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Analysis of low carbon transport in Brunei Darussalam: case study of a sustainability transition in an oil-rich economy

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Muhammad Amirruddin Haji Abdullah

BSc, Environment (Griffith University, Australia)

MSc, Environmental Assessment and Monitoring (Universiti Kebangsaan Malaysia,

Malaysia)

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Abstract

Moving towards sustainable transportation is a challenging task for Brunei, a small oil-rich country situated in South East Asia, whose population currently enjoys subsidised petrol feeding a culture heavily reliant on the automobile for personal mobility. This study aims to investigate the potential for the development of low-carbon transportation in Brunei Darussalam by using the Multi-Level Perspective of socio-technical transition.

This study uses mixed methods (survey questionnaires, interviews, and secondary data) to gain insights into the problems, issues, solutions and expectations of sustainable transportation in Brunei. In summary, Bruneians are over dependent on cars and the majority have negative attitudes and behaviour regarding bus services. The findings on resistance to alternative vehicles in this study are complex, compared to the current literature. The key factors are the car-oriented culture (the product of parenting, employment and security), current transport policies and other government initiatives (such as heavily subsidised petrol); all of which tend to promote the use of cars over buses.

The data were then incorporated into the three levels of the Multi-level Perspective. Results indicated that the transition in Brunei towards sustainable transportation (particularly towards low carbon transportation) is on-going but few disruptions in the regime, (especially attitudes and perceptions) are occurring. The complexity of transition and the technical, institutional, policy and car-related cultures have proved to be the barriers. The niches are finding it hard to compete with the current regime. Furthermore, fragmentations in the transportation institutions contribute to the failure to make progress towards sustainability. Therefore, the potential for transition to low-carbon transportation is essentially challenging and a difficult task to achieve. Thus, this thesis contributes to the transition literature in which the study of human attitudes, behaviour and perceptions (non-technological niche) towards sustainable transport are often under-researched and the study of single, or top-down governance, seems to be limited.

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Abbreviation

ABC	Attitude, Behaviour and Choice
ADB	Asian Development Bank
AFV	Alternative Fuel Vehicle
APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of South East Asian Nation
ATM	Automated Teller Machine
BEDB	Brunei Darussalam Economic Development Board
BND$	Brunei Darussalam Dollar
BRT	Bus Rapid Transit
CCTV	Closed-circuit television
CEO	Chief Executive Officer
CIA	Central Intelligence Agency
CO^2	Carbon Dioxide
CfBT	Brunei's Centre for British Teachers
DEFRA	Department for Environment, Food and Rural Affairs
E-commerce	Electronic commerce
EIA	Environmental Impact Assessment
EDPMO	Energy Department of the Prime Minister's Office
e.g.	Example
EG	Elderly Generation (Above 55 years old)
EU	European Union
EURO II	European emission standards II
EURO V	European emission standards V
FAO	Food and Agriculture Organisation
FCV	Fuel Cell Vehicle
GDP	Gross Domestic Product
GEF-STAP	Global Environment Facility-Scientific and Technical Advisory Panel
GPS	Global Positioning System
HDI	Human Development Index
HoB	Heart of Borneo project
HS	High Salary (above $3000 per month)
ICE	Internal Combustion Engine
ICT	Info Communication Technology
i.e.	That is
IISD	International Institute of Sustainable Development
ITB	Institut Teknologi Brunei
ITS	Intelligent transportation system
KB	Kuala Belait
Km	Kilo metre
Km^2	Kilo metre square
kWh	Kilo Watt per hour
LMS	Lower Middle Salary (BND$1000 - BND$2000 per month)
LNG	Liquefied Natural Gas
LRT	Light Rail Transit
LS	Low Salary (Below BND$1000 per month)
MG I	Mid Generation I (26 – 35 years old)
MG II	Mid Generation II (36 – 55 years old)
mg m^{-3}	Milligrams per cubic metre

MLP	Multi-level Perspective
MRT	Mass Rapid Transit
MTLA	Motor Transport Licencing Authority
N-Bru	Non-Bruneians
n.d	Not dated
N-W	Non-working group (housewife, looking for a job, not working and retired personnel)
NGOs	Non-governmental Organisations
N-PT User	Non-public transport users
NVIVO	NVIVO software for analysing unstructured data, especially interview
OECD	Organisation for Economic Co-operation and Development
PASW	Predictive Analytics Software, formerly known as SPSS
Pg.	Page
PT User	Public Transport user
RFP	Regional Forest Programmes
RIPAS	Raja Isteri Pengiran Anak Saleha Hospital
SOF	Save our future
STT	Socio-technical Transition
Stu	Student Population
TCP	Department of Town and Country Planning
TDM	Travel Demand Management
TESL	Teaching English as the Second Language
TOD	Transit Oriented Development
TV	Television
UBD	Universiti Brunei Darussalam
UMS	Upper Middle Salary (BND$2001 - BND$3000)
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UK	United Kingdom
US	United States
USD $	United States Dollar
USA	United States of America
W	Working group (Government, Private sector and Self-employed
WHO	World Health Organisation
WWF	World Wildlife Fund
YG	Young Generation
£	Pound Sterling

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Chapter 1: Introduction

1.0 Background

Motorised transport has provided and serviced various societal activities such as recreation and leisure, as well as economic functions, such as job opportunities. Motorised transport promotes mobility, which has increased the accessibility of the demands of daily life (such as job opportunities that were used to be far and time-consuming for travel (due to the needs to travel to interchange station) and are now less time needed for travelling. Along with mobility, the motor transportation industry is a major driver of the development of some nations. The car and car-related manufacturing industries are considered the backbone of other industries such as manufacturing, services and construction, in addition to being potentially major employers themselves. Goods and services need to be transported from one area to another, thus indicating the reliance on transportation for economic growth, an approach which is now convenient and less time-consuming to reach the destinations (for delivery of goods and services) (Ahmed et al., 2008; Pradhan and Bagchi, 2013).

