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### Transporting 2014 FIFA World Cup to sustainability: exploring residents' and tourists' attitudes and behaviours

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## Transporting 2014 FIFA World Cup to sustainability: exploring residents' and tourists' attitudes and behaviours

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The forthcoming 2014 Fédération Internationale de Football Association World Cup (FWC) in Brazil provides an opportunity to invest in an efficient public transport (PT) system, whose benefits will extend beyond the event. Moreover, the FWC is a potential powerful force to promote a change in travel behaviour of both residents and tourists. However, the challenges are considerable. Research on mobility and travel behaviour at mega-events is still in its infancy and there is a general lack of baseline data and quantitative studies. Here, we address this shortfall by surveying attitudes and travel behaviour of tourists and residents in the Brazilian city of Manaus, a host city for the 2014 FWC. Our results suggest that in addition to the availability of information about PT, perceptions of 'travel time' and 'convenience' influence attitudes and may be important targets for promoting behavioural change. These results highlight the importance of providing good access to clearly targeted information on sustainable travel options. More generally, we demonstrate that successful development of sustainable mobility for mega-events must carefully align with local attitudes and behaviours.

**Keywords:** mega-events; tourism; sustainability; transport; behavioural change

### Resumen

La próxima Copa Mundial de la FIFA que se celebrará en Brasil en 2014 proporciona una oportunidad de invertir en un sistema de transporte público eficiente, cuyos beneficios se extenderán más allá del evento en sí. Además, la Copa Mundial es una poderosa fuerza potencial para promover un cambio en el comportamiento de viajes tanto de residentes como de turistas. Sin embargo, los desafíos son considerables. La investigación sobre movilidad y comportamiento de viajes en grandes eventos está aún en sus primeras etapas y hay una falta de datos de referencia generalizada y de estudios cuantitativos. En este trabajo abordamos este déficit investigando las actitudes y el comportamiento de viaje de turistas y residentes en la ciudad brasileña de Manaus, una ciudad anfitriona de la Copa Mundial FIFA 2014. Nuestros resultados sugieren que además de la disponibilidad de información sobre el transporte público, las percepciones sobre el 'tiempo de viaje' y la 'conveniencia' influyen en las actitudes y pueden ser objetivos importantes para promover un cambio de comportamiento. Estos resultados destacan la importancia de proporcionar un buen acceso a la información claramente dirigida a opciones de viaje sostenibles. Más en general, demostramos que el desarrollo con éxito de una movilidad sostenible para

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grandes eventos debe coordinar cuidadosamente actitudes y comportamientos locales.

**Palabras claves:** grandes eventos; turismo; sostenibilidad; transporte; cambio de comportamiento

## Résumé

La prochaine Coupe du Monde 2014 de la FIFA (CMF) au Brésil fournit l'occasion d'investir dans un système de transport public efficace dont les bénéfices s'étendront au-delà de l'événement. En outre, la CMF constitue un levier potentiel pour encourager un changement dans les pratiques de déplacement à la fois des résidents et des touristes. Toutefois, les challenges sont considérables. Les recherches sur les pratiques de mobilité et de voyages lors des grands événements n'en sont encore qu'à leurs balbutiements et il y a un manque de données de base et d'études quantitatives. Ici, nous nous attelons à ce déficit d'informations en étudiant les attitudes et les comportements de déplacement des touristes et des résidents dans la ville brésilienne de Manaus, ville d'accueil de la CMF 2014. Nos résultats suggèrent qu'en plus de la disponibilité de l'information sur les transports publics, la perception du « temps de déplacement » et du « confort » influence les conduites et peut constituer un objectif important pour encourager un changement comportemental. Ces résultats mettent en lumière l'importance d'une bonne accessibilité de l'information sur les possibilités de transport durable. Plus globalement, nous mettons en évidence qu'un développement réussi des transports durables lors des grands événements doit attentivement tenir compte des attitudes et comportements locaux.

**Mots clés:** Grands événements; tourisme; développement durable; transport; évolution des pratiques

## 摘要

即将到来的2014年巴西FIFA世界杯 (FWC) 提供了一个投资高效公共交通系统的机会,它带来的收益将超出赛事本身。此外,FWC是一股潜在的促进居民和游客改变旅行行为的重要力量。然而,挑战仍是巨大的。关于大型赛事流动性和旅行行为的研究仍处于萌芽阶段,基础数据和定量研究普遍缺乏。这里,我们通过调研巴西一座举办2014FWC赛事城市——玛瑙斯的居民和游客的态度和旅行行为来弥补这一研究不足。我们的结果表明,公共交通信息可获得性、对'旅行时间'和'方便性'的感知对态度产生影响,并且它们可能是促进行为变化活动中的重要目标。这些结果强调,为公众提供在可持续旅行选择中清晰的信息渠道非常重要。我们更为一般的结论是,大型事件可持续流动性的成功发展一定要仔细地协调当地人群的行为和意愿。

