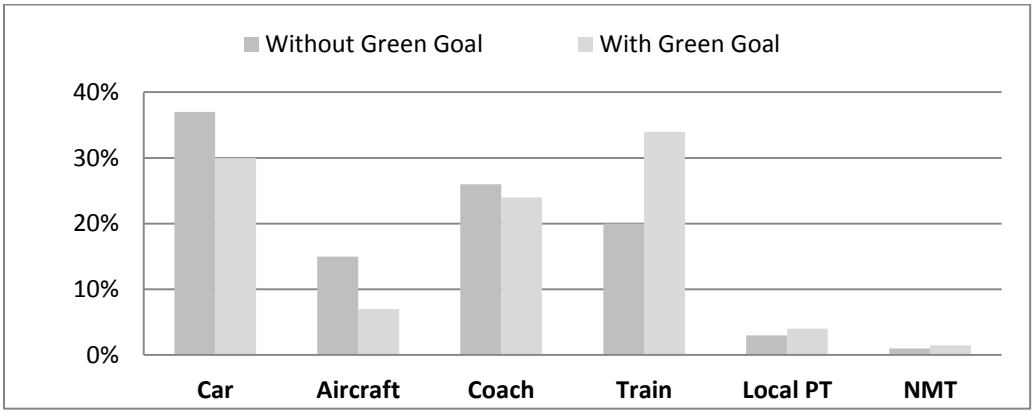
6.2 The Management Phase: During the World Cup

The main objective of the ´Green Goal` transport concept to increase the share of PT by 50% was fulfilled (see figure 21), around 57% of the spectators used the underground, trams and others PT services for travelling to stadiums (52% of spectators used direct services – station to stadium and 5% from park & ride facilities).

Additionally, up to 90% of visitors to public-viewing events (fan parks) travelled by PT. There are many reasons for the successful PT promotion, mainly: the excellent quality, adequate capacity of trains and buses as well as limited parking facilities at the stadiums/fan parks. The ´kombi Ticket`[8], an innovative idea for FWC, surely played an essential role in the achievement of these numbers (Öko-Institut, 2006).

Highlighting the importance of the ´Green Goal` measures for changing behavior, figure 21 shows a comparison of the shares of different travel modes used during the World Cup in relation to applicability or not of Green Goal for the 2006 FWC.

Figure 21 Modal Split during the 2006 World Cup with or without Green Goal Measures



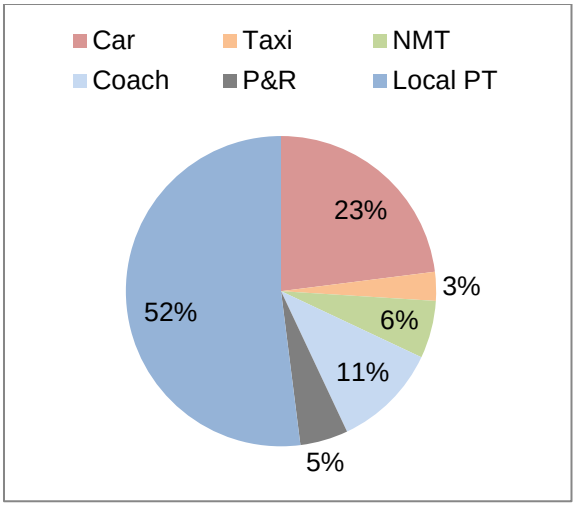
Source: Öko-Institut, 2006

Through ´Green Goal` measures about 19% of transport-related greenhouse gas emissions were avoided. The objective of reducing greenhouse gas emissions from transport during the World Cup was therefore largely achieved.

[8] For the first time at a FWC, tickets were also valid for local public transport without additional payment. The 'Kombi Ticket' (combined ticket) not only enabled ticket holders free travel to and from the stadium; they could also use them from the start of services in the early morning of match days until the early morning of the following day on all buses and trains of the respective transport networks, and often beyond city boundaries. To supplement 'Kombi Tickets', the FIFA, the Association of Germany Public Transport Organizations as well as the transport companies and integrated transport services reached agreement an that the 15.000 World Cup volunteers could use buses and trains free of charge on days when they were on duty.

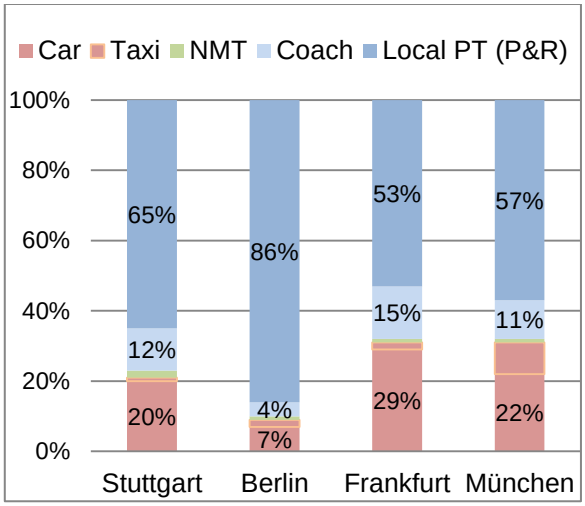
The travel attitudes of fans exceeded all expectations; the preference/use of environmentally friendly transport – such as PT and NMT – could be clearly proved by numbers. In all cities, a minimum of 75% of visitors travelled to stadiums by bus, rail and bicycle or on foot, and maximum 25% travelled by car (figure 22). The only exception was Frankfurt where car users almost reached a 30% share (see figure 23).

Figure 22 Modal Split of Journeys to/from Stadiums of all Host Cities



Source: Adapted from Öko-Institut, 2006

Figure 23 Modal Split of Journeys to World Cup Stadiums by City



Source: Adapted from Öko-Institut, 2006

6.3 The Legacy: Green Goal Legacy Report

"The German Organizing Committee, with the close cooperation of the Federal Environment Ministry, succeeded in setting new environmental protection standards for the organization of large sporting events in the future"

(Öko-Institut, 2006: 7 [words from Schmidt - Vice-President of the Organising Committee, OC])

Although the winner of the 2006 FWC was not Germany, the mega-event was considered a complete success for Germany and Germans in general. The ´Legacy Report` of the 2006 FWC concluded: "Experiences of the Green Goal not only indicated existing opportunities, they also showed where and why an environmental concept for World Cup tournaments has its limitations. It is unfortunate that under the prevailing circumstances the objectives of an increase in energy efficiency, greater use of rainwater and the environmentally beneficial tending of football pitches were not achieved. With Green Goal, however, important organizational tasks and opportunities were identified for all those to be involved in future organization of World Cup tournaments" (Öko-Institut, 2006: 15). An early establishment of responsibilities for all relevant stakeholder groups (i.e., transport and traffic planners, police, fire department and others World Cup's stakeholders) seems essential to ensure appropriate emphasis on effective transport functioning not only for FIFA, visitors and fans, but especially in case of any emergency related or not with the event. The succes of an event is only possible with the support, guidance and cooperation of all stakeholders. According to KAS (2011) cooperation between municipalities and business and civil society are critical. Regular consultation with and involvement of key stakeholders is very important. It is apparent that a shared objective and agreement of the concepts by all stakeholders is therefore an essential first step in solving the challenging transport problems of major sporting events. Collaboration between national and international institutions with major local groups (including local authorities) is relevant in this regard.

The 2006 OC demonstrated that environmental objectives can be a part of the planning of a large sporting event; almost all established ´Green Goal` objectives were achieved, and the setting of these objectives was based on the voluntary co-operation of all participants.

6.4 Conclusion

"Looking back, the project was a success. With support from many sides, the OC showed that environmental and resource protection could be an integral part of a large sporting event. Those who organise large sporting events in future should profit from the experiences made which also indicate where and why such a concept for a World Cup tournament still has its limitations" (Öko-Institut, 2006: 105)

The Green Goal vision was to contribute towards a sustainable legacy of the 2006 World Cup. With respect to transport, the following objectives were presented: avoidance of unnecessary motorized trips and increased use of PT – demonstrating that it is possible to effectively influence attitudes towards and promote more sustainable mobility behavior; reduction in environmental pollution and efficient and ecological design of transport systems.

"Substantially more visitors travelled to host cities and World Cup stadiums with environmentally favorable public means of transport – like bus or train – than had originally been expected" (Öko-Institut, 2006: 94).

Not only the evaluation of the ´Green Goal Legacy Report` showed that it achieved almost all its objectives to a large extent, but also highlighted the valuable importance that ´Green Goal` measures had in changing behavior in favor of sustainable transport use during and beyond the sports mega-event.

7. SOUTH AFRICA 2010 FIFA WORLD CUP

"The 2010 FIFA World Cup provides South Africa with the opportunity to redefine the current national brand as well as to showcase their industrial capacity, infrastructure and attractiveness as a tourism destination, and polish its position and role in Africa" (Kersting, 2010).

The opportunity to host a sport mega-event such as the 2010 FWC contributes to develop South Africa around the 3 phases of hosting a mega-event. The planning phase which involved preparatory activities to receive the FWC such as infrastructure arrangements and improvements; secondly, the management of the event itself; and thirdly, the legacy phase which is accounted by the long-term benefits of the other two phases and a changed perception of the host country and/or cities and their potential for tourism.

Considering that the research case study of the 2010 FWC is the city of Johannesburg, the city has been used as an example in many cases. A brief profile of the city and its transport sector will be given to allow for a sound framing of the case study results.

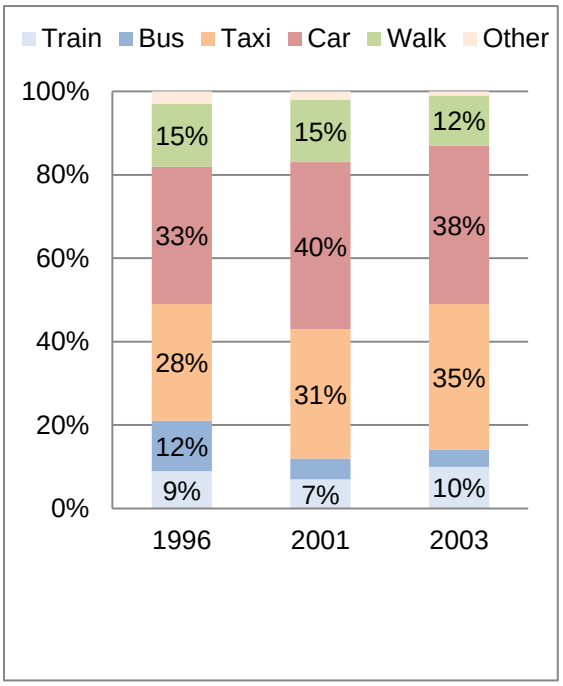
7.1 Brief Profile of Johannesburg and the Transport Sector

Johannesburg is the capital of Gauteng's province and generates about 10% of all Sub-Saharan Africa´s Gross Domestic Product (GDP) (Landau & Gindrey, 2008). The data of the Development Bank of Southern Africa (DBSA, 2007) shows that from 1996 to 2003 the number of work related trips increased by 45%. In 2003 more than 1 million trips to work were made in Johannesburg. A comparative analysis in the travel mode for the years 1996, 2001 and 2003 is presented in figure 24.

Train use, even though at a lower level, shows a constant pattern among the years. The same can be assumed for walking, in African cities usually a form of mobility genuinely used by marginalized populations. Walking has on average accounted for about 10% of the trips to work in metropolitan areas. An inverse trend can be found for the use of minibus-taxis (these are not taxis in the typical Western sense of the term – they are small-scale bus services, often unmarked, operating with neither timetables nor formal stops) which has considerably increased in this period. Car use shows initially a huge increase (2001) and then a slight decrease (2003). The use of buses strongly decreased during all the reference periods.

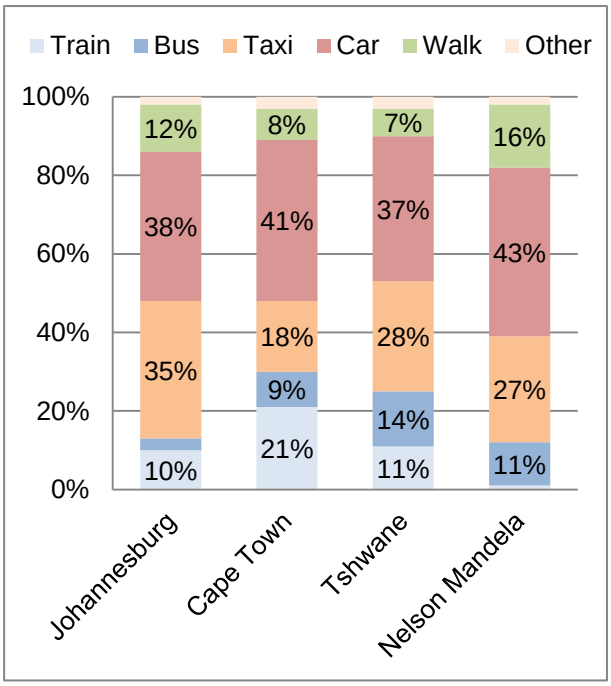
When examining all PT we find that in 1996 the total PT share including taxi (minibus-taxis) was 49% of all trips, in 2001 it was 42% and in 2003 it went back up to 49% again, showing that PT use has a similar trend around these years.

Figure 24 Mode shares for work trips in Johannesburg – 1996 to 2003



Source: Adapted from DBSA, 2007

Figure 25 Mode shares for work trips in Metropolitan Areas



Source: Adapted from DBSA, 2007

Further on, figure 25 presents a comparative analysis of the biggest cities in South Africa for transport modes to work in the year 2003. The dominant modes in all metropolitan areas are the car and minibus-taxis (Vans). The importance of train and bus use for trips to work is relatively low in South Africa as those systems have not been established with due priority in most (South) African cities.

South Africa's public transport system is unreliable and unsafe (Houston, 2011). This critical framework condition, further aggravated by a car-biased transport and urban development policy, has contributed even more to the formation of a pro-car culture, thus increasing traffic problems in urban centers, such as congestion, pollution, accidents which have become a critical burden for urban development and quality of life.

7.2 The Planning Phase: Pre World Cup

The DOT released in 2006 the first version of the Transport Action Plan which contains the following implementation strategies:

- Major public transport improvements including road, rail and aviation infrastructure, non-motorized transport infrastructure, building and upgrading of railway stations and airline terminals, and redesign of fare collection systems;
- Adoption of economic incentives/disincentives such as:
  - Differential parking rates for High Occupancy Vehicles (HOV) – foreseen by DOT but not implemented in Johannesburg;
  - Dedicated lanes for HOVs or buses – BRT (Bus Rapid Transit) system was the only ´dedicated lane for bus`, no dedicated lanes for HOVs were implemented;
  - Secure, weather protected bicycle storage facilities - foreseen by DOT but not implemented in Johannesburg
  - Pedestrian links between venues – implemented with certain limitations in Johannesburg;
  - A week-long valid transport card for all modes – foreseen by DOT but not available in Johannesburg
  - Park and ride areas – extensively implemented in Johannesburg;
- Establishment of a World Cup (Joint) Operations Centre and sub-centers (closed circuit television monitoring, aerial traffic control, etc.).

It is worth noting the aim to promote and support a pro PT strategy for the 2010 FWC. The main three reasons for this goal were: firstly, the high preference for PT modal choice is the best way to cope with rigid travel-time requirements and to maximize security; secondly, mobility of tourists can be advanced by PT as it provides an easy way to move around safely, effectively and cost-efficiently. This is especially important as tourists are usually unsure about local geography and road networks. Thirdly, social equity can be achieved by delivering a reasonable PT service and, additionally, the 2010 FWC can help promote the on-going development of a public transport infrastructure and services which are of vital importance for the city's sustainability and improve accessibility for all residents and tourists.

The main aspirations expected from the action plan involve the management of all transport resources, properly integrating them within contingency plans (e.g., emergency response) and disseminating these plans among stakeholders, residents and tourists. With the support of transport experts and special experience in mega-event management the DOT has

provided a list of specifications for the 2010 FWC Transport Operations Plan outlined in Appendix F.

Greening 2010

"South Africa has always viewed the hosting of the 2010 FWC not as an end in itself, but as a catalyst for development with benefits to be felt long after the tournament" (Platzky et al., 2011: 26)

The opportunity to host the 2010 FWC was defended by DEAT (2008) to be an impetus for the faster development of an efficient, sustainable and affordable public transport system that will benefit the daily travelers and the economy in the years following the event.

According to the framework for Greening 2010, presented by DEAT (2008a), six environmental focus areas were targeted: water, energy, transport, waste, biodiversity and responsible tourism, which were enriched by another four cross-cutting themes: carbon offsetting and reduction, sustainable procurement, job creation and communication (see table 8). Concerning the focus area transport, the National Greening Objectives defined mainly four goals: minimize the use of individual transport during the event; maximize the quality of PT through wide availability; good accessibility and high efficiency; diminished CO_2 emissions from the PT system to mitigate climate change impact and, lastly, to maximize the use of NMT and to provide adequate infrastructure like surfacing and lighting.

Table 8 South Africa's Conceptual Framework for Greening the 2010 FWC

Focus areas	Cross cutting themes	Outcomes	Impacts
▪ Waste ▪ Energy ▪ Transport ▪ Water ▪ Biodiversity ▪ Responsible Tourism	▪ Carbon offset and emission reduction programs ▪ Sustainable procurement ▪ Job creation ▪ Communication and outreach	▪ Environmental footprint for 2010 World Cup is reduced ▪ Legacy projects take forward benefits of Green Goal 2010 ▪ Citizens see the benefits and understand the value of responsible environmental management	▪ Impact of the event on global warming is reduced ▪ South Africa´s long- term development path becomes more sustainable
Monitoring, reporting, evaluation and impact assessment			

Source: DEAT, 2008a

7.3 The Management Phase: During the World Cup

"We must also remind ourselves that what government was able to put into this project came from the taxpayers of this country, both in the business sector and as individuals, and it is to them also that the credit must go" (Gordhan, 2010 [Finance Minister's speech])

The use of PT was highly encouraged during the 2010 FWC. A number of options were available to residents and tourists travelling to stadiums and public viewing areas[9] on the match days. Attention was given to the fact that no private vehicles were allowed within the stadium neighborhood (also in accordance with FIFA regulations). Table 9 provides a description of those options available for Johannesburg and the respective transport statistics.

Table 9 The Transport Options and Usage during 2010 FWC (Johannesburg)

	Price	Usage on match days	Additional Information
Park & Ride	Car R50.00[10]	25% of all spectators	Four allocated areas to park cars with provision of shuttle buses to the stadiums (Soccer City Stadium and Ellis Park Stadium)
Park & Walk	Car R50.00	17% of all spectators	Four allocated areas near the stadiums to park cars and walk to stadiums
BRT Rea Vaya	R12.00 and R50.00 for BRT + Bus (return)	10% of all spectators	New bus service with the aim to connect Soweto and Johannesburg (line was not entirely ready for the 2010 World Cup)
Rail Metrorail	R7.50 (one way) to R42.50 (return), dif. routes	11% of all spectators	Daily train service which was designated to transport fans to stadiums on match days, using several rail lines and additional trains
Bus Metrobus	R20.00 (one way)	19.200 spectators (not a direct FWC service)	Normal bus service to connect Westgate and Sandton
Cab (SA Cab)	R250.00 (30km Sandton to airport)	284 vehicles (regulated metered-taxi)	Commercial taxi service (higher price), however many of the taxis were working informally
Gautrain	R100.00	Route not available for the matches	New high-speed train connecting the airport and Sandton station

Source: Adapted from Dlamini, 2010

Transport integration also played an important role in mobility management for the 2010 World Cup. Daily problems with congestion and parking facilities urgently required solutions.

[9] Public viewing areas, also known as fan-parks or fan-fests, are official spaces for the public viewing of the tournament's matches which bring together thousands of supporters, even if the match is taking place elsewhere.

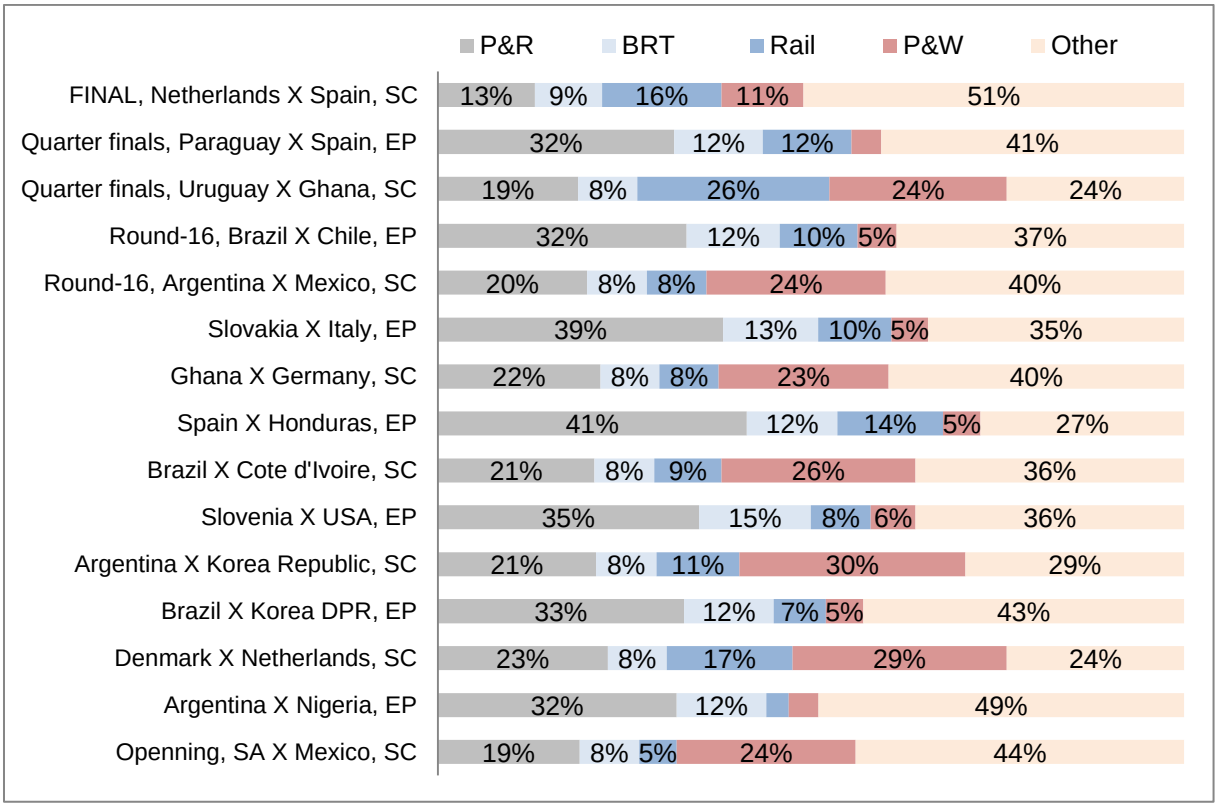
[10] 10.00 ZAR = 1.13 USD

Therefore, it was considered essential to develop an integrated transport system, including shuttle bus services, park & ride (P&R) and park & walk (P&W) facilities.

One of the main priorities during the World Cup was to reduce the regular daily trips (commuters, pupils, students and not really essential trips). Therefore, travel demand management measures were applied. An important aspect for the viability of these measures/approaches is the support received from government, business and individuals. Some specific measures that supported South Africa to manage short-term demand travel in addition to pro-PT use were: endorsement of school holidays during World Cup; incentives for worker's holidays during this period; and to offer flexible working hours on match days to avoid extra congestion generated by regular daily commuting.

Figure 26 shows the results achieved concerning the modal split during 2010 FWC. The percentage of spectators moved by public transport and using the park & ride and park & walk facilities during match days was 63%. The rest of the spectators (about 37%) were made up of VIPs and other guest groups, as well as vehicles parked in the boundary areas of the stadiums, or dropped off by metered taxis in the vicinity of the stadiums.

Figure 26 Overview of Modal Split by Match in the Host City of Johannesburg[11]



Source: ITS Engineers, 2010.

[11] ´SC` – Soccer City Stadium and ´EP`- Ellis Park Stadium

Author's observations made during the World Cup

The investments in new modal infrastructure such as Gautrain and Rea Vaya (BRT) were important. However, some precautions should have been taken, especially concerning fares, because it seems that in the end only the middle to upper class population will be able to profit from these services after FWC. For example, the fare ticket of BRT costs at least three times more than the broadly used transport in Johannesburg - the minibus-taxi. The ticket fare for the Gautrain is also elevated which may jeopardize its use among less effluent people.

To take a minibus-taxi is usually problematic as it works in an unregulated market; meaning that each one makes its own rules and therefore tourists would have difficulties to understand how to use it[12].The price is a bargaining issue which means that tourists may pay from R3.00 to R7.00 for a ride.[13]

Security was only provided in the touristic parts of the cities: around the stadium, the fan parks, and in the main district with tourism accommodations in Sandton. For tourists and residents who were accommodated in other parts of the city, security was in some cases a critical issue. The main transport modes used by those people were private car (residents) and taxi (tourists), however, with a certain level of unreliability, mainly due to congestion.

There was no appropriate timetable for PT and thus fans couldn't plan their trip to the stadium properly. Therefore, the easiest way was always to take a private taxi. Users of the Park & Ride facilities also had to face major challenges: After the games, usually there was an enormous queue to take the bus from the stadium to the Park & Ride areas, sometimes causing waiting times of over two hours.

Congestion was also a problem on match days. The roads and the main streets which connect the city center to suburbs, stadiums and Sandton were always congested (stop and go), which increased the travel time excessively.

[12] Minibus-taxis work with hand sign language which tourists are naturally unaware of.

[13] As there are no fixed prices, tourists are usually overcharged. However, compared to other transport modes this is still a reasonable price.

7.4 The Legacy: Green Goal Legacy Report

"The real legacy of the World Cup will only unfold in the years to come as its economic and social impact becomes clearer" (Political Information & Monitoring Service [PIMS], 2010: 3)

The 2010 World Cup came as a great opportunity for the South African government to support the urgent need of solving transport related problems and advancing local infrastructure in the major cities. As the DEA (2011: 115) stated "in reality, the 2010 FIFA World Cup provided the momentum to take public transport developments out of the conceptual stages and make them a reality".

The sustainability concept was taken into consideration at all stages of planning, design and implementation; for that, the development of the PT system and the promotion of NMT was a priority concern (World Cup Legacy Report, 2011). However, it is important to assess who are the main beneficiaries; residents in general or only those in direct neighborhood of the stadiums. For example, the Gautrain (Africa's first high-speed train), which was not considered as a World Cup budget project but opened only a few days before the FWC started and served mainly to transport tourists, cost R24 billion. Taking into consideration that it links the airport to the upper-class neighborhood (Sandton) for a very high fare is clearly excluding the marginalized population (PIMS, 2010). For this segment of society, there were more pressing needs, highlighting the fact that little attention was given to them in all preparatory measures to host the sports mega-event. Sindane (2008) reported some of these exclusions: Silindra, a resident of Soweto said "It has been clear from the onset that we will not get a slice of the 2010 World Cup". In many similar cases of mega-event organization marginalized people do not seem to have benefited from improvement of infrastructure and services. According to Robbins (2012), there is not clear evidence that the 2010 FWC gain has directly applied for the urban poor and marginalized people.

Attempts to go beyond the direct effects of the 2010 World Cup on transport came up with some additional remarks. According to Fowler (2012), in the City's performance report, a number of targets were met and even exceeded. The Rea Vaya for instance, reached an average of 30,000 passengers per day against a target of 20,000. Raising these remarks, it seems that some of the strategies applied during the World Cup (e.g., restriction of car in the vicinity of stadiums) forced car users to use PT and NMT as a travel mode.

The residents' acceptance of the new modalities and the improvement of already existing travel modes, as well as the transport initiatives, such as Park & Ride and Park & Walk, were positive. As DEA (2011: 115) underlined "many people took the trains for the first time in

years". In this way, one of the key legacies presented by the 2010 FWC was the opportunity to change travel behavior in favor of sustainability. These news opportunities and experiences worked in a complementary way to raise new awareness for more environmentally friendly transport options and to promote a shift in habit, maybe even affecting long-term travel behavior after the sports mega-event.

A range of lessons to be learnt from the 2010 World Cup in the field of transport were presented by ITS (Innovation-Transportation-Solutions, 2010) engineers. A selection of relevant proposals is presented in appendix G.

7.5 Conclusion

The acceptance of public transport as an alternative mode during the 2010 FWC exceeded expectations. Indeed, there were a number of options available to residents and tourists to travel to and from the stadium on match days. This change of urban spaces from predominantly individual transport to a “greener” transport is an important point in the achievement of a sustainable mobility legacy for the future. Transport upgrades, mainly referring to PT, will be enjoyed by future generations of residents of the South African host cities. Besides, these upgrades created the basic potential for new and innovative ways of encouraging middle- to upper-class residents to use PT even if they have a private car available.

Furthermore, the government strategy, with the support of business and individuals, of managing travel demand of regular daily travel, such as trips to work and school, played a considerable role in reducing the already existing pressure within the transport system. Transport event management thus proved to be fundamental for transport operations.

All these newly built and upgraded transport infrastructures and implemented mobility management strategies were fundamental for South Africa since for decades this sector had been neglected and had received inadequate support and investment.

From a more holistic point of view, finance minister Gordhan (2010) said that the most important legacy of the 2010 FWC was “the renewed confidence in us as a nation that hosting the FWC has brought about. For a country, with such a conflict history, huge social problems and lack of financial support to be capable of holding one of the major sport-events in the world is, without doubt, a lift in self-confidence. Indubitably there is no space for comparisons, especially with the ´riches` World Cup; the South Africans did not worry so much about offering the best World Cup, but rather offering a good event within their capacity and minimizing the risks”. South Africa did well and very well if considering its limitations.

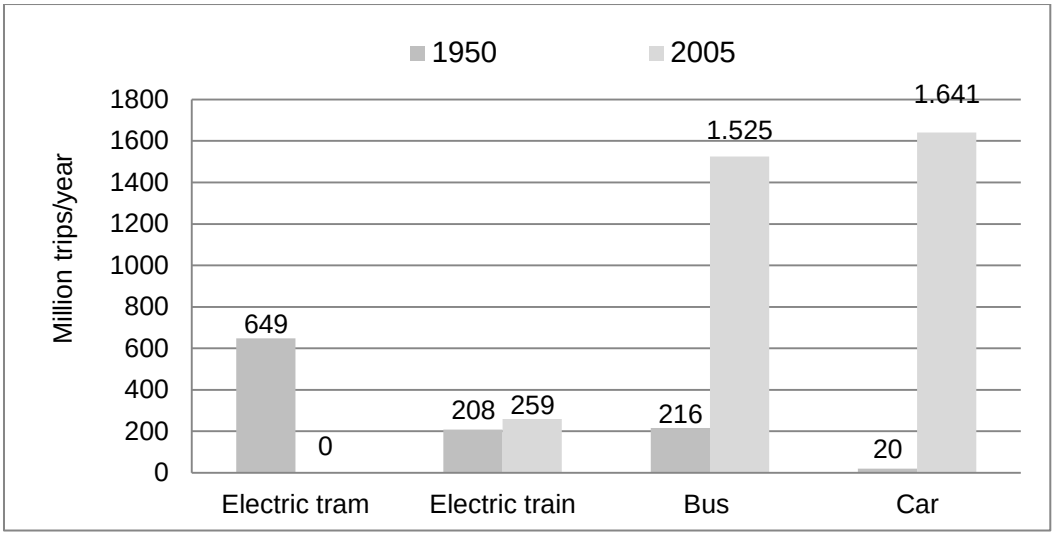
8. BRAZIL 2014 FIFA WORLD CUP

Brazil has been selected to organize the FWC for the 2nd time and will become the 2nd country to have hosted a FWC in Latin America (Mexico). The 2014 FIFA World Cup will be followed within two years by another even bigger sports mega-event, the Olympics in the city of Rio de Janeiro, where the lessons learnt from 2014 FWC can be applied for optimization and the 2016 Olympics shall benefit extensively from the 2014 FWC experience.

8.1 Brief Profile of Urban Mobility in Brazil

Transport is a key element of urban development. Both aspects have strong mutual influences on each other and thus should determine the goal of integrating transport and urban development planning in a holistic perspective. The intense urban growth that Brazilian cities have been experiencing since 1950 in many cases resulted in precarious and underfinanced transport systems with negative social, environmental and economic impacts for the respective urban communities (Instituto de Pesquisa Econômica Aplicada [IPEA], 2011). Intensive urban growth was accompanied by an intense increase in motorization rates, especially through cars and buses. Figure 27 illustrates this development for the city of Rio de Janeiro in two distinct years, 1950 and 2005.

Figure 27 Urban Mobility Distribution in Number of Trips by Vehicle in the city of Rio de Janeiro



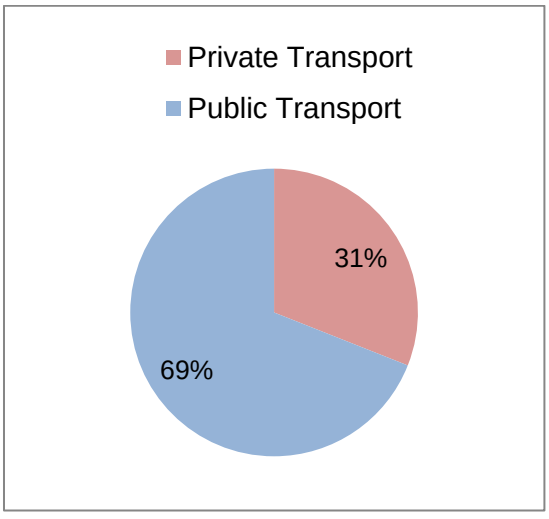
Source: ANTP[14] and GEIPOT[15] (IPEA, 2011)

[14] Associação Nacional de Transportes Públicos
[15] Empresa Brasileira de Planejamento de Transportes (disestablished)

The changes highlighted here for Rio de Janeiro are in principle characteristic for many major Brazilian cities concerning the shift in their mobility profile. The electric trams have given space to buses and, with regard to individual transport, car use has become dominant. Cities have changed from a public mobility based on electric energy, to new patterns that combine public and private mobility but heavily depend on carbon and mostly fossil fuels. Fortunately, nowadays in Brazil the biofuels like ethanol have, increasingly, being offered as a cleaner alternative to fossil fuels. According to Kohlhepp (2010), in Brazil biofuels produced from sugar cane have since several decades also been receiving strong political support.

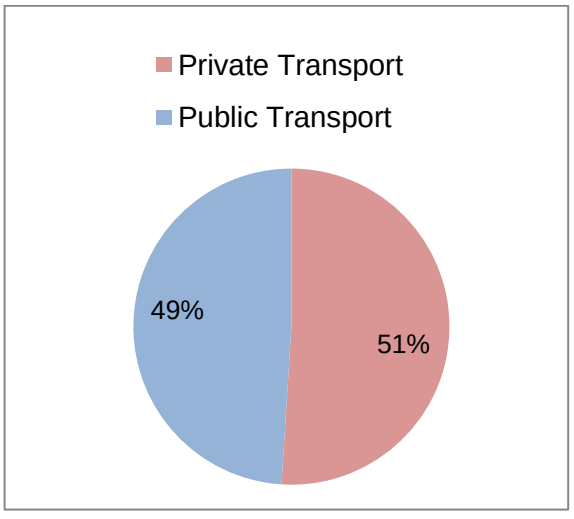
Additionally, in recent years the use of public transport has been decreasing while motorized individual transport has increased. These developments have enormous negative consequences contradicting the concept of sustainability in the transport sector: increasing socially inequality concerning the access to mobility options and increasing environmental and social externalities, such as pollution, congestion and accidents. Figures 28 and 29 show a comparison of transport modes between 1977 and 2005 for the biggest cities and the metropolitan areas of Brazil.