The private car is one of the main modes of ground transportation. One of the most common reasons why people use individual cars is the fact that they give freedom to their users. Freedom in this sense may include, but is not limited to, the destination of travel, period and time of travelling and convenience, such as making it easier to travel with children (Beirão and Cabral, 2007; Eriksson et al., 2008; Farber and Paez, 2009; Gardner and Abraham, 2007). Conversely, the use of public transportation, such as buses and trains, offers a different range of benefits. Users might travel or move to their desired destination (or want) without needing to buy or maintain a car or worrying about paying parking fees (Gardner and Abraham, 2007). Besides, public transport (such as buses) provides opportunities for those who do not have access to private transportation to travel to the destinations they desire.

Although vehicular transport gives comfort to people, it also presents a significant challenge to sustainability (Ahmed et al., 2008; Aftabuzzaman and Mazloumi; Black, 2010; Black and Nijkamp, 2002; Wegener and Green, 2002). Part of this challenges relate to the use of the automobile itself, which comes with urbanisation and urban sprawl. This development has mounted serious challenges to nation worldwide (especially developing nations such as Thailand, Malaysia and Brunei) in achieving sustainable transport (particularly low carbon emission transportation) especially in reducing the problems and negative effects associated with ground transportation (Ahmed et al., 2008; Pongthanaisawan and Sorapipatana, 2010). Thus, restricting people from buying cars would damage the economic growth of certain industries, or countries that are dependent on the transportation industry. Such proscription may create an economically unsustainable society with a decline in wealth accumulation and loss of professions.

Many cities, in both the developed and developing worlds, have suffered from transport-related problems (Aftabuzzaman and Mazloumi, 2011; Black, 2010; Black and Nijkamp, 2002; Gorham, 2002; Han, 2010; Root et al., 2002). Such problems may include traffic congestion, road accidents, increases in pollutant emissions (such as an increase in carbon monoxide and carbon dioxide, and particulate matter from exhaust fumes) the excessive consumption of energy, contributing to anthropogenic climate change (due to the emissions of greenhouse gases), and land clearing for the construction of traffic-related infrastructure (Aftabuzzaman and Mazloumi, 2011; Black, 2010; Wegener and Green, 2002).

Hence, addressing the issue of transportation for sustainability is considered a necessary but complex and challenging task (Black and Nijkamp, 2002; Black, 2010). Sustainable transportation issues have been a key topic of discussion amongst policy-makers, managers, communities and academics. Increasing the sustainability of transportation involves several interrelated issues: technological (improving the performance of mode of transportation, such as fuel efficiency, and the definition of sustainability); economic (cost of public transport infrastructure, changing subsidies for cars, such as below-cost road tax, and increasing subsidies for public transportation); and social (changing people's attitudes and behaviour and increasing the acceptability of public transportation). Therefore, sustainable transportation is important not only because it is beneficial to society and allied economic

activities but also because it will reduce the negative effects of transportation-related matters on the environment.

In recent years, the concept of Socio-Technical Transition (STT) has emerged in the academic literature as a framework for the study of complex sustainability issues (Anable et al., 2010; Geels, 2002; 2004; 2005; 2010b; Köhler et al., 2009; Nykvist and Whitmarsh, 2008). Such transition is often operationally defined as the change or replacement of the structure of the existing system, culture and practices in order to satisfy the needs and demands of human society (Rotmans, 2005). One example of STT is the energy-source change from oil to biogas for farmers in Denmark and the Netherlands (Raven and Geels, 2010). The move replaced the dependence on oil for energy to biogas to reduce costs. However, prior to 1985, the transition was inhibited by negative financial returns. The policy only became fruitful from 1995 onwards. The actors in the transition process used the concept of green electricity, along with the participation of multiple actors in technological innovations and government subsidies. It has proved possible to reduce greenhouse gas emissions by collecting methane gas to generate electricity. The use of a Multi-Level Perspective (MLP, discussed more in chapter three) has explained the reasons for the initial failure of the project and the transformation of the project (energy source from oil to biogas) into a success.

Studies of both the technical and societal aspects of transportation in Brunei could produce results suitable for application to both present and likely future circumstances. Regarding the private transport system, Bree et al. (2010) and Köhler et al. (2009) have attempted to predict likely new technologies and innovations through the use of a MLP in order to shift from over dependent of petroleum based transportation to more greener transportation. They predict that the most suitable car technologies and innovations will be biofuel, internal combustion engine (ICE)/hybrid car (Köhler et al., 2009); battery electric vehicles (Bree et al., 2010) and proposed fuel cell vehicles from 2030 (Köhler et al., 2009)[1].

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[1] Thus, the use of MLP will not only predict the suitable car technologies and innovations in Brunei but also the changes needed in term of societal and cultural behaviour towards the acceptance of predicted car options (that are moving away from petroleum).

However, an area of research that tends to be overlooked is that of MLP studies on the role of individuals. A transition perceived as valuable to policy-makers (Köhler et al., 2009; Shove and Walker, 2007), or one that has occurred without intentional steering, may not be ideal for the public (Shove and Walker, 2007). The pathway to sustainability (or transition towards sustainable transportation) is important. However, politically prescribed pathways tend to force people to follow regulations while neglecting their choices towards a greener transportation options that they wish to have. Thus, the government and institutions use political power to attempt to achieve sustainability (especially towards greener mode of transportation) (Geels and Kemp, 2007; Shove and Walker, 2007). Public participation is a critical factor in the success of various types of initiatives (especially environmental initiatives). An example is the issue of the Queen's Pier heritage site, which was due for demolition in Hong Kong (Yung and Chan, 2011). The public were not given sufficient information about the new project that prompted the decision to demolish the heritage area. Furthermore, arguments arose in favour of preserving the heritage site. Because of the arguments and lack of information, leading to an insufficient process of public participation, the pier was about to be destroyed. Hence, sufficient public participation in processes might improve initiatives by providing transparency in decision-making (Jingling, 2010) as well as involving the relevant stakeholders affected by the initiative (Jingling, 2010; Laurian and Shaw, 2009). Thus, issues that are important in decision-making will not be overlooked if stakeholders and the public are involved (Laurian and Shaw, 2009; Portman, 2009).