关键词: 大型事件; 旅游; 可持续; 交通; 行为变化

## Introduction

Transport plays a central role in the global economy (Rodrigue, Comtois, & Slack, 2006) and arguably provides the greatest challenge to sustainable development. Unsurprisingly, recent decades have seen a fundamental shift in transport planning from the traditional perspective based on travel cost minimization towards a sustainable mobility paradigm that emphasizes actions that reduce the need to travel, encourage modal shifts, reduce trip lengths and encourage greater efficiency in the transport system (Banister, 2008). Such actions should ultimately benefit society, distributing wealth, serving basic needs and rights, and mitigating or reducing environmental impacts (Basler, 1998).

Despite the clear societal benefits of adopting policies based on sustainable mobility, changing transport systems involves many challenges. For example, a key element of successful implementation of sustainable transport measures is public acceptability, which may need to overcome ingrained attitudes of 'car cultures' which equate personal freedom with car ownership (Sheller, 2004). In this context, one of the key research themes of sustainable mobility is to understand individual attitudes and choices to alternative transport modes and, critically, how (if at all) these might be changed (Lanzendorf, 2003). Banister (2008) identifies two key elements to the personal acceptance of sustainable transport options: first, an acceptance that the alternative transport policies being proposed will actually work and that they will be efficient; second, that any new policy will be fair to both individuals and society as a whole.

### ***Behavioural change models***

There is an enormous and varied literature on how public attitudes to transport can be changed. Many of these studies draw upon behavioural change models from psychology to inform their approach, rationale and methodology. One of the first types of behavioural change models to be developed were rational choice models, which form the foundation for consumer preference theory (Jackson, 2005). These models basically assume that an individual's choice is based on maximum utilization, where utility can be represented as the level of satisfaction (Heath, 1976) and personal advantage (Friedman, 1953).

One of the most commonly applied rational choice models is the theory of reasoned action (TRA). The TRA holds that an individual's motivation to engage in a behaviour is primarily defined by the attitudes that influence that behaviour (Fishbein & Ajzen, 1975). In this context an attitude refers to an individual's perception (in favour or against) towards a specific behaviour (Werner, 2004). 'Subjective norm' refers to the individual's subjective judgement regarding others' preference and support for a behaviour (Werner, 2004). A closely related extension of the TRA is the theory of planned behaviour (TPB), which seeks to explain how the intentions to perform a given behaviour are formed. As described by Budeanu (2007), the TPB is based on three determinants: an individual's perception of a future behaviour; the 'pressure' to act towards certain behaviour and the ability to perform a certain behaviour, 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 behaviour of being environmentally friendly (Ajzen, 2005).

Reasoned choice models have had some success in explaining and predicting behaviours, but have frequently proven to be inadequate (Weinstein, 2007). This is because there is frequently a so-called 'attitude-behaviour gap' between the attitudes of an individual and their actual behaviour (Kollmuss & Agyeman, 2002). The attitude-behaviour gap is an acknowledgement that the transition to a new behavioural pattern may be prescribed by various factors, both internal and external (Blake, 1999; Burguess, Harrison, & Filius, 2008; Dickson, 2001; Gale, 2008; Owens, 2000). One of the strongest barriers to achieving a behavioural change appears to be habit (Triandis, 1977): repeated activities become a habit rather than a conscious and reasoned action (Aarts, Verplanken, & Van Knippenberg, 1997; Verplanken, Aarts, Van Knippenberg, & Moonen, 1998). For example, a number of authors (Fujii & Kitamura, 2003;

Thogersen & Moller, 2008) have found that the habit of car use is an important factor preventing individuals from changing to alternative travel modes.

One of the latest attempts to incorporate habit into behavioural choice models is the theory of interpersonal behaviour (TIB). The TIB is an integrated theory that combines the role of habit (as the most influential factor), intention and facilitating conditions (environmental factors) in driving behavioural change. The theory assumes that behaviour is a result of conscious deliberation, although it has been suggested that repeated behaviour is habitual and involves no conscious deliberation (Aarts & Dijksterhuis, 2000). The more times that behaviour is repeated, the more habitual and less consciously controlled it becomes.

Most of the above theories/models draw upon internal determinants to explain individual behavioural change, and do not necessarily address some of the conditions out of the individual's direct control, such as external and situational factors. These may also have a significant influence on a person's capacity to change their transport behaviour. Thus, new behaviours can only be developed if the necessary conditions and options are provided (e.g. the use of PT can only be made if there is an efficient and effective PT system on offer). The needs–opportunities–abilities model (NOA) has been developed to explicitly account for the role of opportunities in behavioural change. Specifically, the NOA 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 behaviour as opportunities and abilities also play key roles.