Figure 28 Share of Public and Private Transport in Metropolitan Areas in Brazil - 1977



Source: Adapted from GEIPOT (IPEA, 2011)

Figure 29 Share of Public and Private Transport in Metropolitan Areas in Brazil - 2005



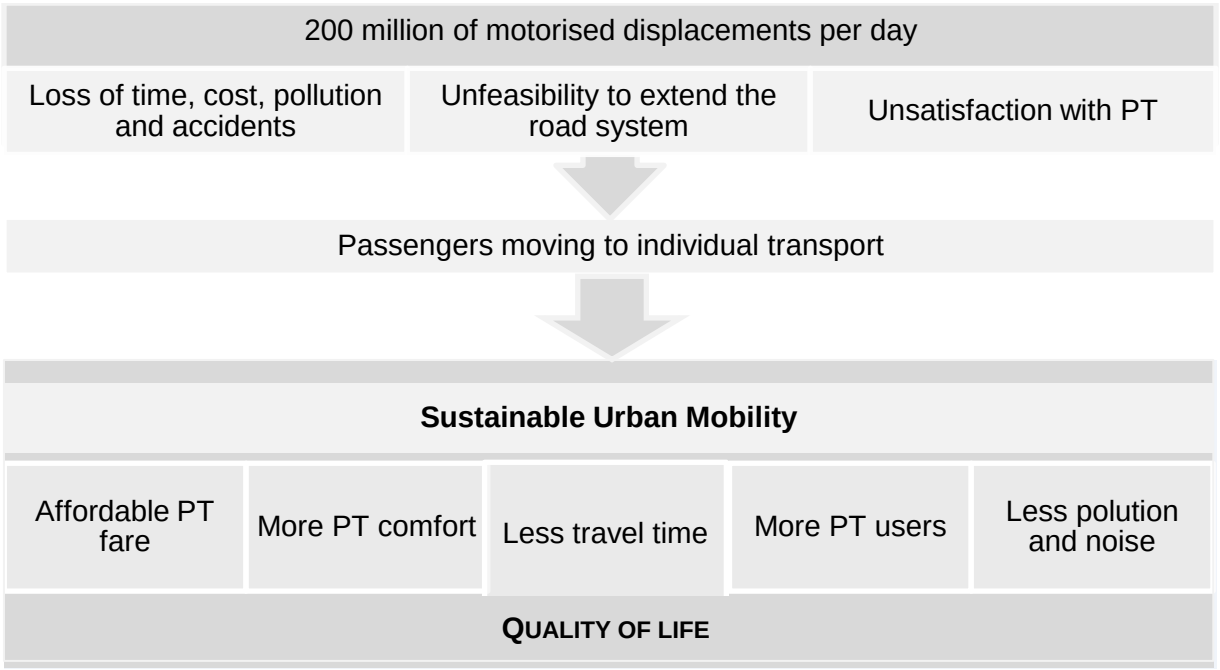
Source: ANTP (IPEA, 2011)

With more than half of the Brazilian population living in metropolitan areas, the big cities are facing far reaching infrastructural problems, aggravated by the steep growth without proper planning, especially in the field of transport.

As outlined in figure 30, there are around 200 million motorized displacements per day in Brazil. The mobility profile together with users' dissatisfaction is determining the high use of

individual transport. As mentioned above, this new mobility profile entails many negative externalities, especially to the environment. The policy-makers are facing a dilemma: the right to mobility for all segments of society versus the limitations and difficulties to provide quality services at affordable prices for the entire population. The solution is complex and therefore the planning of urban mobility needs to be designed in a multidisciplinary context to provide benefits to all segments of society and to the environment.

Figure 30 How to Face the Increase of Individual Transport



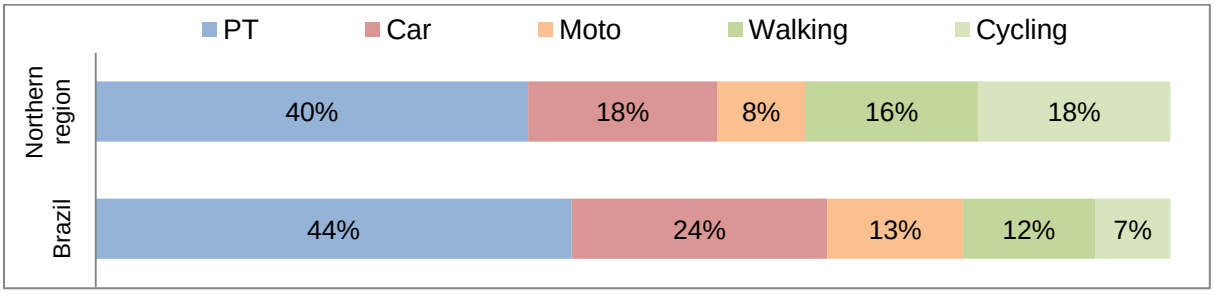
Source: Adapted from Secretaria de Estado de Planejamento e Desenvolvimento Economico [SEPLAN], 2009

8.2 Brief Profile of Urban Mobility in the Northern Region

The analysis of urban mobility in the city of Manaus is essential to identify problems and propose solutions. This subchapter highlights some mobility characteristics in Brazil (national average) and within the Northern region of Brazil (Manaus), according to the Indicators' System of Social Perception (SIPS – Sistema de Indicadores de Percepção Social).

Figure 31 shows that the main transport mode used by Brazilian commuters is public transport (44%), followed by car (23%). Cyclist and pedestrians represent only 12% and 7%, respectively. Analyzing the Northern region, NMT is more prominent and the car, compared to the national average, is less used.

Figure 31 Modal Split for Local Mobility in the Northern Region and Brazil

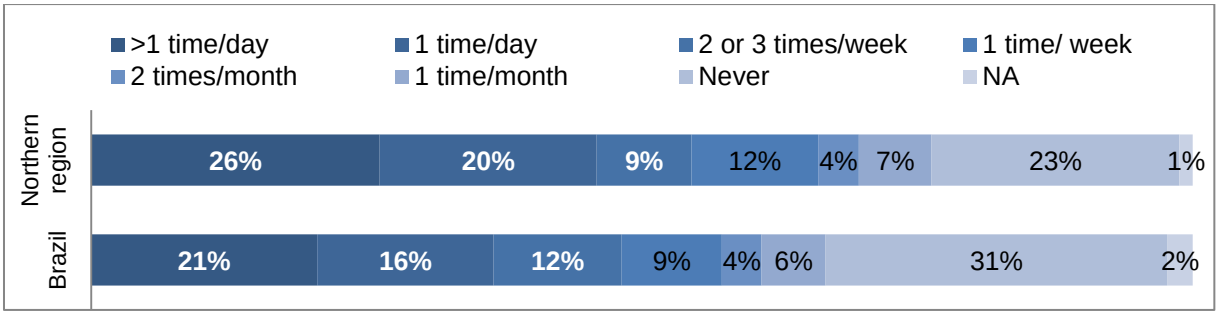


Source: adapted from SIPS, 2010 (IPEA, 2011)

Congestion

Congestion has been noticeable in metropolitan cities nationally; Manaus is no exception. Congestion may be the result of the low quality of the PT system and service, but also of inadequate road infrastructure. In figure 32, the number of people facing congestion more than once a day is higher in the Northern region (26%) than the national average (21%).

Figure 32 Congestion Frequency in the Northern Region and Brazil

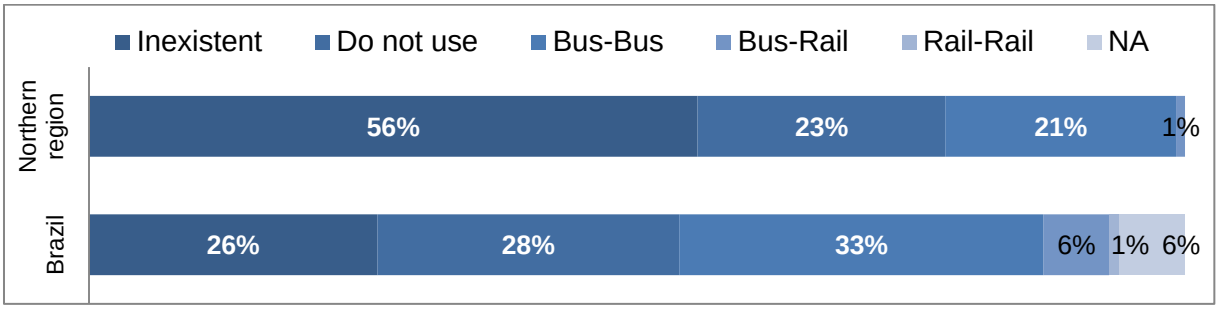


Source: adapted from SIPS, 2010 (IPEA, 2011)

Transport integration

According to figure 33, around 56% of respondents claimed that there is no transport integration in the Northern region, while the national average is 26%.

Figure 33 Transport Mode Integration in Daily Mobility in the Northern Region and Brazil

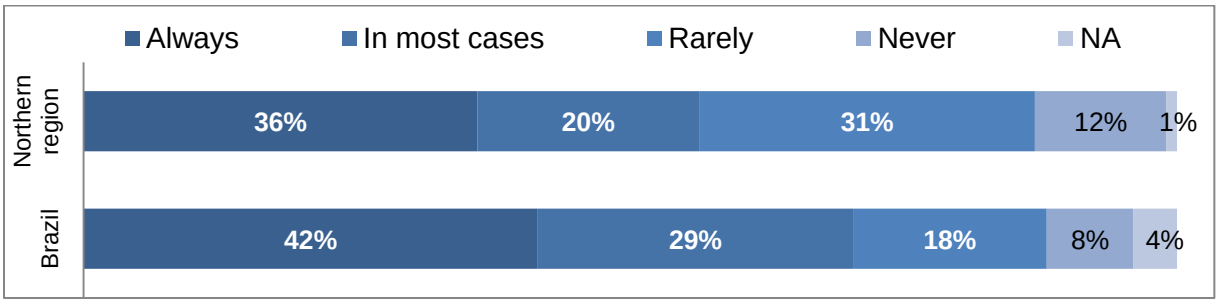


Source: adapted from SIPS, 2010 (IPEA, 2011)

Punctuality

Figure 34 illustrates the punctuality of PT service. Compared with the national average, 42% state that there are always delays. In the Northern region, 12% state there is never a delay in PT.

Figure 34 Public Transport Service in the Northern Region and Brazil - Punctuality



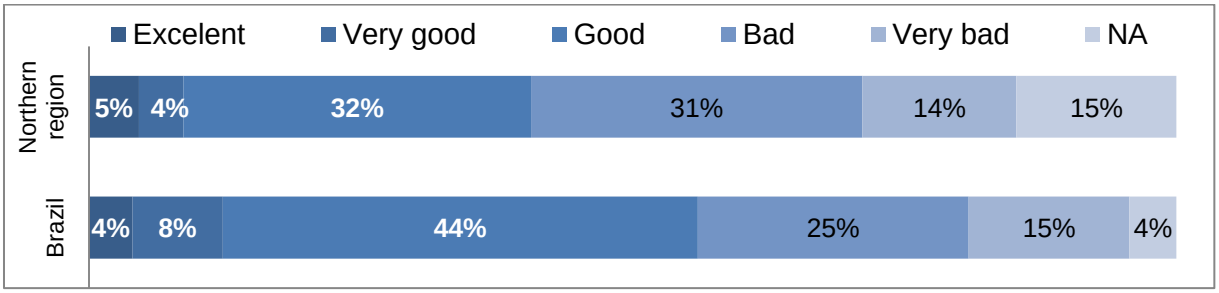
Source: adapted from SIPS, 2010 (IPEA, 2011)

Signposting

Figure 35 demonstrates an important aspect which is also relevant to tourism: the clarity of signposting for orientation within a city. The following evaluation reflects the perception of users with own vehicles and the easiness/difficulty to reach a certain place within a city. The population's perception with regards to signposting shows that in the Northern region 45% of

the respondents find signposting bad or very bad, with the national average slightly lower at 40%.

Figure 35 Signposting for Local Mobility in the Northern Region and Brazil

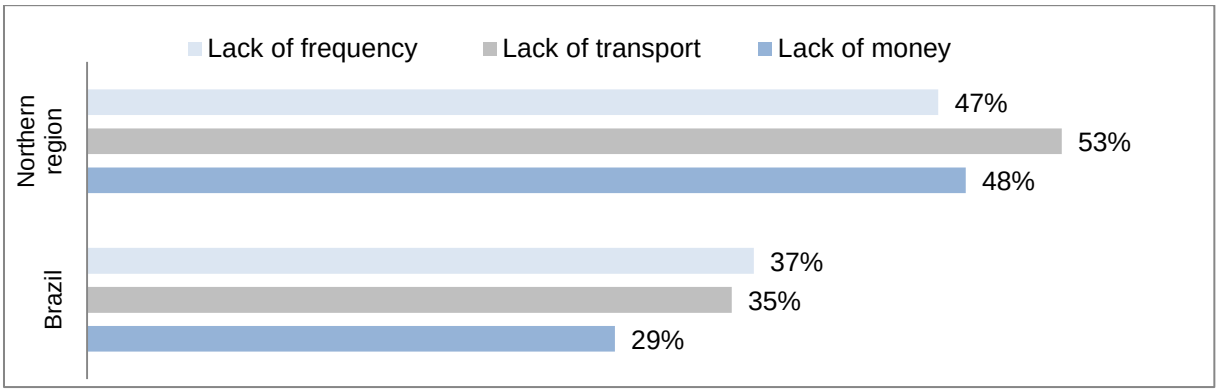


Source: adapted from SIPS, 2010 (IPEA, 2011)

Behavior abandonment

Figure 36 refers to times when the population dropped out or had to use other transport modes due to three reasons: lack of money, lack of transport, lack of service at the required time. Around 49% of the respondents in the Northern region gave up due to lack of money, (national average: 29%), 54% due to lack of transport (national average: 35%) and 47% due to the lack of frequent service (national average: 37%). These high percentages clearly reflect an undermining in the right to come and go of the population in Northern region.

Figure 36 Reasons for Choosing another Transport Mode in the Northern Region and Brazil



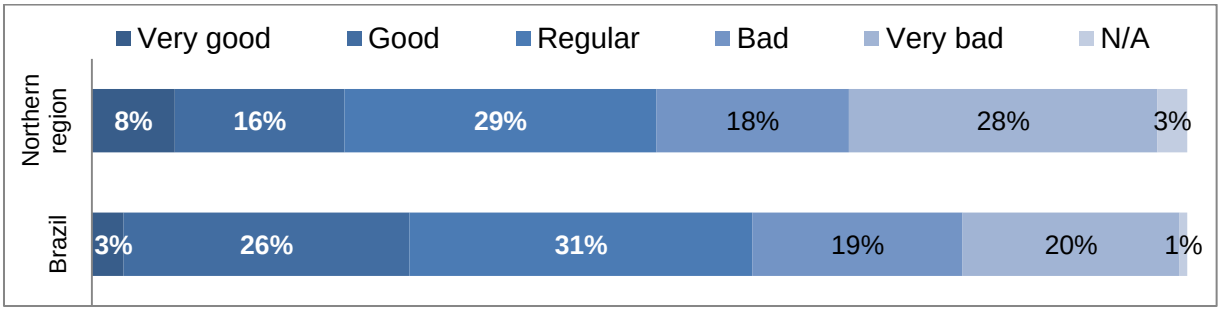
Source: adapted from SIPS, 2010 (IPEA, 2011)

PT quality

Figure 37 illustrates the user perception of the quality of the system and service of PT. Nationally, less than 20% of the respondents evaluate PT as very bad. In the Northern region

however, 28% gave this negative opinion. Including the responses ´very bad` and ´bad`, the Northern region reaches a level of 46% whereas the national average stays at 39%.

Figure 37 Perceived Public Transport Quality in the Northern Region and Brazil

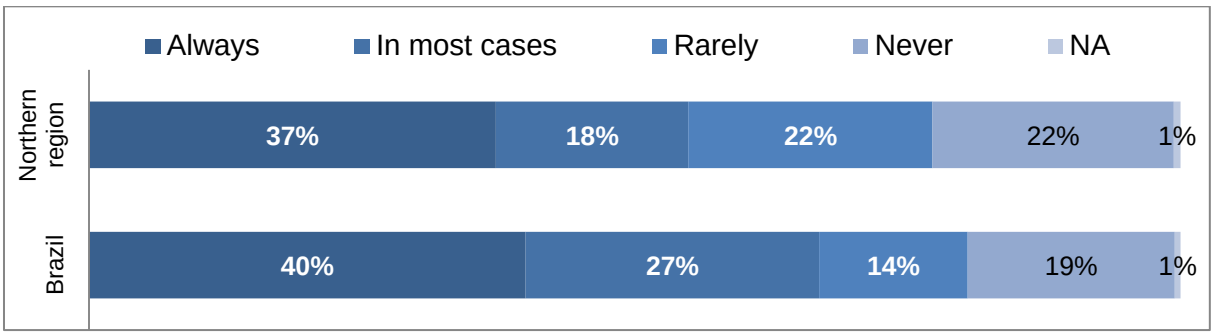


Source: adapted from SIPS, 2010 (IPEA, 2011)

Safety and security

Figure 38 shows the perceived level of security of users with regard to their most used transport mode. The data shows that 67% of respondents felt ´always` or ´most` safe with their modal choice, and 33% ´never` or ´rarely` felt safe.

Figure 38 Perceived Security/Safety with Chosen Transport Mode in the Northern Region and Brazil

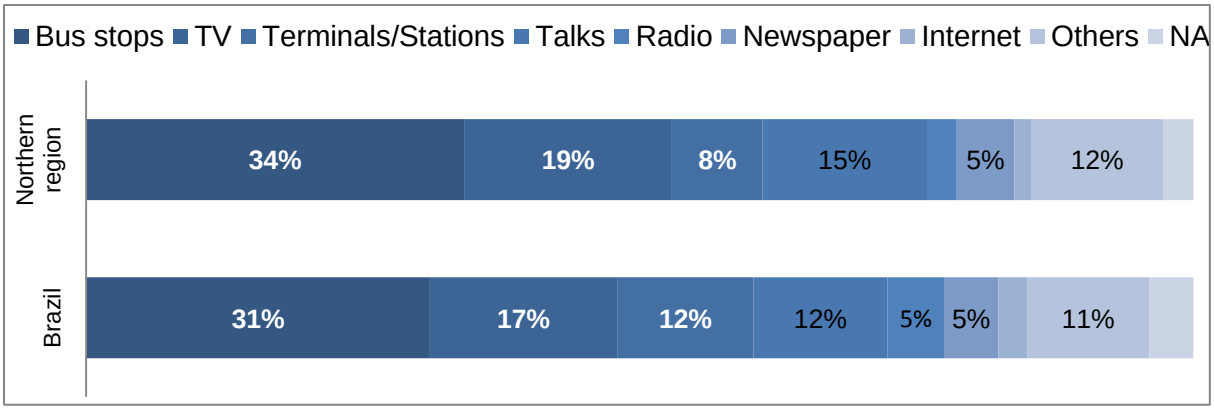


Source: adapted from SIPS, 2010 (IPEA, 2011)

Information availability

Figure 39 presents the most important sources of information for residents with regards to transport choices. Bus stops are the main source of information nationally (31%) and in the Northern region (34%). TV, terminals and stations as well as informal sources (personal conversations) also play an important role in the process of information gathering by users. Clearly, there is an unexplored potential for the internet which is especially essential to provide pre-travel information, above all for tourists.

Figure 39 Main Sources of Travel Information in the Northern Region and Brazil

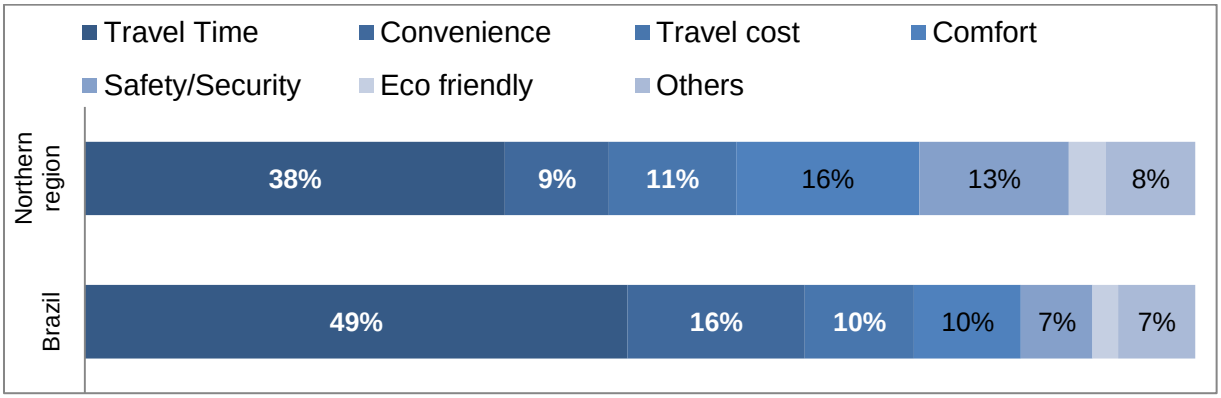


Source: adapted from SIPS, 2010 (IPEA, 2011)

Important factors and main reason for travel mode choice

Figure 40 indicates the main criteria that users take into consideration when they assess the different transport modes. Travel time is the most important factor in all Brazilian regions. For the national average the second most chosen criterion is convenience (e.g., the distance between home and the bus stop may be perceived as inconvenient to walk; at the same time to take the car from/to home may be perceived as very convenient), in the Northern region the second most important factor is comfort.

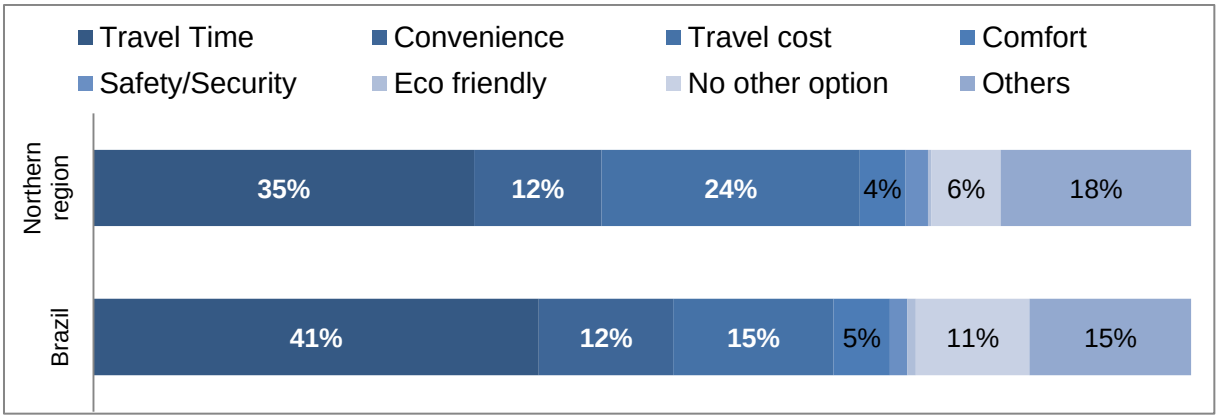
Figure 40 Characteristics for a Good Transport in the Northern Region and Brazil



Source: adapted from SIPS, 2010 (IPEA, 2011)

The main reason why respondents have chosen the most intensively used travel mode is shown in figure 41. Again, travel time is the main factor for modal choice. Travel costs are the second most important criterion nationally (15%) and in the Northern region (24%).

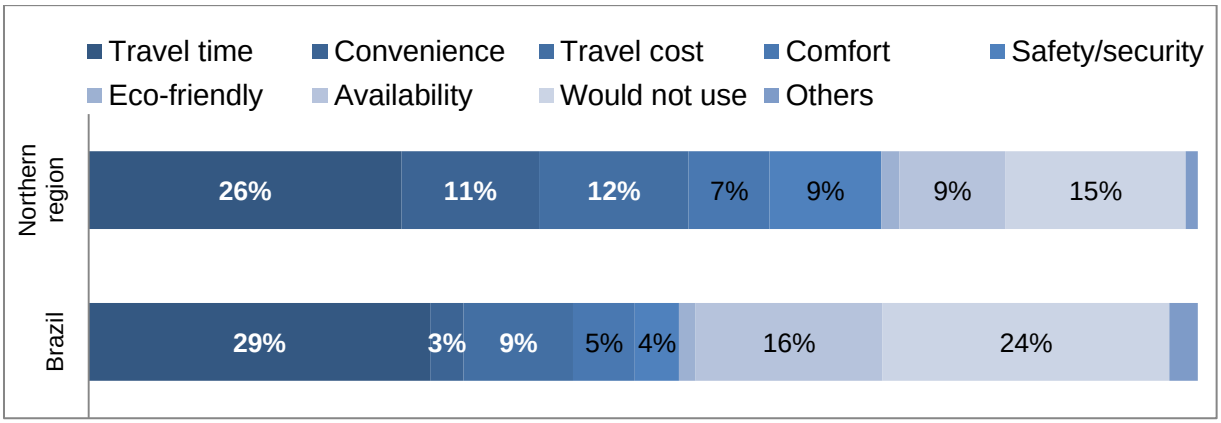
Figure 41 Reasons for Daily Choice of Transport Mode in the Northern Region and Brazil



Source: adapted from SIPS, 2010 (IPEA, 2011)

Figure 42 shows the results to the question of what could make non PT users actually use PT. Travel time, availability and travel costs seem to be the most important facilitating conditions nationally. In the Northern region the most important factors would be travel time, comfort and travel costs. It is worth mentioning that a considerable portion of respondents said that they would not change behavior or they would not use PT under any circumstances (15% in the Northern region and 24% in national average).

Figure 42 Facilitating Conditions for Public Transport Use in the Northern Region and Brazil



Source: adapted from SIPS, 2010 (IPEA, 2011)

8.3 Transport and Development in Manaus

Manaus is the capital of the State of Amazonas and considered the main metropolitan center of the Northern region. Manaus covers an area of 11,401 km^2 and in 2010 had a population of 1,802,525 inhabitants (IBGE, 2011), being the 8th biggest city of Brazil.

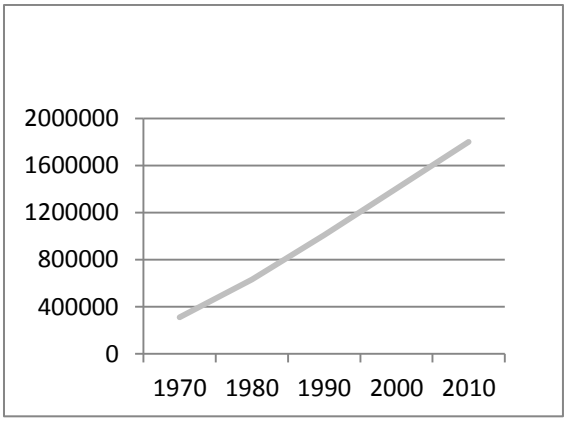
Manaus developed its first phase of economic prosperity during the two rubber booms (in the late 19th century and during World War II). Its strategic location and prominent role in the extractive industry made it a major city in the Amazon region. A reflection of this period of affluence is to be found in the mansions and monuments of Manaus, such as the Amazonas Opera House, opened in 1896. The rubber boom ended around 1910 and subsequently Manaus went into decline and only entered a period of renewed development in the 1950s.

The 1960s brought deep changes in the economy, as the national government created a set of economic incentives to establish an industrial pool in Manaus. In 1966 Manaus was declared a free-trade zone (Zona Franca de Manaus). Industrial activity has taken-off in the last 15 years, with a huge presence of high-tech companies which benefit from tax incentives (or even tax exemption). The free-trade based retail throughput declined in the early' 90s when the government reduced import tariffs for the whole country, but with the free-trade zone still in place, manufacturing carries on. The Manaus Industrial Park has today more than 400 companies, many of them with a worldwide scope, and generates more than 50,000 direct and 350,000 indirect jobs. Currently, the total generated turnover is over US$ 10 billion.

As a result of these economic incentives, immigration to Manaus intensified considerably. Within just a few decades the city's population grew to 1,8 million inhabitants. According to the IBGE census, the population increased from 173,000 inhabitants in 1960 to 311,622 inhabitants in 1970. In percentage, the city's population growth between 1960 and 1970 was 79% while between 1970 and 1980 it reached 103%. In the period 2000 to 2010 population growth went down to 28% (see figure 43).

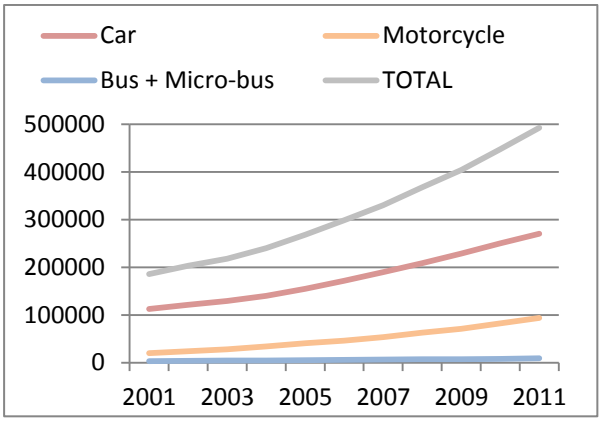
As figure 44 shows, in 2001 the vehicle fleet in Manaus was around 112,000 cars, 20,000 motorcycles, 3,600 buses, summing up to a total fleet of 186,000 vehicles (not including trucks). By exactly 10 years later, the vehicle fleet had experienced a growth of 141% in cars, 370% in motorcycles, 150% in buses and 164% in the total volume. Considering the biggest cities in Brazil, between 2001 and 2009, the vehicle fleets' average growth was only 76,5% (Departmento Nacional de Trânsito [DENATRAN], 2011). With 1,802,525 inhabitants and 492,237 vehicles, the city of Manaus has for every 3,6 residents one vehicle available and thus a gross motorization rate of 273 vehicles per 1,000 inhabitants.

Figure 43 Population Growth - Manaus



Source: adapted from IBGE, 2010

Figure 44 Vehicle Fleet Growth - Manaus



Source: adapted from DENATRAN, 2011

Due to the limited attention paid by the state, the road system in Manaus grew just as a result of the growth of settlement areas, but insufficiently and inadequately with regard to the capacities at certain bottle-necks within the road network. In this sense it is correct to say that the government, instead of being ahead of the city's growth process and the road system's growth, was behind it (Souza, 2009). The result is that, nowadays, the city suffers from a severely unsuitable urban road infrastructure compared to its size. In addition to the limited number of trunk roads, they are mostly too narrow and winding. The secondary roads show the same characteristics, making it difficult to use them as alternative routes to escape from congestion. As a result of the deficient road infrastructure, the main corridors are congested not only during peak hours but usually all day long.

The PT system of Manaus is based on a network of bus lines. The system plays an important role in daily mobility of the city. The fare is one of the highest among the Brazilian capitals (R$ 2.75[16]). The bus system transports almost 800,000 people daily on nearly 300 bus lines which are operated by several private companies. Note that the current bus system has a great overlap in lines and that the urgently needed expansion of PT travel volumes on the main roads of the city is hampered by critical physical constraints.

Cycling and walking are limited within the city, mainly, because of inappropriate or even missing infrastructure. The lack of cycling lanes inhibits the increase of bicycle use; additionally the few cycle lanes implemented are found only at certain areas such as parks, clearly underlining the leisure character of this transport means. The proposal presented by the Municipal Institute of Traffic and Transportation (IMTT) for the construction of bicycle

[16] US$ 1.40

lanes at strategic points of the city has not been implemented appropriately. Additionally, sidewalks are often constructed in an irregular way posing many obstacles to pedestrians and above all to persons with physical disabilities. Often sidewalks are invaded by homeowners and traders and used for their individual purposes. Trees, utility poles, and trade stands (newspaper, food, etc.) complete the list of obstacles that hinder and sometimes even make it impossible to use sidewalks (Souza, 2009).

Some measures to promote NMT can already be seen in Manaus. For example, in 2007 the first "day without my car" was organized. Others NMT related studies promoting mobility management have been developed for Manaus, for instance to promote bicycle use within the campus of the Federal University of Amazonas (Kuwahara et al., 2008).

Since 2008, the city has adopted mitigation measures to alleviate the problems caused by traffic such as parking restrictions (e.g., Blue Zone) and limited access for trucks and cargo vehicles within the city-center during certain hours. Undoubtedly, these measures are insufficient to systematically solve the overall transport problems of the metropolis. A long-term solution for urban mobility needs to take into account the growing vehicle fleet and the need to reserve spaces for pedestrians. Over the last years, with the opportunity to host the 2014 FWC in Manaus, the possibilities of constructing two new transport modes in Manaus, a Monorail and a BRT system have been analyzed.

8.4 Tourism in Manaus

Manaus is an important center for ecological tourism. One of its most popular attractions is the Ponta Negra beach, 13 kilometers from the city center, where, when the river is low, the sands are exposed right down to the river bed, forming a beautiful contrast with the dark waters of the river itself. There is also the forested area of the National Research Institute of Amazonia (INPA), a complex made up of the Botanical Gardens, rich in plant species from the Amazon region, and the Zoological Gardens, which contain various animal species of the region, including some facing extinction. For the visitor who wishes to learn more of the history and way of life of the Amazonian tribes, Manaus has several important museums: the Indian Museum, with a large collection of objects from the indigenous peoples of the upper Negro river; the Amazonian Natural Science Museum, where a large variety of embalmed animals and insects can be seen; the Museum of Northern Man, which has a collection of objects illustrating the way of life, customs and culture of the local people; and the Port Museum, with a collection of historical items, documents, plans and instruments.

Manaus is also the main departure point for trips into the Amazon region, as it is the heart of Amazonia and thus the hub of tourism on the rivers and to the jungle lodges.

The Amazon region's share of the Brazilian tourism industry is relatively small, it accounts for 5% of all tourism establishments and 7% of all tourism-related employment (Ministério do Turismo [MTur], 2008). Nevertheless, tourism-related employment in Amazonia showed a growth of 47% between 2002 and 2006, which is far above the average growth of 14% for Brazil as a whole (Ros-Tonen & Werneck, 2009). Furthermore, the number of tourists (national and international) in Manaus has increased by 25% between 2006 and 2008 (SEPLAN, 2009).

Manaus can be reached by air (Eduardo Gomes International Airport - third largest Brazilian airport in terms of cargo), by road (interregional and international buses from Venezuela) and by river boat (multiple ports on the Amazon, all the way upstream from Peru or downstream from Belem). The port of Manaus is the largest floating port in the world with a total area of 94,923 m^2.

8.5 Brazil, Transport and World Cup

"One hundred and ninety million people will turn the World Cup into the greatest party in the world, a party of much joy and good organization. The world should prepare itself to become more Brazilian as of 2014. ´Brazilianize` will be the new verb conjugated by the planet. I can assure you that FIFA 2014 World Cup in Brazil will be a perfect and unforgettable celebration. The entire world is already invited"
(Ricardo Teixeira, 2010 [speech given by the president of the ´Brazilian Confederation of Football` in Johannesburg, when the country officially launched the ´Journey to the 2014 World Cup`])

The 2014 FIFA World Cup will be the 20th FIFA World Cup. It will take place in Brazil from 12 June to 13 July 2014. This will be the second time the country has hosted the competition, the first being the 1950 FIFA World Cup. The 2014 FWC in Brazil is organized in 12 host cities: Belo Horizonte, Brasilia, Cuiaba, Curitiba, Fortaleza, Manaus, Natal, Porto Alegre, Recife, Rio de Janeiro, Salvador, and São Paulo. For the country this is an important chance to show the mosaic of Brazilian landscapes and seascapes and the vibrant culture of each peculiar region of Brazil, from the Amazon's heart in Manaus to the diversity of climates and sceneries of the other eleven host cities.

Brazil is motivated to host a world-class sports mega-event in two years time, in the hope of enjoying the possible long-term benefits arising from it. However, in order to achieve this, a major effort must be made in the planning and operation of adequate transport in the host cities. Urban and transport planners must take this unique opportunity to upgrade and build sustainable transport systems in the host cities within a relatively short period of time (see figure 45).

8.5.1 Brazilian Host Cities and the Mobility Challenge during the Mega-Event

Nations around the world are struggling to accommodate their cities within mobility systems that are more efficient, effective, and ultimately more sustainable through reducing dependence on cars. In Brazil, the challenge arises from the growth of the metropolitan cities, together with the lack of investment in public transport and inadequate public policies, largely favoring motorized individual over public transport in terms of infrastructure investment and fiscal policies, thus worsening the framework conditions of metropolises to

improve their transport situation in a sustainable way. This leads to a scenario which combines a growing loss of mobility (for instance through congestion) with the loss of economic sustainability of the more effective and environmentally friendly modes. The disadvantageous effects of motorized individual transport on the mobility situation of an urban population have been emphasized by Dupuy (1995), the car disturbs accessibility standards that govern the use of urban space. Once an individual has a car, there are many possibilities, but if not, access is restrained.

Figure 45 Host cities and Transport Upgrade Projects for the 2014 FWC in Brazil

Curitiba 1 BRT project 2 road projects 1 monitoring project 3 corridor projects 1 requalification project 1 terminal project	**Salvador** 1 BRT project	**Rio de Janeiro** 1 BRT project	**São Paulo** 1 monorail project
Brasília 1 VLT project 1 road project	**Natal** 1 corridor project 2 road projects	**Cuiabá** 2 BRT projects 1 corridor project	**Manaus** 1 BRT project 1 monorail project
Fortaleza 3 BRT projects 1 VLT project 1 subway project 1 corridor project	**Recife** 2 BRT projects 2 corridor projects 1 terminal project	**Belo Horizonte** 6 BRT projects 1 road project 1 monitoring project	**Porto Alegre** 2 BRT projects 3 corridor projects 1 monitoring project

Source: Thesis' author

Brazil, a country of almost 200 million inhabitants with an additional 3 million tourists expected to flock to South America's largest country for the 2014 FWC, will need to be prepared to deliver reasonable mobility services to residents and tourists. There is no ´quick fix` solution for the different realities of each host city that could be applied generally. The most important recommendation is planning (Bovy, 2004). This encompasses a whole range from strategic infrastructure planning and the operational planning, to communication and

information of the different actors involved with the FWC. Additionally, these transport upgrade projects must be inserted into a long-term strategy and integrated into urban planning concepts. Otherwise there is a great set of under-usage after the FWC. Similarly, if there is no continuity after the World Cup, the widespread transport problems will just be temporarily alleviated and then return in the short or middle-term.