This current research explores people's perceptions of transportation and carbon emissions in the context of an attempted transition to a sustainable transport system in Brunei Darussalam. (Note: from now on Brunei Darussalam will be referred to as Brunei). The research examines how the social (e.g., culture, every day practices and participations) and technical (system of governance, laws, knowledge and technology) aspects (in the transportation sectors) are interrelated in the transition to a low-carbon transportation system. The study thus examines the extent to which the concept of STT is useful for understanding developments towards increasing the sustainability of transportation in a political, economic and cultural setting, which has not previously been subjected to such an examination.

Sustainable transportation is a particular challenge for Brunei, an oil-rich nation accustomed to subsidised fuel, and where bus use is currently largely restricted to the migrant community (Bahrum, 2008; Buntar, 2010; Shen, 2011). Options for lower-carbon emission transportation might include the increase usage of public transportation (for example, greener buses), cleaner fuel and hybrid cars. Comparisons will be made with efforts to promote green transport policies in other settings with a tradition of high car dependence. This study is novel both in its attention to the role of the public in the transition to greater sustainability success and in the application of the MLP to an oil-dependent and non-European cultural-economic setting.

1.1 Research aim

The aim of this research is to assess the suitability of sustainability transition theory to analyse the development of low-carbon transport in Brunei. Therefore, this thesis has formulated four research questions.

1. *What is the political, social and economic context of ground transportation in Brunei?*

This study will explore the transportation policies relative to low carbon emission sustainability of road-going vehicles. Realising that land use plays an important role in the move to such sustainability, the research will consider other types of policy measures that have directly and indirectly impacted on the ground transportation in Brunei. Policy-makers (particularly the government) must take a positive approach to the issue of transportation by highlighting the benefits and problems it brings to society, the economy, and the environment. It is important to explore new practices, innovations and technologies to establish a less carbon emission consumption (especially in the transportation sector). However, not all of the practices produce positive outcomes as there are barriers to the improvement of transportation in Brunei. This leads to the second question:

2. *What steps have been taken in Brunei to promote sustainable transport at both regional and national levels of governance?*

This study explores the attitudes and behaviour of Bruneians in the transportation sectors, focusing on private cars and public transportation (buses and taxis). This brings us to the third question:

3. *What is the attitude and behaviour of people in Brunei with regard to different transport options (especially cars and buses)?*

Finally, the study will use the findings to understand the variables exerting pressure and influence on the transition to low-carbon transportation, the actors and institutions involved in the transportation sectors, the barriers, and the potential technology and innovation that will help to implement low-carbon transportation in Brunei.

4. *What does the MLP of the sustainable transport system consist of in the Brunei context?*

1.2 Why study Brunei?

This section provides some brief background information on various aspects of Brunei that make it a unique and interesting location for a study of a sustainable transportation transition. Brunei, with its geographical profile, system of government and administration, economic development and socio-cultural context is different from many other countries. This uniqueness is due to the differences in demographic profile (small land area and small population), system of government (ruled by a monarch who is also the prime minister), economic growth (based on natural resources) and policy development in Brunei.

Another key reason for studying Brunei is the fact that Brunei's economic development is heavily dependent on non-renewable petroleum and its associated industries. Attempts have therefore been made to diversify the nation's economic growth. Due to the availability of petroleum and natural gas, petrol has been heavily subsidised to the public since 1978 (Mahmud, 2008); the cost of petrol in Brunei is amongst the cheapest in the world (Bandial, 2010; Masli, 2010a; 2010b; 2010c; Oxford Business Group, 2008). The price of a litre of petrol in Brunei is cheaper than that of a litre of mineral water in Brunei. Therefore, petrol is

considered 'less valuable' and there is little incentive to consider alternatives to private motorised transport.

Conversely, it is necessary to have sustainable transportation in Brunei to limit congestion (efficient travel both for individuals and for the delivery of goods and services), and to reduce pollution and carbon emissions. There would also be social benefits from sustainable transport, including enhanced public transport. This would ensure that Bruneians, with no access to private vehicle transportation, enjoyed the same benefits as those with access to cars in terms of job opportunities and recreational activities.

Therefore, this research study seeks to promote an improvement in the transportation sectors in Brunei; especially in Bruneians' acceptance of low carbon transportation options, particularly the use of public transportation. It will also be suggested that the improvement of the transportation system should be based on successful examples from other countries, such as Singapore.

1.3 Brunei's demographic profile

Brunei is located on the northwest of Borneo Island, in the South East Asian region, facing the South China Sea. It has a land area of 5,765 km^2 and a coastline of up to 160 km. About 75 percent of the land area is covered in Equatorial Rainforest (Forestry Department Brunei, 2003; Oxford Business Group, 2008). Brunei is a prosperous modern country. However, it was a British protectorate from 1888 until the 1st of January 1984; Brunei celebrates its National Day every 23rd of February.