### ***Mega-events and sustainable mobility***

Mega-events, in turn, have the potential to transform a host city economically, socially and environmentally: they generate economic activity on a major scale during the preparation phase, the event itself and even afterwards (Hiller, 2000a; Ward, 1998). As a consequence, mega-events have been characterized as accelerators of national economies (Clark, 2010), stimulators of local economies (French & Disher, 1997), investment catalysts (Law, 1992) and responsible for tourism growth (Saunders, 2010). From a social perspective, a mega-event represents a singular occasion to mobilize behavioural change in favour of more sustainable attitudes (Bovy, 2001). Moreover, a mega-event can promote environmental responsibility through engaging residents and tourists, and ensuring that a culture of ecological attitudes is promoted (Otto & Heath, 2009). Nevertheless, the benefits arising from hosting a mega-event may not all be realized (Gratton, Shibli, & Coleman, 2005; Hall, 2001, 2006).

Mega-events also provide unparalleled opportunities and challenges for the development of sustainable transport. For example, they may result in increased investment in transport infrastructure and an expansion and/or modernization of PT systems (Chalkley & Essex, 1999; Hiller, 2000b; Matheson, 2012). More generally, the global publicity and influx of international tourists into the hosting cities provide incomparable possibilities to promote sustainable transport alternatives, changing attitudes and modifying behaviours (Beyer, 2006; Bovy, 2006; Rose, 2003). Furthermore, mega-events can leave a powerful sustainable transport legacy, permanently altering the travel behaviour of residents and improving quality of life within the city. Conversely, a lack of planning before and during an event could cause negative social, cultural

and environmental impacts, damaging the image of the host city and reinforcing unsustainable travel behaviour. Moreover, tourism (in particular sport tourism) often generates sustainability deficits with respect to climate change, greenhouse gas (GHG) emissions, energy use, resource use and contributing to environmental challenges (Gössling & Hall, 2006; Hall, 2011; Hall & Lew, 2009).

Mega-events generate high concentrations of traffic flows over significant space and time (Federal Highway Administration [FHWA], 2005; Robbins, Dickinson, & Calver, 2007), resulting in considerable additional traffic for often already overloaded transport systems (Bovy, 2006). The basic problem that planners face is mainly related to the provision of additional capacity to meet peak levels demand (Robbins et al., 2007, p. 304). Thus, host cities need to develop strategic and operational measures (European Conference of Ministers of Transport [ECMT], 2003) and, in the case of mega-events, the transport operationally must be 'beyond ideal' (Kassens-Noor, 2009).

The traffic challenges of mega-events frequently promote a modal split, with a high proportion of PT (Meyer, 2001) and non-motorized transport during the event. Moreover, 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' (Robbins et al., 2007, p. 304). Therefore, a strategic decision is needed on the capacity of the transport infrastructure. This may mean adapting the infrastructure to the event or, more frequently, adapting the event to the available infrastructure (ECMT, 2003).

Changes in transport associated with a mega-event can potentially stimulate changes in daily mobility among tourists and residents. Moreover, mega-events frequently lead to innovations in transport systems and mobility management programmes, providing groundwork for creating new user attitudes and for changing habits (Bovy, 2006; Brown & Massey, 2001; Murphy & Bauman, 2007; Preuss, 2004; Rose, 2003; Rose & Ampt, 2003). Other benefits include better quality of life, less congestion, better air and more attractive travel (Brajer & Mead, 2003; Getz, 1999; Matsudo, Matsudo, & Andrade, 2004).

Mega-events clearly provide singular opportunities to raise awareness and promote new ways of thinking and behaving. They have been demonstrated to increase self-image from a local to an international dimension (Getz, 1989; Hall, 1992; Roche, 1994). Mega-events are also a unique opportunity to promote new behaviours and change attitudes in favour of more sustainable ways of life (Pellegrino & Hancock, 2010). However, effective strategies for promoting behavioural change require an in-depth understanding of the attitudes and behaviours of residents and tourists, and how this information can be used to promote sustainable practices and ensure a longer-lasting legacy of a mega-event. Event planners thus need to develop a profound understanding of the host city, its residents and tourists if they are to capitalize on the transformative potential of the event. In other words: 'understanding and adapting to consumer motivation and behaviour is not an option – it is an absolute necessity for competitive survival' (Engel, Blackwell, & Miniard, 1995, p. 12).