Table 10 Overview of Distances and Transport System in the Host Cities of 2006, 2010 and 2014 FWC

	2006 FWC Germany	**2010 FWC South Africa**	**2014 FWC Brazil**
Host cities/distances			
<250 km	3	3	1
250 – 500 km	7	3	2
500- 1000 km	2	2	2
1000- 2500 km	-	1	6
>2500 Km	-	-	1
Average distance in km[17]	400	450	1400
Longest distance betw. cities	600	1550	3150
Transport system (availability, capacity)			
Motorways + highways	★★★★★	★	★
Railway	★★★★★	★	-
Airports	★★★★★	★★★	★[18]

Source: Bovy, 2011

Analyzing table 10, it becomes evident that the challenges facing Brazil in managing the mobility of national and international tourists between the host cities, under the current conditions of transport logistics in Brazil, will be a matter of great concern. It will require strategic planning to cope with such great distances, in most cases only possible by air craft. However, even the airport infrastructure is considered alarming in many host cities at the level represented by and international event like the World Cup. There is a lack of airport capacity to meet the influx for the 2014 FWC as many of the airports of the host cities already operate close to their full capacity. Where distances can be managed by road transport, tourists will often face precarious and unsafe infrastructure. Table 10 highlights only some of these problems that go beyond the scope of this study. The focus here shall be to look at urban mobility management challenges, analyzing in detail the situation of the case study host city of Manaus.

Confirming this challenge, Melo (2012) writes that during the 2014 FWC, it is very reasonable to assume that daily mobility problems will be worsened. He adds that, given the distances

[17] Flight distances (often much shorter than land transport)

[18] Except Sao Paulo (★★★★) and Rio de Janeiro (★★★)

and the operating conditions of roads, airports and railways in Brazil, traveling between the Brazilian host cities will be very expensive and lengthy. It is evident that the negative environmental impacts arising from the trips between the host cities are even much more severe than those stemming from urban mobility. It will be the task of further studies, however, to focus on this specific inter-city mobility challenge.

8.5.2 **Manaus, Transport and 2014 World Cup**

The monorail and the BRT are the two major projects in urban mobility that have been planned to prepare the city of Manaus for the extraordinary challenge of the 2014 FWC. The monorail is a project to be financed by the state government and, according to the bidding, will be built by the companies ´CR Almeida e Mendes Júnior` and ´Malasi` (responsible for the construction of the monorail in Kuala Lumpur). The BRT is a World Cup project of the city government, the consortium ´Construbase – AS Paulista` will be responsible for execution of the BRT system.

Bus Rapid Transit (BRT)

In an attempt to address the urban mobility problem in Manaus, the local government has decided to implement a BRT system, a bus corridor to connect exclusively the eastern districts to the city center. The BRT system should reach a length of 23 Km and its costs are estimated at R$ 223 million (US$ 109 million) The design is similar to the ´Express` bus-based system created at the beginning of the decade and which, because of many failures, was not completed until today. The integration of the terminals shall be adjusted to integrate the new system. One of the advantages mentioned by the government is the much lower investment cost if compared with modes like subway and Light Rail Train (LRT). The km/capacity ratio, that have been projected for some host cities, is attractive for operations of this size due to the fact that the ideal operational capacity is between 15 thousand and 35 thousand passengers per hour in each direction at peak times. However, an important feature to be considered is that the system may be saturated in the middle-term, as is the case in the Colombian capital Bogotá which after 10 years is now studying the implementation of a complementary but much more costly metro system, offering roughly the double capacity compared to the existing BRT road transport system.

Monorail

To complete the ring road of Manaus, the government of Amazonas has planned to build a monorail system. It will be an investment of R$ 1.4 billion (US$ 760 million) and will be constructed by companies that are part of the Manaus Monorail Consortium (Portal 2014, 2012). The monorail is composed of two corridors: the north-central and east-central. The first will link the most populous neighborhoods with downtown, passing in front of the Amazon Arena – the venue for the 2014 FWC matches in Manaus. It will also connect existing terminals.

This monorail can carry 170,000 passengers per day and the time economy can be up to one hour compared to road transport. The monorail project has been presented as a sustainable, safe and comfortable system with good accessibility. It is based on a new technology that reduces nuisance and emissions and is suitable to Manaus´ framework conditions and its city environment.

8.6 Conclusion

Analyzing the population's perception of urban mobility through the ´System of Indicators for Social Perception` allows concluding that the Northern region has not received adequate support from local, state and national governments with regards to urban mobility: the indicators are for most categories worse than the national average.

In general, public policies still favor investments for motorized individual transport and its respective infrastructure. Fiscal policies often disfavor public transport and facilitate MIT, provoking a chaotic transport situation in many Brazilian metropolises.

In Manaus the possibilities to build two new transport systems, Monorail and Bus Rapid Transit (BRT) have been explored to prepare the city to host the 2014 FWC. The proposed solutions show a great potential to cope also with the daily traffic problems of the Amazonian metropolis (Farah, 2010). Nonetheless, the proposed solutions must be evaluated cautiously: the monorail system is effective but expensive and takes much more time to be implemented. The BRT is feasible and practical to implement and therefore helps to solve a major transport problem of the city in the short-term. However, it may be not be effective enough in the long-term since the city has faced intense population growth in the past years.

Moreover, the BRT and Monorail have been launched far too late and therefore have hardly any chance to be ready before the 2014 FWC, missing out the great opportunity to boost transport capacities for this singular sports mega-event and ensuring at the same time that a World Cup can bring long-lasting benefits to the whole population of Manaus. In this scenario, it is difficult to visualize a timely and effective solution for the 2014 FWC mobility demands in Manaus.

Such transport system investments would obviously not be justified by only considering the short period of the FWC mega-event. But the probably lost opportunity of creating a positive long-term legacy through the 2014 FWC in terms of an improved urban mobility situation in Manaus is regrettable.

Conclusion Literature Review

A general model to analyze the sustainability of mega-events does not yet exist, probably due to their relatively small impact in comparison to the large and diverse urban economies in which these events take place. However, behavior change towards a culture of sustainability is a key legacy for the host city and country. The long-term benefit of reducing traffic flows and related transport emissions by offering more attractive alternatives to commuters in a pro-car culture can be one of the major positive impacts of green sports mega-events. For this reason, a review of the literature aiming to analyze the relevant behavior theories and their significance for the specific theoretical framework within the scope of this study was fundamental.

Although transport is an essential feature of urban development it is remarkable that most of the host cities have been suffering impacts generated by increased urbanization, modernization, population growth and unsustainable consumption patterns. The latter involve a boost in private car sales, attributed to the fact that in many developing economies car ownership is regarded as an important status symbol of a growing middle and upper class (Diekstra & Kroon, 1997; Sheller & Urry, 2000). The private car is often the preferred transport mode of the population. This preference comes from the fact that users enjoy the specific advantages that this mode provides (Vasconcellos, 2001). As underlined by Souza (2001), the car is a transport means which gains its attractiveness from several unique benefits, but finally shows the worst results when compared with other urban transport mode.

It is expected that investing in road infrastructure will not improve the road traffic situation considerably in the long term (Dimitriou & Banjo, 1990). Instead, it is likely to lead to even more car use and thus greater traffic volumes and consequently congestion. The most effective solution for daily traffic problems and for coping with the peak demand generated during mega-events is to promote public transport.

Investment in new transport modes as the projected BRT and Monorail systems which are not only faster and more environmentally friendly but also better integrate the city and allow the inclusion of substantially more people can surely provide better long-term solutions for the urban mobility problems of a metropolis. These new infrastructures, coupled with the government incentives and strategies to promote sustainable transport modes instead of the private car, would strongly benefit sound mobility management for 2014 FWC by relieving the traffic flow and congestion problems. In parallel the up-scaling of the public transport infrastructure would help reduce greenhouse gas (GHG) emissions, thus contributing to sustainable development of the host city as a whole and in the long run.

Another important point relates to the population, residents and tourists alike, since its support and involvement is of utmost importance to extend the long-term effects of the benefits generated by hosting a mega-event. It is justifiable to study the population's behavior since its inclusion in the decision-making process plays a key role, not only in the performance of any mega-event, but also for the adjustment of preparatory measures to the general needs of the host city's society as a whole. Turco (1998) and Waitt (2003) remark that, if no attention and consideration is given to the residents' opinion, this may well discourage and endanger the support of the population to cope with the manifold challenges that hosting of a sports mega-event poses to the people of the respective community.

DATA ANALYSIS & HYPOTHESES

The overall purpose of the empirical studies in South Africa and Brazil is to identify and test how factors, aspects, behaviors and attitudes towards mobility and transport may lead to an optimization and promotion of sustainable mobility for the 2014 FWC. The two case-studies relate to transport behavior and attitudes. However, the case-study of South Africa is used as comparative and complementary data for the main case-study, the 2014 FWC in Manaus, Brazil. The hypotheses are developed considering some of the influences outlined in the behavior theories/models and also envisaging the variables selected throughout the literature review. The hypotheses do not transpose the research question but provide statistical reinforcement to answer the research questions on an empirical basis.

9. CASE- STUDY SOUTH AFRICA – HYPOTHESES

The descriptive analyses as well as the inferential statistics test for each hypothesis are given in the technical appendix (H1SA - H4SA) in more detail. Figures are used throughout the hypothesis to display percentages and mean values (unless otherwise stated). In some instances the percentages do not sum up to 100% because multiple responses were possible.

Hypothesis 1 Relating to Modal Choice and Satisfaction Level (H1SA)

Testable hypothesis: Transport satisfaction varies significantly between different modal choices and between tourists and residents.

The level of satisfaction within the modal choice is outlined in figure 46. Residents are generally more satisfied (higher means). An exception is metro/rail, where tourists are more satisfied (mean=4,5) than residents (mean=3,8). However, there were only few respondents here (2 tourists, 10 residents), so this result should not be over-interpreted.

Figure 46 Level of Satisfaction with Modal Choice during the 2010 World Cup

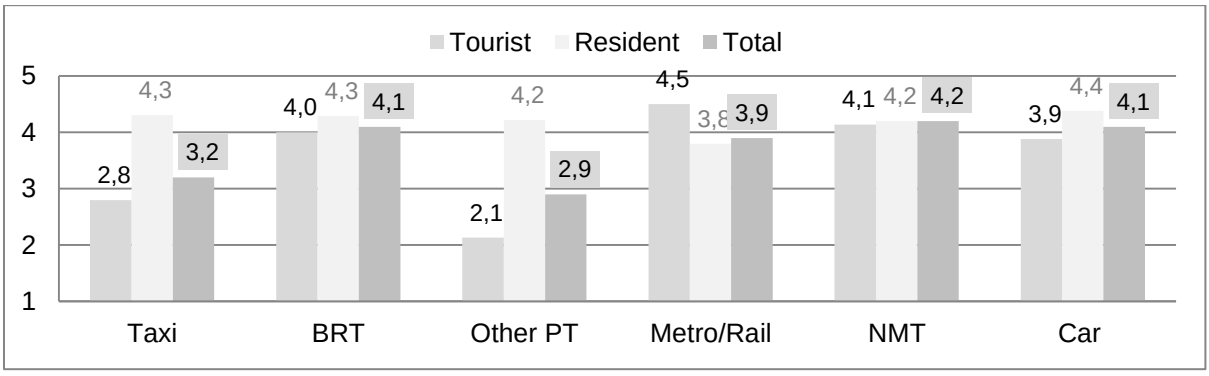


Table 11 Model Summary[a] - H1SA

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,368[a]	,136	,117	1,193

a. Predictors: (Constant), Walk/Cycle, Metro/Rail, Other PT, BRT, Taxi

Regression analysis: R^2=0,136, means that 13,6% of the variance in satisfaction can be explained by the independent variables, the modal choice. It is plausible that this figure is not very high: satisfaction cannot be determined by modal choice alone, but also by other factors.

Table 12 ANOVA[b] - H1SA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	50,474	5	10,095	7,094	,000[a]

a. Predictors: (Constant), Walk/Cycle, Metro/Rail, Other PT, BRT, Taxi
b. Dependent variable: Mode of Transport Satisfaction (recoded)

This ANOVA table uses sums of squares to determine whether the model delivers an overall contribution to the explanation of satisfaction. It can be concluded that modal choice contributes significantly to explaining transport satisfaction (p<0,0005, therefore p<0,05, which is statistically significant).

Table 13 Coefficients[a] – H1SA

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4,097	,118		34,857	,000
	Taxi	-,889	,208	-,284	-4,263	,000
	BRT	,046	,254	,012	,180	,857
	Other PT	-1,180	,270	-,284	-4,366	,000
	Metro/Rail	-,180	,364	-,032	-,496	,620
	NMT	,079	,312	,016	,254	,800

a. Dependent Variable: Transport Satisfaction (recoded)

Table 13 lists all the coefficients. Choosing a taxi brings about a significantly lower satisfaction than going by car (B=-0,889, p<0,0005). The regression coefficient B means: Taxi satisfaction is, statistically by 0,889 scale units (on a scale from 1=not at all satisfied to 5=very satisfied), lower than satisfaction in car transport. Other PT show a significantly lower satisfaction level than car (B=-1,180, e.g., satisfaction is, according to the model, by 1,1 scale units lower; p<0,0005). The BRT vs. car comparison is irrelevant (p=0,857), as well as the metro/rail vs. car comparison (p=0,620) and the NMT vs. car comparison (p=0,800). All these coefficients are close to 0.

Table 14 Model Summary – H1SA

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,464[a]	,215	,194	1,139

a. Predictors: (Constant), tourist Cluster 1: tourist vs. resident, other PT, NMT, BRT, Metro/Rail, Taxi

When comparing the clusters of tourists with residents, R^2 is a bit higher now, 21,5% of the variance in satisfaction can be explained when taking into account both cluster and modal choice. In this case, the added variable turned out to be expressive. So the adjusted R^2 is higher than R^2 in the previous model, but a little lower than the unadjusted R^2 in the current model.

Table 15 ANOVA[b] – H1SA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	80,146	6	13,358	10,295	,000[a]

a. Predictors: (Constant), tourist Cluster 1: tourist vs. resident, other PT, NMT, BRT, Metro/Rail, Taxi
b. Dependent Variable: Transport Satisfaction (recoded)

The model in table 15 shows overall significance (p<0,0005).

Table 16 Coefficients[a] – H1SA

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4,518	,143		31,687	,000
	Taxi	-,765	,201	-,245	-3,810	,000
	BRT	-,001	,243	,000	-,006	,996
	Other PT	-1,134	,258	-,273	-4,390	,000
	Metro/Rail	-,476	,353	-,083	-1,350	,178
	NMT	-,034	,299	-,007	-,112	,911
	tourist cluster 1: tourists vs. residents	-,747	,156	-,292	-4,782	,000

a. Dependent Variable: Transport Satisfaction (recoded)

According to the model in table 16, tourists are significantly less satisfied than residents (by 0,747 scale units; p<0,0005). However, the other effects hardly changed. Controlling for cluster 1 (tourists vs. residents), only taxi and other PT led to significantly lower satisfaction levels, compared to the choice of a car.

According to this model, satisfaction can be determined as follows:

Satisfaction = 4,518 – 0,765*Taxi - 0,001*BRT - 1,134*OtherPT – 0,476*MetroRail -0,034 * NMT - 0,747*tourist.

It is possible to calculate examples in which level of satisfaction the model would predict certain combinations of independent variables. The common coding is 0 for “not selected” and 1 for “selected”. Example: tourists (value 1) who go by taxi:

Satisfaction = 4,518 – 0,765*1 - 0,001*0 - 1,134*0 – 0,476*0 -0,034*0 - 0,747*1 = 3,006.

In other words, for tourists going by taxi, the model predicts a “neutral” satisfaction level of 3 on a (recoded) scale from 1 to 5. Residents going by car have, according to the model, a clearly higher satisfaction: Satisfaction = 4,518. “Car” and “resident” are the reference categories, so we can enter 0 for all other options, which leaves only the constant in the equation.

It is interesting to see that tourists are significantly less satisfied than residents, and that going by car corresponds to a significantly higher satisfaction than choosing taxi and other PT.

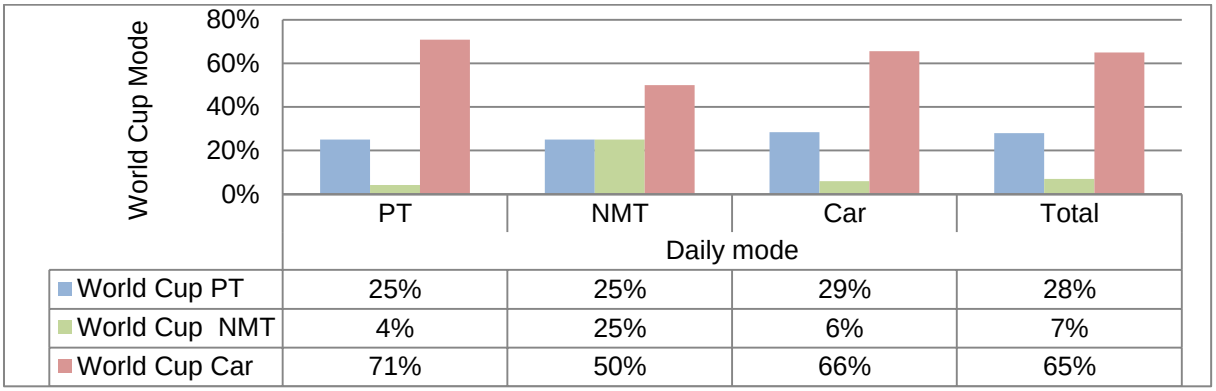
The hypothesis can be accepted as modal choice contributes significantly to explaining transport satisfaction, but not very strongly, as only 13.6% of the variance in satisfaction can be explained by modal choice. Tourists are significantly less satisfied than residents.

Hypothesis 2 Relating to Modal Choice during 2010 FWC and Beyond (H2SA)

Testable hypothesis: There is a positive correlation between the choice of the transport mode during the 2010 FWC and the choice of the transport mode for daily mobility.

To make results more comparable, the mode of local transport was recoded: BRT, other PT, metro/rail = Public Transport; and taxi and car = Car (see figure 47).

Figure 47 2010 World Cup Transport Mode versus Daily Transport Mode



	PT	NMT	Car	Total
World Cup PT	25%	25%	29%	28%
World Cup NMT	4%	25%	6%	7%
World Cup Car	71%	50%	66%	65%

According to the selected column (% of daily mode), 25% of those who selected PT as a daily mode, did so during the FWC. However, 71% of those who select PT as a daily mode went by car during the FWC. NMT is a rather rare choice. Most of those who usually choose public transport went by car during the FWC. Those who usually go by car are most consistent in their modal choice: 66% also went by car during the World Cup; however, almost one third (29%) switched to PT.

Table 17 Symmetric Measures – H2SA

		Value	Approx. Sig.
Nominal by Nominal	Contingency Coefficient	,257	,014
N of Valid Cases		176	

As a statistical measure, the contingency coefficient is designed to correlate nominal (categorical) variables. The coefficient is 0,257; p=0,014 which is significant (p<0,05). The coefficient is scaled between 0 (no association) and 1 (very strong association), assuming that the modal choices are (of course) associated, but not too strongly, which means the modal choice differs to some extent between daily life and the special World Cup situation.

The hypothesis can be accepted as there is a correlation between the ´travel mode choice for the World Cup` and ´the daily travel mode`, but this correlation is not very strong.

Hypothesis 3 Relating to Information Evaluation and Transport Mode Satisfaction (H3SA)

Testable hypothesis: There is a positive correlation between information evaluation and transport mode satisfaction during the 2010 FWC.

Both variables (satisfaction and information) are ordinal and suitable for correlation.

Table 18 Correlations – H3SA

		Transport Satisfaction	Information Evaluation
Transport Satisfaction	Pearson Correlation	1	,303**
	Sig. (2-tailed)		,000
	N	232	230

**. Correlation is significant at the 0.01 level (2-tailed).

The correlation coefficient is 0,303 and its possible range extends from -1 to +1. Interpreting the direction (sign) shows a positive correlation meaning that the higher the information evaluation the higher the satisfaction. This relationship is statistically significant (at 1% level). However, a ´perfect` correlation would be documented by a coefficient close to 1. Being considerably smaller than 1 means: while there is a clear and significant tendency that higher evaluation values go along with higher satisfaction, this does not hold true for each and every individual. So there might be people who found the information provided on transport options very helpful, but were not satisfied, and vice versa.

The analysis is split to get separate results for car users and non-car users.

Table 19 Correlation[a] Cluster Car Users (Spearman's Rho) – H3SA

		Transport Satisfaction	Information Evaluation
Transport Satisfaction	Correlation Coefficient	1,000	,284**
	Sig. (2-tailed)	.	,000
	N	151	150

**. Correlation is significant at the 0.01 level (2-tailed).
a. Cluster Car users/Non-car users = Car users

Table 20 Correlation[a] Cluster Non-Car Users (Spearman's Rho) – H3SA

		Transport Satisfaction	Information Evaluation
Transport Satisfaction	Correlation Coefficient	1,000	,325**
	Sig. (2-tailed)	.	,003
	N	81	80

**. Correlation is significant at the 0.01 level (2-tailed).
a. Cluster Car users/Non-car users = Non-car users

The hypothesis can be accepted as ´information evaluation` and ´transport mode choice satisfaction` are correlated. These correlations are positive and significant for both car users and non-car users. Note that for non-car users the correlation is slightly higher than for car users (0,325 and 0,284 respectively). This means that information evaluation brings a high value of satisfaction among the non-car users if compared to car users.

Hypothesis 4 Relating to Possible Reasons for Modal Choice (H4SA)

Testable hypothesis: The items eco-friendly, comfort, travel time, travel cost, safety/security are significant in explaining the use or not of a car among tourists during the 2010 FWC.

Car users include car and taxi; Non-car users include public transport and NMT. However, the coefficients do not provide a significant contribution to the choice of the transport mode.

Table 21 Omnibus Tests of Model Coefficients – H4SA

		Chi-square	df	Sig.
Step 1	Model	6,018	7	,538

Table 22 Variables in the Equation – H4SA

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Eco Friendly	-,131	,195	,451	1	,502	,877
	Comfort	,133	,231	,331	1	,565	1,142
	Punctuality	,120	,309	,151	1	,698	1,128
	Safety	-,212	,283	,559	1	,455	,809
	Travel cost	,288	,223	1,668	1	,197	1,334
	Travel time	,047	,263	,032	1	,858	1,048
	Security	-,327	,310	1,114	1	,291	,721
	Constant	-,407	1,041	,153	1	,696	,666

a. Variable(s) entered on step 1: Eco-friendly (Eco), Comfort (Comf), Punctuality (Punct), Safety (Safe), Travel cost (Cost), Travel time (Time), Security (Secu).

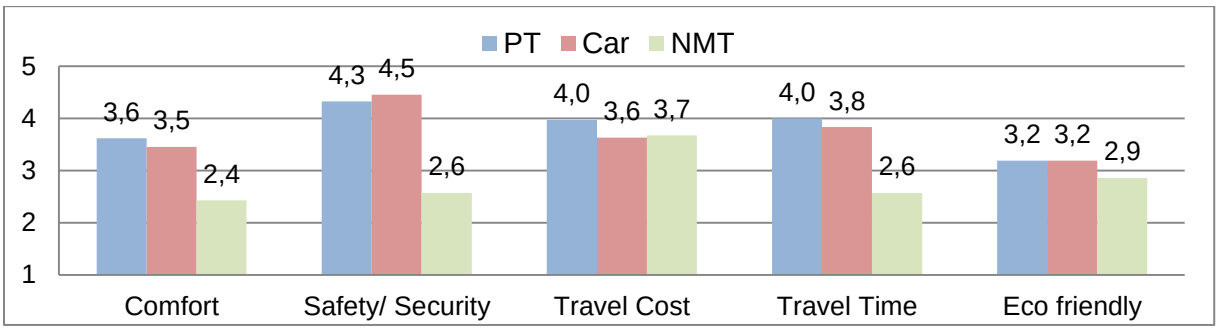
Table 22 presents the main results of the model. The significance levels (before last column) illustrate that none of these variables make a significant contribution to explain whether a tourist chooses a car or not.

The regression coefficients (first column) display effects on the estimation of events; representing the tendency for the given factors (variables) in influencing the travel mode choice, compared to the reference category – Non-car users. Signs can be interpreted in terms of positive and negative effects (note that none of the effects is statistically significant). The variables are recoded (the higher the number, the higher the importance).

Exp(B) is SPSS's reference to *odds ratio*. Odds represent ratios between probabilities (not choosing a car) divided by the opposite probability (choosing a car). Looking at odds ratios, 1 is neutral (meaning "no effect"). Odds ratios (OR) < 1 indicate negative effects; ORs > 1 indicate positive effects. An example for interpretation: If security is rated higher (by one scale unit), the OR of choosing public transport are lower by a factor of 0,721 or 27,9% (100% - 72,1%) than the OR of choosing to go by car (note that this effect is not significant).

Some more descriptions on the importance of ratings and transport modes are given below. The aspects safety and security were grouped and ´means` recalculated. Some differences are noteworthy, but also linked to small Ns.

Figure 48 Reasons for Transport Mode Choice in 2010 World Cup (Means Report)



According to figure 48, the most important items for defining the PT and car mode use are safety/security and travel time. Whereas both of them have means (recoded) which reach category 4 ´important`, the lowest important aspect is the environmental friendliness. The main aspects for defining NMT choice are travel costs, followed by environmental concerns.

According to the T-test (see appendix) ´safety and security` are not significant at a 5% level, but ´marginally` significant at a 10% level (p=0,088 and p=0,062, respectively). All other variables are not even marginally significant.

The hypothesis cannot be accepted as the main result of this mode shows that the importance ratings for the items: environmental friendliness, comfort, travel time, safety and travel cost do not help predict whether a tourist chooses to go by car or not.

The last model insufficiently answered why people prefer going by car, but according to the theoretical background, a reasonable answer could be given through the variable of income. Assuming that in a country like South Africa the car is a status symbol, if someone can afford it, he will most probably opt for this means of transportation. And if someone owns a car, he wants to use it. It can be assumed that one of the reasons for using PT is that users can't afford a car (so called "captive riders"). To find out whether income can be a satisfactory answer, logistic regression is performed.

Table 23 Omnibus Tests of Model Coefficients – H4SA

		Chi-square	df	Sig.
Step 1	Step	5,933	4	,204

Not significant overall, but when analyzing each variable separately in a regression model, class A has a significant effect when compared with class E (reference category).

Table 24 Variables in the Equation – H4SA

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	ClassA	-1,099	,524	4,388	1	,036	,333
	ClassB	-,928	,486	3,650	1	,056	,395
	ClassC	-,550	,509	1,168	1	,280	,577
	ClassD	-,368	,585	,396	1	,529	,692
	Constant	,000	,392	,000	1	1,000	1,000

a. Variable(s) entered on step 1: ClassA, ClassB, ClassC, ClassD.

Respondents with income class A have significantly lower odds (factor of 0,333) of being a non-car user than respondents with income class E (→ all results are compared to the reference category); p=0,036.

For respondents in income class A, the odds of choosing PT are lower than for respondents whose income is classified in group E., the odds of choosing public transport are by a factor of 0,333 or 66,7% (1 – 0,333 or 100% - 33,3%) lower than the odds of choosing to go by car and this effect is significant at the 5% level (p=0,036; p<0,05). Class B vs. Class E is only marginally significant at the 10% level (p=0,056; p<0,1).

The hypothesis can be accepted as ´income` is a reasonable factor in explaining why people use PT transport or not. The higher the income the lower the odds are of choosing PT.

10. CASE-STUDY BRAZIL – HYPOTHESES

Descriptive analyses as well as some inferential statistics tests for each hypothesis are detailed in the appendix (H1BR – H8BR). Figures are used throughout the hypothesis to display percentages and mean values (unless stated otherwise). In some instances the percentages do not sum up to 100% because multiple responses were possible.

Hypothesis 1 Relating to Transport Mode Satisfaction (H1BR)

Testable hypothesis: The relationships between car-users/non-car users and transport mode satisfaction are significant. Car-users are more satisfied than non-car users.

Theories/models: Expected-Utility Theory

To check whether the satisfaction items are normally distributed the ´One-Sample Kolmogorov-Smirnov Test` is performed. For all 6 items, this assumption does not hold ($p<0,0005$). Therefore, it can be concluded that satisfaction is not normally distributed. Considering that a) satisfaction is not really measured on a metric scale and b) it is not normally distributed, it is recommended to use a non-parametric test rather than a parametric one to determine differences between car users and non-car users.

Figure 49 shows an overview of the satisfaction level means. The car users are more satisfied than non-car users for all of the 6 analyzed items: comfort, travel time, traffic, safety/security, convenience and general satisfaction. Car users have a higher satisfaction with comfort and convenience (3,93 and 3,52, respectively, on a scale from 1=´very unsatisfied` to 5=´very satisfied`) and a lower satisfaction with traffic/congestion (means reaching 2,3). Non-car users seem to be unsatisfied with almost all items.

Figure 49 Satisfaction Level (Means Report)

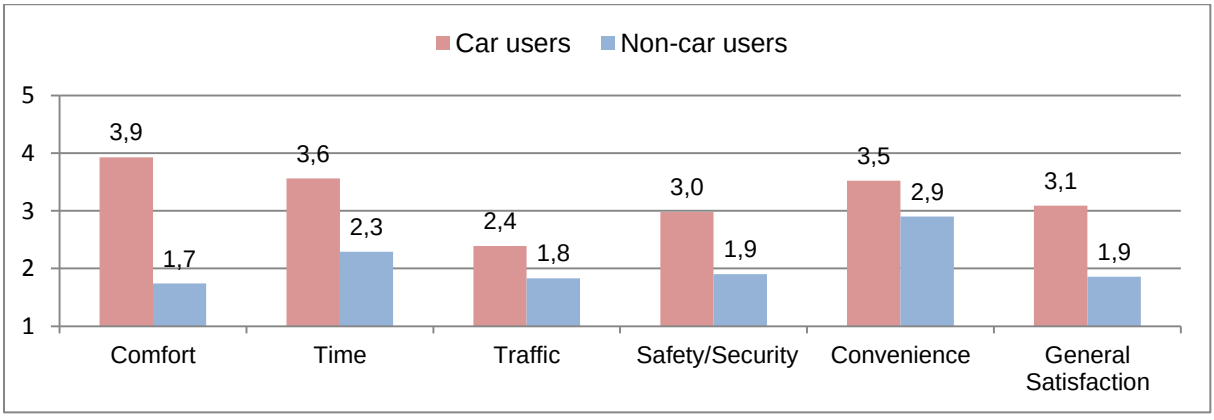


Table 25 Test Statistics[a] – H1BR

	Comfort	Time	Traffic	Safety	Security	Convenience	General Satisfaction
Mann-Whitney U	7460,000	14562,000	21146,000	17656,000	13264,500	21488,000	13683,500
Asymp. Sig. (2-tailed)	,000	,000	,000	,000	,000	,000	,000

a. Grouping variable: Cluster2, Cluster Car users/Non-car users

According to the nonparametric Mann-Whitney-U-Test (see table 25), the differences between car users and non-car users are significant for each of the modal satisfaction items ($p<0,0005$).

The T-Test (see appendix H1BR) comes to the same conclusion: Car users are significantly more satisfied. The Levene Test, which tests the assumption that variances in the two groups are equal, except for modal satisfaction concerning ´convenience`, reveals that this assumption does not hold ($p<0,05$). If this assumption is violated, then it interprets the second (lower) line for each satisfaction item.

The hypothesis can be accepted as the differences between car users and non-car users are significant for each of the satisfaction items and car users are significantly more satisfied than non-car users.

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Hypothesis 2 Relating to the Use of Non-Motorized Transport (H2BR)

Testable hypothesis I: Non-car user rate ´NMT implementation` for 2014 FWC is more important than the car user rate.

Testable hypothesis II: Among people who use NMT as a travel mode the intention to often use NMT as a travel mode for the 2014 FWC is more frequent than among people who more rarely use NMT as a travel mode.

Theories/models: Model of Pro-environmental behavior and Theory of Interpersonal Behavior

The reported means are rather high (above four) in both groups, so there seems to be a widespread agreement that the use of NMT is desirable, both among car users and non-car users.

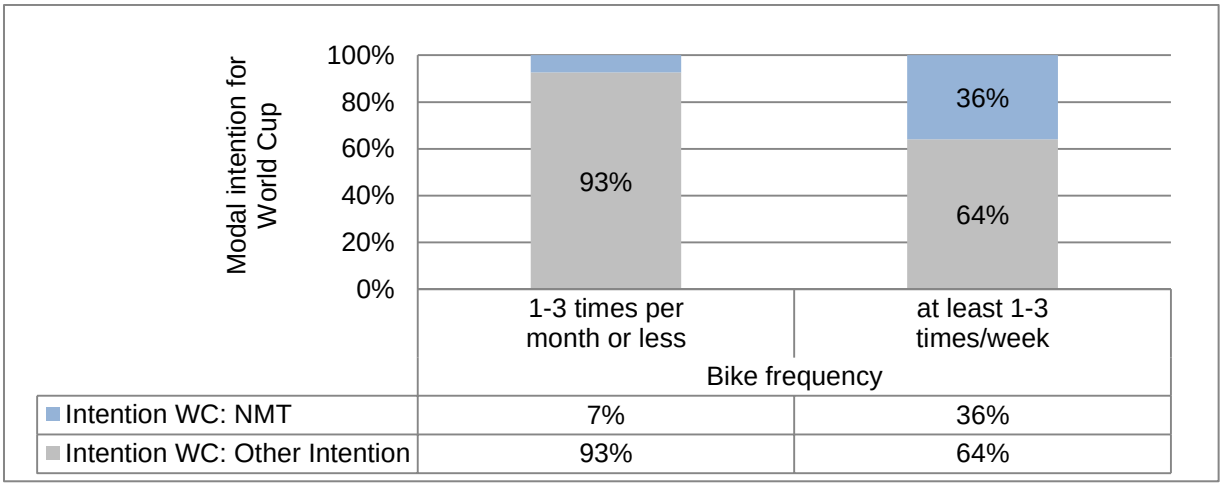
Table 26 Independent Samples Test - Levene Test Significance – H2BR

		Levene's Test for Equality of Variances		T-Test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
NMT implementation	Equal variances assumed	,480	,489	-,183	515	,854	-,020	,110	-,236	,196
	Equal variances not assumed			-,178	324,726	,859	-,020	,113	-,243	,203

However, the difference in importance rating of NMT implementation between car users and non-car users is not significant according to the T-test. According to the Levene test significance (see table 26), the assumption of equal variances in the two groups holds. Therefore, the upper line of the T-test is interpreted: P=0,854 (>0,05, not significant).

When exploring bike use frequency (as a daily transport mode) versus the intention to use NMT during the FWC the following was found: NMT is favored for the FWC by 36% of those who use the bike at least 1-3 times per week. Only 7% of those who use the bike less often (or not at all) intend to use NMT during the FWC (see figure 50).

Figure 50 Modal Choice Intention for the World Cup in Reference to the Daily Use of NMT



The Chi-squared test is used to determine whether this difference is statistically significant. The Chi-squared test compared expected frequencies (an overall 9,5% intend to use NMT during FWC) to observed frequencies (7,3% in one group, 35,9% in the other). The Chi-squared test clearly yields a significant result (see table 27), i.e. the null hypothesis cannot be sustained. In other words, the above hypothesis is confirmed.

Table 27 Pearson Chi-squared – H2BR

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	34,330[a]	1	,000
N of Valid Cases	506		

Hypothesis I cannot be accepted as non-car users do not rate NMT implementation as more important than car users.

Hypothesis II can be accepted as, among people who use NMT as a travel mode almost every day, or 1-3 times per week, the intention to use NMT as a travel mode for the World Cup is significantly more frequent than among people who use NMT as a travel mode more rarely.