Brunei is divided into four districts: namely Brunei Muara, Belait, Tutong and Temburong. The Temburong district has green surroundings, where most of the virgin forests are located. Temburong district is separated from the other districts by e Brunei Bay. The Tutong and Belait districts run the petroleum industries (offshore fields), though much of their interior land areas are covered in forest. Bandar Seri Begawan, the capital city, is located in the Brunei Muara district. As the centre of administration, all of the main government buildings and head offices are located in Brunei Muara. Brunei Muara attracts numerous private companies and industrial and service sectors. Thus, Brunei Muara offers plenty of job

opportunities to both locals and immigrant nationalities. For this reason, 70 per cent of Brunei's total population lives in Brunei Muara (Department of Statistics, 2011; 2012; Eastern and Southern Asia, 2008).

Figure 1.3 Map of Brunei Source: U.S. Department of State (2014).

The population of Brunei was about 399, 800 in 2012 (Department of Statistics, 2012). Of that number, 262,800 are Brunei citizens, 41, 000 are Chinese and 96, 000 are temporary residents. Sixty-six per cent of the population are Malays, followed by Chinese (11 per cent) and others (23 per cent). There are no data on the origin of the 'other ethnic' population. Brunei has a balanced ratio of males to females.

	2008	2009	2010	2011	2012
Bruneian	285 000	288 900	294 000	298 980	303 800
Non-Bruneian	90 000	91 200	92 800	94 392	96 000
Total	375 000	380 100	386 800	393 372	399 800

Table 1.3 Population of Brunei Source: Department of Statistic (2012).

The Brunei labour force is heavily reliant on immigrant workers; 70% of whom are employed in the private sector (Anaman, 2004; Hashim, 2010). There is no specific information on the origins and the period of stay of immigrant workers. Therefore, it is uncertain to what extent these workers are a transient population.

1.4 Brunei's political philosophy

Brunei is a constitutional sultanate. His Majesty Sultan Haji Hassanal Bolkiah Muizzaddin Waddaulah is the current sultan. His Majesty is the head of state. As the decision-maker, the Sultan has the power to approve or reject any part of the governmental systems (Oxford Business Group, 2008). For example, a relevant governmental agency, such as the Department of Environment, Parks and Recreation, will draft a set policy and His Majesty has the power to reject or accept that policy. His Majesty also has the power to enforce any policy, such as the implementation of an Environmental Impact Assessment (EIA), a decree announced during the 26th Brunei National Day. In response to His Majesty's decree, all private and public construction projects must seek EIA approval from the Ministry of Development (Ahmadanawi, 2010; Thien, 2010a). Since the decree, the Ministry of Development has enforced the requirement of Environmental Impact Assessment for development projects. The project must pass a mandatory assessment before it can be approved (Thien, 2010a).

His Majesty has established three bodies to assist him in his work: the Privy Council, the Council of Ministers and the State Legislative Council. These three councils are based on the 1959 Constitution of Brunei (Jabatan Majlis-Majlis Mesyuarat, 2011) and His Majesty appoints members of those councils (CIA, 2011). Table 1.4 explains the functions of each body. The Legislative Council was suspended on 27th December 1983 and re-established on the 25th September 2004. The re-establishment was aimed at improving the system of governance while ensuring stronger institutions and a government that are closer to the people (Institute of Southeast Asian Studies, 2005). This was seen as a stepping-stone for public participation processes as well as to enable representatives to speak freely on behalf of the public. Currently, there are 36 members on the Legislative Council with two women representatives. The council members include His Majesty the Sultan of Brunei, ministers,

and other representatives (such as heads of villages); these members are appointed by His Majesty. On the 29th May 2010, His Majesty the Sultan of Brunei announced a reshuffle of the Council of Cabinet Ministers. Currently, there are 16 ministers on the Council and His Majesty holds the posts of Prime Minister, Minister of Defence and Minister of Finance.

Body	Functions
The Privy Council	Shall advise His Majesty on matters such as: Any amendment, addition or revocation of any provision of the Constitution in accordance with Article 85; Appointment of persons to Malay customary ranks, titles, honours and dignities and the designation of the functions appertaining thereto; Other functions as may be conferred on it by the Succession and Regency Proclamation, 1959, any other written law or by His Majesty the Sultan and Yang Di-Pertuan.
The Council of Ministers	Responsible for foreign affairs and trade; education; defence; finance; industry and primary resources; development; culture, youth and sports; health; religious affairs and communication
The State Legislative Council	Annual forum where His Majesty: Delivers ministers' national directives to be followed Introduces issues to be addressed and rehearsed Hears from ministers and other representatives from society about the issues Brunei, as a nation, is currently facing.

Table 1.4 Summary of the Privy Council, the Council of Ministers and the State Legislative Council. Source: (Jabatan Majlis-Majlis Mesyuarat, 2011; Oxford Business Group, 2008; *The Brunei Times*, 2010).

The only elections in Brunei are those in which people vote for the council representatives of their villages and mukim (sub-districts); eligible voters are locals aged over 18. The representatives will be placed under the Ministry of Home Affairs. The locals may have consultations with their representatives, and they may channel the feedback or queries to the relevant government ministers and officials. In addition, each district has one or more representatives in the State Legislative Council (Jabatan Majlis-Majlis Mesyuarat, 2011; Oxford Business Group, 2008).The 'Melayu Islam Beraja' or the Malay Muslim Monarchy is the nation's ideology, which guides its life and government administration. This ideology integrates the elements of Malay culture, Islamic principles and the Monarchy system into the daily lives of Bruneians. It means that Brunei is a Malay nation in which Islam shapes the daily lives of its people, and the Monarchy informs the country's administration (Oxford

Business Group, 2008). Thus, in Brunei, any development and progress should be in line with the Bruneian philosophy and it must not depart from the Islamic teaching, the Malay culture and the Monarchy system.