The challenge of integrating environmental issues into the planning of tourism events in Brazil has so far received little attention from researchers (Pereira, 2007). Similarly, there have been relatively few Brazilian-based studies on mobility and tourist preferences and attitudes. This shortfall is not restricted to Brazil; there are still big gaps in the mobility and tourism literature in respect to travel choice and attitudes (Kelly, Haider, & Williams, 2007). More research specifically addressing these issues is needed in order to develop a genuinely holistic approach to mega-event and

tourism planning. Such planning will be an essential task for the 2014 Fédération Internationale de Football Association World Cup (FWC) in Brazil, not only to ensure that potentially harmful environmental impacts of the enormous influx of tourists into host cities during the event are minimized, but as a unique opportunity to find solutions for the persistent mobility problems which already affect the major metropolitan areas of Brazil (Basto & Moraes, 2010; Vasconcellos, 2005).

In the current study our general objective is therefore to assess the potential for sustainable mobility for the 2014 FWC in the northern Brazilian city of Manaus. Specifically, we address the following questions: (1) how can the travel behaviour be changed in the framework of a mega-event in order to promote sustainable mobility behaviour? (2) What facilitating conditions will be most effective for promoting sustainable mobility among car users and what are the barriers restricting use of sustainable modes? (3) What strategies can be used to promote sustainable mobility for the 2014 FWC?

#### *Case study: the 2014 FWC in Manaus*

The city of Manaus is located in the middle of the Amazon forest, about 1450 km inland from the Atlantic Ocean. Manaus is the Amazon's largest city, covers an area of 11,401 km<sup>2</sup> and had an estimated population of 1,802,525 habitants, 87% of whom are concentrated in the urban area (Instituto Brasileiro de Geografia e Estatística [IBGE], 2011). Manaus, along with most of the Brazilian host cities for the 2014 FWC, has suffered increased urbanization, modernization, population growth and unsustainable consumption. The latter include an increase in private car ownership, generally regarded as an important symbol of power and status (Diekstra & Kroon, 1997; Sheller & Urry, 2000) and an excessive use of private single-occupancy transport.

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, although the fare is one of the highest among the Brazilian capitals (R\$2.75/US\$1.40). The bus system transports almost 800,000 people daily on nearly 300 bus lines (many overlapping) which are operated by several private companies. 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, 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 complete the list of obstacles that hinder and sometimes even make it impossible to use sidewalks (Souza, 2009).

Two new transport systems have been proposed for the 2014 FWC in Manaus: Monorail and bus rapid transit (BRT) (Farah, 2010). These new infrastructures, coupled with government incentives to promote sustainable transport modes, would strongly benefit the mobility management for 2014 FWC. The up-scaling of the PT infrastructure would also help to reduce GHG emissions, thus contributing to the sustainable development of the host city as a whole. However, the BRT and Monorail projects have been launched far too late and are unlikely to be ready before the 2014 FWC. It is therefore difficult to visualize a timely and effective solution for

the 2014 FWC mobility demands in Manaus based on improvements of the PT infrastructure.

## Methodology

### *Data collection and sampling*

The case study (cf. Rowley, 2002) was conducted in Manaus, Brazil. A quantitative approach was adopted based on 565 surveys, of which 48 were invalid. Additionally, a pilot survey was conducted with a small group of nine people prior to the development of the final questionnaires.

A cross-sectional survey methodology was adopted – data collected at one point in time from a sample selected to represent a larger population. The survey used self-completion questionnaires delivered in person. This has the advantage of decreasing refusal rates and allowing respondents to clarify the meaning of questions.

A non-probability sampling technique, called convenience sampling, was used. According to United Nations Educational, Scientific and Cultural Organization (UNESCO, 2005) a sample of convenience describes a sample where individuals are selected from the target population on the basis of their accessibility or convenience to the researcher. The sampling frame consisted of the residents and tourists in Manaus within the first beltway in leisure places (parks, restaurants, shopping's centre) and near the 2014 FWC venue. The survey population was grouped into two main clusters for analysis: cluster I consisting of tourists and residents, and cluster II consisting of car users and non-car users.

Quantitative data analysis was performed with the Statistical Package for the Social Sciences. Two main inferential statistics were utilized: first, tests of group differences, mainly related to cluster I (tourists and residents), cluster II (car users and non-car users) and the differences (within the cluster) to their mean scores on some response variables; second, tests of association with selected variables. Six main hypotheses about mobility behaviour, attitudes and preferences were tested:

Hypothesis 1: There is an association between current daily travel mode and intended travel mode during the 2014 FWC.

*Based on model of pro-environmental behaviour and TRA.* Non-motorized travel (NMT) use for the 2014 FWC is estimated to account for less than 10% of transport. Moreover, daily users of PT and car are less likely to choose NMT. Additionally, almost half of the daily car users had no intention to change their behaviour – 48% intend to drive during the FWC. However, the remaining respondents indicated that they were willing to switch to PT (48%) or NMT (4%).