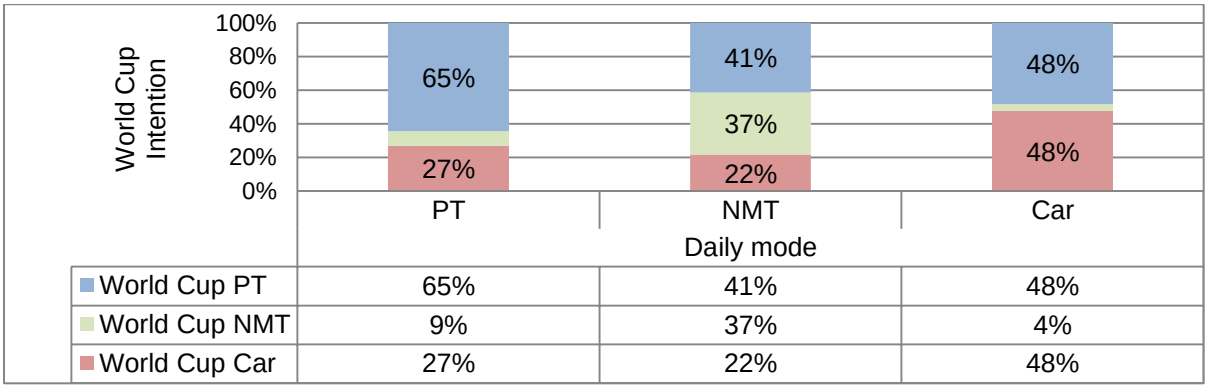
Hypothesis 3 Relating to Daily Transport Mode versus 2014 FWC Transport Mode Intention (H3BR)

Testable hypothesis: There is a positive correlation between the daily travel mode use and the intended travel mode to be used during the 2014 FWC.

Theories/models: Model of Pro-environmental Behavior and Theory of Reasoned Action

According to figure 51, NMT use during the FWC would account for less than 10% and the daily PT and car users are less likely to choose NMT. Almost half of the daily car users have no intention to change behavior - 48% will still drive by car during the FWC. However, the other half indicated that they are willing to switch to PT (48%) and NMT (4%).

Figure 51 World Cup Modal Choice Intention versus Daily Modal Choice



	PT	NMT	Car
World Cup PT	65%	41%	48%
World Cup NMT	9%	37%	4%
World Cup Car	27%	22%	48%

It is important to take into consideration the daily PT users of whom 27% are willing to use cars during the FWC. This reinforces the importance of implementing strategies in the field of mobility management during FWC that to cope with and possibly decrease such intentions.

The contingency coefficient is 0,336 which is significant (p<0,0005). We can conclude that the intention to use a transport mode and the actual modal choice are (of course) associated. But this association is not so strong which means that the actual modal choice differs to some extent between daily life and the intention to use a certain mode during the FWC.

Table 28 Symmetric Measures – H3BR

		Value	Approx. Sig.
Nominal by Nominal	Contingency Coefficient	,336	,000
N of Valid Cases		510	

The hypothesis can be accepted as there is a correlation between the choices for daily travel mode and travel mode intention for 2014 FWC.

Hypothesis 4 Relating to Strategies/Measures and Acceptability to 2014 FWC (H4BR)

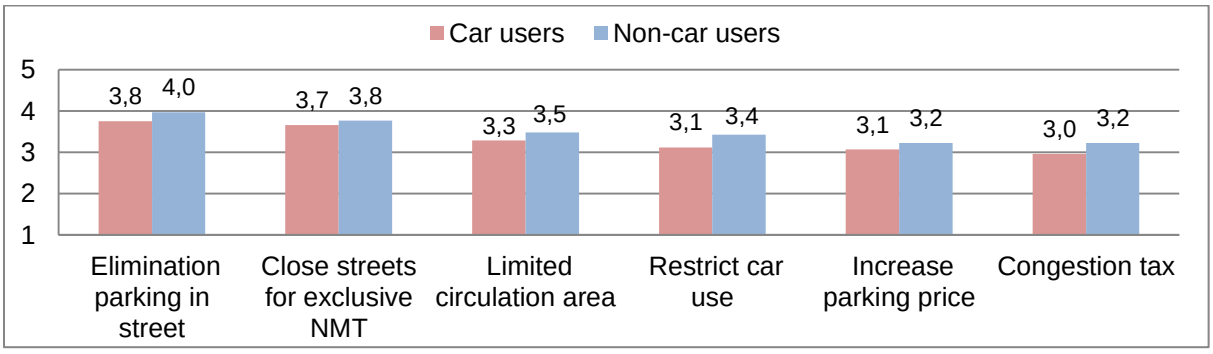
Testable hypothesis I: Restrictive strategies for the 2014 FWC which limit or prohibit car use, such as ´car restriction in some areas`, ´zone of limited circulation` and ´parking elimination in some streets` are more accepted by non-car users than by car users.

Testable hypothesis II: Restrictive measures which involve pricing/taxation, such as ´increased parking price` and ´congestion tax` are strategies which would hinder car use in the 2014 FWC.

Theories/Models: Expected-Utility Theory

Non-car users have generally better acceptance (higher means) of all restrictive or "push" measures to be implemented for the 2014 FWC (see figure 52): parking elimination in some streets, close streets for exclusive use of NMT, area/zone of limited circulation, restrict car use, increase parking fees and introduce congestion charge.

Figure 52 Restrictive or "Push" Measures Acceptance (Means Report)



Surprisingly, when considering the promoting or "pull" measures (see figure 53), car users show a higher acceptance of all items to be implemented for the FWC: Transport integration, higher PT frequency, special PT services during matches, bikes to rent, walk together and combined PT and stadium ticket. Note that for the pull measures the means are rather high in both groups, well above four, delineating a great level of acceptance for such measures.

Figure 53 Promoting or "Pull" Measures Acceptance (Means Report)

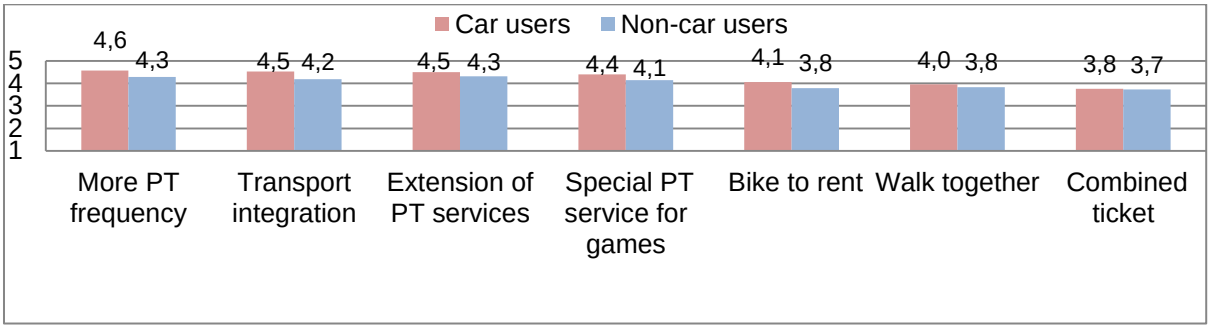


Table 29 Test Statistics[a] (Push Measures) – H4BR

	Eliminate parking in streets	Close streets for exclusive NMT	Limited circulation area	Restrict car use	Increase parking price	Congestion tax
Mann-Whitney U	27006,000	26034,500	24697,500	24353,000	26922,500	24185,000
Asymp. Sig. (2-tailed)	,127	,182	,145	,044	,279	,062

a. Grouping Variable: Cluster2 Cluster Car users/Non-car users

Table 30 Test Statistics[a] (Pull Measures) – H4BR

	More PT frequency	Transport integration	Extension of PT services	Special PT service for games	Bike to rent	Walk together	Combined ticket
Mann-Whitney U	25379,500	24377,000	26004,500	25147,500	24616,500	27446,000	28408,000
Asymp. Sig. (2-tailed)	,018	,004	,079	,030	,029	,447	,964

a. Grouping Variable: Cluster2 Cluster Car users/Non-car users

According to the nonparametric Mann-Whitney-U-Test, the differences between car users and non-car users are significant (p<0,05) for the following pull measures: ´Transport integration`, ´higher PT frequency`, ´special PT services for games`, ´bikes to rent`; and for the following push measure: ´Restrict car use`.

Considering the Levene Test (see appendix H4BR) which assumes that the variances between car users and non-car users are equal, this assumption holds true (p>0,05) for the following strategies: ´Close streets for exclusive use of NMT`, ´Increase parking price`, ´Area of limited circulation`, ´Congestion tax` and ´Combined ticket`. For those cases, the upper line of the T-test is interpreted.

Considering the push measures, including pricing measures like ´increase parking fees` and ´congestion charge`; according to the Levene test significance, the assumption of equal variances in the two groups holds. Therefore, the ´Sig. (2-tailed) upper line` of the T-Test is interpreted: P= 0,267 and P= 0,068, both of them are not significant (p>0,05).

Hypothesis I can be partially accepted as the strategy of ´car restriction in some areas` has more acceptability for non-car users than car-users (higher means and significant at p<0,05). The strategies ´parking elimination in some streets` and ´zone of limited circulation` also find more acceptance among non-car users; but these results are not significant (p>0,05).

Hypothesis II cannot be accepted as the acceptance of strategies which would involve higher prices to hinder car use is not significant, showing that these strategies would not be suitable to promote sustainable mobility for the 2014 FWC.

Hypothesis 5 Relating to Possible Reasons for the Choice of Transport Modes (H5BR)

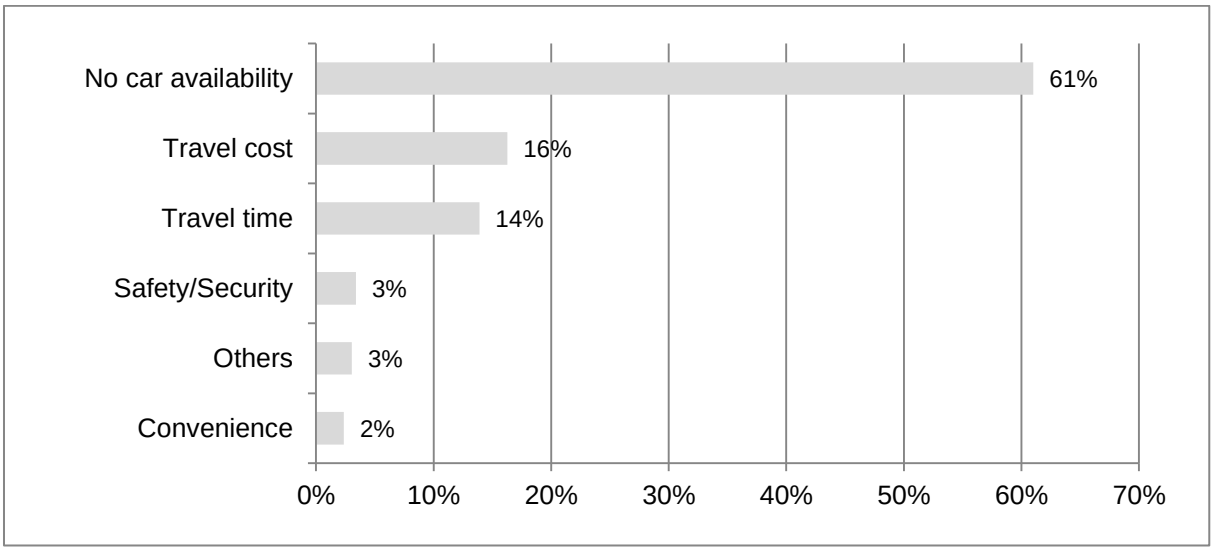
Testable hypothesis: ´Travel time` is the main reason for travel mode choice among car user and ´travel cost` is the main reason among PT and NMT users.

Theories/models: Expected-Utility Theory

According to the theoretical background of economic-behavioral theories, the travel time is the main reason for choosing cars as a travel mode. At the same time, the travel cost is the main reason for choosing PT as a travel mode.

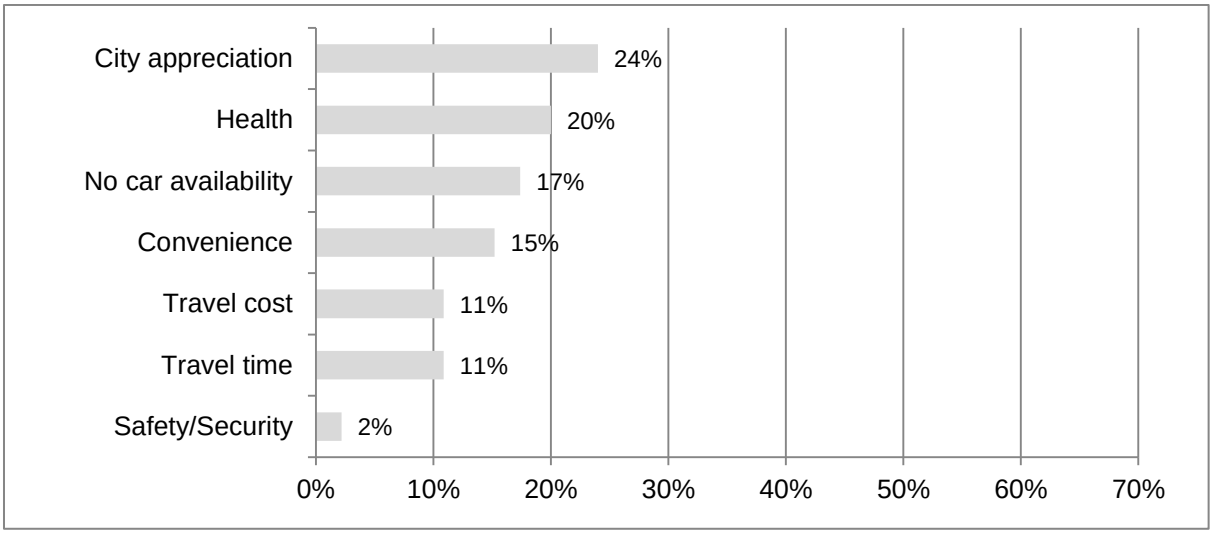
As figure 54 shows, the main reason to choose PT is ´no car availability`. This is a "negative" reason, i.e. not the quality of PT convinced users, but the lack of other options ("captive riders"). Cost and time are in 2nd and 3rd place, but far behind the lack of a car.

Figure 54 Main Reasons for Using PT



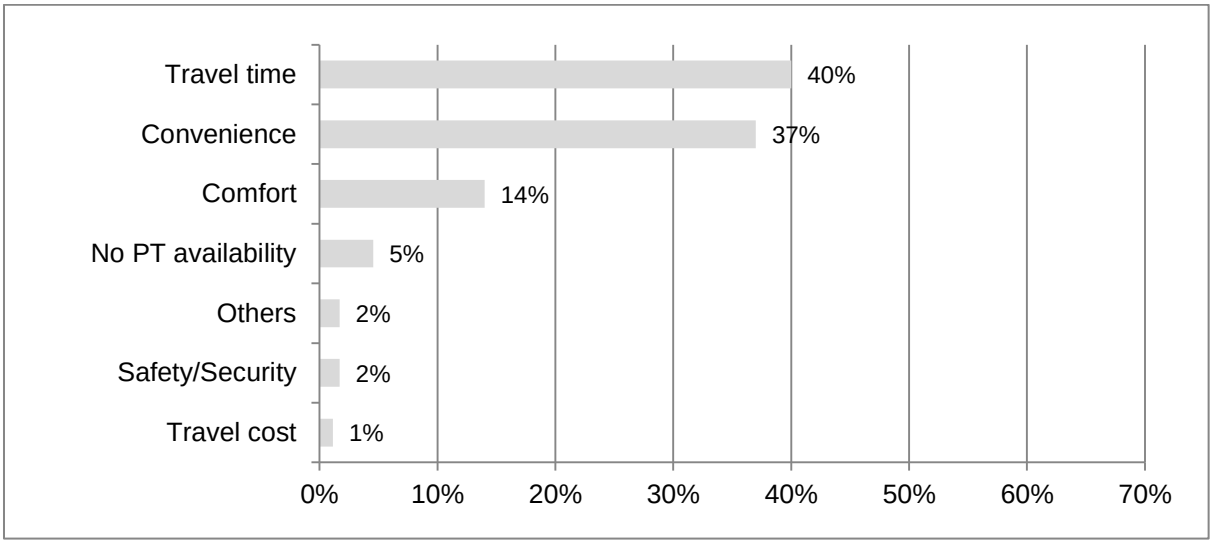
The main reasons to use NMT are city appreciation (in the sense that tourists and residents enjoy and appreciate the direct contact with the city) and health (24% and 20%, respectively). The lack of a car also plays a relevant role in 3rd place (17%). The variables ´City appreciation` and ´Health` were recoded into ´others` in the main table, as it was only cited by NMT users (see figure 55).

Figure 55 Main Reasons for Using NMT



According to figure 56, the main reason to use a car is travel time (40%), followed by convenience and comfort. The three reasons may be closely linked together. “No PT availability”, which is linked to the PT user group’s main argument “no car availability” to choose PT, plays only a minor role here (5%). Safety/Security is a minor reason for all modal choices.

Figure 56 Main Reasons for Using MIT



The hypothesis can be partially accepted as the main reason for using a car is travel time; in contrast the main reason for using PT is the lack of a car.

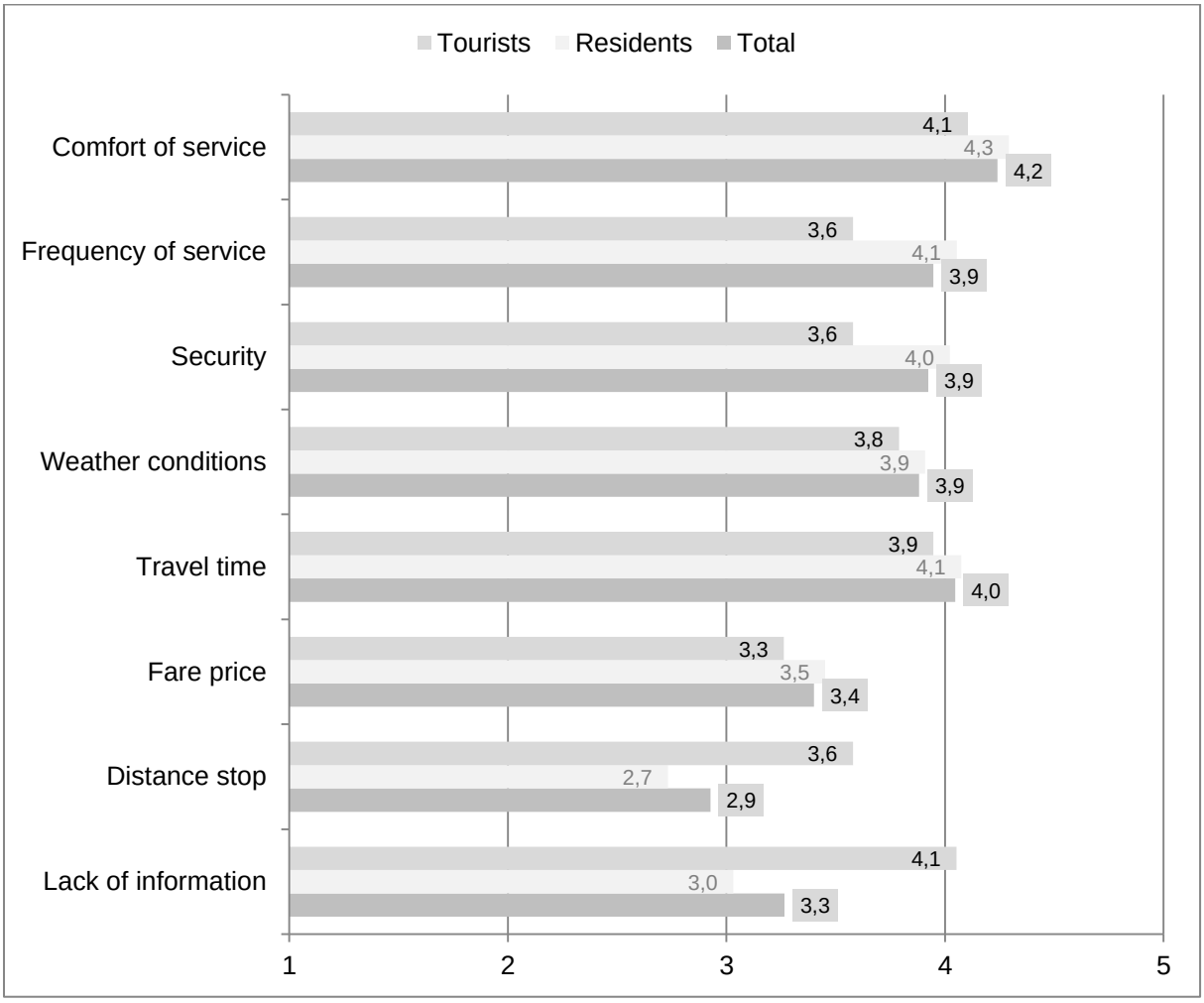
Hypothesis 6 Relating to the Aspects Preventing Public Transport Use (H6BR)

Testable hypothesis: ´Lack of information` is the main factor keeping car users from a more sustainable modal choice.

Theories/models: The Value-Action Gap

As figure 57 shows, the top reason preventing car users to use PT or NMT is ´comfort of service` (4.2 on a scale from 1=not at all important to 5=very important), while ´distance to station/stop` is the least important (mean of 2.9) reason preventing a more sustainable travel behavior of car users. Considering only the cluster of tourists, a strong change becomes obvious: ´lack of information` is the second most important reason in preventing the use of NMT or PT. This feature is fundamental for mobility management during the 2014 FWC.

Figure 57 Aspects Preventing Sustainable Mobility (Means Report)



A T-test for the dependent variable (paired-samples) is conducted in order to evaluate a comparison between lack of information and security which are two reasons that can be more easily targeted by policies and strategies (e.g., weather conditions, travel time and distance stop/station are more difficult to be targeted).

Table 31 Paired Samples Statistics – H6BR

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Lack of information	3,27	166	1,604	,124
	Security	3,93	166	1,322	,103

Table 32 Paired Samples Correlations – H6BR

		Correlation	Sig.
Pair 1	Lack of information & security	,120	,124

Table 33 Paired Samples Test – H6BR

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Lack of info Security	-,669	1,952	,152	-,968	-,370	-4,413	165	,000

According to the T-test, the factor ´security` is significantly more important than ´lack of information` for the modal choice.

The hypothesis can be partially accepted as lack of information is by far the most important reason for residents keeping car-users from adopting a more sustainable mobility behavior. Also among tourists this is a very important reason. Additionally, considering that this is a measure that can be implemented relatively easily (based on soft policy measures) it can be assumed to be one of the most important and effective measures to be implemented during the 2014 FWC.

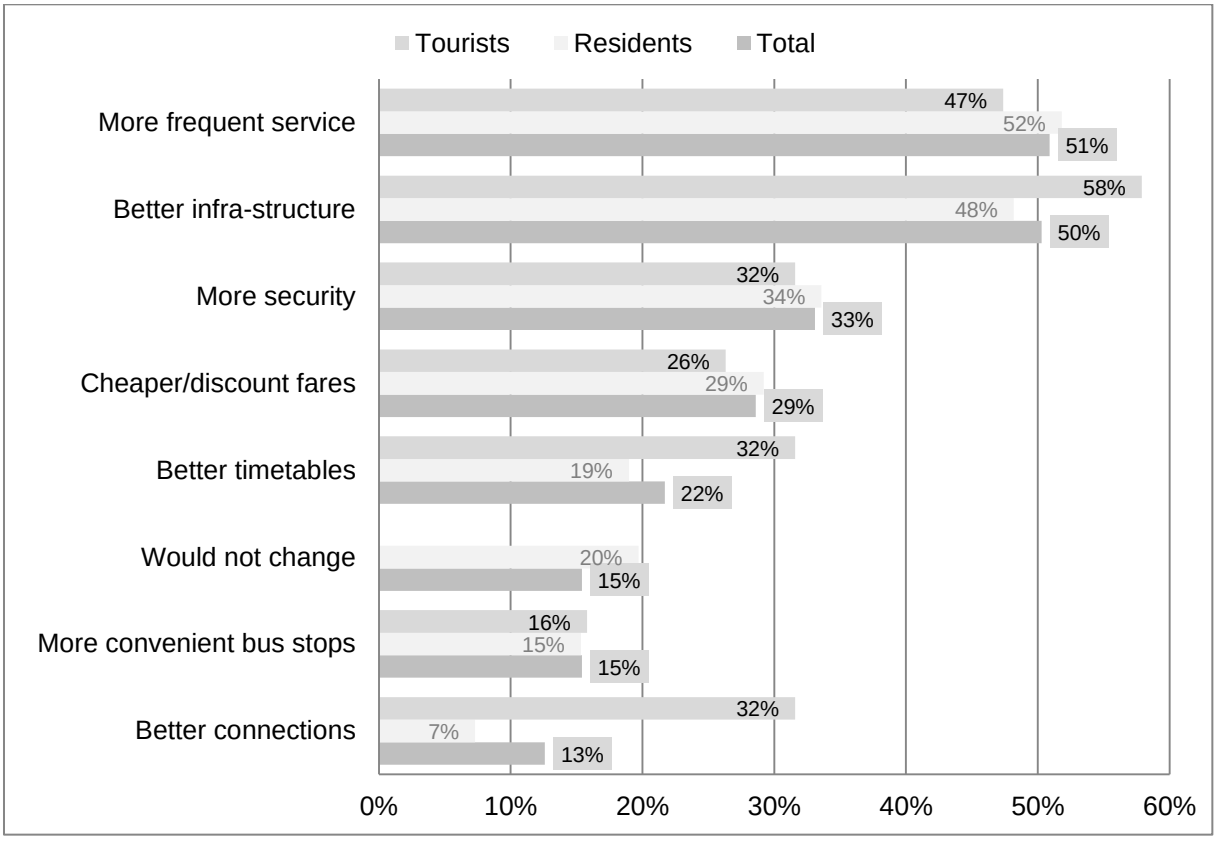
Hypothesis 7 Relating to the Facilitating Measures for Public Transport Use (H7BR)

Testable hypothesis: The main reasons why car users do not use PT are ´habit` (they do not calculate at all how effective an alternative would be) and ´lack of service`. Therefore, it is assumed that ´I wouldn't change` and ´more frequent service` are the most popular answers to the question what could hinder PT use.

Theories/models: Theory of Interpersonal Behavior (TIB) and Needs-Opportunities-Abilities (NOA) Model

According to figure 58, focusing on people, it can be concluded that 51% of respondents who answered this question voted for ´more frequent service`. Contrary to the assumption at the beginning of this section, ´Would not change`, understood here as ´Habit`, does not play such an important role. Nevertheless, consideration must be given here to the phenomenon of social desirability influencing answer behavior.

Figure 58 Facilitating Measures for Sustainable Mobility



The hypothesis is partially accepted as habit is not the main reason why to use a car, however, the offer of a better PT service would play a major role in promoting more sustainable mobility.

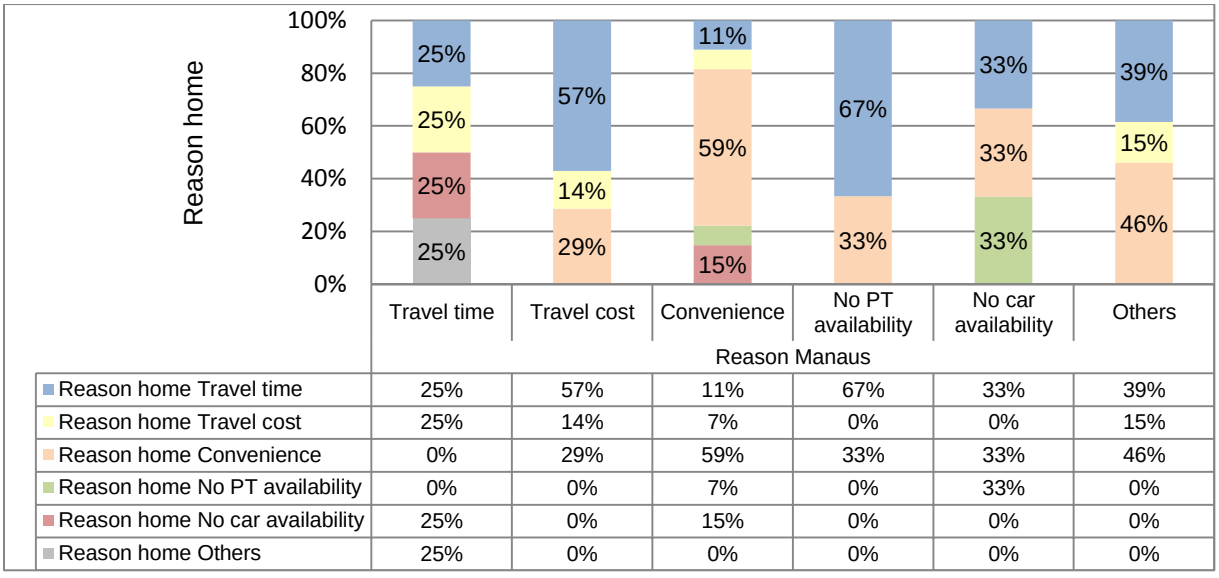
Hypothesis 8 Relating to the Reasons for Modal Choice at Home and during Holidays (H8BR)

Testable hypothesis: The reasons why tourists choose a transport mode in Manaus is correlated with the reasons why the transport mode is chosen at home.

Theories/models: Theory of Planned Behavior (TPB)

According to the cross-tabulation some outlines can be highlighted: the reasons ´safety` and ´congestion` were not even cited by the tourists. ´Security` was also not cited as a reason for travel mode choice at home. As figure 59 shows, ´convenience` was by far the most important reason for travel mode choice during holidays (37%) and still around 59% of those tourists who stated that ´convenience` was the most important reason in Manaus, did so for travel mode choice at home. In contrast, for travel mode choice at home not only ´convenience` was important but also ´travel time`.

Figure 59 Reason for Modal Choice in Manaus versus Reason for Modal Choice at Home



	Travel time	Travel cost	Convenience	No PT availability	No car availability	Others
Reason home Travel time	25%	57%	11%	67%	33%	39%
Reason home Travel cost	25%	14%	7%	0%	0%	15%
Reason home Convenience	0%	29%	59%	33%	33%	46%
Reason home No PT availability	0%	0%	7%	0%	33%	0%
Reason home No car availability	25%	0%	15%	0%	0%	0%
Reason home Others	25%	0%	0%	0%	0%	0%

The contingency coefficient is 0,765; p<0,0005 which is significant, meaning that the reason for modal choice during holidays and the reason for modal choice at home are associated.

Table 34 Symmetric Measures – H8BR

		Value	Approx. Sig.
Nominal by Nominal	Contingency Coefficient	,765	,000
N of Valid Cases		74	

The hypothesis can be accepted as the reasons for travel mode choice at home are strongly correlated with the reasons for modal choice in Manaus.

RESULTS and DISCUSSION

11. RESULTS AND DISCUSSION

This chapter presents the results of South Africa's survey conducted in Johannesburg during the 2010 FIFA World Cup and the findings of the survey performed in the city of Manaus pre 2014 FIFA World Cup. It closes with a discussion of the patterns and divergences between the two case-studies.

11.1 Discussion Case-Study South Africa

According to the descriptive analysis, 57% of the respondents were tourists (national and international) and 44% residents from the Johannesburg area; 44% used a car and 21% taxi. NMT accounted for only 7% and PT around 28% (BRT: 12%, Metro/rail: 5%, other PT: 10%). All trips were for the purpose of tourism and leisure as respondents were going to the stadium or a public viewing fan park.

The following conclusions can be drawn from the data analysis:

i. Transport satisfaction varies among the travel mode choices. Using the car gives significantly more satisfaction than other transport modes. Slightly different from the results found by Deloitte (2010), on their survey of public perception of transport during the 2010 FWC, where those using public buses, 81% rated the experience as either ´very good` or ´excellent`, while 76% of those using cars thought the same. Nevertheless, according to the same study, only 27% of respondents had a positive experience of Metrorail with 62% thinking it was an ´average` experience. In this case the total satisfaction of non-car users (bus and train) would decline and the results of total satisfaction/experience between car-users and non-car users would perfectly fit with the results found in this study.
ii. Habit is an important determinant of transport mode in leisure/tourism. It is clear that most of the users who use car for daily mobility do not consider using another travel mode on holiday. King et al. (2009) underlines that it is not hard to motivate people to occasionally change travel behavior during their journeys. It is very difficult, however, to change habits as it requires a change both in mind-set and behavior. It is known that one of the main barriers in changing behavior is the habitual character of individual travel behavior (Møller, 2002).

iii. Environmentally-friendly transport, safety and travel cost do not help to predict whether a tourist will choose to use the car or not. Car choice is closely associated with sociodemographic parameters such as income. According to the Office for National Statistics (ONS, 2008), there are some social trends which show that people are rather willing to engage in environmentally-friendly behavior related to the household (e.g., less consumption of water, gas, electricity) than to engage in transport related changes such as using more sustainable transport means.

iv. Information evaluation is correlated to transport satisfaction, meaning that the more information available to a user, the higher his satisfaction level is. This correlation is stronger among non-car users. A study performed by King et al. (2009) concluded that access to information is therefore still perceived as a barrier to the use of public transport. This lack of information is perceived as being connected to dissatisfaction with travel mode choice. The study of Deloitte (2010) highlighted for the 2010 FWC as areas for improvement the provision of information, highlighting the need of clear information and communication to transport users. Further opportunities mentioned were the development of a communication strategy, the increase of knowledge sharing, the use of online tools, and the provision of useful information (e.g., on a website) that compares transport modes, costs, timetables and interconnectivity.

Most of the respondents identified as the main weak point in logistics for the 2010 FWC as the underdeveloped PT system and service in terms of frequency, timetable and the lack of routes and connections (see figure 60). Inconvenience in using PT is related to the lack of integration and timing of services and the relative locations of bus stops and rail stations (King et al., 2009). Congestion was identified as the second most common weak point (a high concentration of traffic flow leading to increased travel times). As Kim et al. (2006) points out, congestion is one of the biggest problems during mega-events and even getting worse during events of longer duration such as the FWC. Road congestion has even been identified as the third most important disadvantage of South Africa as a host country for the 2010 FWC (Bob et al., 2009).

The most important positive aspects of the 2010 FWC (figure 61) were, firstly, that the PT system (BRT and Gautrain) had been upgraded, and that accessibility and transport infrastructure (highways) had been improved. A recent study by Gaffeny et al. (2011) shows that the development of new public transport systems is frequently presented as an alternative solution to persistent urban problems and to bring long-term benefits to the population: increasing mobility and decreasing congestion. The study of Deloitte (2010) on the 2010 FWC indicates that most respondents were positively affected by improvements in

the public transport industry; additionally, the road upgrades where evaluated by 58% of the respondents as positive.

Figure 62 is related to the open question ´recommendation for 2014 FWC in Brazil`. The recommendations strongly refer to the weak points of the South African FWC. Thus the most recommended measure for the 2014 FWC is to improve the efficiency of the PT system and service. Improvements on safety and security were also an important recommendation. According to Bovy (2004), the visitors and fans of a mega-event are looking for easy access, safety and security. As stated in ´our goals` within the DfT report (2008) there is a need to promote transport which is accessible, affordable, available, acceptable and safe to users.

Figure 60 Main Weak Points of 2010 FWC

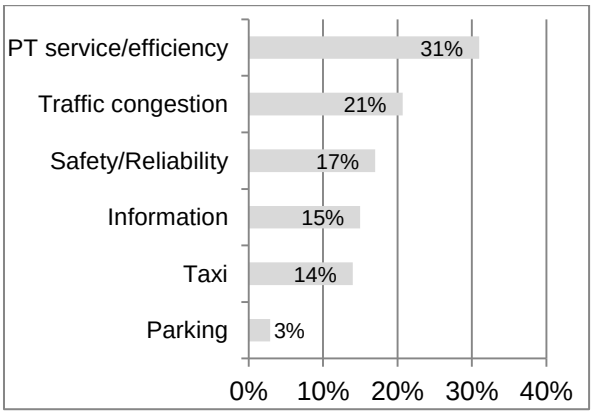


Figure 61 Main Strong Points of 2010 FWC

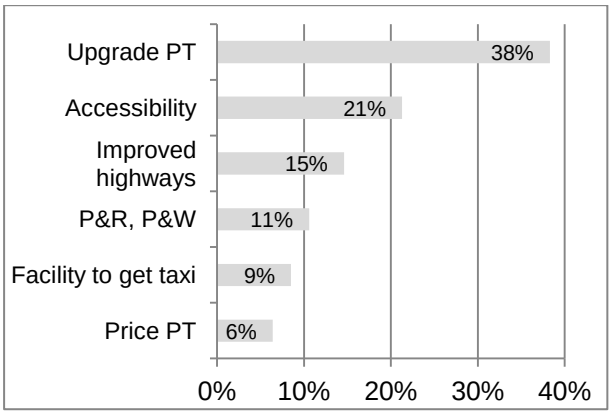
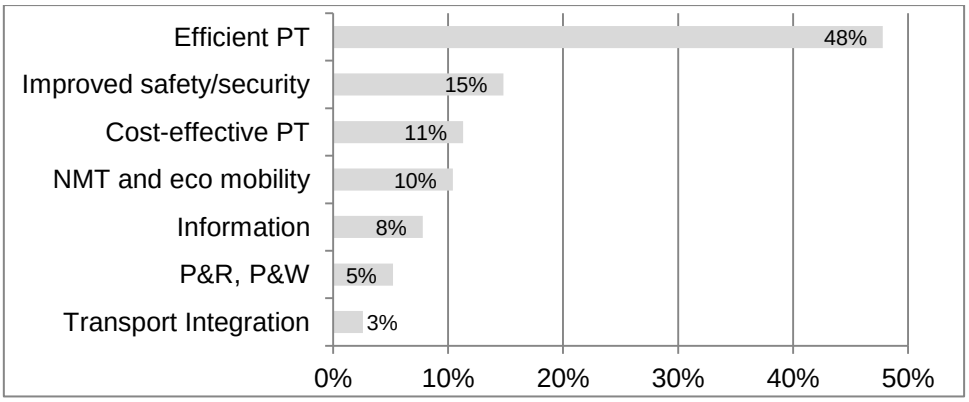


Figure 62 Main Recommendations for 2014 FWC



According to the report on ´Sustainable Mega–events in Developing Countries` one of the most prominent recommendations and lessons from South Africa for host cities relates to resource allocation for PT upgrade, stressing the high importance that this transport infrastructure has for the World Cup. It needs to be carefully integrated into longer-term transport planning to maximize the benefits of this significant investment also beyond the mega-event (KAS, 2011).