1.5 Research significance

The researcher's interest in this topic grew from his experience of using public transport in the countries he has visited. As a student studying in Brisbane (Australia) and Kuala Lumpur (Malaysia), the researcher used public transport for the majority of his activities: education, leisure and shopping. From this developed a habit of using buses and trains, although the researcher has a driver's licence and had the opportunity to buy a car while studying in Malaysia. Upon arriving back in Brunei, the researcher quickly discovered that his public transport habit could not be continued due to limited services (the bus system does not enter his housing area and there are no trains in Brunei). Due to this limitation, the researcher was motivated to understand the reasons for these problems and to explore ways in which Bruneians might optimise the use of bus services in Brunei, as practised in other countries. The researcher also wishes to explore the government's initiative to attract more Bruneians to use the bus services. However, it was found that there have been very few studies and only limited research in the area of transportation.

Thus, this research study is significant in various ways. Previous studies have investigated human behaviour and perceptions regarding the choice of mode of transportation and other transportation options, with a view to achieving sustainable transportation (Dobbie et al., 2010; Farber and Paez, 2009; Gardner and Abraham, 2007; Guiver, 2007; Headicar, 2009; Heiskanen et al., 2009; Hine, 1999; Hiscock et al., 2002; Kopnina, 2011; Nolan, 2010; Polk, 2004; Root et al., 2002; Solomon, 1999; Steg et al., 2001). However, the majority of studies have focused on people's behaviour and the conditions of transportation in the West, for example in Canada (Abrahamse et al., 2009), Great Britain (Headicar, 2009), Portugal (Beirão and Cabral, 2007), the Republic of Ireland (Nolan, 2010) and Scotland (Hiscock et al., 2002). These countries have quite different socio-cultural parameters from those of Brunei.

This research study aims to extend the understanding of the relationship between people and modes of transportation, especially in places with similar socio-cultural and economic conditions to those of Brunei. This research study will provide a good example to other countries that have the same transport conditions and environment as Brunei in the Eastern context. This study will hopefully add to the cross-cultural literature on transportation issues. Brunei offers a new challenge to academics, especially in the area of transport sustainability.

The development of Brunei is different from that of Western cities as the development is mostly concentrated in the Brunei Muara district, and the country's economic growth is largely dependent on the exporting of petroleum products (oil and gas). Brunei offers an appropriate case for the study of environmental policy as the nation (mostly in the Brunei Muara district) shows the characteristics of an unsustainable transportation system, such as diminishing petroleum reserves, negative local air quality impacts and the level of mobility (Aftabuzzaman and Mazloumi, 2011; Black, 2010; Black and Nijkamp, 2002).

Country	Car ownership per 1000 people
Monaco	863
USA	809
Iceland	767
Luxembourg	747
New Zealand	733
Qatar	724
Brunei	696

Table 1.5 (a) Top seven nations for car ownership per 1000 people. Source: The World Bank (2011).

In particular, the rate of car ownership in Brunei is among the highest in the world (Bandial, 2012; The World Bank, 2011) (Table 1.5 (a)) and the cost of petrol per litre (Table 1.5 (b)) is among the cheapest in the region (Bandial, 2010; Masli, 2010a; 2010b; 2010c; Oxford Business Group, 2008). Thus, the study will extend an understanding of the relationship between humans (in this case, Bruneians) and transportation. The study will further address previous research on human perceptions and transportation and the relevant issues (related to

human-transportation relationship) in a continuously changing environment, especially in oil-dependent nations. Additionally, Brunei has an imbalance in its development progress. It is still not known whether Brunei should be categorised as a developed or developing country. Thus, comparing Brunei with other countries may be difficult. This study will challenge the academic community on the validity of research based on the study of the fixed economic development category.

Petrol	Cost without subsidy (Brunei)	Cost with subsidy (Brunei)	Cost with subsidy (Malaysia[2])
Ron 97	£ 0.513	£ 0.259	£ 0.429
Ron 92	£ 0.482	£ 0.264	£ 0.398
Diesel	£ 0.476	£ 0.157	£ 0.455

Table 1.5 (b) Cost of petrol[3] per litre in Brunei and Malaysia. Source: Masli (2010a) and Othman (2010).

Country	Petrol Price	Diesel Price
Australia	1.39	1.59
Bahrain	0.27	0.17
Egypt	0.45	0.18
Qatar	0.27	0.27
Singapore	1.68	1.26
Thailand	1.56	0.97
UAE	0.47	0.64
UK	2.17	2.27

Table 1.5 (c) Cost of petrol and diesel per litre in USD[4] Source: The World Bank (2015).

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[2] Malaysia is Brunei's neighbouring country. One of Malaysia's industries is oil and gas, and Malaysia provides subsidies for petroleum (IISD, 2014) (http://www.iisd.org/gsi/sites/default/files/ffs_malaysia_czguide.pdf). However, starting 1st December 2014, the Government of Malaysia will abolish the subsidies of petrol and diesel. *Reuters* reported that the move would save USD $5.97 billion annually (Ngui and Raghu, 2014).

[3] £ 1 = BND $2.07 (3rd September 2014: Source: XE (2001) (http://www.xe.com/)).

[4] Based on 2012 price. Data available at http:// http://data.worldbank.org/indicator.

The findings of the study will be of interest to policy-makers, institutions, the government and the members of the public themselves. It will also be interesting to compare the results of this study with the findings of previous studies conducted in Western countries. This research will seek to address the gap between the government's assumptions and the perceptions of the locals regarding transportation. Therefore, the major impact of this research will be to generate more interest in studies on the attitudes, behaviour and perceptions of the Bruneians concerning sustainable transportation. Such a focus will also impact on research and development, especially of low-carbon transportation in Brunei, in terms of its technology and regulatory aspects, as well as its management and policy.