A significant contingency coefficient (.336;  $p < .001$ ) indicates that the intention to use a transport mode during the FWC and current modal choice is associated.

Hypothesis 2: Tourists' choice of a transport mode in Manaus is associated with choice of transport mode in the home location.

*Based on TPB.* Modal choice during holidays and at home location were significantly associated (contingency coefficient = .765;  $p < .001$ ). Several transport attributes (e.g. 'safety' and 'congestion') were not cited by tourists. 'Convenience' was by far the most important reason for travel mode choice during holidays (37%). Approximately



59% of tourists who stated that ‘convenience’ was the most important travel mode attribute also chose this as the most important attribute for travel at their home location. However, for travel mode choice at home ‘travel time’ was also considered as important.

Hypothesis 3: (a) Non-car users do not rate NMT implementation as more important than car users. (b) Among people who commonly use NMT, the intention to use NMT for the 2014 FWC is more frequent than among people who use NMT more rarely.

*Based on model of pro-environmental behaviour and TIB.* The reported means were high ( $>4$ ) in both car users and non-car users, indicating that within this population sub-set there seems to be a widespread agreement that the use of NMT is desirable. However, the difference in the importance rating of NMT use between car users and non-car users is not significant ( $p = .854$ ).

NMT was the favoured transport mode for the FWC for 36% of respondents who use bikes at least 1–3 times per week. Only 7% of those who use bikes less often (or not at all) intended to use NMT during the FWC.

Hypothesis 4: ‘Lack of information’ is the main factor keeping car users from a more sustainable modal choice.

*Based on the attitude–behaviour gap.* The most important reason identified for preventing car users from using PT or NMT is ‘comfort of service’ (mean of 4.2). Considering only tourists, a strong pattern emerges: ‘lack of information’ is the most important reason in preventing the use of NMT or PT.

Hypothesis 5: 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’.

*Based on TIB and NOA model.* A total of 51% of the respondents who answered this question identified ‘more frequent service’ as a key barrier. Contrary to the assumption at the beginning of this section, ‘would not change’ (understood here as ‘habit’) does not appear to play an important role in transport mode choice. However, social desirability may be influencing the answers.

When evaluating the cluster tourist separately, around 58% chose ‘better infrastructure’, 47% ‘more frequent service’ and 32% ‘more security’ as main reasons for using the car. No tourists chose ‘would not change’, while 20% of residents chose this option.

Hypothesis 6: (a) 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; (b) restrictive measures which involve pricing/taxation, such as ‘increased parking price’ and ‘congestion tax’ would reduce car use in 2014 FWC.

*Based on 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: parking elimination in some streets, closed streets for exclusive use of NMT, area/zone of limited circulation, restrictions on car use, increases in parking fees and introduction of congestion charge. Surprisingly, car users show a higher acceptance of incentive-based (‘pull’) measures that are planned for the FWC: transport integration, higher PT frequency, special PT services during matches, bikes to rent, walk

together and combined PT and stadium ticket. These differences are significant ( $p < .05$ ) for 'transport integration', 'higher PT frequency', 'special PT services for games' and 'bikes to rent'. Moreover, the means for pull measures are high ( $>4$ ) in both groups, suggesting a high level of acceptance of such measures.

### Modal choice and conditions for promoting sustainable mobility

The sample consisted of 517 individuals of whom 48% were male and 52% female (see Figure 1 for details of socio-demographic characteristics). Net monthly income was used to define social classes: class E (<US\$370): 11%, class D (US\$370–592): 26%, class C (US\$592–2.550): 38%, class B (US\$2.550–3.326): 11% and class A (>US\$3.326): 14%. This social class division is based on the official classification system of the Brazilian Institute for Geography and Statistics (IBGE). More than half of the respondents were classified in the lower social classes; this percentage considerably decreases when considering only tourists. Most respondents had a high-school certificate or Bachelor's degree, and the majority belonged to the younger age group. Most of the respondents are residents from Manaus, only one-sixth of this sample are tourists (national and international).