11.2 Discussion Case-Study Brazil

This subchapter presents the findings of the survey performed in the city of Manaus in November/December 2011. The main findings of the survey were that 28% of respondents use a private car for daily trips and 6% a taxi. NMT accounted for around 9% of the trips and PT around 57%. The majority of the trips was to and from work (35%), followed by trips with an educational purpose (going to university, school, etc.). Tourism and leisure was the prime motive for 23% of the trips. Distance was significant for the choice of travel modes and, not surprisingly, NMT was important for shorter trips of up to 2 km (over 50%). PT was the dominant form of transport for trips above 10 km. However, the car was the preferred means of transport for trips of 5-10 km, with over 40% of such trips undertaken by car.

The main findings of the survey were that convenience and travel time were the most important reasons for car use. According to Hine and Scott (2000), passengers tend to choose modes which provide the fastest and most direct route, especially in certain tourism contexts. City appreciation (24%) was the most important feature when cycling or walking. Guiver emphasizes that (as cited in Lumdson et al., 2006) opportunities for social interaction and sightseeing may be a useful way of encouraging a modal shift. A lack of more comfortable alternatives (no car availability) was the main motive for using PT (61%). As these users are “captive riders” it was expected that they would shift to private car use as soon as they are able to afford a private car. Enhancing PT service, mainly by reducing travel time and increasing bus frequency, has been identified as a possible means to create an incentive for travelers to shift from private car to PT. Further research regarding the modal choice rationale of PT users is required (Lumdson et al., 2006). The effective transformation of behavior is much more likely if situational factors (access to adequate pro-environmental services and infrastructure) are improved along with raising levels of general awareness (Anable et al., 2006). Variable travel costs that are directly related to travelling, e.g., gasoline price or parking fees, were not among the most prominent motives for any modal choice.

The results of the survey also showed that car users perceived their mode of transportation to be more satisfactory than NMT and PT users, respectively. This means that if more car users shall be motivated to change to sustainable modes of mobility, their quality must be improved and in some cases even implemented anew (e.g., cycling lanes and sidewalks) for the 2014 FWC. As stated by Guiver (cited in Lumdson et al., 2006), PT may not be able to compete with cars, as long as cars and fuel are widely available at relatively accessible costs, when both are judged by the same criteria.

The intention of potential visitors of the 2014 FWC to use different transport modes during the sports mega-event was also analyzed. The results show that the travel mode intention diverged slightly from that actually used for daily transport. However, the overall modal split is exactly the same if the daily mode and the intended mode for the intended mobility during the FWC are compared. The survey also looked at the potential of more sustainable travel behavior. Approximately half of the respondents would choose a more sustainable way of travelling during 2014 FWC. However, a large group of respondents (50%) would use their car and were not thinking of switching to another mode of transport during the 2014 FWC. The findings of Portugal and Rubert (2010) in a study on the situation in the city of Rio de Janeiro are very much alike: Among car owners the intention to use buses during a mega-event is almost 50% lower compared to non-car users.

Certain measures in host cities may also help to reduce car use. The change to sustainable transport means can be achieved by the introduction of various incentives and measures. The measures which usually provide positive long-term effects may include improved accessibility (NMT introduction and improvement) and other benefits and incentives that boost sustainable mobility beyond the mega-event itself. As Peeters and Schouten (2006) state, improvements in PT technology (e.g., shifting to natural gas vehicles or vehicles using bioethanol) may also help to improve the eco-efficiency of transporting tourists. In contrast, the use of financial instruments to reduce private car use seems to be ineffective, or at least not statistically significant for both car and non-car users. Likewise, external factors such as travel costs up to a certain level do not reduce car trips significantly. Nevertheless, the cost argument was the second most important reason mentioned by PT users. Maatz (2010) recommends that to promote more sustainable mobility behavior it is fundamental to provide public passenger transport which ensures an adequate volume and capacity, attractive fares and incentives as well as technological improvements in terms of low-emission vehicles.

Convenience, travel time and frequency of service were identified as the three most important aspects keeping citizens from using PT. The study of Cullinane and Cullinane (1999) showed similar results: ´Frequency of service` and the ´extent of the transport network` have been identified as prominent impediments to the use of public transport. According to the Olympic Delivery Authority (ODA, 2009) in its ´Transport Plan for the London 2012 Olympic and Paralympic Games`, in order to meet the transport demand during the games, it is necessary to provide frequent, reliable, accessible and simple public transport for visitors. Furthermore, the study ´Transport Performance of the Sydney Olympics` developed by Hensher and Brewer (2002) affirms that the transport system is highly expected to respond to user needs by ensuring that fans get well on time to all events.

The strategies and measures include positive pull measures (usually short-term solutions for mobility management during the 2014 FWC) and negative push measures. The pull measures which are highly acceptable among both car users and non-car users include the creation of some facilitating conditions, e.g., offers of integrated multi-modal packages (combined PT and stadium tickets, or one single ticket to use different transport modes), more frequent and extended PT services. These measures seem to be an effective strategy for mega-events. Following these patterns, Portugal and Rubert (2010) outlined ´transport integration` as the main preferred strategy by car and non-car users. It is worth to add that Rio de Janeiro offers a range of modal integration measures whereas in Manaus buses are the only PT mode available so far.

The push measures which involve the adoption of restrictive and prohibitive strategies to make travel by car less appealing are slightly accepted by non-car users. Measures which involve ´financial punishment` are the least acceptable for both clusters. According to Portugal and Rubert (2010), the most important strategies in transport for mega-events are those based on integration, reinforcement of public transport with comparatively more capacity and efficiency (e.g., BRT system with separate bus lanes, free of any congestion) to discourage car use. The least accepted strategies are related to ´private car restriction`. This shows there is a common understanding among transport users that measures promoting sustainable mobility should be given priority over punishing private car use.

Another important feature of travel mode choice relates to ´travel information`. For tourists the issues of ´lack of information` and ´convenience-comfort` were identified as the most important in hampering the use of PT. Naturally, tourists need effective information on bus schedules, stops, stations and routes to be able to use this transport mode conveniently. In the same way tourists need clear and easy to grasp signposting and appropriate infrastructure to be able to move on foot around the city. Lack of information may also be linked to a lack of environmental awareness. Both tourists and residents scored environmental importance as astonishingly low concerning its relevance in their personal travel mode choice. Seemingly, most citizens are not particularly concerned about climate change or simply not aware of the relevance of their own travel behavior for overall environmental problems.

11.3 Discussion about Patterns between South Africa and Brazil

This subchapter presents patterns and divergences between Johannesburg and Manaus. The comparison provides interesting potentials for the 2014 FWC. The lessons learned through the documentation review and the case study results (2010 FWC) provide valuable recommendations in the planning of an effective sustainable urban transport. This is particularly reinforced in the singular character shown by both developing cities, such as the social and economic inequalities, significant transport infrastructural deficits and environmental problems. Therefore, the combination of the two case-studies seems highly appropriate in guiding the research approach.

Reasons for modal choice

It is important to note that figures 63 and 64 cannot be compared directly, because the South African respondents had a multiple choice response option and Brazilian respondents were only allowed to give one answer. However, despite of percentage difference, some general conclusions can still be drawn: Travel time (including avoided delays and congestion) was a very important reason for modal choice in both countries and is more important for car users than for non-car users. Safety and security was very important only for the South African respondents by both car and non-car users. In the Deloitte study (2010) security and safety was a major concern prior to the 2010 FWC. The reasons – no car availability and no PT availability – are not cited here because it was only a valid reason for the Brazilian surveys, since these two variables where not directed questioned to the South African respondents.

Figure 63 Main Reason for Modal Choice in Brazil

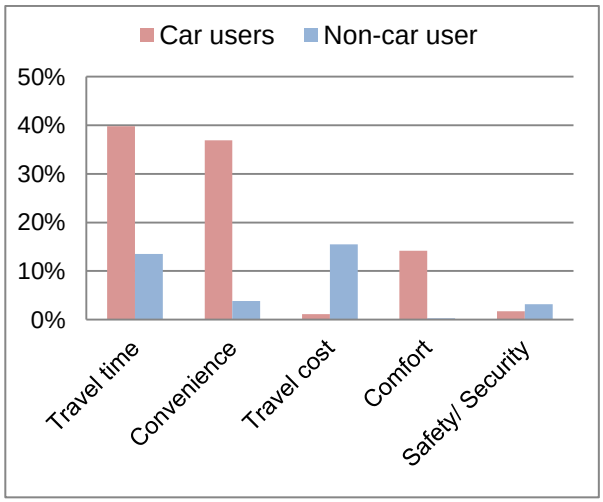
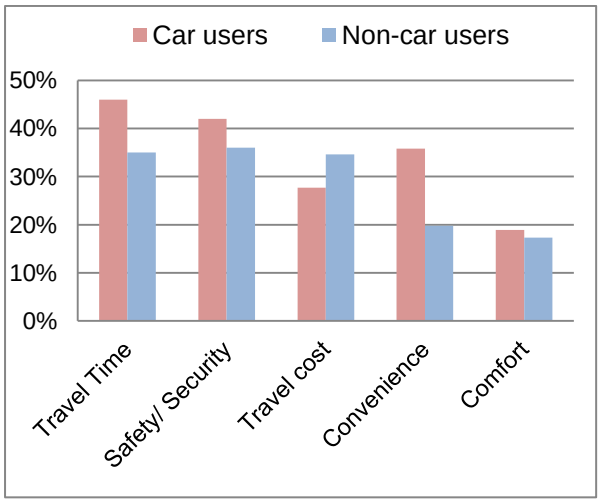


Figure 64 Main Reason for Modal Choice in South Africa

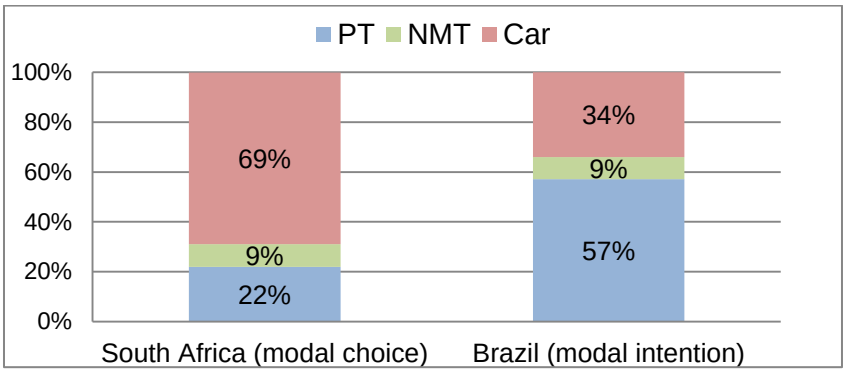


Modal choice and modal intention

The modal choice during the FWC clearly shows the dominant use of private cars by the respondents. The study developed by Deloitte (2010) achieved comparable results (68% used private cars in 2010 FWC), emphasizing the high propensity to use motorized individual transport when users can afford it.

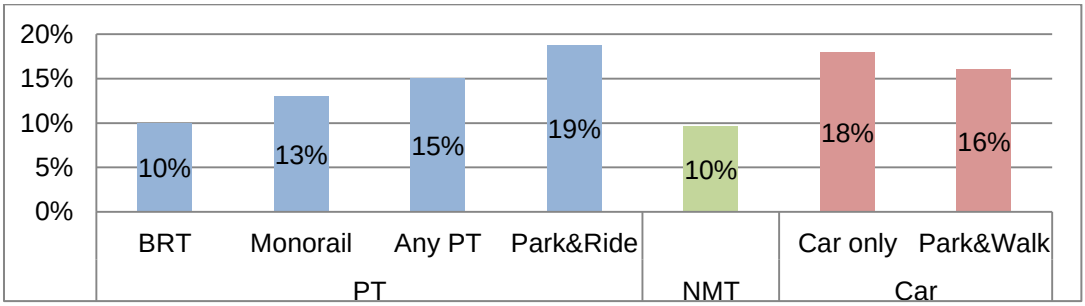
According to figure 65, the anticipated PT use for the 2014 FWC (57%) will be much higher than during the 2010 FWC (22%). This indicates that a great effort on behalf of policy-makers and operators will be needed to improve and develop PT strategies to successfully cope with this increased demand. However, the indicated intention of respondents to choose PT during the 2014 FWC needs to be treated cautiously as this question offered three PT subgroups which partially have not yet been implemented: BRT, if available (10%); Monorail, if available (13%) and; any PT (34% any kind of PT and Park & Ride).

Figure 65 World Cup Transport Mode in South Africa 2010 and Brazil 2014 (expectation)



Taking into consideration that the two new transport modes may not be timely implemented for the 2014 World Cup in Manaus, the respondents' intended choices may likewise change. Assuming that car use is the main alternative for this group, PT use may drop to only 33% and car use is expected to increase to 57% (see figure 66). Modal choice during the 2014 FWC would then largely correspond to the situation observed during the 2010 FWC.

Figure 66 World Cup Modal Split – Intention for the 2014 FWC in Manaus

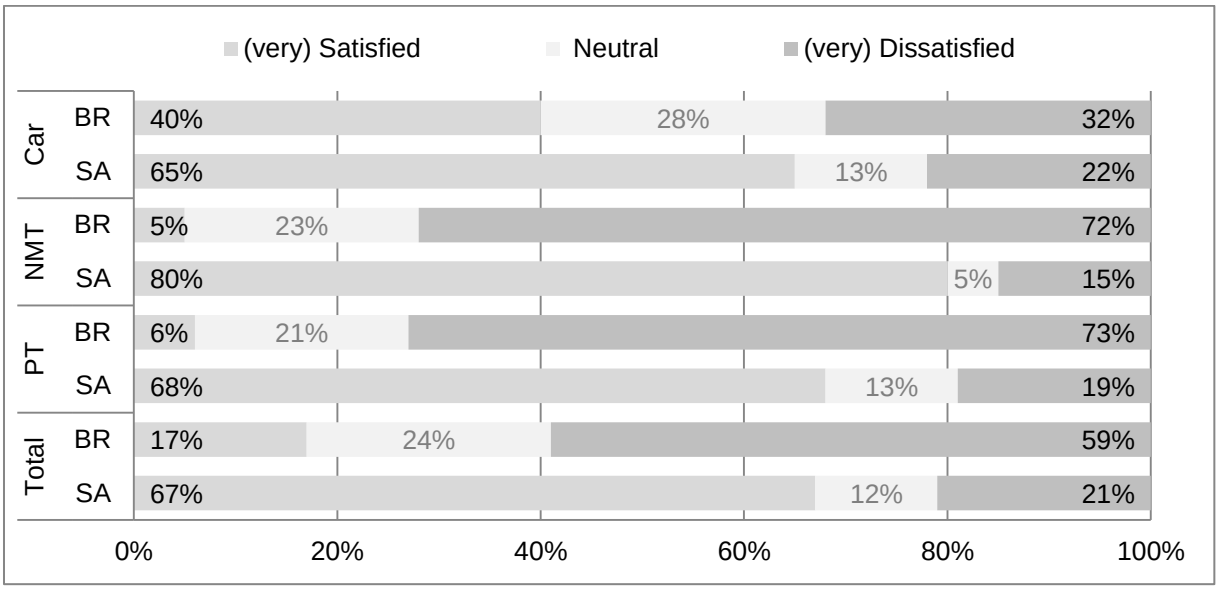


General satisfaction and modal choices

In order to facilitate an easier visual comparison, the satisfaction levels of figure 67 were transformed from a five-level scale (very satisfied, satisfied, neutral, dissatisfied, very dissatisfied) into a three-level scale ((very) satisfied, neutral, (very) dissatisfied).

In contrast to 2010 FWC (30% very satisfied and 38% satisfied) the PT users in Brazil are highly dissatisfied (25% dissatisfied and 49% very dissatisfied). The car users follow broadly the same trend: car users in SA are more satisfied than in Brazil (66% and 40%, respectively). It is worth noting that South African respondents are generally much more satisfied than Brazilian interviewees considering either of the three transport modes – 67% (39% very satisfied and 29% satisfied) in Johannesburg, compared to only 17% (8% very satisfied and 7% satisfied) in Manaus. Even though this difference may partially be attributed to different levels of expectation among users, it has to be interpreted as a strong signal towards policy makers and organizers of the 2014 FWC in Manaus that the transport sector will require a lot more attention in the remaining years before the mega-event.

Figure 67 Satisfaction with Modal Choice among Users in Manaus (BR) and Johannesburg (SA)

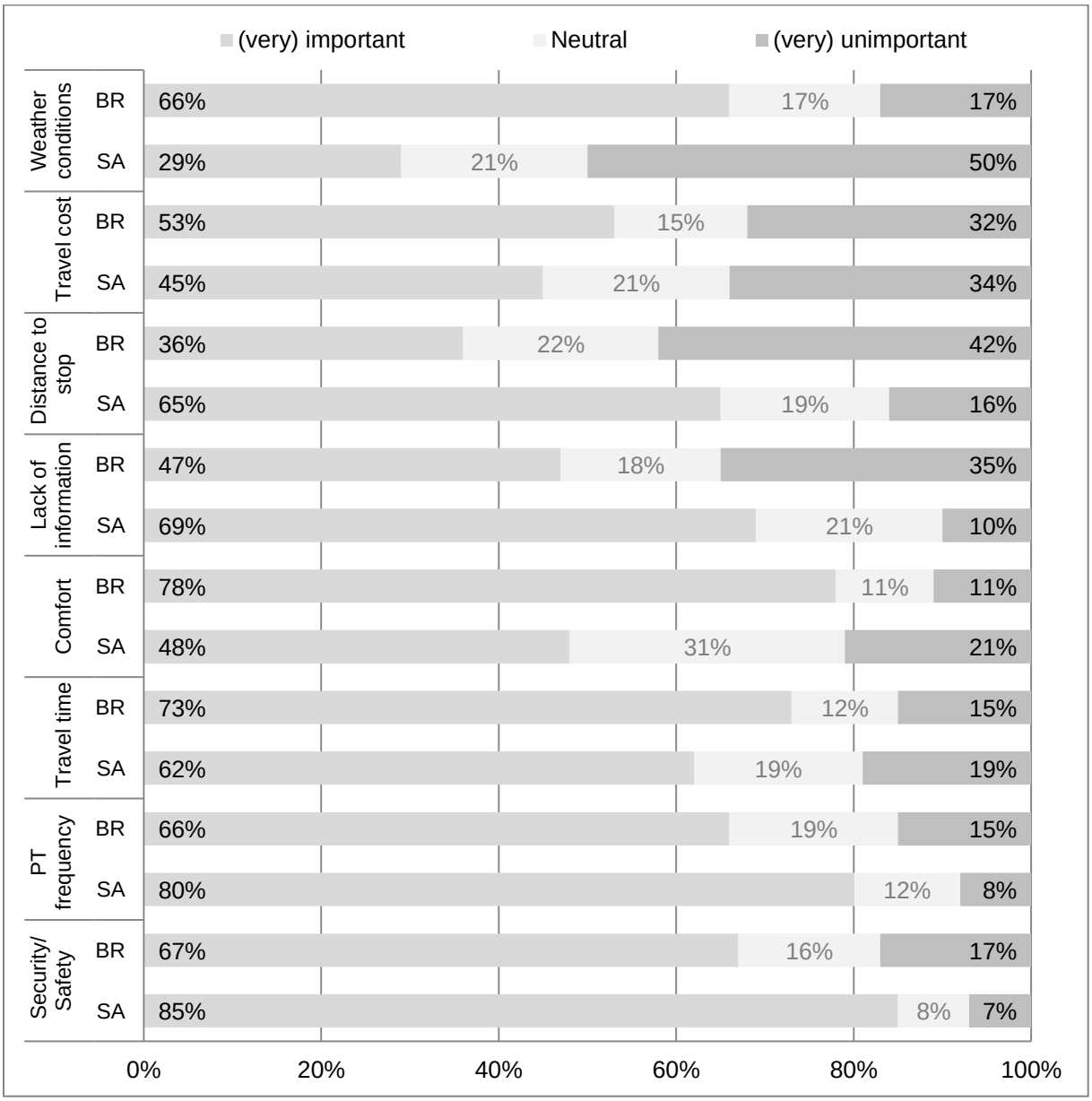


Barriers for sustainable mobility

Factors such as travel time, security/safety, and frequency of service have an extremely strong impact on preventing car users from using PT (figure 68). Comparing the trends between respondents from the two countries, it is obvious that percentages are quite close to each other.

Comfort of travel is also important to the Brazilian (BR) respondents but not particularly important to South African (SA) respondents. Lack of information is more important to respondents from SA than to those from BR: note that 47% still indicate a ´lack of information` as a (very) important aspect in preventing the use of PT in Manaus. Weather conditions were the most divergent factor for modal choice between the countries: 66% of the BR respondents evaluated it as (very) important whereas it was evaluated in the same way by only 29% of the SA respondents and as (very) unimportant by 50%, in comparison to 17% in the case of BR. A reasonable explanation is the different climate with very heavy rain falls and high temperatures in Manaus almost throughout the year, often even provoking road flooding, rendering NMT use rather unattractive.

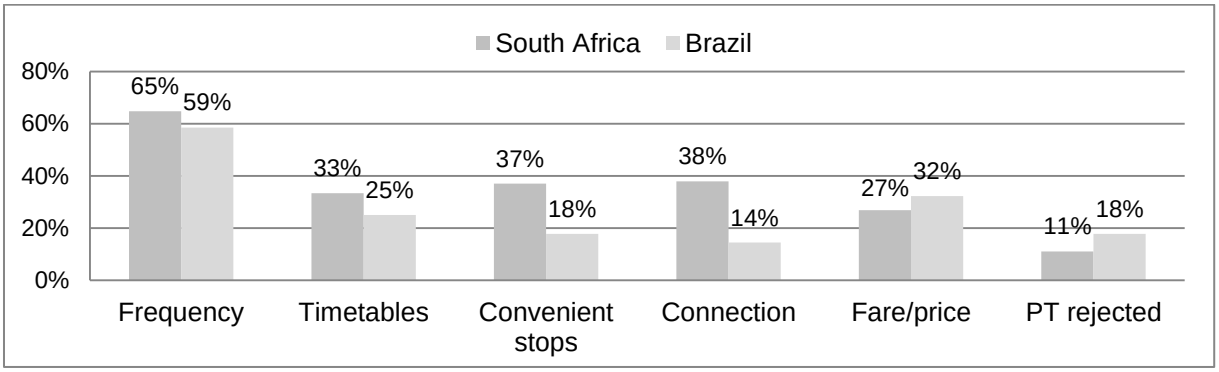
Figure 68 Barriers for Sustainable Mobility in Manaus (BR) and Johannesburg (SA)



Facilitating conditions for sustainable mobility

As figure 69 shows, the most effective measure to promote the use of sustainable means of transport is to offer a better, and especially a more frequent service.

Figure 69 Requested Measures to Increase Attractiveness of Public Transport for Car Users



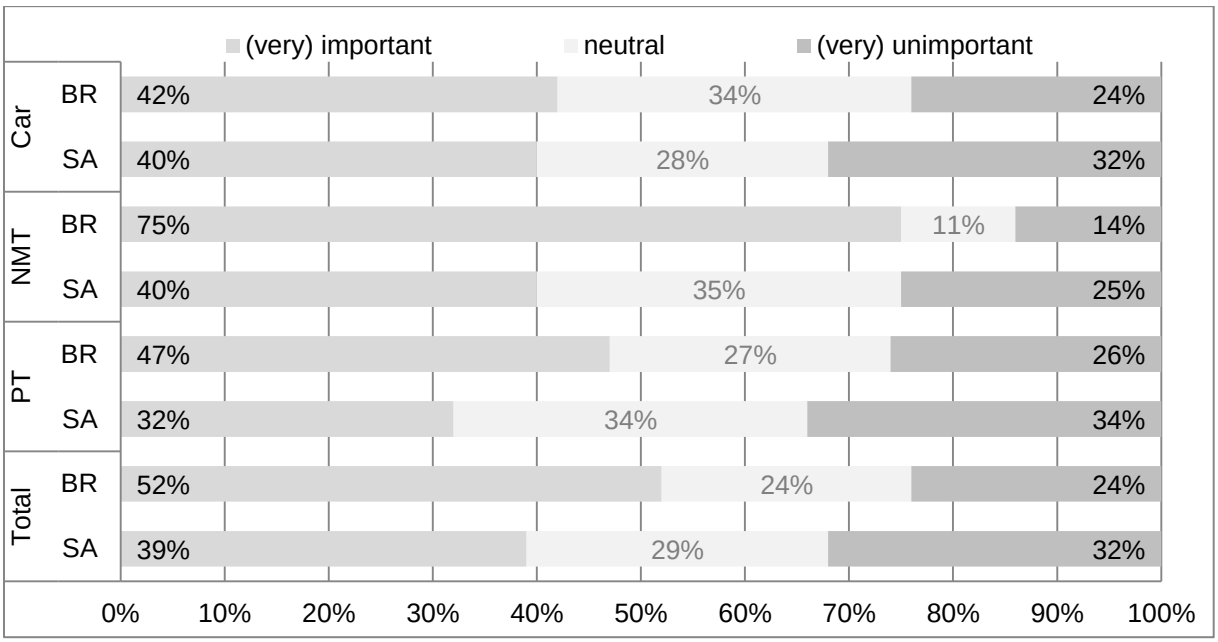
The other factors, such as more attractive timetables, more convenient PT stops and better PT connections, are less important for changing travel behavior in Manaus than in Johannesburg. However, altogether (in total 22% of the Brazilian respondents chose at least one of these 3 items) these measures would also be effective and thus should not to be neglected by policy-makers. For the Brazilian respondents the second most important facilitating condition would be more attractive PT fares. Finally, there is a group of respondents who are convinced car users and, despite all measures to increase PT attractiveness, will not be willing to change their travel behavior. For the Brazilian respondents this percentage accounts for 18%, a relevant portion of users. As stated by Lanzendorf (2001), habits play a central role for leisure travel. However, 82% of car users may change behavior if appropriate measures to improve PT are implemented.

Environmental importance and modal choice

The tourism industry, particularly in developing countries is highly dependent on the appeal of the given natural landscapes (Sasidharan et al., 2002). Sports tourism events sometimes have a negative impact on these natural assets. On the other hand, mega-events can also have positive environmental impacts through new or at least modernized mass transport infrastructure that would not have been implemented without the extra inflow of investments due to the event (Dodouras & James, 2004). Furthermore, mega-events contribute to raise questions on environmental impacts caused by mass tourism, the level of public participation in planning and their desirability in terms of an increased cooperation towards more environmentally-friendly behavior of tourists and residents (Silvestre, 2009).

Figure 70 shows a great similarity with regard to the response patterns between Brazilian and South African interviewees' attitudes towards the environmental importance of different transport choices.

Figure 70 Environmental Importance Attributed to Transport Modes



The only significant deviation is in the field of NMT where the Brazilian respondents attributed a much higher importance to environmental considerations than the South African interviewees (76% versus 40%, respectively). Generally, it seems that environment does not influence directly the modal choice in both countries. According to the table, there is no obvious association between respondents who consider the environment to be important and those who use a more sustainable mobility. This seems to illustrate the common observation in psychological studies that attitude does not dictate behavior directly – the often cited ´attitude-behavior gap`.

The study by King et al. (2009) produced similar results: participants were unaware of the extent of their personal contribution to climate change with respect to their modal choice. Moreover, only about half of the participants believed that they personally had an impact on the environment with their behavior. These findings are in total consonance with the results of the present study concerning the attributed environmental importance and actual modal choice.

Environmental importance and sociodemographic characteristics

Analyzing figures 71 and 72, it can be observed that ´environmental Importance` is evaluated as more important by Brazilian respondents than by South Africans within all subgroups (gender, age group, residents of South Africa and Brazil).

On average, respondents from the age group of 36 to 55 years differed from other age groups by rating ´environment` less important. Considering the income class, both countries' respondents evaluated the importance of ´environment` quite similarly. Only in ´income class A` (richer class) the difference is highly relevant: the percentage of Brazilian respondents (63%) is more than twice as high as among the corresponding income group of South African respondents. In contrast to South Africa, in Brazil the higher the income level, the higher the importance attributed to the environment seems. Interestingly, King et al. (2009) found out in their study in United Kingdom that participants from higher socioeconomic strata of society were significantly more certain that they personally contributed towards climate change than those in lower socio-economic groups.

Interestingly, a higher education level does not relate to a more pronounced environmental consciousness. In both countries approx. 75% of the most educated respondents evaluated the environment as (very) unimportant or neutral. However, it has to be taken into consideration that only few respondents (15 people or 2% of the total sample of the South African and Brazilian case studies) had a doctorate and therefore the representativeness is limited.

Figure 71 Environment Judged as ´(Very) Important` by Socio-Demographic Groups (1)

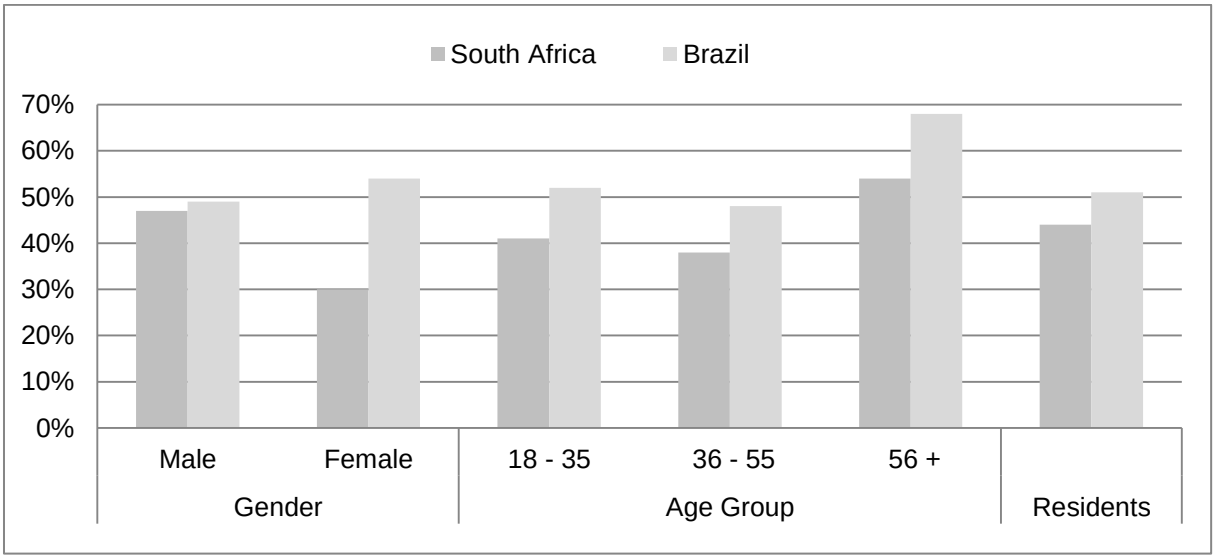
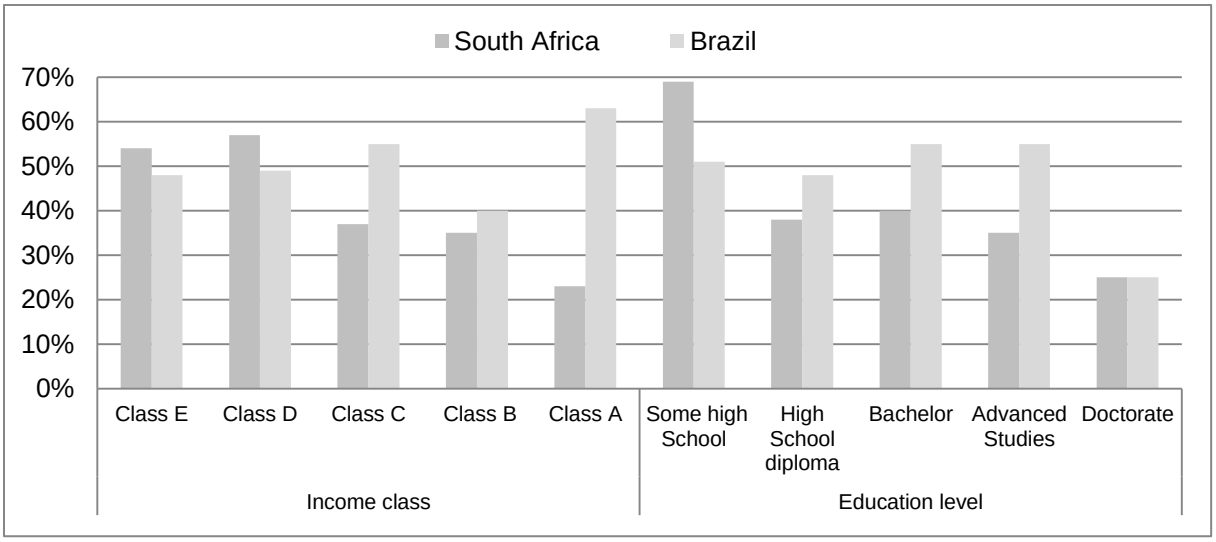


Figure 72 Environment Judged as ´(very) Important` by Socio-Demographic Groups (2)



Car users and non-car users in reference to socio-demographic characteristics

As figures 73 and 74 show, there is no substantial difference among car users and non-car users from different socio-demographic backgrounds. This suggests that gender, age group and country of residence do not directly influence the choice of using a car or not. The authors, Best and Lanzendorf (2005) in their study ´Division of labour and gender differences in metropolitan car use`, in an effort to determine if car use is influenced by gender found that there were no significant differences in the total number of trips between men and women.

Figure 73 Car Users and Non-Car Users by Gender

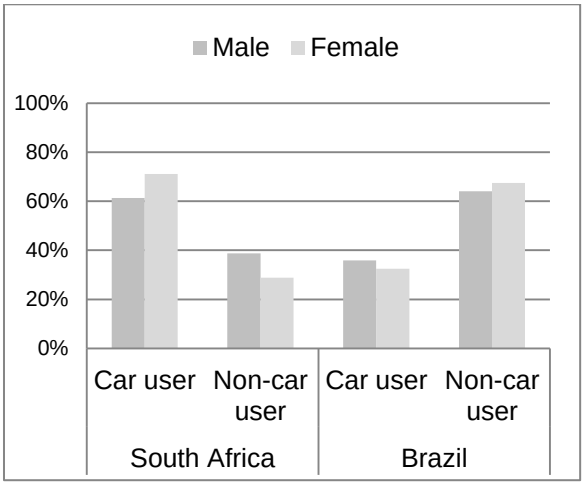
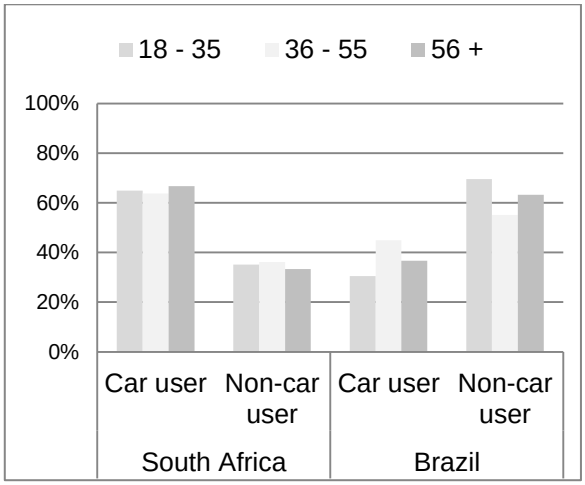


Figure 74 Car Users and Non-Car Users by Age Group



In both countries, the higher the respondents' income class the higher the use of cars (figure 75). This can be clearly explained by the availability of financial resources to buy a car. Brazilian respondents said they use PT as a modal choice because they do not have a car. In countries like Brazil and South Africa the car is explicitly seen as a key sign of social status and, due to government incentives and increasing wealth, people are increasingly obtaining the necessary purchasing power to own a car. A number of authors indicate income and car ownership as significant factors in influencing travel behavior (Best & Lanzendorf, 2005; Boarnet & Sarmiento, 1998).