In addition, this research seeks to further strengthen the concepts of STT and MLP. One of the key areas to have been criticised is the role of the public, especially in terms of their influence in the regime level Geels (2010a) indicated that pressure from the public on policy-makers is necessary to bring about changes in regulation. However, this may not be applicable to all nations as some are not familiar with the role of public participation, such as in Kenya (Okello et al., 2009), or governments may supply limited and insufficient information on specific issues (Yung and Chan, 2011). Furthermore, there may be some mismatches in terms of the public interest, leading to conflict (Gauthier et al., 2011; Jingling; 2010; Yung and Chan 2011). This study examines the role of the public in STT. By focusing on the attitudes and behaviour of the public, especially in choosing modes of transportation, insights will be provided into ways of achieving sustainable transportation that favours the public. Such an approach may initiate policy recommendations that might be used for educational campaigns and changes in culture towards green ideologies. Thus, fostering cooperation with all stakeholders in the regime, and identifying the role of these stakeholders, will reduce the barriers to sustainable transportation.

Various qualitative methods have been used to study perceptions of transportation and transport systems. Furthermore, researchers have demonstrated the use of science and technologies (such as electric vehicles and cleaner fuels for low carbon transportation) and have forecast methods of convincing actors in the regime of the importance of STT. This research study will employ both qualitative and quantitative methods in order to shift the focus of attention away from technological development to include the aspects of social

perceptions, networks, awareness and the learning process. Thus, it will indicate improvements in future methods that will allow all actors to be involved in the learning process, to participate and to be part of the policy-making process.

1.6 Thesis outline

The thesis has ten chapters. The first chapter has provided an introduction to the thesis, highlighting the research questions, aims and significance of the study. Chapters two and three review the literature on sustainability and STT. The literature review provides overviews of transportation sectors: behaviour, perceptions and the pros and cons of transition to sustainable transportation. Chapter four reviews the methods and approaches adopted by this study. In chapters five, six, seven and eight, the findings are presented. Chapter nine provides a discussion of the findings. Finally, the conclusion and recommendations resulting from this study are presented in chapter ten.

1.7 Conclusion

The transportation sector serves society and provides various benefits. Transportation sectors are not only of specific importance to the public (offering the ability to move from one place to another) but are also important for the economic development of a nation. However, despite the benefits, there are also some negative impacts emerging from transport systems, especially concerning the environment. This study focuses on the development of low-carbon transportation in Brunei in order to move towards a more sustainable environment-friendly transportation system. Brunei is considered a good place to conduct the research. For example, it offers a unique research environment due to its particular government structures, landscape of transportation and socio-economic background. This will enable a different approach from that which is normally reported in the literature, since most research has focused on the West or developed countries. Therefore, this study will fill in the gaps on the issues of attitude to, and perceptions of, the transportation sector, especially in a developing country whose economic activities are dominated by petroleum industries.

Chapter 2: Sustainability in transportation sector

2.0 Background

This literature review focuses on the transportation sector, including people's perceptions and sustainability relating to transportation. It starts by reviewing the term sustainability, especially towards mobility. Most of the discussions come from the perceptions of motorised transports (car and public transport) and its role towards achieving equity and environmentally sustainable transportation. The aim of this orientation is to understand the current conditions of transportation-related sustainability in other countries, which could be used to provide a potential means to improve the transportation sectors in Brunei.

This chapter also discusses the role of stakeholders, government, public transport operators and non-governmental organisation (NGOs) toward achieving sustainability. This chapter then shifts to an overview of public participation, based on respective projects that could be utilised as instruments for establishing a sustainable transportation vision in Brunei.

2.1 Sustainability and transportation

The concept of sustainable development has achieved worldwide attention since the publishing of the Brudtland Commission's report in 1987. The report challenged scholars, professionals, governments and institutions to re-examine effectively the issues of development and environment in terms of seeking a balance between economic, societal and ecological factors (United Nations, 1987). The concept has brought together stakeholders in terms of policy, decision making and international cooperation to sustain the needs of the current generation without jeopardising the ability of the future generations to meet their own needs.

The World Commission on Environment and Development (United Nations, 1987, p. 41) defined sustainable development as *"...development that meets the needs of the present without compromising the ability of future generations to meet their own needs"*. The definition acknowledges the importance of economic development to society; thus the definition is set to balance the economic development, social demands and lifestyle and the environment.

In assessing sustainable development, there are three aspects that are utilized as indicators, namely economic, environment and social (Boer and Hueting, 2004; Dunlop, 2004; Giovannini, 2004). In that respect three conditions have been proposed as necessary to satisfy the necessity of sustainable development ((Dally, 1991) in Wegener and Greene (2002)). The first condition is that the rate of renewable resource usage does not exceed their rate of regeneration. Secondly, the utilization of non-renewables should not exceed the rate of the growth of a sustainable renewable substitute. Finally, the rate of pollution emission does not exceed the assimilative capacity of the environment. Sustainable development should include the aspects of growth, intergenerational equity, as well as intra-generational equity, and should not just be confined to the interrelationship of growth and environment.

Transportation can be defined as the movement of people and/or goods from one place to another for a variety of reasons, such as personal, family, work related reasons or business purposes (Black, 2002). Aside from facilitating the movement of people and goods, transportation also serves to create or develop economic growth by exploring geographical areas which were previously inaccessible. Thus, the transportation sector offers services that provide for the movement of people and goods which were once very limited or restricted. In addition the provision of transport services and manufacturing of equipment itself is an economic development opportunity. Transportation has a significant role in the economic development of a country, generating potential wealth accumulation and employment. It plays a role in the advancement of social stability through the increase in standards of livelihood. The development of transport might speed up a nation's economic growth through improved access (especially to those who do not have cars, to participate in the development activities such as employment).