All factors, with the exception of travel costs, positively influence the decision in favour of car use (Figure 2). It is important to take into consideration that there are factors which are not included in the model 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'). The results indicate that the items

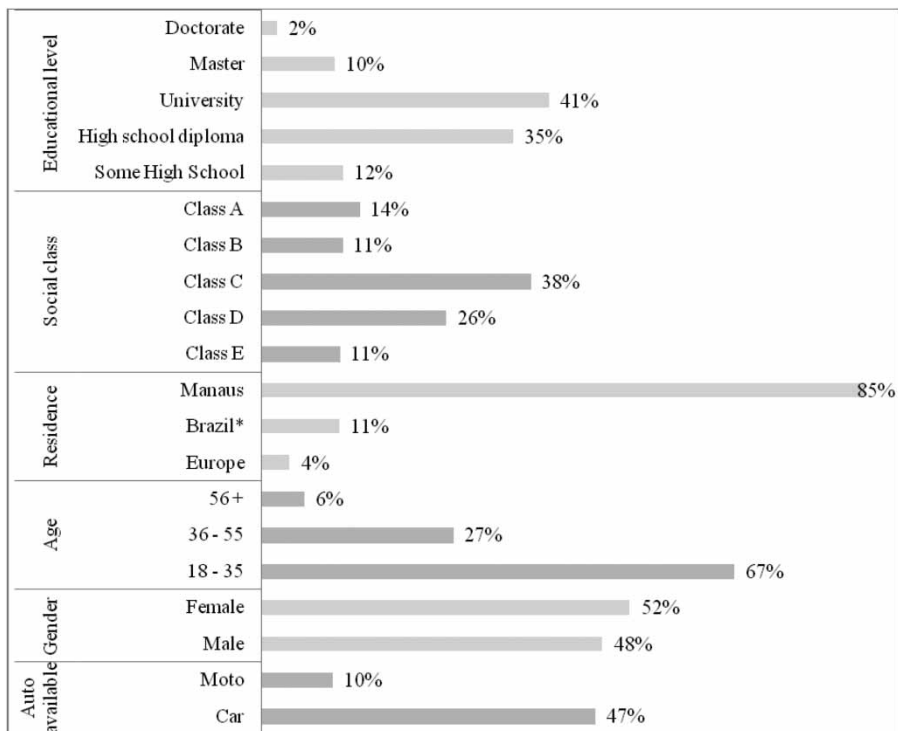


Figure 1. Socio-demographic characteristics of survey population.

Note: \*Excluding the residents of Manaus.

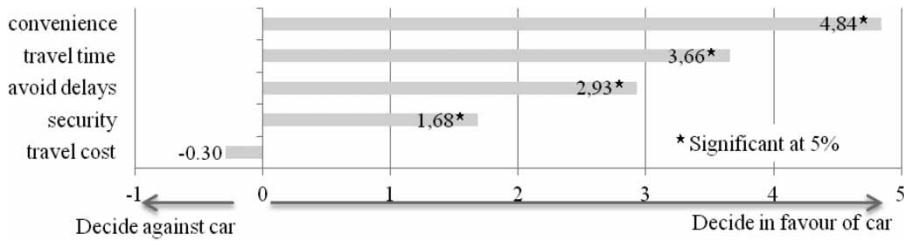


Figure 2. Influence of factors on modal choice.

'convenience', 'travel time', 'avoid delays' and 'no PT availability' positively influence the decision to use a car while 'travel cost', 'no car availability', 'city appreciation' and 'health' are causal reasons for choosing sustainable modes of mobility.

The percentage of respondents can be used to rank the importance of facilitating conditions in promoting sustainable mobility (Figure 3). This question permitted multiple responses and was answered only by car users. For approximately 50% of the respondents 'more frequent service' and 'better infrastructure' were the most important means to facilitate sustainable mobility. Measures such as 'more convenient bus stops' and 'better connections' appear less effective. However, some car-owning respondents claimed they would not change their behaviour regardless of any of the promotion measures.

The question about obstructive factors in promoting sustainable mobility was only asked to car users (Figure 4). The factors 'distance to bus stop/station' and 'lack of information' were identified as the least important barriers keeping car users from using alternative modes of transport. However, as shown in previous analyses, 'lack of information' is the most important reason in preventing car users from using PT or NMT when considering only tourists. The factors 'comfort of PT service' and 'travel time' appear to be the most important challenges for promoting sustainable mobility. Not all factors attained scores of 4 and 5 (respectively, 'important' and 'very important'), which may indicate that the promotion of sustainable mobility is hampered by external and situational factors in addition to internal factors, such as habit and social norms.

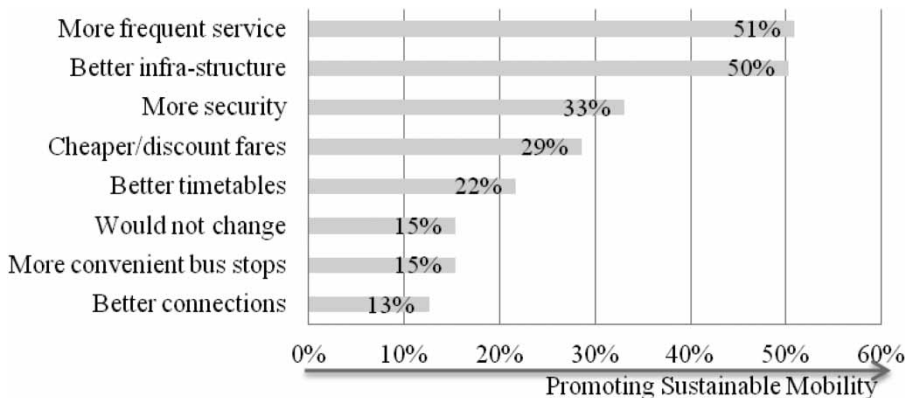


Figure 3. Importance of facilitating conditions for car users.