Figure 75 Car Users and Non-Car Users by Level of Income

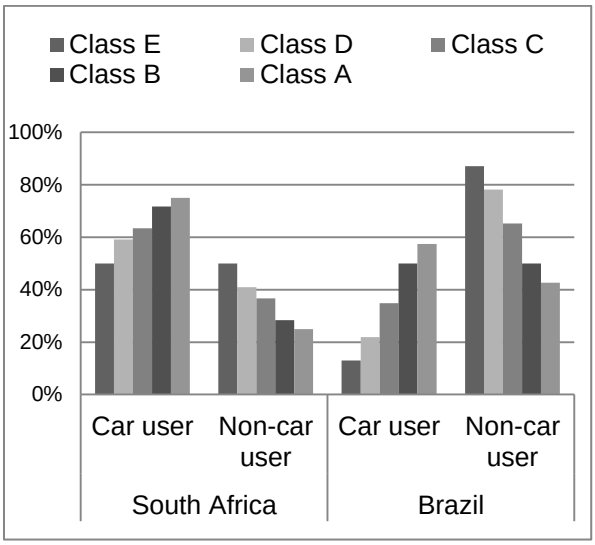
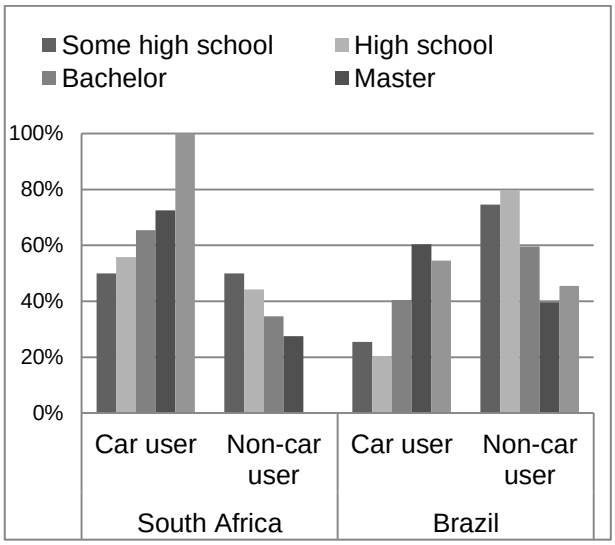


Figure 76 Car Users and Non-Car Users by Level of Education



The level in education is also an important characteristic explaining car use in both countries. There is a direct relation between education level and the use of the private car. A reasonable assumption is that the level in education is directly related to the level of income in both countries. Thus there is a tendency of more highly educated people having easier access to a privately owned car. This tendency is stronger among South African respondents.

FINAL INTERPRETATION

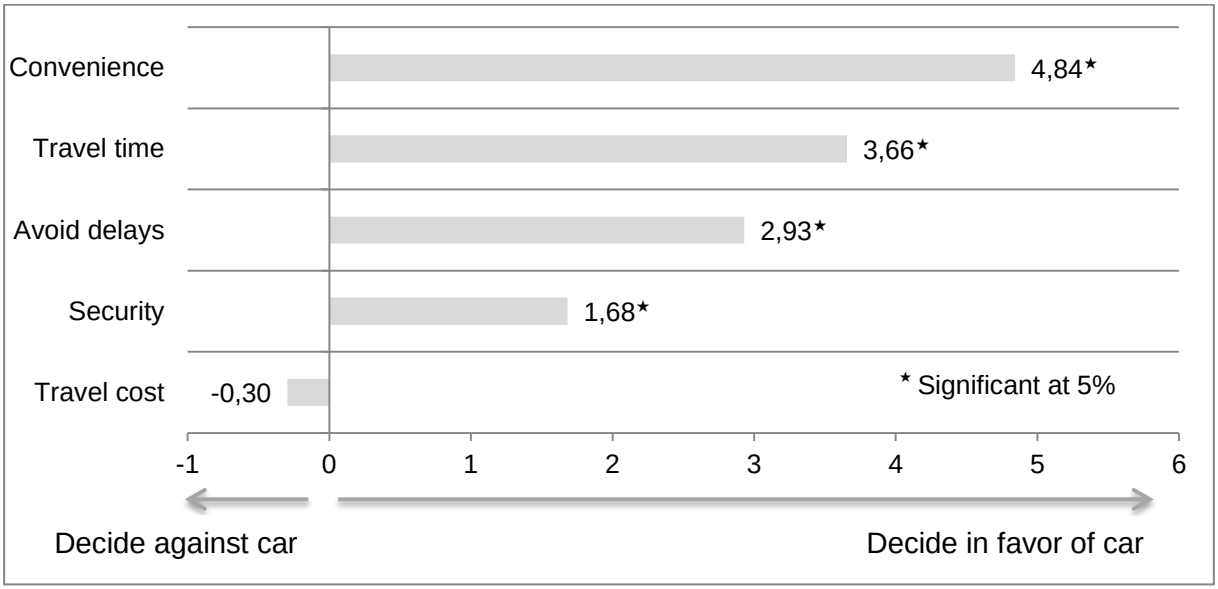
12. FINAL INTERPRETATION AND PROPOSED FRAMEWORK

This chapter presents the conclusive interpretations of the data analyzed in the main case-study (Manaus) and develops two frameworks to cope with sustainable urban mobility for mega-events, one aiming at short-term consequences (usually only during the event itself) and the other aiming at travel behavioral change (long-term benefit).

12.1 Reasons for Modal Choice

All reason items, with the exception of travel costs, are positively influencing the decision in favor of car use. The B coefficients are used for comparison (see figure 77 and appendix I). It is important to take into consideration that there are factors which are not included in the model and in the following figure because of their perfect association with non-car use (´no car availability`, ´city appreciation` and ´health`) or a perfect association with car use (´no PT availability`).

Figure 77 Influence of Factors on Modal Choice

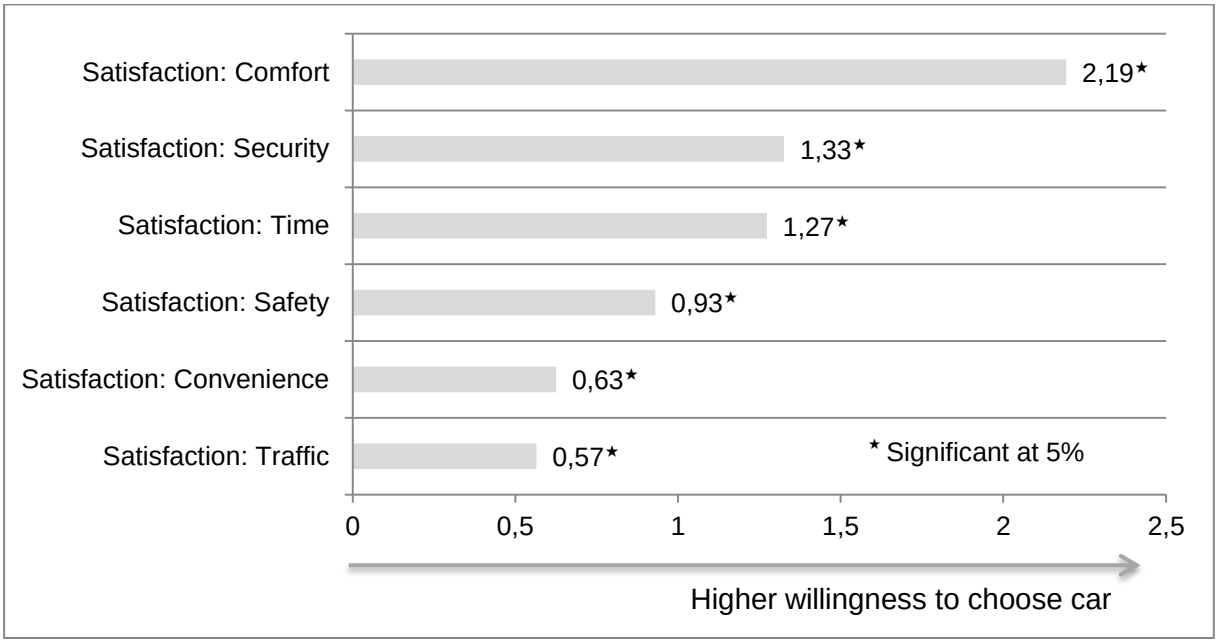


In this way it is reasonable to affirm that the items ´convenience`, ´travel time`, ´avoid delays` and ´no PT availability` are causal reasons in choosing to use a car and the items ´travel cost`, ´no car availability`, ´city appreciation` and ´health` are causal reasons for choosing sustainable modes of mobility.

12.2 Modal Satisfaction

The mean difference (displayed in appendix H1BR [Independent sample test]) is used to rank satisfaction items. Figure 78 illustrates which items bring about large or small differences between car users and non-car users.

Figure 78 Mean Difference for Modal Satisfaction between Car Users and Non-Car Users



The use of cars versus non-car use is influenced largely by the items ´comfort` and ´security`. Congestion apparently has the least influence, probably because it will affect both car users and PT users among the non-car users since they usually share the same road infrastructure.

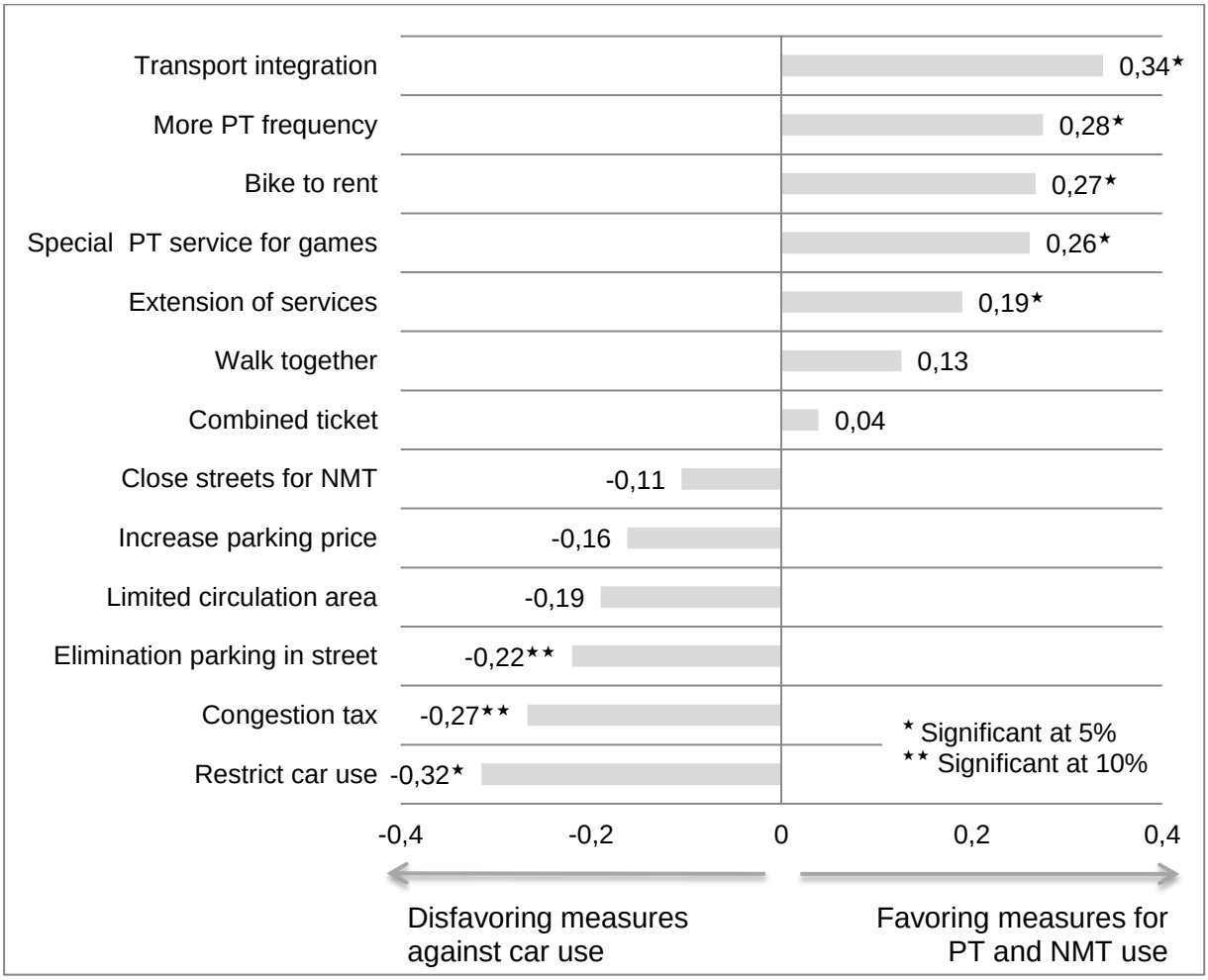
In Manaus, this problem may be exacerbated as alternative roads have equally severe traffic problems during peak hours. Therefore, it is plausible that car users perceive their mode as more comfortable, secure and faster than other modes, such as buses. Although car and non-car users both experience the same congestion, some reasonable explanation for the different perception on modal choice benefits can be given. Driving an own car for instance does not impose waiting for the next bus; many times these buses are completely full or requires users to stand all journey. Additionally the small crimes noticed every day in shared places such as buses and bus stops/stations increase the level of insecurity of using PT.

In order to attract car users to more sustainable mobility modes during the FWC it is important that users perceive these alternative modes as reliable, comfortable and fast.

12.3 Acceptance of Measures

The indicator of the mean difference (displayed in appendix H4BR [Independent samples test]) is used to rank the acceptance of measures to discourage car use and to promote the use of more sustainable means of transport.

Figure 79 Mean Difference for the Acceptance of Measures to Discourage Car Use and Favor PT/NMT



In figure 79 the mean difference is used to outline attitudes towards and agreement with potential strategies which can be implemented for the 2014 FWC. A positive attitude towards ´transport integration` is not necessarily a sign of actual car use; it just shows that car users show a little higher agreement with such strategies than non-car users.

According to some behavioral theories (e.g., TPB, TRA, TIB) it is plausible to assume that if an individual has a positive attitude (in this case agreement) towards certain measures, he/she is more likely to change behavior in favor of the measures. The opposite also applies: When the individual has a negative attitude to certain measures, the willingness to perform the target behavior is relatively low.

There seems to be a common agreement in the acceptance of strategies which aim at improving the PT system and service quality. Most probably fans will be looking for a transport service which is accessible, convenient and will bring them to the match on time. If these fans perceive that PT services can cope with that, they will surely be more willing to use it.

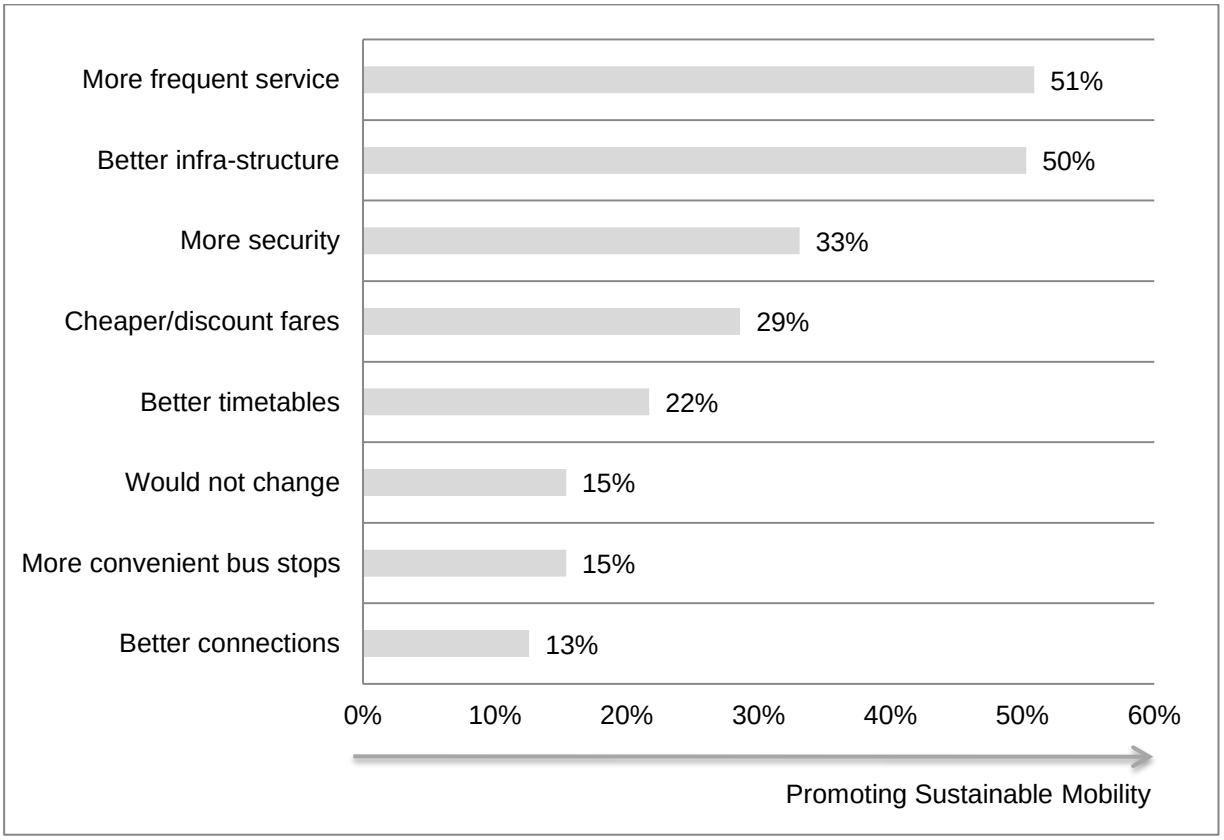
Car users seemingly do not agree with any of the strategies which could restrict them in using their own vehicle. Interestingly, non-car users have the same tendency. Strategies involving financial ´punishment` of car use were unacceptable to them too.

Strategies involving the promotion of NMT were also very positively perceived by them as they do not restrict them. Otherwise they are not supported, as in the case of ´closing streets for exclusive use of NMT`.

12.4 Facilitating Conditions

The percentage of respondents (displayed in appendix H7BR [PT facilitating conditions frequencies]) is used to rank the importance of facilitating conditions in promoting sustainable mobility. This question permitted multiple responses and was answered only by car users.

Figure 80 Importance of Facilitating Conditions for Car Users

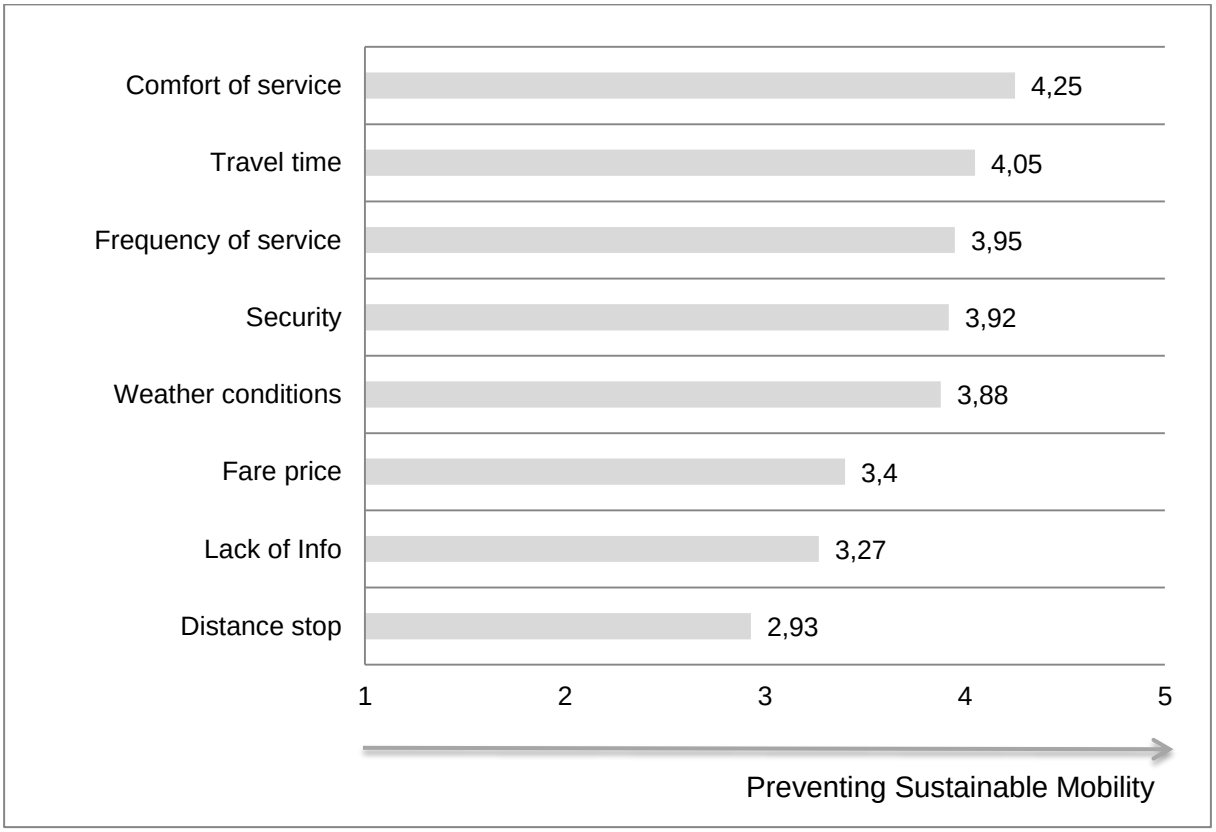


For approximately 50% of the respondents the conditions of ´more frequent service` and ´better infrastructure` are the most important measures to facilitate an effective promotion of sustainable mobility. The conditions of ´more convenient bus stops` and ´better connections` seemingly would not be so effective in promoting sustainable mobility. It is important to note that some respondents would not change their behavior regardless of any of the promotion measures. These are car holders whose behavior is probably determined by habit or conviction.

12.5 Obstructive Factors for Increased Use of Sustainable Modes

Means (displayed in appendix H6BR [Report]) are used to report the importance (Likert scale from 1=´not at all important` to 5=´very important`) of obstructive factors in promoting sustainable mobility. This question was only asked of car users.

Figure 81 Importance of Obstructive Factors for PT Use as Perceived by Car Users



The factors; ´distance to bus stop/station` and ´lack of information` are the least important barriers keeping car users from using alternative modes of transport. However, as shown in previous analyses, ´lack of information` is the second most important reason in preventing car users from using PT or NMT when considering only the group of interviewed tourists. The factors ´comfort of PT service` and ´travel time` seem to be very important challenges when promoting sustainable mobility. Note that not all factors attain scores of 4 and 5 (respectively, important and very important) which may indicate that the promotion of sustainable mobility is somehow hampered by these external and situational factors in addition to internal factors, such as habit and social norms.

12.6 Validation of Behavior Theories/Models

The following table shows the set of theories that served as orientation for the empirical work of this study. Most of the hypotheses could be confirmed but in some cases travel behavior and attitudes seemingly followed other patterns with relevance to the FWC measures.

Table 35 Validation of Behavior Theories and Models for achieving sustainable mobility for 2014 FWC

Theories/Models	Influences	Hypotheses tested	Examples	Validation
Expected Utility Theory	Level of satisfaction	Satisfaction varies significantly between groups of modal choice	H1SA H1BR	Accepted Accepted
Pro-EB Model TIB	Habit	Correlation between daily modal choice and FWC modal choice	H2SA	Accepted
Value-Action gap	Level of satisfaction and information	Correlation between travel mode satisfaction and information provision	H3SA	Accepted
Expected Utility Theory	Travel time Travel cost	Travel time and travel cost are significant and explain car/non-car use	H4SA	Rejected
NOA Model	Sociodemographic characteristics	Income is significant in explaining car or non-car use	H4SA	Accepted
TIB	Intention & habit	NMT implementation and intention to use among people who are daily users/infrequent users	H2BR	Accepted
TPB	Intention	Correlation between daily modal choice and 2014 FWC modal intention	H3BR	Accepted
Expected Utility Theory	Push measures (travel cost)	Efficacy of hindering car use through financial punishment	H4BR	Rejected
Expected Utility Theory	Travel time	Main reason for using car	H5BR	Accepted
Expected Utility Theory	Travel cost	Main reason for using PT	H5BR	Rejected
NOA Model	Abilities	Main reason for using PT is no car availability	H5BR	Accepted
Value-Action Gap	Lack of information	Lack of information is the main factor preventing sustainable mobility	H6BR	Partially accepted
TIB	Habit	Important reason why car users do not use PT is habit	H7BR	Partially accepted
NOA Model	Opportunities	Important reason why car users do not use PT is lack of service	H7BR	Accepted
TRA	Rational action	Correlation among reasons for modal choice on holiday and at home	H8BR	Accepted

Note that the literature on the factors influencing human behavior is not limited to the above. For the purpose of this study it was necessary to focus on the most relevant factors underlying travel behavior and influencing individuals in adopting a more sustainable mobility behavior, especially during mega-events.

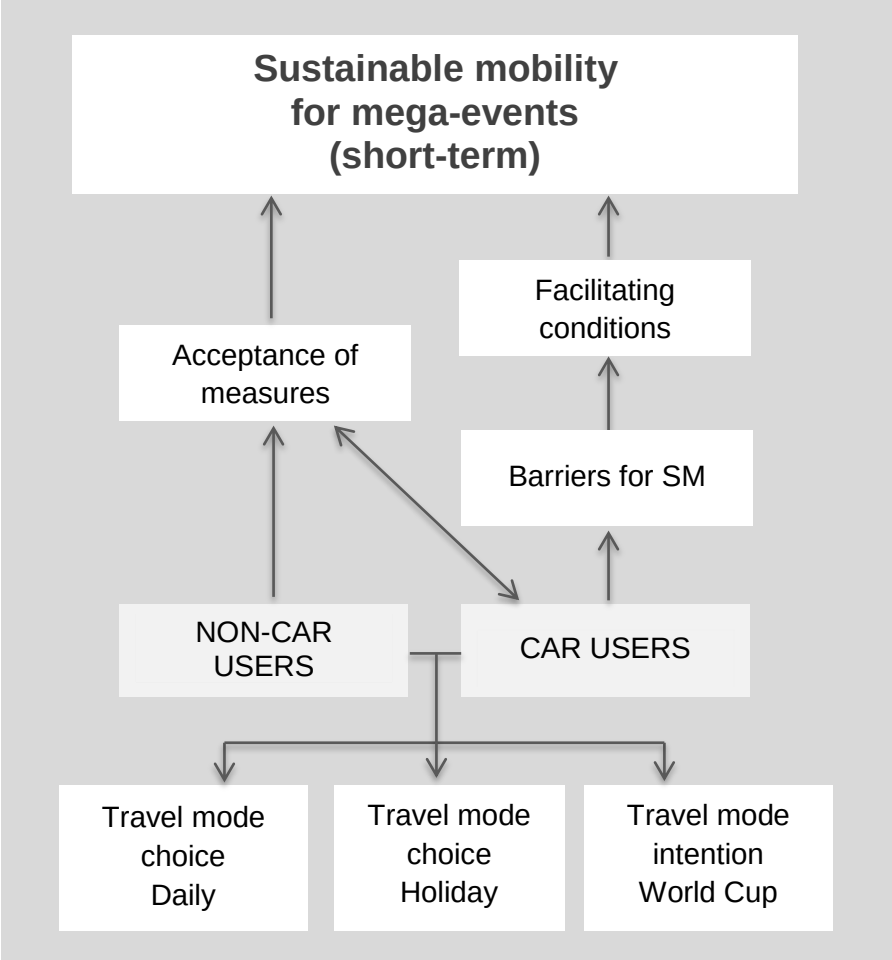
This study considered attitudes and the perceived willingness and acceptance of carrying out a behavior successfully (e.g., impediments and obstacles pointed out by car users or non-car users during 2010 and 2014 World Cup) with respect to modal choice and tried to identify the relative importance and validation of these influences.

The validation of models and theories aims at supplying the necessary comprehension to identify determinant factors which influence travel behavior and to understand under which circumstances individuals change their behavior. Moreover, this validation seeks to explain how travel behavior can be changed, support measures and policies for changing behavior or promote new behavioral patterns. These models can be used to help transport policy makers find better ways to support individuals on their way to more sustainable mobility behavior. For many issues, the theories and models are used in parallel to provide an effective understanding of behavioral change. A combination of some of the concepts in the different models can also be observed.

12.7 Final Proposed Framework

The following framework (figure 82) presents the effects of variables in the cluster car users and non-car users in terms of short-term consequences. In the specific context of a mega-event, transport planners would need to implement a wide range of measures, incentives and strategies to reduce car usage and to promote PT and NMT use – sustainable mobility (SM).

Figure 82 Model Framework for Promoting Sustainable Mobility during Mega-Events

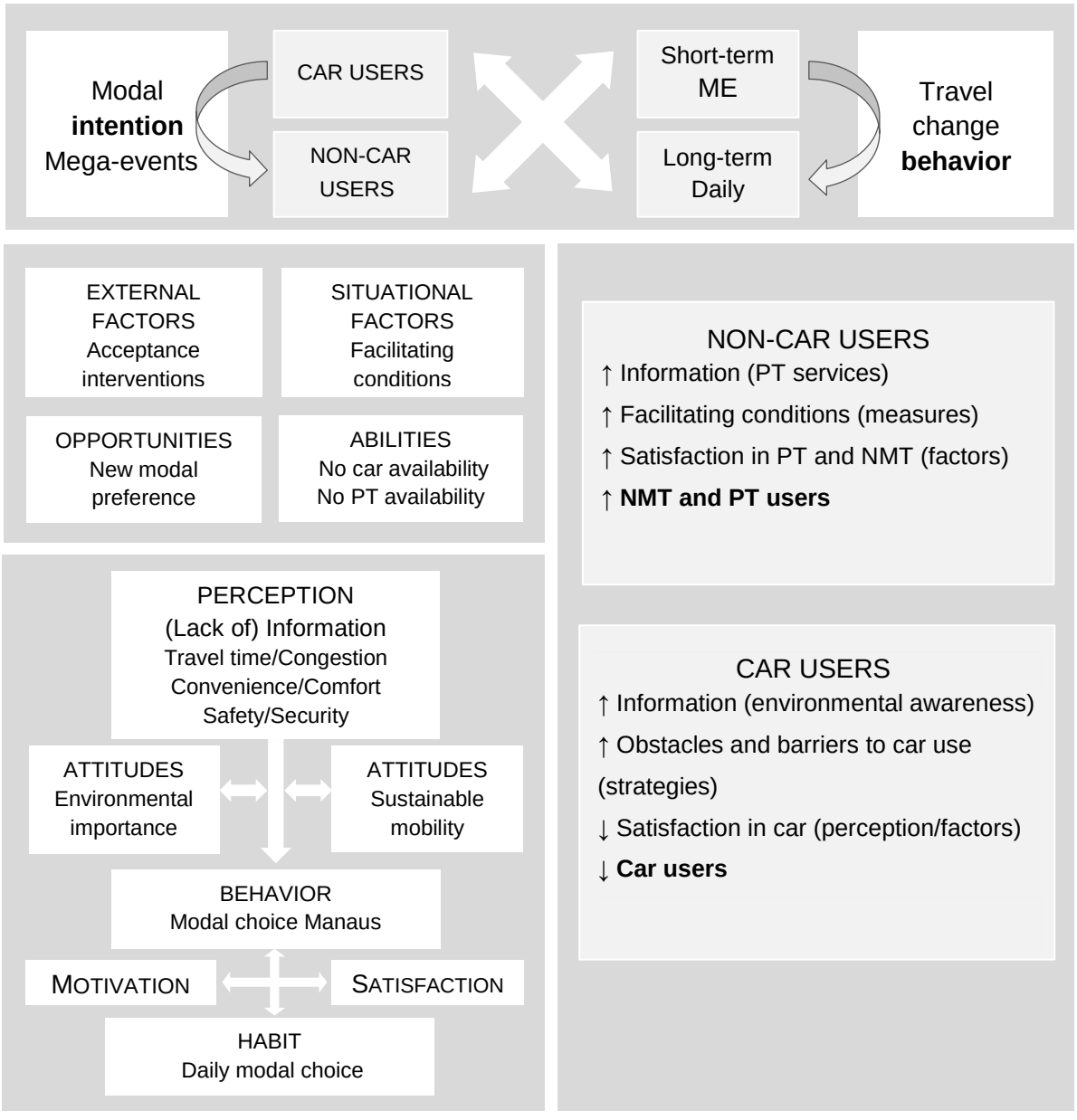


Many of these measures will probably only be viable during the mega-event, especially the restrictions on free circulation (e.g., limited access zone, closed streets for mere NMT use) and those directly related to the event (e.g., combined ticket, PT service to the stadium).

To promote long-term travel behavior change effectively it is necessary to evaluate the psychological, emotional and social factors determining an individual's perception, attitude and behavior regarding sustainable mobility (figure 83), identifying the obstacles and barriers (physical or psychological) and facilitating more conducive conditions.

Most of the models and theories which were discussed have some validity under certain circumstances. This indicates that the question of what shapes travel behavior in a mega-event (ME) is so complex that it cannot be easily visualized or understood through a single theory, framework or model. Thus, when designing a transport strategy for a mega-event it is of fundamental importance to consider all influencing factors concerning travel behavior, including external factors (e.g., economic, social and cultural), situational factors (e.g., facilitating conditions), opportunities (e.g., implementation of new transport modes), abilities (e.g., ability or disability to choose certain modes) and, finally, internal factors (e.g., reasons, satisfaction, environmental concern, attitudes, perception and habit).

Figure 83 Conceptual Framework for Travel Behavior Change in Mega-Events and Daily Mobility



According to the second framework (figure 83), a range of measures, strategies and barriers as well as information provision is aimed at lowering the level of satisfaction associated with car use, thus affecting personal perception and changing the attitudes towards modal options. In turn, this may determine new behavioral patterns and, finally, reduce the number of car users. In the same way, providing effective information about and improving PT services, removing barriers and providing incentives for PT use, will result in a higher level of satisfaction in PT users. The net effect of these strategies should be a net increase in sustainable mobility.

The perception of a number of factors (e.g., travel time, cost, safety, convenience) strongly influences attitudes, as does consciousness related to the environment and sustainable mobility. These attitudes are, in turn, influencing behavioral choices of tourists. Habitual behavior, related to satisfaction with the preferred travel mode and motivation or reasons for this travel mode choice, will also strongly influence future modal choices.

CONCLUSIONS

13. CONCLUSIONS

Well-functioning transport systems are essential for the tourism sector (Leiper, 2004) and have been referred to as “one of the most significant factors which has contributed to the international development of tourism” (Lohmann, 1993: 1). There is increasing evidence that mobility management during mega-events needs to go far beyond and complement the technical dimension of transport engineering. Many behavioral issues need to be considered to ensure successful mobility management during the event and to achieve sustainable mobility behavior in the long-term.

This study contributes original data and analysis to understanding behavioral choices related to transport during mega-events. In doing so it acknowledges the multi-dimensional and complex problems related to the promotion of sustainable mobility during mega-events without seeking to solve or comprehensively understand all the factors related to the problem – a task that is beyond the scope of this thesis. In other words, it is important to note that behavioral trends, motivations and actions related to transport at mega-events are intimately associated with cultural attributes, overarching socio-economic conditions, and individual preferences, attitudes and habits.

Nevertheless, despite the complex net of behavioral cause and effect, considerable insights can be gained though empirical research. By gathering information and analyzing data from transport users in South Africa during the 2010 FWC and from Brazil, the host country for the 2014 FWC, it was possible to cover the relevant issues for understanding travel behavior during mega-events.

Through the empirically tested hypotheses and the discussion of their implications it was possible to identify some central conclusions:

i. There are some important situational factors that relate to the cultural attributes of the location and country; for example, safety and security is a very important factor in South Africa, but far less important in Brazil. A plausible explanation would be the South African crime statistics, which are higher for murder rates than in Brazil.
ii. There are factors that seem to have equal importance in both countries. For instance, travel time is the most important factor in travel choice in both countries. This clearly highlights the need to get to events quickly and on time. Travel time has been perceived as more important to car users than to non-car users.

iii. PT users in Brazil have been extremely dissatisfied with the service they receive and, due to the lack of a private car, have to be qualified today and during the 2014 FWC as “captive riders”. In the long-term these PT users may be lost as more and more citizens are able to afford their own car.

iv. Security and safety, PT frequency, lack of information and travel time have been highlighted by car users in SA as the main barriers for using PT during the 2010 FWC.

v. Comfort, travel time, safety, security and PT frequency are the most important factors keeping residents and visitors from using PT in Manaus (Brazil).

vi. In both countries, effective measures to facilitate the use of sustainable mobility are related to the improvement of the PT system to provide more frequent and reliable services and better adjusted timetables.