Transportation sectors have influenced the economic activities of nations, both in the European Union (Köhler et al., 2009) and in Asia (such as Japan, South Korea, Malaysia and Thailand) (Economist Intelligence Unit, 2010; Han, 2010). The sector contributes to employment in manufacturing and services (Geenhuizen et al., 2002; Han, 2010) and transportation such as cars, trucks, high-speed trains and planes ensures modern economies function smoothly (Wegener and Greene, 2002).

In addition, with the pressure for environmentally sustainable or green technology, car manufacturers are pushing towards producing greener vehicles. With the aim of reducing vehicles' carbon dioxide emissions, research and development, for example by Toyota, is focused on producing technologies to promote fuel efficiency (Yamamoto, 2000). This creates more job opportunities to improve the vehicles, especially in the fields of engine research and development and fuel efficiency.

Transportation has benefitted humans in terms of social interaction. Current transportation services offer more access (such as better connectivity to job opportunities or workplace) and freedom of movement, compared to transportation in the past (Chee and Fernandez, 2013; Grdzelishvili and Sathre, 2011). This facilitates social interactions such as shopping, social outings and family gatherings (Anable and Gatersleben, 2005; Buys and Miller, 2011; Hine and Scott, 2000). Furthermore, the opening up of land for development (through land planning) and residential housing offers people opportunities to live and work away from family and friends, thus increasing the dependency on transport in order to maintain interactions that would have been more local and concentrated in the past. The current transportation situation offers immediate and good efficiency in terms of travelling timing, access and flexibility of travel, which were not offered or available in the past (Beirão and Cabral, 2007; Chee and Fernandez, 2013; Gardner and Abraham, 2007; Hiscock et al., 2002).

2.2 Perception of motorised transport: cars vs. public transport

It is important to understand human travel behaviour, as it influences the choice of mode of transportation. Changes to greener, more sustainable travel behaviour and modes of transport, would reduce the negative impact of transport on the environment. Travel behaviour can be influenced by the perception that a car is a necessary item to own. The perception of cars may be influenced by the benefits the car has to offer, such as mobility, convenience, participation in physical, recreational and job-related activities (Huijts et al., 2012; Gatersleben and Uzzell, 2002). It would allow the development of more options to improve present transport systems (such as services, infrastructure and coverage), and identify the best available technology; options that would benefit the community and the appropriate management and policies regarding sustainable transportation.

Individuals' selection of their mode of transportation comes from different characteristics, such as the services offered by public and private transport, their cost and their culture. In order to move towards sustainable transportation, the selection of a preferred mode of transportation should not be limited to the use of public transport alone, but also the options of green transportation and green travel behaviour. A number of studies of perceptions towards public transport and private cars indicate that car users have lower perceptions of public transport, compared to public transport users. Such studies have been conducted in a range of locations: West of Scotland (Hiscock et al., 2002), Edinburgh, Scotland (Stradling et al., 2007), Brisbane, Australia (Buys and Miller, 2011), Porto in Portugal (Beirão and Cabral, 2007), Brighton and Hove in England (Gardner and Abraham, 2007), Oman (Belwal and Belwal, 2010) and Malaysia (Chee and Fernandez, 2006; Mohammed and Shakir, 2014). From this research, it was seen that the car is the preferred mode of transportation when compared to public transport.

Cars are seen as ensuring the users' flexibility in deciding the time and route of the journey, convenience, comfort and ownership of their own private space (Beirão and Cabral, 2007; Belwal and Belwal, 2010; Buys and Miller, 2011; Gardner and Abraham, 2007; Hiscock et al., 2002), and safety and protection (Buys and Miller, 2011; Ellaway et al., 2003; Gardner and Abraham, 2007; Hiscock et al., 2002).

Conversely, some of the positive perceptions towards public transport are that it provides enjoyment and pleasure (Buys and Miller, 2011), it is relaxing (Beirão and Cabral, 2007; Hiscock et al., 2002), it provides environmental benefits (Beirão and Cabral, 2007; Buys and Miller, 2011), it is convenient (Beirão and Cabral, 2007; Belwal and Belwal, 2010; Gardner and Abraham, 2007) and, in most cases, it can be secure (Hiscock et al., 2002). Public transportation offers fast journeys, especially within the city (Beirão and Cabral, 2007; Buys and Miller, 2011). In addition, if a traffic jam occurs, it would decrease the stress a car driver might experience (Beirão and Cabral, 2007; Hiscock et al., 2002), whereas passengers in the public transport have the opportunity to rest (Beirão and Cabral, 2007; Buys and Miller, 2011; Gardner and Abraham, 2007; Hiscock et al., 2002) and to do other activities such as reading (Gardner and Abraham, 2007), and interacting with other passengers (Beirão and Cabral, 2007; Hiscock et al., 2002).

Most of the negative perceptions (from both car and public transport users) of cars are based on traffic and its related problems (Beirão and Cabral, 2007; Buys and Miller, 2011; Gardner and Abraham, 2007; Hiscock et al., 2002), and impact on the environment (Beirão and Cabral, 2007; Buys and Miller, 2011). The experiences and perceptions of these problems could reduce the use of private transport if public transport offers, and is perceived to offer, some solutions to these problems.

On that point, there are some mixed perceptions of public transport services, especially in terms of its regularity, frequency and safety. The majority of the literature indicated that public transport is not regular, it is infrequent and can be unsafe (Beirão and Cabral, 2007; Belwal and Belwal, 2011; Buys and Miller, 2011; Gardner and Abraham, 2007; Hiscock et al., 2002; Stradling et al., 2007; Wall and McDonalds, 2007). However, the perceptions tend to vary depending on their source location; for example, there could be very frequent and reliable services in some areas, especially in the urban and city centres. In the case of Brisbane, public transport is an alternative for inner-city travel during the day (quicker than cars) but is infrequent for night services (Buys and Miller, 2011).