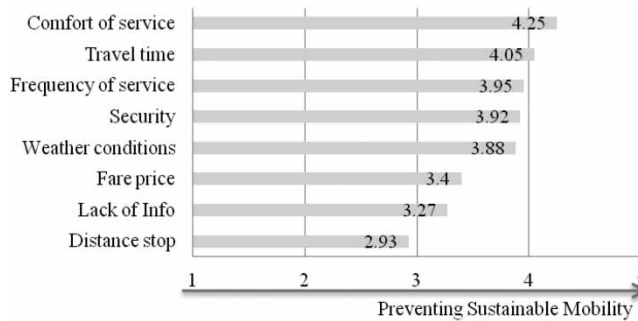


Figure 4. Importance of obstructive factors for car users.

## Discussion

This case study explored the attitudes, preferences and behaviour of residents and tourists in Manaus to promote sustainable mobility with particular reference to the 2014 FWC. To the best of our knowledge, this is the first study of residents' and tourists' travel behaviour in the context of mega-events in Brazil. Furthermore, previous research on mega-events and transport has generally only considered the rationale of transport improvement (external factors), without exploring the internal contribution of preferences, needs, and acceptability by tourists/residents. These factors could significantly diminish any lasting beneficial outcomes of the mega-event.

One of the main findings of the survey was that travel mode intention diverged slightly from that currently used for daily transport. However, the overall modal split was identical if the daily mode and the intended mode during the FWC are compared. The survey also explored the potential of more sustainable travel behaviour. Approximately half of the respondents claimed they would choose a more sustainable way of travelling during the 2014 FWC. Nevertheless, a large group of respondents (50%) intended to use their car and were not thinking of switching to another mode of transport during the 2014 FWC. These findings are similar to a recent study in Rio de Janeiro which observed that the intention of car owners to use buses during a mega-event is almost 50% lower compared with non-car users (Portugal & Rubert, 2010).

Convenience, travel time and frequency of service were identified as the three most important factors keeping citizens from using PT. This is also in concordance with other studies. Cullinane and Cullinane (1999) observed that frequency of service and extent of the transport network were prominent impediments to the use of PT. According to Olympic Delivery Authority (ODA, 2007) 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 PT for visitors. Furthermore, the study 'Transport Performance of the Sydney Olympics' affirmed that the transport system was expected to respond to user needs by ensuring that fans arrive on time to all events (Hensher & Brewer, 2002).

Another important aspect of travel mode choice was the availability of travel information. For tourists, lack of information and convenience/comfort have been identified as the most important factors restricting the use of PT. Naturally, tourists need information on bus schedules, stops, stations and routes to be able to effectively and conveniently use this transport mode. In the same way tourists need clear signposting and appropriate infrastructure to be able to move on foot around the city.

Incentives or restrictions in host cities may help to reduce car use. The measures which usually provide positive long-term effects may include improved accessibility (NMT introduction and improvement) and incentives that boost sustainable mobility beyond the mega-event itself. 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 (Peeters & Schouten, 2006). 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 users and non-car users. Similarly, external factors such as travel costs up to a certain level do not reduce car trips significantly. Nevertheless, cost was the second most important reason mentioned by PT users. Maatz (2010) recommends that providing 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 is essential to promote sustainable mobility behaviour.

Strategies to encourage sustainable mobility 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. This has led some researchers to identify transport integration as the preferred strategy by car users and non-car users during mega-events (Portugal & Rubert, 2010). However, it should be noted that in Manaus buses are the only PT mode currently available.

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

### ***Framework for promoting sustainable mobility at mega-events***

An effective sustainable transport strategy for a mega-event should consider all influencing factors in a long-term perspective. It is of fundamental importance to include 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/disability to choose certain modes) and, finally, internal factors (e.g. reasons, satisfaction, environmental importance, attitudes, perception and habit). There is a consensus arising that a mega-event can only benefit a host city if the strategic planning addresses a long-term perspective (Chalip, 2004; Gratton & Preuss, 2008).