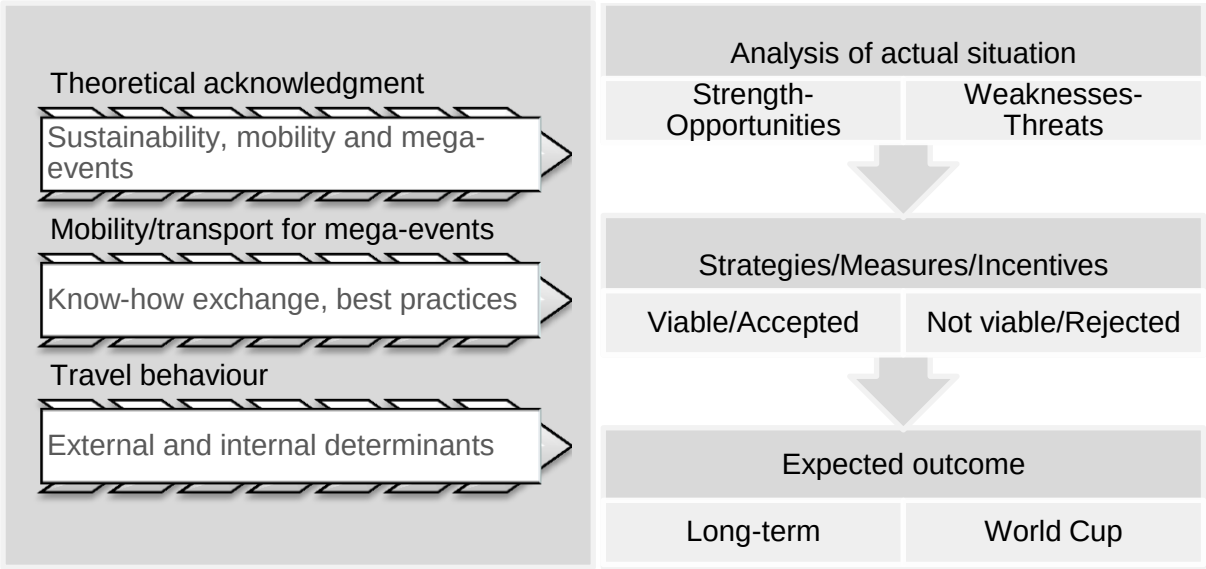
vii. Attributed environmental importance did not significantly influence modal choice, with the exception of NMT users. No differences have been observed among South African and Brazilian respondents.

viii. Attributed environmental importance, unexpectedly, has not shown a direct association with levels of education or income of respondents from both countries. However, Brazilian respondents evaluated the “environment” as more important in travel mode decisions than South African respondents. This result was further emphasized in qualitative responses where a high number of respondents voiced the sentiment that “it is the World Cup and the environment is far from a priority”.

ix. Modal choice is highly influenced by income and education level of both tourists and residents. Notably, the higher the respondent’s income class, the more prevalent is the use of the private car. It seems that car use is related to social status in Brazil and South Africa and thus using PT is considered to be a sign of low social status and therefore will be avoided, if possible. This indicates that government incentives for car ownership (tax incentives and loan offers) may result in a further modal shift from NMT and PT to the private car.

According to these conclusions, a range of external and internal factors largely determine individual travel behavior during mega-events. When this knowledge is combined with better practices in mobility management for mega-events and the current transport system situation in Manaus, it is possible to develop a SWOT analysis (see figure 84). A number of potential outcomes were identified considering the use of public transport, non-motorized transport and cars.

Figure 84 Influences to Perform the Final Conclusion



13.1 SWOT Analysis

The theoretical framework and empirical results form baselines to shape a picture of the actual situation and gain substantial knowledge regarding the promotion of sustainable mobility for the 2014 FWC in Manaus. The SWOT analysis, then, concentrates on the strengths, weakness, opportunities and threats of the transport issues in Manaus; these driving powers support transport planners with a systematic approach to plan a series of measures and strategies to overcome the identified threats in achieving sustainable mobility.

13.1.1 Public Transport

Coach

The coach service in Manaus basically serves workers of private companies who commute on a daily basis. The service is operated by private companies and is not , compared with the regular PT, under control of the local government. The only coach service for tourists is the "Hop on – Hop off" bus. This service is also operated by a private company (Tourism Agency of Manaus). However, coach services could offer huge opportunities for mobility during the 2014 FWC, especially for those tourists who are not well informed in how to use the PT system.

Table 36 SWOT Analysis for Coach as Means of Transport for 2014 FWC in Manaus

S	**Strengths** • Reliable and convenient guided tour around Manaus • More reliable and flexible than the regular PT bus lines • Flexible to adapt to demand • Fast and relatively cheap to launch	**W**	**Weaknesses** • Totally new market of visitors to be explored and served • No experience with potential demand as it would be a totally new market • Short-term solution
O	**Opportunities** • New services for tourists to move from airport to hotel, hotel to stadium and to other tourist facilities and attractions • New services for destinations not served by regular PT • Transfer between Park & Ride and stadium (feeder service)	**T**	**Threats** • Road based mode which will also be affected by high volumes of traffic bringing problems to cope with travel time • Difficulties to find reliable operators willing to invest in new coach services

Bus

Traffic and congestion are significant barriers to bus reliability and to increase use. Surveys undertaken with tourists and residents identified travel time as one of the most critical issues. Dedicated bus lanes and provision of real-time information can help moreover to attract residents and tourists, and transform furthermore negative perceptions into positive attitudes.

Table 37 SWOT Analysis for Bus as Means of Transport for 2014 FWC in Manaus

S **Strengths** • Established and growing market in the city • Fleet is being renewed • Provides journeys for around 800,000 passengers (daily) • Tourists and residents to not need to worry about finding a parking place • More environmentally-friendly	**W** **Weaknesses** • The system is poorly managed and regulated • Lack of appropppriate infrastructure and services as well as poor conditions of buses • No reliability of time schedules • No transparent route maps • Capacity constraints: passenger volume is extremely high on certain routes, buses are crowded resulting in uncomfortable, unsafe and dissatisfying service • Bus has a bad public image • Road based mode contributing to traffic and congestion
O **Opportunities** • Market regulated before 2014 FWC, providing monitored, reliable and safe bus service • The bus system "Executivo" could supply the demand during 2014 FWC for the middle to upper class and tourists who are willing to use more costly PT providing better service conditions • Feeder services to Monorail and BRT (in case of implementation) • Better integration of PT services • Implementation of website offering reliable PT information services	**T** **Threats** • Reliability of travel time possibly affected by congestion; passenger volume is going to be extremely high on certain routes only during on-site hours (before and after games) • To supply demand with extra vehicles will generate more traffic • Future competition with BRT and Monorail (if implemented) • Different operators control different routes, some of these operators are not under regulation which could be a challenge in managing the demand for the 2014 FWC in accordance with all operators

13.1.2 Non-Motorized Transport

In order to ensure that the modes of walking and cycling are perceived as attractive options for residents and tourists, it is necessary to implement cycling lanes and sidewalks, as well as facilities such as secure parking. With the 2014 FWC, the network of sidewalks and cycling lanes must be adapted with linkages to the wider PT network.

Table 38 SWOT Analysis for Non-Motorized Transport as Means of Transport for 2014 FWC in Manaus

S **Strengths** • Reduce the traffic pressure near to the stadium • No negative effect on climate change (pollution free) • Health benefits • Low investment and no costs for users at all • City appreciation, opportunity for social interaction and cultural exchange among fan groups of different nationality • Minimal use of road and public space • Depending on distances and routes, the NMT journey can be quicker than PT and car	**W** **Weaknesses** • Not effective for long distance • No "culture" of cycling among residents, as cycling lanes are almost inexistent in Manaus • Unsafe to cycle, since it shares the same roads with car, bus and motorcycle • Appropriate sidewalk infra-structure is almost inexistent or in bad condition • Obstacles through parked cars, shop-stands and street vendors on sidewalks • Sidewalk lowering for disabled persons is inexistent • Weather conditions, especially high temperature and rainfalls may make NMT inconvenient
O **Opportunities** • Implement cycling lanes and sidewalks • Improve and regulate sidewalks • Promote NMT for 2014 FWC through image campaigns • Implement strategies like "Walk Together" (2006 FWC) to encourage fans to use NMT • Gives the opportunity for changing behaviour by trying a new type of mobility	**T** **Threats** • Implementation of cycling infra-structure can further restrict the already limited space for PT • Traffic congestion may be worsened by poorly regulated streams of NMT users • Unsafe to users, chance of injury due to poor sidewalk conditions • Lack of security for fans, especially at night • Weather dependency

13.1.3 Motorized-Individual Transport (Car and Taxi)

Park & Walk and Park & Ride

There is a need to carefully balance the supply and price of car parking as part of a strategy to discourage car use, while at the same time ensuring consistency with the aim of promoting sustainable mobility during the 2014 FWC. Extensively available and cheap parking could encourage car use, while limited and expensive parking will probably encourage sustainable mobility.

Table 39 SWOT Analysis for Park & Walk and Park & Ride for 2014 FWC in Manaus

S **Strengths** • Reduces the traffic pressure near to the stadium • Generates public revenue • Convenient for car users • Provide mobility to people living/staying in/at neighborhood not served properly by public transport	**W** **Weaknesses** • Still relies on the use of private car, contributing to traffic • Influencing negativelly the air quality (pollution) and climate change • No "culture" of using such facilities among residents as Park & Walk and Park & Ride are inexistent in Manaus • Park & Ride: depends on a second mode to perform the final transfer from car parking to the stadium • Park & Walk: no proper sidewalk infrastructure within the city
O **Opportunities** • Revenue can be used to improve PT service or upgrade transport infrastructure • Incentive the use of PT (Park & Ride) among car users • Encourage the use of NMT (Park & Walk) among car and non-car users • Provide the opportunity for breaking the car use habit and trying an alternative travel option (Ride - PT/Park – NMT)	**T** **Threats** • Traffic congestion near to car parking • Supply may be insufficient (uncertainty of demand) • Time pressure in peak-hours (before games), as the fans rely on PT service for the “last mile” to the stadium • Still inefficient if cars are used with low occupancy (1-2 people)

Taxi

The taxi market should provide a professional and reliable service with a reasonable price for fans on the move during the 2014 FWC. In this sense it plays a potentially important role for the mega-event where a high mobility is expected. Furthermore, the public transport system may not serve user's needs (e.g., ineffective and inefficient information on services, insecurity especially at night), additionally, taxis can be the first positive impression of a city and may serve as an important information service for tourists and fans visiting Manaus.

Table 40 SWOT Analysis for Taxi as Means of Transport for 2014 FWC in Manaus

S **Strengths** • Extensively available, easily accessible within the central areas of the city (downtown, shopping centres, touristic places) • Easy way to move around the city especially for tourists who do not know the city and/ or are not aware of the PT system functionality in Manaus • Provide service for areas where PT is not available • Flexible by taking customers directly to the destination • Comfortable • Round-the-clock service	**W** **Weaknesses** • Road based mode, contributing to high volume of traffic • Pollution • There are taxis which are not regulated or licensed • Many taxis do not use taximeter for charging, price is agreed before or after journey, the latter often leading to overcharging of tourists • Taxi drivers are not trained to attend the clients properly, especially foreign tourists
O **Opportunities** • Training for taxi drivers • Regulation of all taxis, monitoring to restrict the use of unregulated taxis • Improve service quality, such as basic English skills and proper welcoming of tourists • Implementation of technologies such as GPS	**T** **Threats** • Traffic congestion • Manage taxi demand and growing pressure on road transport infrastructure • Safety to tourists and residents

13.1.4 Changing Awareness and Travel Behavior

Based on the assessment of attitudinal and travel behavior change in South Africa and Brazil, the following SWOT analysis gives an overview of the current situation to promote sustainable mobility for the 2014 FWC in Manaus.

Table 41 SWOT Analyses for the Strategy of Changing Awareness and Travel Behavior for 2014 FWC in Manaus

S **Strengths** • Existing local NGO initiatives promoting and incentivating an environmentally-friendly mobility culture, such as "Pedala Manaus" • People getting more concerned about the environment and climate change: possibly results in a growing number of PT users in the long-term • Awareness helps to avoid hard measures to discourage the use of the private car	**W** **Weaknesses** • Car is still a status symbol • Lack of academic knowledge and research • Change in behaviour is a slow process and needs efficient strategies to be effective • Diverse bus operators are an obstacle for integrated solutions • PT fare in Manaus is among the most expensive of all metropolites in Brazil • Users perceive the present PT service quality as poor (route, timetable, comfort, crowdedness) • PT in Manaus so far depends completely on the bus system
O **Opportunities** • Promotion of NMT as healthy, environmentally-friendly mode and cost free to use (proper infrastructure to be provided) • Opportunity for daily car users to try an alternative transport mode during the 2014 FWC may contribute to a long-term change of travel behavior if positive experiences allow forming a positive attitude • Companies agree with working time flexibility or allowing to work from home, or even facilitating holiday break during the 2014 FWC (2010 FWC and London 2012)	**T** **Threats** • Supply of existing PT is not sufficient for 2014 FWC demand • Car-dependent culture may be hard to influence by soft measures, risking a traffic chaos during the 2014 FWC • Many individuals stated that they use PT because of no car availability and not due to awareness • People may be willlling to try a new travel mode but possibly no adequate infrastrucutre improvemente will have been implemented in time

Table 42 Expected Outcomes for 2014 FIFA World Cup and Long-Term

Public Transport	2014 FWC	Long term
Maximized share of public transport (coach and bus)		
Maximized information provision to help tourists in using PT		
Adequate supply of PT for fans, both residents and tourists		
Minimized investments in public transport that will not be useful after FWC		
Non-Motorized Transport	2014 FWC	Long term
Maximized use of non-motorized transport, especially walking		
Implementation of adequate infrastructure and/or improvement of accessibility		
Maximized provision of information about the mode's benefits such as environmentally-friendliness, healthiness, fun		
Supportive and satisfactory information on routes, time, distance		
Private Car and Taxi	2014 FWC	Long term
Minimized investments in road infrastructure aimed at the FWC		
Provision of extensive information about the disadvantages of using private car and taxis such as emissions, pollution, increased travel time, congestion		
Minimized use of private cars, saving public spaces necessary for parking		
Increased vehicle occupation of taxis and private cars		
Changing Awareness and Behavior	2014 FWC	Long term
Changed public image of PT (from negative to positive)		
Increased perception on safety and security among PT users		
Increased positive perception on sustainable transport		
Reduced perception of car use convenience and comfort		
Better perception of PT service		
Increased awareness of environmental problems and climate change		
Changed public image of car being a status symbol		
Increased concern about self-behavior		
Better workplace flexibility – changed attitude of companies and workers in relation to working time options and working at home		
Final changed behavior (from car-user to non-car user)		

In conclusion, the promotion of sustainable mobility for the 2014 FWC in Manaus will be an arduous task and constitutes a huge challenge for transport and urban planners, as well as for mega-event managers. There is a need to implement a wide range of policies and measures to reduce car use and encourage the use of PT and NMT. However, to be able to identify, prioritize and implement these measures, policies and strategies, firstly, it will be necessary to develop the appropriate transport infrastructure. With relatively little time left before the 2014 FWC takes place, it seems likely that key elements of the transport infrastructure will not be ready. This is deeply worrying since the FWC represents a unique opportunity to implement those long-needed urban mobility projects which have been “on paper” for many years.

The 2014 FWC will be a mega-event of considerable political as well as public interest. There will be a few segments of society that will benefit economically from it, but the majority of the public will see only a few lasting benefits, among those the promised improvements in urban mobility.

Although such a mega-event constitutes a unique opportunity to achieve changes in travel behavior through improved offers, this aspect is virtually invisible in discussions of the transport planning for the 2014 FWC in Brazil and especially in Manaus. As has been clearly argued theoretically and confirmed through data analysis, the basic strategy must be to first provide appropriate conditions to adopt new behavioral patterns and, subsequently, create a positive attitude providing long-term benefits through the achievement of concrete and tangible behavioral change.

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Appendix A Questionnaire Brazil

I. Characteristics of your trip (TODAY)

MIT	☐ Driver	☐ Passenger	☐ Taxi
NMT	☐ Bicycle	☐ Walk	
PT	☐ Bus	☐ Minibus/Executive	

1.1	Travel Purpose (only residents)			
	☐ Work ☐ Leisure/Tourism	☐ Personal ☐ Education/Study	☐ Visiting family/friends ☐ Shopping	☐ Others

1.2	Waiting time for the PT (only PT users)			
	☐ < 5 min ☐ 5 – 10 min	☐ 10 – 20 min ☐ 20 – 30 min	☐ > 30 min	

1.3	Travel time			
	☐ < 15 min ☐ 15 – 30 min	☐ 30 – 45 min ☐ 45 – 60 min	☐ 1h – 1h 30 min ☐ > 1h 30 min	

1.4	How many Kilometers did you take in your trip			
	☐ < 2 km ☐ 2 – 5 km	☐ 5 – 10 km ☐ 10 – 15 km	☐ 15 – 20 km ☐ > 20 km	☐ Don´t know

1.5	What's is the main reason for your modal choice			
	☐ Travel Time ☐ Cost ☐ Safety	☐ Avoid delays/ congestion ☐ Security ☐ Health	☐ Convenience ☐ No PT availability ☐ Comfort ☐ No car availability	☐ City appreciation ☐ Others

1.6	Frequency of modal use			
	☐ (almost) everyday ☐ 1 – 3 times/week	☐ 1 – 3 times/month ☐ less 1 per month	☐ (almost) never	

1.7	How important is the environment in your decisions to choose your travel mode?	**Very** Important → **Not at all** Important				
		1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

Only for car users

1.8	With which frequency do you use PT?		
	☐ (almost) everyday ☐ 1 – 3 times/week	☐ 1 – 3 times/month ☐ less 1 per month	☐ (almost) never

1.9	How important are these factor in preventing you to use PT	**Very** Important → **Not at all** important				
1	Lack of info	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
2	Distance	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
3	Travel cost	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
4	Travel time	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
5	Weather conditions	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
6	Security	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
7	Frequency of service	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
8	Comfort	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

1.10	Which measures would incentive you to use PT? (max. 3 answers)			
	☐ More frequent service ☐ Better infra-structure	☐ Better timetables ☐ Convenient PT stops	☐ Better connections ☐ Better security	☐ Cheaper fares ☐ I wouldn´t change

II. Modal satisfaction

	How satisfied are you with the following aspects in your modal choice?	**Very** satisfied → **Not at all** Satisfied				
2.1	Confort	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
2.2	Travel Time	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
2.3	Traffic/congestion	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
2.4	Safety	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
2.5	Security	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
2.6	**General Satisfaction**	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

III. Strategy agreement

	What is your opinion about the viability of the following strategies to be implemented for 2014 World Cup?	**Totally agree** → **Totally Disagree**				
3.1	Transport integration	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
3.2	More frequency of PT	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
3.3	Extension of PT services (until later)	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
3.4	Special PT service for stadium (Bustival)	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
3.5	To close streets/roads (exclusive for pedestrians)	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
3.6	Availability to rent a bike	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
3.7	"Walk Together"	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
3.8	Parking elimination in some streets/roads	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
3.9	Increase praking price	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
3.10	Car restriction in some areas	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
3.11	Zone of limited circulation	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
3.12	Congestion tax	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
3.13	Combined Tickets (PT + game ticket price)	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

IV. Implementation of cycle lanes and sidewalks for 2014 World Cup

4.1	Do you agree that the NMT implementation/ upgrade is important?	**Totally agree** → **Totally Disagree**				
		1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

4.2	Do you use bicycle as a mean of transport (for example to work)?	
☐ (almost) everyday ☐ 1 – 3 times/week	☐ 1 – 3 times/month ☐ less 1 per month	☐ (almost) never
4.3	Do you use bicycle for leisure and/or sport?	
☐ (almost) everyday ☐ 1 – 3 times/week	☐ 1 – 3 times/month ☐ less 1 per month	☐ (almost) never
4.4	Which measures would incentive you to use it more? (max. 3 answers)	
☐ I wouldn't use ☐ Better infra-structure ☐ Safety (accidents)	☐ Implementation cycle lanes ☐ Implementation sidewalks	☐ Parking facilities ☐ Security (assaults)

V. Implementation of new modal for World Cup (only for residents)

5.1	Most adequate travel mode to be implemented for 2014 WC	☐ BRT	☐ Light rail
5.2	Reasons for your choice (max. 3 answers)		
☐ Infrastructure cost ☐ Operational cost ☐ Implementation time ☐ Better integration - other modals ☐ Greater vehicle capacity ☐ Less pollution	☐ Greater route coverage ☐ More efficient service ☐ Route/station beneficiary ☐ Vehicle speed ☐ Less noise ☐ Cheaper fares	☐ Better visual ☐ better accessibility ☐ More security ☐ More comfort ☐ Less travel time ☐ Others	

VI. Means of transport used in your city of residence (only for tourists)

6.1	Which travel mode do you use at home	☐ Car	☐ PT	☐ NMT
6.2	Main reason for travel mode use at home			
☐ Travel Time ☐ Cost ☐ Safety	☐ Avoid delays/ congestion ☐ Security	☐ Convenience ☐ No PT availability	☐ Comfort ☐ Others	
6.3	Frequency of use			
☐ (almost) everyday ☐ 1 – 3 times/week	☐ 1 – 3 times/month ☐ less 1 per month	☐ (almost) never		

VII. Means of transport to be used during World Cup

7.1	Which modal do you intent to use during the 2014 World Cup in Manaus (Brazil)		
MIT	☐ Park & Walk	☐ Park & Ride	☐ Car user
PT	☐ BRT, if available	☐ Light rail, if available	☐ Any PT
NMT	☐ Bicycle	☐ Walk	☐ Walk together

VIII. Socio demographic questions

8.1	Gender	☐ 🚹	☐ 🚺	
8.2	Age group	☐ 18-35	☐ 36-55	☐ 56 +
8.3	Residence	☐ Manaus ☐ Brazil	☐ Latin America ☐ North America	☐ Europe ☐ Others
8.4	Availability	Moto	☐ Owner ☐ Shared ☐ No	
		Car	☐ Owner ☐ Shared ☐ No	
8.5	What´s is your net monthly household income (in reais)			
☐ < R$ 751- Class E ☐ R$ 751-1.200- Class D		☐ R$ 1.200-5.174- Class C ☐ R$ 5.174-6.745- Class B		☐ >R$ 6.745- Class A
8.6	What´s your highest level of education completed			
☐ Some high school ☐ High school diploma		☐ University - Bachelor ☐ Advanced studies - Master		☐ Doctorate

Appendix B Questionnaire South Africa

Q1. Travel mode used to arrive in South Africa (only for tourists)

Q2. Which local mode transport did you use to reach this football match?

- Walking
- Bicycle
- Car
- Taxi
- Minibus - Vans
- Bus Rapid Transit
- Other bus (coach/private bus)
- Metro

Q3. How satisfied are you with your transport choice? Why?

- Very satisfied. _____
- Satisfied. _____
- Indifferent. _____
- Unsatisfied. _____
- Not at all satisfied. _____

Q4. How do you evaluate the information, pamphlets or advertisements to help tourists to get to the stadium/public viewing site and around in the city? Why?

- Very helpful. _____
- Helpful. _____
- No opinion. _____
- Weakly Helpful. _____
- Not at all helpful. _____

ONLY FOR CAR USERS:

Q5. Which measures would make you to change from using your car to use public transport? (Multiple choice)

- More frequent bus/train services
- Discount tickets available
- Better timetables
- More convenient bus stops
- Better connection from station to stadium
- Better connection from home to stadium
- Other, specify _____
- I wouldn't change

Q6. Rate how important the following factors are in preventing you from using public transport:

	1	2	3	4	5
Lack of information					
Distance to bus/train stop					
Cost					
Travel time					
Weather conditions					
Safety					
Frequency of service					
Cleanliness of transport					
Comfort of travel					

Q7. When making this trip to arrive to the stadium/public viewing site, what were the most important aspects to you when travelling?

- Travel time
- Travel costs
- Avoid delays / congestion
- Safety from accidents
- Security (robbery, assault, etc.)
- Comfort of travel
- Convenience of use
- OTHER, SPECIFY: _____

Q8. When making this local trip, how important were environmental aspects (sustainability, emission, etc.) in influencing your decision?

- Very important
- Important
- Indifferent
- Unimportant
- Very unimportant

Q9. **ONLY FOREIGN VISITORS:** During your stay in South Africa, rate how important the following factors are in defining your choice of transport (1=very important 5=not important)

	1	2	3	4	5
Environmental friendliness					
Comfort					
Punctuality					
Safety/Security					
Price					
Travel time					

Q10. Rate how effective you think the following initiatives would be to encourage sustainable transport use during a mega-event (1=very effective 5=not effective)

	1	2	3	4	5
More bus routes					
Cheaper bus/metro fares					
More bus/metro frequency					
Extended metro lines					
Higher parking fees					
Safety					
More comfortable service					
More cycle parking/lanes					
More sidewalks					

Q11. Which types of transport are you more used to take for commuting or leisure (daily life) in your home town?

- Walking
- Bicycle
- Car
- Taxi
- Bus (including coach/private bus)
- Metro/Rail

Q12. The next World Cup will be held 2014 in Brazil. How, in comparison to local transport in South Africa, do you think the public transportation system is over there?

- Much better than in S.A.
- Better than in S.A.
- Similar
- Worse than in S.A.
- Much worse than S.A.

OPEN QUESTIONS

Q13. In respect of transport, for you what are the strong and weak points in Johannesburg/Pretoria?

Note: This was an open question in which some variables were created with the answers given

Q14. Is there any recommendation for the future Brazilian host cities that you could make in terms of environmentally friendly local transport for visitors of the 2014 World Cup?

Note: This was an open question in which some variables were created with the answers given

ONLY FOR SOUTH AFRICANS' RESIDENTS:

QS1. How much do you think the public transport system has been improved to prepare South African cities for the World Cup 2010?

- Very important
- Important
- Indifferent
- Unimportant
- Very unimportant

QS2. Will the improvement of the public transport system affect your behavior through using a more sustainable mode of transport? Why?

- Yes
- No

QS3. What is your personal perception of the city through the improved public transport system? Do you believe it will bring long-term benefits for Johannesburg/Pretoria?

- Yes
- No

GENERAL QUESTIONS

Gender	☐ 🚹	☐ 🚺		
Age group	☐ 18-35	☐ 36-55	☐ 56 +	
Residence	☐ Johannesburg ☐ South Africa	☐ Africa ☐ Europa	☐ North America ☐ Latin America	☐ Others
What´s is your net monthly household income (in reais)				
☐ < 500 US$ ☐ 500 - 1.000 US$	☐ 1.000 - 2.000 US$ ☐ 2. 000 - 5.000 US$	☐ > 5.000 US$		
8.6 What´s your highest level of education completed				
☐ Some high school ☐ High school diploma	☐ University - Bachelor ☐ Advanced studies - Master	☐ Doctorate		

Appendix C Approaches to Sustainability

Approach to Sustainability	Policy characteristics
Economic: Look for representing the sustainability of hosting mega-events primarily in terms of a single type of impact, usually economic impact (though may have a long-term economic growth perspective). The event system is defined in primarily economic terms.	▪ Sustainability in economic terms may include mid to long-term perspectives on ROI (return on investment) of economic capital invested in the hosting of the event. ▪ Focus on contribution to economic growth, GDP (gross domestic product), as well as on visitor numbers and expenditure as the main parameters of regional development ▪ A 'trickle-down' approach for promoting the benefits of the event for host communities and regions. ▪ Insufficient attention given to opportunity costs or long-term effects. The loss of natural capital is not cost and is usually regarded as a public good. ▪ Substantial emphasis given to the use of the event to enhance international and domestic profile and image.
Balanced: Look for balancing economic impacts of mega-events with environmental and social ones. The event system does include economic, social and environmental elements but these are supposedly given equal weight in system management.	▪ Attention to and promotion of 'triple-bottom line' (economic, environmental and social dimensions) of the event. ▪ Multiple-evaluation and assessment. Usually accompanied by decision to go ahead anyway because of perceived economic benefits. Although in theory all three dimensions are considered. ▪ Focus on efficiency and technological solutions to the sustainability problem. ▪ Relatively little comment on equity dimension of sustainability. The social and equity dimensions of sustainability are regarded as 'political' ▪ Concurrent with economic sustainability approach
Steady-state: Sustainability is understood as being grounded in the constraints of natural capital/natural systems. It includes some aspects of sustained yield together with a more fundamental notion of environmental conservation. Event system is recognized as being dependent on natural capital.	▪ Grounded in ecological economics ▪ Looks to develop a steady-state approach, related to sustainable consumption, that pays attention to systemic effects of hosting event ▪ Examines opportunity costs and does not regard economic growth or impacts as a good indicator of development. ▪ Use of a broader set of economic, social and environmental indicators as part of a quality of life approach to regional development ▪ Reduce, reuse, recycle and regulate (also including tax and charge for running down and damage to natural capital). ▪ Environmental and sustainability dimensions are evaluated before bids to host a mega-event proceed and are integral to the decision-making process ▪ In some cases hosting a mega-event might not even be considered as an appropriate development option

Source: Hall, 2010

Appendix D Objectives and Strategies for the Greening of Mega-Events

Key Objectives	Recommended Strategies
Minimisation of transport needs	
In order to minimize the transport needs makes necessary to locate venues close to tourism facilities and spread largely the use of NMT such as walking and cycling. As example, the 2006 World Cup provided fans with attractive on foot routes from main stations to stadium, called “Fan Miles”.	▪ Select event venues and accommodation facilities that are near each other. ▪ Implement attractive pedestrian and cycle routes between stations and stadium. ▪ Time events during off-peak hours to avoid more pressure on traffic.
Promotion of public transport	
For those fans/tourists coming from domestic and abroad borders the use of rail should be encouraged when available. Special charter services should be provided for teams and fan groups, especially for travel between host cities (Germany, 2006). A widely-used incentive for the use of PT is the issuing of event tickets that are also valid for use on PT. As example, the “kombi ticket” offered during the match days (Germany, 2006). Raising awareness around transport impacts and reducing car use through promoting behavioural change can also be achieved by using the educational potentiality of the sports event. A PT system needs to be effective and efficient in order to attract users so it is important to match transport with the needs of the event.	▪ Raise awareness about the benefits of using PT amongst residents, fans and tourists. Provide information about available routes. ▪ Promote behavioural change towards the use of PT by enhancing tourism facilities that are accessible via PT. ▪ Create P & R facilities at transport hubs. ▪ Create incentives for using “mass” transport (e.g., make event tickets valid on local PT). ▪ Use volunteers or trained staff in key areas to assist people in finding their way to the games and related events/ services. ▪ Provide efficient PT system to attract users. ▪ Provide adequate signage and information
Reduction of pollution from transport	
New technologies and fuels can severely reduce emissions from vehicles. These new technologies are exciting to the public and have the power to raise awareness if well-showcased at events. For example, the 2006 FIFA World Cup used hydrogen powered buses to transport fans that were pollutant free and carbon neutral, since the hydrogen for the fuel cells was produced using renewable sources. Where existing vehicles are to be used, they can be retrofitted with particulate filters, catalytic converters or LPG tanks. Emissions standards can be set for vehicle fleets, with maximum CO levels depending on vehicle type.	▪ Use energy efficient and low emission technologies and fuels ▪ Use non-motorized transport, e.g., bicycles; ▪ Provide walking and cycling routes and supply maps of these. Provide secure bicycle parking at venues; ▪ Provide clear and reliable information on alternative transport methods in various media, particularly the internet; ▪ Vehicles should be made subject to national emission standards.

Source: Adapted DEAT, 2008

Appendix E International Best Practice Lessons

Public Transport and International Sporting Events: International Best Practice Lessons

Lesson 1 – Transport is either the clear impediment to a major event's success, or the fundamental, "invisible" enabling factor

1998 FIFA World Cup, Paris – In a city of 5 million people, rich with a variety of well-integrated modes of transport, familiar with enormous crowds for special events, close to half a million people walked away viewing from the final match closing celebrations to no means of public transport. Most services stopped at 5 pm on Sundays.

Lesson. 2 – Success will only be achieved by naming a single transport decision-making body well in advance of the planned events

Athens Olympic Preparation, 2001 – After seven years of debates over which public authority had decision-making power and little implementation, the International Olympic Committee (IOC) warned Greece that if the country did not deliver an action plan and key milestone success in Athens' transport sector in six months, the IOC would retract the right to hold the Olympics and name a new venue. The IOC understood the centrality of transportation management to the success of the event. Greece quickly named a transport decision-making authority. Although the final touches to the Athens Olympic transport system were ready just days before the opening ceremony, the Olympics went without major transport difficulties.

Lesson 3 – Plan for Success: Co-ordinate all aspects of mobility

Sydney Olympics, 2000 – Sydney pledged to make transport management the "invisible success factor" for the 2000 Sydney Olympics. New transport facilities and services included hundreds of kilometres of dedicated pedestrian walkways, dignified public spaces and bicycle ways and lanes, permanent and temporary dedicated, separated bus corridors, new railway stations and lines, improved water transport, transport control centres, 50,000 transport volunteers, and a 24-hour, free inner city "circulation" service. Fundamental to these new services were passenger information, public awareness marketing, a special Transportation Media Centre, enforcement, and security.

The approach to transportation management taken for the Sydney Olympics - distinct from the city's choices about infrastructure - has become the Gold Standard for managing transport for major international events.

Lesson 4 – Co-ordination requires a well-articulated operational plan

The World Summit for Sustainable Development (WSSD), Johannesburg 2002 – Efforts by the City of Johannesburg's Transportation Planning section to develop a WSSD transportation plan was hinted by the absence of a clear decision-making authority. Midway through the planning effort, collaboration between the stakeholders, WSSD Company, and concession operators specific transport issues with perceived security implications were addressed. No final transportation management plan was ever established for WSSD.

According to City of Johannesburg officials, the combination of re-scheduled school holidays and 30,000 fewer conference participants created the good luck to overcome the absence of a strong operational plan. This strategy made transportation issues a minor challenge to residents, business and WSSD participants rather than the potential difficulty that the absence of a plan might have created.

Even with quieted background demand for mobility, and low conference-related demand, a single security-related incident might have caused havoc for the entire city. Who would respond, how, and what the contingency plans were for the rest of city's commuters were left unaddressed. No agency or authority's plan interrelated with others.

While the event mobility was smoothly assessed, only concessionaires and rental car companies profited from the related transport investment. The City of Johannesburg and Gauteng Province could not profit from any legacy of improved transport from the event.

Lesson 5 – Without specific planning, hosting an international event provides no return on transport investment

World Summit on Sustainable Development, 2002, World HIV/AIDs Conference 2001, ICB Cricket World Cup, 2003 – In each of these examples of South Africa's "ability" to host international events, millions of Rand were invested in traffic management, traffic modelling, temporary management efforts, and transport service concessions. With the exception of limited transport management learning, no lasting transportation system benefits to South Africans were realised from the hosting of these events. Without specific planning, the transport sector received no return on investment for hosting the events, nor improved the country's "ability" to host more and larger revenue-spinning international events.

Lesson 6 – The challenges of diverse venues; the risk of diluted investment and wasted investment

2002 FIFA World Cup, Japan Korea – While sharing the hosting of this FIFA event may have promoted better international understanding, the multiple venues meant significant investment costs in all host cities, including those for transportation. Japan ended up tearing down not only extraneous stadia after the event, but numerous transport facilities as well.

Lesson 7 – The combination of reasonable public transport services, transportation demand management, and limited access can get people out of their cars and engender a virtuous cycle of public transport sustainability

Athens Olympics, 2004 – Athens transportation officials "expropriated" continuous lanes of city streets to create an exclusive public transport corridor system for the Olympic period.

Use of these lanes by private vehicles carried a €1000 fine, and enforcement was stiffly maintained. The "expropriation" of what is largely publicly-funded private vehicle infrastructure created intense traffic jams - for one day only. By the second day of the Olympic "period", commuters had shifted to new, quality public transportation developed for the event.

Athens Olympic game venues excluded private vehicle access and parking to spectators.

This choice, a requirement due to security constraints, enabled the financial sustainability of the public transport operations serving the sites by creating a captive market. It also minimised road congestion in the areas surrounding the events.

Athens, which four weeks before the event was a city with an average travel speed of less than three kilometres per hour, obstructed by its own congestion, transformed into a city of public transport use, almost overnight. It is important to note that this transformation was only possible due to the considerable investment in high quality, extensive public transport services, as well as transport infrastructure.

Lesson 8 – Travel demand can be managed - "created" or abated / Access expands the opportunity

Sydney Olympics 2000 – Sydney transportation and events managers collaborated to expand the "access" to events, as well as create and abate travel demand by the use of open-air large-screen television broadcasts, "country tents" and sponsored special events such as free public concerts and markets. These special events were situated in public spaces with existing or recently improved quality public transport and non-motorised transport access.

The non-Olympic venue events managed the travel surges, flattened travel demand across resources, and expanded the "access" to the Olympic experience to those without tickets to actual events. The result was a minimisation of traffic congestion, and an optimisation of transportation resources and fun! A carnival atmosphere prevailed right across the city as the Olympic outreach venues were created in almost every neighbourhood. The economic benefits of the event were thus more broadly realised across the city than they would have been with spectators and revellers contained to sporting venues and conventional entertainment precincts.

Lesson 9 – Quality information, vehicles, stops and stations for all

None of the success stories relayed above were possible without considerable investment in the basic features of public transport quality. Quality is herein defined by:

- Accuracy, availability, timeliness, and consumer-friendliness of information,
- Safely functioning and operated, clean, attractive and clearly delineated public transport vehicles,
- Punctual, reliable, frequent and safe operations during both peak and off-peak periods, and
- Well-lit, secured, well-marked, clean and pleasant public transport stops and stations.

These elemental investments serve spectators, media, and sporting participants beyond event activities, scholars, workers, those seeking public services, and youth. These elements are the non-negotiable of a transport success. They serve all.

Source: Transport Action Plan for 2010, appendix A (pp. 2-4)

Appendix F Guidelines and Specifications for a World Cup Transport Plan

Guidelines and specifications for a World Cup Transport Plan developed by the Department of Transport (DOT) under the direct source: Transport Action Plan for 2010. Version 1

1. Objectives of Transport Operations Plan

Improvements in overall transportation system efficiency and safety by anticipating and meeting all the transport operational (logistical) needs related to a particular event. Specific benefits include:

- Reduced delay for event attendants "through more active dissemination of information, traffic management, and alternate mode use"
- Reduced delay for non-attendants "through active promotion of alternative routes or modes"
- "Reduced overall traffic demand at or near special event sites through active promotion of alternative routes or modes or dissemination of information, resulting in the cancellation or delay of unnecessary trips"; and
- "Improved safety through more active traffic management and reduced motorist frustration"
- Consult, communicate with, and prepare all key stakeholders and the general public, so as to execute the Plan with minimal effort

2. Traffic Management Principles

- Maximum safety and security
- Maximise ability of emergency response
- Minimal congestion (vehicular and pedestrian)
- Optimal spectator and non-spectator convenience
- Maximum efficiency (practical and cost-effective)
- Maximum impact - leave clear post-event legacy
- Accommodation of soccer culture
- Adherence to international benchmarks (i.e. measures of effectiveness)
- Minimise noise and localised pollutants from the transport sector during the events

3. Stakeholder(s) Involvement

- What is the structure for stakeholder involvement
- Who are the key stakeholders relevant to the development of this plan
- Who are secondary but fundamental stakeholders to the Plan's execution
- What are the fundamental responsibilities of each specific stakeholder
- Who is in charge / what the command hierarchy is
- How to resolve conflicting needs
- Feedback loop to stakeholders : if/when a needed action is identified, but is not the responsibility of any existing stakeholder
- What is the timeframe for engagement and each stage of Plan's execution

4. Traffic Communication Tools (Motorist Information)

Variable Message Signs

- Information displays re day, date & time of event, lane closures, warnings, directional information, etc.
- Active monitoring required to ensure accuracy
- Permanent or temporary installations

Radio Broadcasting

- Sharing information to motorists & public transport drivers via local radio/ traffic information programmes
- Typically use AM frequencies (new special purpose radio stations set up well in advance of event)
- Assist in providing detailed messages
- Geographically specific - use local radio stations for each region/ centre

Media Partnerships

- Provide pre-trip & on-route information to motorists
- Radio, television, print, web
- Media information to be obtained from single source (e.g., Traffic Management Centre) to prevent inconsistent & confusing messages

Pre-Event Informational Campaigns

- Use of brochures, informational flyers, pamphlets distributed to various audiences -event patrons, security forces, relevant emergency response agencies,
- event participants and VIP transport managers
- Presentations of the appropriate features of the Plan to key audiences
- Inform motorists & public transport drivers prior to event
- Information relates to suggested parking areas, recommended routes, early arrival encouragement, etc.
- Additional communication to non-patrons to discourage use of key event routes

5. Traffic Management Tools

Traffic Control Devices: standard set of tools to regulate, warn and guide traffic

- Traffic cones: used to channel vehicles, divide opposing traffic, or divide multiple lanes in the same direction
- Portable static signs: signs mounted on temporary posts or trailer-mounted, to conform to normal standards
- Portable traffic signals: signal poles installed on semi-permanent basis, or trailer-mounted

Patrols: manual patrols to monitor traffic conditions

- Law enforcement motorcycle patrols
- Law enforcement service patrols (vehicle or on foot)
- Non-law enforcement service patrols
- Traffic management teams (multidisciplinary)
- Aircraft (helicopter) patrols (eye-in-the-sky)

Electronic Surveillance

- Electronic loop detection: monitor traffic volumes & vehicle speeds
- Video & closed-circuit television (CCTV)
- Traffic management centres: central communication hub for traffic-related information (permanent or portable)

Signalisation

- Standard signal systems: adjusted timing plans for changing traffic conditions
- Traffic-responsive signal systems: dynamic adjustment of cycle characteristics (e.g., splits, phasing & offsets) for individual intersections and road networks
- Ramp metering: manage traffic entering controlled access facilities and prevent bottlenecks

Geometric Modifications: temporary and/or permanent modifications to accommodate increased traffic demand

- Temporary lane/road closures: create traffic free zones for pedestrian prioritisation; security requirements; VIP, media and emergency vehicle access
- Reversible lanes/ temporary contra-flow/ movable barriers: add temporary capacity in peak traffic direction; proper traffic control & signing essential; use of shoulders useful but block emergency response vehicles
- Major capacity improvements: widening lanes or roadways, adding turning lanes, building additional roads, intersections or interchanges

6. Travel Demand Management

Economic or Preferential Incentives and Disincentives

- Economic dis/incentives for alternate mode use: differential parking rates for High Occupancy Vehicles (HOV's) - free or reduced - & Single Occupancy

Vehicles (SOV's)

- Preferential dis/incentives for alternate mode use. Examples: HOV or bus lanes; secure, on-

site weather protected bicycle storage facilities; wider pedestrian crosswalks, street closures for pedestrian only use; pedestrian links between venues
- Allow SWC ticket holders “free passage” on public transport for the date of the game. Public transport costs built into the ticket price

Make a special SWC weekly public transport pass/ card available for purchase that can be used on all public transport modes
- Traffic free (restricted) zones: eliminate motorised traffic on selected routes or sections, or allow only specified users
- Economic dis/incentives for alternate travel times and congestion tax: Fees charged for travel during peak traffic demand periods (should this form part of wider TDM strategy in particular host city)

Alternate Routes
- Beneficial for motorists accessing special events sites and for those wishing to avoid the event

Parking Strategies
- Parking management systems: Monitor use of spaces and inform motorists of vacancies and their location; purchasing parking tickets in advance or on exit to prevent queues at entry points : reduce the need for on-site parking facilities reduce traffic demand near event sites; role shuttle services; use of temporary parking Park-and-ride areas facilities - school sports fields, public open space

Major Public Transport Improvements
- Service (increased frequencies; locating stops in vicinity of event sites; upgraded terminals/ stops; redesigned fare Improve public transport accessibility and se collection systems, etc.)

Normal Commuter Restrictions
- Investigate feasibility of restricting normal commuting behaviour (e.g., encourage leave taking, flexi-time)

Commuter Information during the Event Period
- Create and distribute event transport information in several local and international languages for wide-spread distribution just before and during the event
- Create and market media briefings on transport management
- Secure space in print, radio and television media just before and during the event to ensure blanket coverage of event access and transport restriction requirements
- Create and distribute city-specific information packets for transport/travel information sources (call centres, radio, television, SMS and other traffic services) for use prior to and during the event to guide transport clients

7. Co-ordination and Communication

- Establish World Cup (Joint) Operations Centre and sub-centres (closed circuit television monitoring, area traffic control, etc.)
- “Overall success or transportation management during special events requires combination and coordination of multiple tools and techniques ... development of formal protocols to assist in the coordination of responsible personnel during special events is essential ...e.g. Incident Command System, which allows for the effective management of interagency teams.” (TRB, 2003).

8. Visitor Transport Services

Detailed operational specifications per mode for each city:

- Types of services to and from major gateways (airports, harbours, rail stations) : rail, buses, shuttles, taxis, minibuses, car hire, etc. - physical accommodation, service characteristics (frequency & capacity)
- Capacity to meet projected demand
- Feeder & distribution routes in relation to major accommodation centres
- Internal services between accommodation centres & event venues
- Use of techniques to assess system capacity & service provision, e.g. arrival/ departure curves

- Information for trip planning and during trip progress/emergency notice

9. VIP and “FIFA Community” Services

- Dedicated vehicle fleet and drivers for designated VIP and FIFA community members
- Restricted parking facilities in selected zones (TFZ’s, park-and-ride)
- Information to service providers for VIP services
- Accreditation and Validation of VIP access cards
- Information on anticipated, regular security checks for VIP vehicles at stadia, hotels, and potential on board security communications
- Secured channels for transport notification for VIP fleet

10. Parking & Access User Requirements

Parking and access requirements & provision for hierarchy (range) of users:

- FIFA members
- Other VIP’s (sponsors, hospitality guests)
- Suite owners, debentures, season ticket holders
- Emergency vehicle operators
- Teams and officials (players, managers, coaches)
- Media
- Support service vehicles (deliveries, SWC & hospitality staff, refuse removal, etc.)
- Outside broadcasting units (OBU’s)
- Special needs passengers (SNP’s)
- Tour groups (in 40/60 seated buses)
- General public

11. Operational Focus Areas: Security

- Vehicle control points: all identified primary and secondary routes
- High visibility operations in outer perimeters: stop & search, foot patrols, search & seizures, vehicle patrols, cordon & search, and air support operations
- Access control to the entrances of the inner and outer perimeter
- Controlling of traffic flow to and from stadia and pre-identified areas
- Controlling access to key station and stops for Public Transport
- Securing of parallel events
- Securing of all the tourist attraction spots and priority areas in the city/ region

12. Ticketing

- Develop transport co-ordinated (event-public transport integrated) ticketing systems
- Separate ticket acquisition/check and boarding/security check queues at all major stations and stops for public transport and specialised services
- Encourage and enable pre-event day ticket purchase for public, private and specialised transport services
- Maximize pre-selling of tickets and encourage use of online services
- Encourage group sales to tour groups (benefits transport system by travelling to venues by bus)
- Calculate service rates at ticket booths and provide sufficient capacity

13. Emergency Response Procedures

- Engage all relevant emergency response agencies, i.e. police, military (if needed), contracted security, fire services, paramedic teams, ambulances, etc.
- Identify other services required on stand-by basis such as utility and breakdown services & response teams.
- Facilitate inter-agency coordination
- Identify emergency vehicle routes to and from stadia and ensure rights-of-way are secured
- Identify priority parking areas dedicated to emergency vehicles
- Identify emergency evacuation assembly points (to be determined if required - open areas in vicinity of stadia to where people can be evacuated in case of emergencies)
- Provide appropriate assurance and information/instruction to general public relating to Emergency Response Procedures in advance of the event

14. Plan for Avoiding Transport Management Issues/ Pitfalls

Establish how the following risks will be averted:

- Too many organisations involved or no clear lead agency - complicates communication & coordination
- Getting the scale right: overestimating number of spectators could happen as easily as underestimating, leading to unnecessary disruption of normal transport facility operations
- Security requirements could overextend operational measures, e.g. extensive traffic free zones could have major impact on general traffic operations; body searches at entry points result in long queues.
- Delays in servicing transport needs could have "domino" effects whereby bottlenecks develop in the transport system and further delays incurred.

15. Transport Management Success Factors

Ensure that:

- A good event organiser ("champion") is essential.
- Transport management plans must be comprehensive and clear and have input from all relevant parties.
- For annual events, stick to the same plan (provided it works!).
- Publish the plan widely in newspapers, on radio and on TV well before the event.
- There must be close liaison between event organisers and traffic police in particular.
- Routes for shuttles must be congestion free i.e. they require exclusive lanes for efficient operations.
- Road closures must be pre-advertised by newspaper adverts and indicated by means of temporary signage erected well in advance of the event.
- Security concerns often have a major (adverse) impact on the traffic operations in the vicinity of the event.
- Public transport can play a major role and must be utilised optimally.
- Where events impact on residential areas, close liaison with the relevant ratepayer organisations is essential prior to the event.
- The Operations Centre should follow Transport management plans on the day(s) of the event.
- The Operations Centre must be able to react to ad hoc problems.
- Security concerns often have a major (adverse) impact on the traffic operations in the vicinity of the event.
- Public transport can play a major role and must be utilised optimally.
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- The Operations Centre should follow Transport management plans on the day(s) of the event.
- The Operations Centre must be able to react to ad hoc problems.

Source: Transport Action Plan for 2010 (pp. 40-46)

Appendix G Lessons for Transport Event Management

Lessons learned from the 2010 FIFA World Cup transport event management

Transport Event Management

- The transport event management served as an essential support to the transport operations
- Transport players need to be flexible to asset a “plan B” and make decisions to respond to unforeseen incidents

Travel modes used during the FWC

- Rail was the “mass mover” mode which assisted the stadiums` clearance inside of the 2 hours set up by FIFA;
- BRT Rea Vaya is an efficient travel mode for mega-events
- The travel time to/from and stadium was reduced due to the use of the dedicated lanes
- Loading procedures at the BRT stations can be easily implemented

Park & Walks

- P&W are efficient but need to be limited due to the congestion that it attracts in the vicinity of the stadium
- Traffic models need to be performed prior the event to simulate the traffic flow in the precinct

Vehicle fleet

- The fleet size should be estimated based on travel demand models as well as previous experiences during similar events
- Buses and Taxis must be roadworthy, cleanliness in buses/mini-bus is important
- Travel time surveys must be carried out before the event to determine location of potential traffic congestion

Drop-off / Pick-up Points

- Drop-off/ Pick up points were located 1-1.5 km away from the stadium. This proved to be challenging for some spectators, however it was necessary in order to better manage the crowd arriving/leaving at/from those points
- Stacking areas must be considered when selecting the drop-off/pick up points;
- The high volume of spectators required specific crowd control measures and specialised vehicle loading techniques
- The use of fencing is essential for crowd control

Ticket sales

- Issue regarding the accessibility of the ticket retailers (both international and national) should be considered
- The introduction of the pre-booked Park & Ride/Walk tickets assisted tremendously with the planning for each match day

Key Messages

- The public responded very positively to the need to make use of public transport to the stadium.
- In general, the World Cup contributed to the establishment of a very positive image of the public transport system.
- Going forward, the successful roll-out of the World Cup transport system should be used as a basis to promote the use of public transport – long-term benefit.
- Key legacy of the 2010 World Cup: public transport usage and walking culture.
- The transport operations were incident free, apart from the illegal strike by some of Rea Vaya drives.
- The success could only be achieved through the cooperation of the role, general spectators, regular commuters and road users during the event.

Source: ITS Engineers, 2010 (pp. 27-31)

Appendix H Hypotheses

Appendix H1SA

Report
Transport Satisfaction

World Cup modal	Cluster combination 1+2	Mean	N	Std. Deviation
Taxi	Tourist car user	2,80	35	1,256
	Residents car user	4,31	13	,751
	Total	3,21	48	1,320
BRT	Tourist non-car user	4,00	14	1,109
	Residents non-car user	4,29	14	1,139
	Total	4,14	28	1,113
Other PT	Tourist non-car user	2,13	15	1,125
	Residents non-car user	4,22	9	,667
	Total	2,92	24	1,412
Metro/Rail	Tourist non-car user	4,50	2	,707
	Residents non-car user	3,80	10	,789
	Total	3,92	12	,793
NMT	Tourist non-car user	4,14	7	1,215
	Residents non-car user	4,20	10	1,229
	Total	4,18	17	1,185
Car	Tourist car user	3,88	58	1,244
	Residents car user	4,38	45	,912
	Total	4,10	103	1,133
Total	Tourist car user	3,47	93	1,348
	Tourist non-car user	3,32	38	1,454
	Residents car user	4,36	58	,873
	Residents non-car user	4,14	43	,990
	Total	3,79	232	1,269

Appendix H2SA

Cross tabulation
World Cup transport * Transport at home

			Daily modal Leisure/ Commuting			
			PT	NMT	Car	Total
World Cup modal	Taxi	Count	11	5	27	43
		% within Daily modal	22,9%	25,0%	17,9%	19,6%
	BRT	Count	9	2	16	27
		% within Daily modal	18,8%	10,0%	10,6%	12,3%
	Other PT	Count	1	3	18	22
		% within Daily modal	2,1%	15,0%	11,9%	10,0%
	Metro/Rail	Count	2	0	9	11
		% within Daily modal	4,2%	,0%	6,0%	5,0%
	NMT	Count	2	5	9	16
		% within Daily modal	4,2%	25,0%	6,0%	7,3%
	Car	Count	23	5	72	100
		% within Daily modal	47,9%	25,0%	47,7%	45,7%
Total		Count	48	20	151	219
		% within Daily modal	100,0%	100,0%	100,0%	100,0%

Cross tabulation recoded:

Cross tabulation
World Cup transport * Transport at home

			Daily modal for commuting/others			
			PT	NMT	Car	Total
World Cup modal (recoded)	PT	Count	12	5	43	60
		% within Daily modal	25,0%	25,0%	28,5%	27,4%
	NMT	Count	2	5	9	16
		% within Daily modal	4,2%	25,0%	6,0%	7,3%
	Car	Count	34	10	99	143
		% within Daily modal	70,8%	50,0%	65,6%	65,3%
Total		Count	48	20	151	219
		% within Daily modal	100,0%	100,0%	100,0%	100,0%

Appendix H4SA

Additional statistical measures:

Classification Table[a]

			Predicted		
			Car users/Non car users		Percentage
	Observed		Car users	Non-car users	Correct
Step 1	Car users vs. Non-car users	Car users	80	2	97,6
		Non-car users	31	2	6,1
	Overall Percentage				71,3

a. The cut value is ,500

This table compares observed and predicted values. The model is not very useful because for only very few of the tourists who are analysed here, the model predicts the choice of PT for 4 respondents. Two of these are correct (observed: non-car and predicted: non-car); two are “false positives” (observed: car user, predicted: non-car). 31 actual non-car users are predicted to be car users (based on their answers to Q9).

Report

World Cup modal		Comfort	Safety/ Security	Travel Cost	Travel Time	Eco friendly
PT	Mean	3,62	4,32	3,97	4,00	3,19
	N	29	31	30	29	27
	Std. Deviation	1,015	1,134	,999	1,165	1,145
Car	Mean	3,45	4,45	3,63	3,83	3,19
	N	89	89	89	87	83
	Std. Deviation	1,148	1,027	1,228	1,081	1,283
NMT	Mean	2,43	2,57	3,67	2,57	2,86
	N	7	7	6	7	7
	Std. Deviation	1,272	1,388	,816	,976	1,464
Total	Mean	3,43	4,31	3,71	3,80	3,17
	N	125	126	125	123	117
	Std. Deviation	1,145	1,147	1,163	1,130	1,255

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					
								95% Confidence Interval Difference	
		F	Sig.	t	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Eco friendly	Equal variances assumed	,964	,328	,293	,770	,075	,256	-,433	,583
	Equal variances not assumed			,301	,764	,075	,249	-,423	,573
Comfort	Equal variances assumed	,000	,995	,267	,790	,061	,227	-,389	,510
	Equal variances not assumed			,266	,791	,061	,228	-,394	,515
Punctuality	Equal variances assumed	4,343	,039	,837	,404	,178	,212	-,243	,598
	Equal variances not assumed			,769	,445	,178	,231	-,285	,641
Safety	Equal variances assumed	7,866	,006	1,966	,052	,435	,221	-,003	,873
	Equal variances not assumed			1,739	,088	,435	,250	-,067	,936
Travel Cost	Equal variances assumed	4,571	,034	-1,255	,212	-,287	,229	-,741	,166
	Equal variances not assumed			-1,387	,169	-,287	,207	-,700	,125
Travel Time	Equal variances assumed	2,636	,107	,469	,640	,105	,225	-,340	,550
	Equal variances not assumed			,440	,661	,105	,239	-,374	,584
Security	Equal variances assumed	6,680	,011	2,099	,038	,462	,220	,026	,897
	Equal variances not assumed			1,900	,062	,462	,243	-,025	,948

Appendix H1BR

One-Sample Kolmogorov-Smirnov Test

		Comfort	Time	Traffic	Safety	Security	Convenience	General Satisfaction
N		506	506	505	503	502	505	499
Normal Parameters[a,b]	Mean	2,48	2,71	2,02	2,22	2,24	3,11	2,27
	Std. Deviation	1,552	1,431	1,232	1,339	1,369	1,463	1,271
Kolmogorov-Smirnov Z		5,502	3,803	6,221	5,333	5,610	3,439	4,953
Asymp. Sig. (2-tailed)		,000	,000	,000	,000	,000	,000	,000

a. Test distribution is Normal.
b. Calculated from data.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Satisfaction: Comfort	Equal variances assumed	13,481	,000	20,202	504	,000	2,193	,109	1,979	2,406
	Equal variances not assumed			18,646	277,667	,000	2,193	,118	1,961	2,424
Satisfaction: Time	Equal variances assumed	4,010	,046	10,413	504	,000	1,273	,122	1,033	1,513
	Equal variances not assumed			10,096	312,638	,000	1,273	,126	1,025	1,521
Satisfaction: Traffic	Equal variances assumed	9,204	,003	4,996	503	,000	,565	,113	,343	,788
	Equal variances not assumed			4,764	301,662	,000	,565	,119	,332	,799
Satisfaction: Safety	Equal variances assumed	24,078	,000	7,786	501	,000	,930	,119	,695	1,165
	Equal variances not assumed			7,268	282,017	,000	,930	,128	,678	1,182
Satisfaction: Security	Equal variances assumed	20,062	,000	11,505	500	,000	1,326	,115	1,099	1,552
	Equal variances not assumed			10,693	277,164	,000	1,326	,124	1,082	1,570
Satisfaction: Convenience	Equal variances assumed	,840	,360	4,612	503	,000	,625	,135	,359	,891
	Equal variances not assumed			4,708	352,618	,000	,625	,133	,364	,886
Satisfaction: General	Equal variances assumed	23,979	,000	11,458	497	,000	1,232	,107	1,020	1,443
	Equal variances not assumed			10,334	254,942	,000	1,232	,119	,997	1,466

Appendix H2BR

Group Statistics

	Cluster Car users/ Non-car users	N	Mean	Std. Deviation	Std. Error Mean
NMT Implementation	Car users	176	4,35	1,261	,095
	Non-car users	341	4,37	1,142	,062

Cross tabulation
World Cup transport * Bike as transport

			Bike					
			(almost) everyday	1-3 times/week	1-3 times/month	< 1 time/month	(Almost) never	Total
World Cup transport	BRT	Count	0	1	2	0	48	51
		% within Bike	,0%	3,8%	13,3%	,0%	10,9%	10,1%
	Any PT	Count	3	3	2	3	65	76
		% within Bike	23,1%	11,5%	13,3%	27,3%	14,7%	15,0%
	Light Rail	Count	0	5	1	2	59	67
		% within Bike	,0%	19,2%	6,7%	18,2%	13,4%	13,2%
	NMT	Count	3	11	4	0	30	48
		% within Bike	23,1%	42,3%	26,7%	,0%	6,8%	9,5%
	Park& Walk	Count	2	2	0	3	73	80
		% within Bike	15,4%	7,7%	,0%	27,3%	16,6%	15,8%
	Park& Ride	Count	2	4	5	2	83	96
		% within Bike	15,4%	15,4%	33,3%	18,2%	18,8%	19,0%
	Car only	Count	3	0	1	1	83	88
		% within Bike	23,1%	,0%	6,7%	9,1%	18,8%	17,4%
Total		Count	13	26	15	11	441	506
		% within Bike	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Cross tabulation
Modal intention in WC: NMT vs. Rest * Bike as transport: frequency

			Bike: frequency		
			1-3 times per month or less	at least 1-3 times/week	Total
Modal intention in WC: NMT vs. Rest	Other Intention	Count	433	25	458
		% within Bike as transport	92,7%	64,1%	90,5%
	NMT	Count	34	14	48
		% within Bike as transport	7,3%	35,9%	9,5%
Total		Count	467	39	506
		% within Bike as transport	100,0%	100,0%	100,0%

Appendix H3BR

Cross tabulation
World Cup transport * Daily modal

			Daily modal choice			
			PT	NMT	Car	Total
World Cup modal Intention	PT	Count	187	19	84	290
		% within Daily modal	64,5%	41,3%	48,3%	56,9%
	NMT	Count	25	17	7	49
		% within Daily modal	8,6%	37,0%	4,0%	9,6%
	Car	Count	78	10	83	171
		% within Daily modal	26,9%	21,7%	47,7%	33,5%
Total		Count	290	46	174	510
		% within Daily modal	100,0%	100,0%	100,0%	100,0%

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Modal used today * Modal intention in WC	510	98,6%	7	1,4%	517	100,0%

Appendix H4BR

Report

Cluster 2 Car users/Non car users		Elimination parking in street	Close streets for exclusive NMT	Limited circulation area	Restrict car use	Increase parking price	Congestion tax
Car users	Mean	3,75	3,66	3,29	3,12	3,07	2,96
	N	174	169	169	170	170	168
	Std. Deviation	1,471	1,327	1,428	1,580	1,590	1,570
Non-car users	Mean	3,97	3,77	3,48	3,43	3,23	3,23
	N	336	331	317	321	336	320
	Std. Deviation	1,330	1,437	1,411	1,430	1,520	1,507
Total	Mean	3,90	3,73	3,41	3,32	3,18	3,14
	N	510	500	486	491	506	488
	Std. Deviation	1,382	1,400	1,418	1,490	1,544	1,533

Report

Cluster 2 Car users/Non car users		More PT frequency	Transport integration	Extension of PT services	Special PT service for games	Bike to rent	Walk together	Combined ticket
Car users	Mean	4,57	4,52	4,50	4,40	4,05	3,95	3,76
	N	171	172	169	169	169	170	170
	Std. Deviation	,868	,848	,914	,901	1,267	1,235	1,411
Non-car users	Mean	4,29	4,18	4,31	4,14	3,78	3,83	3,73
	N	332	328	335	333	328	336	335
	Std. Deviation	1,149	1,171	1,088	1,147	1,348	1,332	1,453
Total	Mean	4,39	4,30	4,37	4,22	3,87	3,87	3,74
	N	503	500	504	502	497	506	505
	Std. Deviation	1,069	1,082	1,036	1,077	1,326	1,300	1,438

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Transport integration	Equal variances assumed	24,989	,000	3,348	498	,001	,338	,101	,139	,536
	Equal variances not assumed			3,692	449,144	,000	,338	,091	,158	,517
More PT frequency	Equal variances assumed	21,261	,000	2,753	501	,006	,275	,100	,079	,471
	Equal variances not assumed			3,006	433,848	,003	,275	,092	,095	,455
Extension of services	Equal variances assumed	7,796	,005	1,945	502	,052	,190	,097	-,002	,381
	Equal variances not assumed			2,060	393,117	,040	,190	,092	,009	,371
Special PT service for games	Equal variances assumed	10,193	,001	2,584	500	,010	,261	,101	,063	,460
	Equal variances not assumed			2,792	415,684	,005	,261	,094	,077	,445
Close streets for NMT	Equal variances assumed	2,267	,133	-,790	498	,430	-,105	,132	-,365	,156
	Equal variances not assumed			-,811	363,078	,418	-,105	,129	-,358	,149
Bike to rent	Equal variances assumed	5,020	,026	2,133	495	,033	,267	,125	,021	,513
	Equal variances not assumed			2,176	358,506	,030	,267	,123	,026	,508
Walk together	Equal variances assumed	5,210	,023	1,026	504	,305	,126	,122	-,115	,366
	Equal variances not assumed			1,052	363,017	,293	,126	,119	-,109	,360
Elimination parking in street	Equal variances assumed	5,602	,018	-1,710	508	,088	-,220	,129	-,474	,033
	Equal variances not assumed			-1,656	320,821	,099	-,220	,133	-,482	,041
Increase parking price	Equal variances assumed	,901	,343	-1,112	504	,267	-,162	,145	-,447	,124
	Equal variances not assumed			-1,096	326,247	,274	-,162	,147	-,452	,129
Restrict car use	Equal variances assumed	5,765	,017	-2,241	489	,025	-,315	,141	-,592	-,039
	Equal variances not assumed			-2,174	316,192	,030	-,315	,145	-,601	-,030
Limited circulation area	Equal variances assumed	,001	,969	-1,404	484	,161	-,190	,135	-,455	,076
	Equal variances not assumed			-1,399	339,411	,163	-,190	,135	-,456	,077
Congestion tax	Equal variances assumed	,234	,629	-1,832	486	,068	-,267	,146	-,553	,019
	Equal variances not assumed			-1,809	327,549	,071	-,267	,148	-,557	,023
Combined ticket	Equal variances assumed	1,454	,228	,290	503	,772	,039	,135	-,227	,306
	Equal variances not assumed			,293	348,581	,770	,039	,134	-,225	,303

Appendix H5BR

Cross tabulation
Reason daily * Daily modal

			Daily modal			
			PT	NMT	Car	Total
Reason for daily modal	Travel time	Count	41	5	70	116
		% within Daily modal	13,9%	10,9%	39,8%	22,4%
	Travel cost	Count	48	5	2	55
		% within Daily modal	16,3%	10,9%	1,1%	10,6%
	Safety/Security	Count	10	1	3	14
		% within Daily modal	3,4%	2,2%	1,7%	2,7%
	Convenience	Count	6	7	65	78
		% within Daily modal	2,0%	15,2%	36,9%	15,1%
	No PT availability	Count	0	0	8	8
		% within Daily modal	,0%	,0%	4,5%	1,5%
	No car availability	Count	180	8	0	188
		% within Daily modal	61,0%	17,4%	,0%	36,4%
	Others	Count	9	20	3	32
		% within Daily modal	3,1%	43,5%	1,7%	6,2%
	Comfort	Count	1	0	25	26
		%within Daily Modal	,3%	,0%	14,2%	5%
Total		Count	295	46	176	517
		% within Daily modal	100,0%	100,0%	100,0%	100,0%

Appendix H6BR

Report

Cluster 1 Cluster Tourists/Residents		Lack of Info	Distance stop	Fare price	Travel time	Weather conditions	Security	Frequency of service	Comfort of service
Tourists	Mean	4,05	3,58	3,26	3,95	3,79	3,58	3,58	4,11
	N	38	38	38	38	38	38	38	38
	Std. dev.	1,251	1,518	1,605	1,161	1,212	1,244	1,106	,981
Residents	Mean	3,03	2,73	3,44	4,07	3,91	4,02	4,05	4,29
	N	128	127	129	134	131	132	129	130
	Std. dev.	1,626	1,545	1,600	1,407	1,356	1,345	1,377	1,248
Total	Mean	3,27	2,93	3,40	4,05	3,88	3,92	3,95	4,25
	N	166	165	167	172	169	170	167	168
	Std. dev.	1,604	1,576	1,598	1,354	1,322	1,332	1,332	1,193

Appendix H7BR

Case Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PT_facilitating_conditions	175	33,8%	342	66,2%	517	100,0%

The case-summary shows that 175 people answered the question (e.g., chose at least one item) and gave 399 answers (measures). Dividing 399 by 175 there is on average of 2.28 measures selected. It can also be verified in the total percentage of cases: 228% relates to 2.28 answers per respondent (multiplying 100% by a factor of 2.28 gives us 228%).

Frequencies
PT facilitating conditions

		Responses		Percent of Cases
		N	Percent	
Measures to facilitate PT use[a]	More frequent service	89	22,3%	50,9%
	Better infra-structure	88	22,1%	50,3%
	Better timetables	38	9,5%	21,7%
	More convenient bus stops	27	6,8%	15,4%
	Better connections	22	5,5%	12,6%
	More security	58	14,5%	33,1%
	Cheaper/discount fares	50	12,5%	28,6%
	Would not change	27	6,8%	15,4%
Total		399	100,0%	228,0%

a. Group

Cross tabulation
PT Cluster 1

			Cluster1 Tourists/Residents		Total
			Tourists	Residents	
PT facilitating[a]	More frequent service	Count	18	71	89
		% within Cluster1	47,4%	51,8%	
	Better infra-structure	Count	22	66	88
		% within Cluster1	57,9%	48,2%	
	Better timetables	Count	12	26	38
		% within Cluster1	31,6%	19,0%	
	More convenient bus stops	Count	6	21	27
		% within Cluster1	15,8%	15,3%	
	Better connections	Count	12	10	22
		% within Cluster1	31,6%	7,3%	
	More security	Count	12	46	58
		% within Cluster1	31,6%	33,6%	
	Cheaper/discount fares	Count	10	40	50
		% within Cluster1	26,3%	29,2%	
	Would not change	Count	0	27	27
		% within Cluster1	,0%	19,7%	
Total		Count	38	137	175

Percentages and totals are based on respondents.
a. Group

Appendix H8BR

Cross tabulation
Reason home modal * Reason daily

			Reason for modal choice in Manaus						
			Travel time	Travel cost	Convenience/Comfort	No PT availability	No car availability	Others	Total
Reason modal at home	Travel time	Count	2	8	3	4	2	5	24
		% within Manaus	25,0%	57,1%	11,1%	66,7%	33,3%	38,5%	32,4%
	Travel cost	Count	2	2	2	0	0	2	8
		% within Manaus	25,0%	14,3%	7,4%	,0%	,0%	15,4%	10,8%
	Safety/ Security	Count	0	0	2	0	0	0	2
		% within Manaus	,0%	,0%	7,4%	,0%	,0%	,0%	2,7%
	Convenience/ Comfort	Count	0	4	16	2	2	6	30
		% within Manaus	,0%	28,6%	59,3%	33,3%	33,3%	46,2%	40,5%
	No PT availability	Count	0	0	0	0	2	0	2
		% within Manaus	,0%	,0%	,0%	,0%	33,3%	,0%	2,7%
	Others	Count	2	0	0	0	0	0	2
		% within Manaus	25,0%	,0%	,0%	,0%	,0%	,0%	2,7%
	No car availability	Count	2	0	4	0	0	0	6
		% within Manaus	25,0%	,0%	14,8%	,0%	,0%	,0%	8,1%
Total		Count	8	14	27	6	6	13	74
		% within Manaus	100%	100%	100%	100%	100%	100%	100%
		% of Total	10,8%	18,9%	36,5%	8,1%	8,1%	17,6%	100%

Appendix I Reasons for Modal Choice

Cross tabulation
Reason modal choice * car

		Car		
		Non-car	Car	Total
Reason modal choice	Travel time	26	51	77
	Travel cost	53	2	55
	Safety	3	3	6
	Avoid delays/congestion	20	19	39
	Security	8	0	8
	Convenience	13	65	78
	No PT availability	0	8	8
	Comfort	1	25	26
	No car availability	188	0	188
	City appreciation	11	0	11
	Others	9	3	12
	Health	9	0	9
Total		341	176	517

The “perfect determinants” are: security (all respondents who gave that reason decided against the car), No PT availability (obvious), no car availability (obvious), city appreciation and health (both exclusively associated with non-car).

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Model	308,546	5	,000

All reasons combined make a significant contribution to explaining modal choice (p<0,0005).

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	354,576[a]	,449	,622

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted		
			Car		Percentage Correct
			Non-car	Car	
Step 1	Car	Non-car	301	40	88,3
		Car	35	141	80,1
	Overall Percentage				85,5

a. The cut value is ,500

Overall, 85,5% of the cases are classified correctly by the model. 301 out of 341 non-car users are classified correctly, and 141 out of 176 car users are also classified correctly.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Travel time	3,656	,392	87,015	1	,000	38,696
	Travel cost	-,295	,784	,142	1	,707	,744
	Avoid delays	2,931	,445	43,346	1	,000	18,741
	Security	1,683	,721	5,448	1	,020	5,380
	Convenience	4,843	,422	131,712	1	,000	126,818
	Constant	-2,982	,309	93,097	1	,000	,051

a. Variable(s) entered on step 1: travel time, travel cost, avoid delays, security, convenience.