Based on the Manaus case study, a range of measures, strategies and barriers as well as information provision can be used to lower the level of satisfaction of using cars (Figure 5). This in turn may determine new behavioural patterns and, finally, reduce the number of car users. In the same way, providing effective information about (and

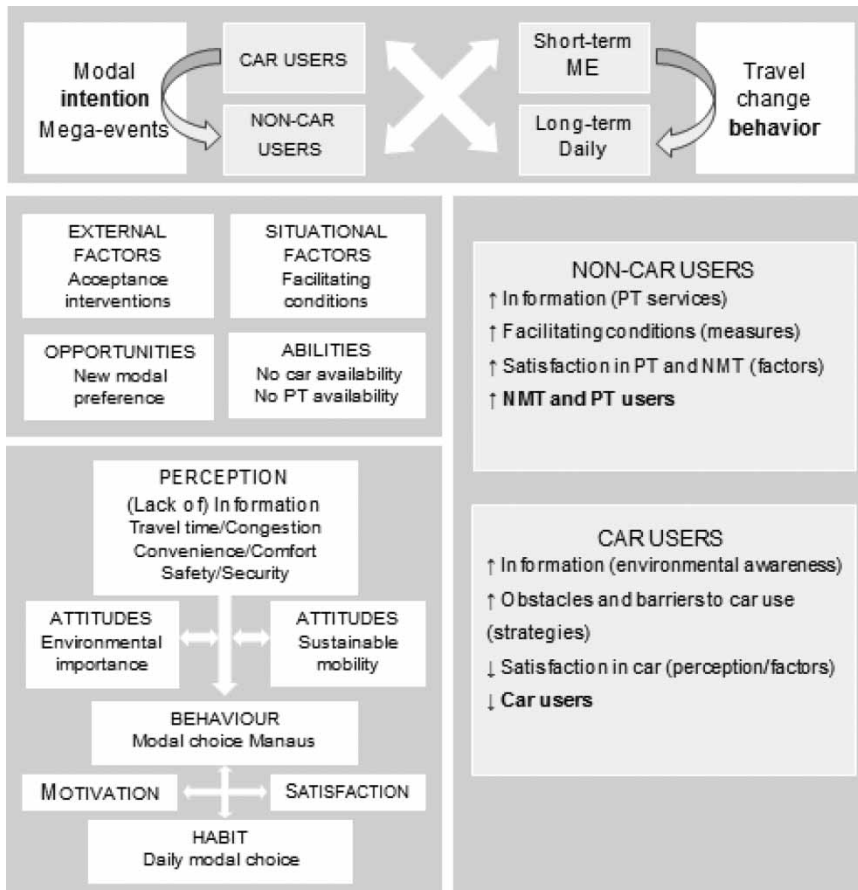


Figure 5. Proposed conceptual framework for travel behaviour change in mega-events and daily mobility.

improving) PT services, removing barriers and providing incentives for PT use will result in a higher level of satisfaction of PT users. The overall 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 and convenience) strongly influences attitudes, as does awareness of environment issues and sustainable mobility. These attitudes are, in turn, influencing behavioural choices of tourists. Habitual behaviour, related to satisfaction with the modal choice and motivation or reasons for the modal choice, will also strongly influence modal choices.

### Travel behaviour change and sustainable mobility for the 2014 FWC

There is increasing evidence that mobility management during mega-events needs to go beyond the technical dimension of transport engineering. Behavioural issues need to be considered to ensure successful mobility management during the event and to achieve sustainable mobility in the long term, contributing further to the attractiveness of the city/region and country as a potential tourism destination.

This research contributes original data and analysis to understand behavioural choices related to transport at mega-events. However, no single study can fully address the multi-dimensional and complex problems related to the promotion of sustainable mobility in mega-events. Behavioural 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 web of behavioural causes and effects, considerable insights can be gained through empirical studies.

Generally, it is clear that the promotion of sustainable mobility for the 2014 FWC in Manaus will be an arduous task and will be a huge challenge for urban planners and mega-event managers. A wide range of policies and measures to reduce car use and encourage the use of PT and NMT need to be implemented. However, to effectively identify, prioritize and implement these measures it will first be necessary to develop an appropriate transport infrastructure. With less than 2 years before the FWC, 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 desperately needed urban mobility projects.

In addition to improvements in transport infrastructure, mega-events constitute a unique opportunity to change norms of travel behaviour. However, this aspect is virtually invisible in discussions of transport planning for the 2014 FWC in Brazil. As demonstrated in the current study, the basic strategy should be to provide appropriate conditions to adopt new behavioural patterns, paving the way for long-term and sustainable changes in transport use.

In the wider context, this study provides a preliminary empirical analysis of the links between the tourism event industry, travel behaviour and transport in the city of Manaus, a host city for the 2014 FWC. Clearly, further empirical research is desirable, both within the broader Brazilian context and to provide a more in-depth analysis of the relationships among mega-events, transport, sustainability and behaviour.

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