People too have negative perceptions about public transport, especially in terms of social status (Ellaway et al., 2003; Hiscock et al., 2002; Steg 2005) and socio-cultural perceptions (Beirão and Cabral, 2007; Belwal and Belwal, 2010; Hiscock et al., 2002). Such perceptions help to explain preferences for the use of cars (Stradling et al., 2007).

The cost, especially of public transport, affects the attitude towards the choices of modes of transportation (Beirão and Cabral, 2007; Gardner and Abraham, 2007; Guiver, 2007; Hiscock et al., 2002). The low cost of public transport is important to low and middle class groups (Beirão and Cabral, 2007; Gardner and Abraham, 2007). The cost of using public transport is lower than the cost of travelling using a private car. This is because public transport users do not have to (directly) pay the cost of fuel, parking fees, maintenance, insurance, tax and vehicle-related expenses (Gardner and Abraham, 2007).

Furthermore, research in Germany and USA has provided mixed results regarding public transport usage (Buehler and Pucher, 2011; 2012). Although the numbers of users are increasing, the services in the USA have higher operating costs, compared to those in Germany, and require a large government subsidy to enable the public transport companies to continue operating. In Germany, the services offered to public transport users are improving. The infrastructure is not entirely dependent on government subsidies, and the cost of providing the services (including infrastructure and maintenance) is also being reduced. The government of Germany has helped the public transport operators to attract more public transport ridership compared to cars. This increase is served by implementing several policies such as increasing fees for automobile parking, 'traffic calming' (such as speed limits of 30 km/h or less at most residential areas) and reducing parking space. (Buehler and Pucher, 2012). Furthermore, the cost of petrol and sales tax has been increased. These actions have caused car usage to begin to be perceived as inconvenient, costly and not attractive (Buehler and Pucher 2011; 2012). Hence more people are turning to public transport for better choices and cheaper prices.

Nevertheless, some users think using and owning a car is worthwhile, notwithstanding the costs (Guiver, 2007). People tend to realise the high cost of automobile usage compared to low public transport cost (Beirão and Cabral, 2007; Gardner and Abraham, 2007; Guiver, 2007; Hiscock et al., 2002). Yet, people perceive that having a car is worth it (Guiver, 2007)

even if it is not cost-effective (Hiscock et al., 2002). Therefore, the material cited in this subsection indicated that the perceptions of public transport are not only influenced by the quality of the public services provided, but are also based on the real or imagined advantages of cars over public transport and the pressures, especially from the culture and society, that cause public transport to be on the receiving end of rather negative views.

2.3 Transportation equity

The primary factor in equity is justice or fairness distribution (Pacione, 2005; Welch, 2013) especially in income (Pacione, 2005), benefits and services (Litman, 2012; Welch, 2013; Welch and Mishra, 2012), disadvantages and cost (Litman, 2012). Inequity in transportation occurs for various reasons. One factor is the distribution of investment in transformational infrastructure (Ahmed et al., 2008). Transportation investment often disproportionately affects different classes and races. For example, fast growing, developing countries focus on the growth of highways to support private transportation (Pongthanaisawan and Sorapipatana, 2010) rather than centring on public transport and non-motorised transit. This creates unfair disparities in available modes of travelling, especially to those persons in the lower income group, as the development of public transport may reduce the incidence of social exclusion (Welch and Mishra, 2013). This was happening in the large cities of Beijing and Karachi (Ahmed et al., 2008) where the majority of the population relies on walking, biking and the bus system, in environments where public policies are focused on planning for automobiles.

The disproportionately small investment in public transport may affect the low-income populations, as well as the elderly or disabled, who are unable to drive. High-income earners with access to mobility (cars) tend to live in better quality housing areas, whereas lower income earners tend to live in noisy, compacted and polluted areas (Wegener and Greene, 2002). This is because low-income earners have to live and travel to work and school in a timely and cost-effective manner (Beirão and Cabral, 2007; Bose, 2013; Chee and Fernandez, 2013). Also low-income earners tend to use non-motorised transport, such as walking and cycling (Ahmed et al., 2008; Wegener and Greene, 2002). Low-income earners have more travel difficulties because they often need to travel for a longer time, due to their

reliance on non-motorised transport, and they travel less for leisure and business activities. Still, with limited investment in infrastructure for cycling and walking, road accidents between automobiles and non-car users, such as pedestrians and cyclists, including children, tend to occur. So the safety of pedestrians and cyclists tend to be overlooked (Ahmed et al., 2008).

A poor public participation process can contribute to injustice in transportation planning (Ahmed et al., 2008), which can impact on a range of groups in different ways, depending on their circumstances. Litman (2014) indicated that transport concerns different groups and disadvantaged people seldom leave their neighbourhood. Furthermore, women too have different transportation experiences than men. Root et al., (2002) indicated that women tend to make complicated trips such as those involving multiple destinations, travel with children and have longer trips compared to men. Root et al., (2002) also added that women faced dilemmas in travelling; for example, a lack of security if they travel by public transport, especially at night. Hence, people should be involved in public participation, especially in transport planning (Shi and Zhou, 2012). Karner and Niemeler (2013) indicated that public input on alternative plans is important, especially based on experience and social-background informed by individuals' daily activities. Based on several literature sources (Laurian and Shaw, 2005; Okello et al., 2009; Portman, 2009; Saarikoski, 2000; Yung and Chan, 2011), it is arguable that relevant agencies should provide more information about the process of public participation: education, awareness and adequate information in order to ensure the public express their views in confidence. The aspects of time and location for the public transportation should be considered before any public debate or hearings occur.

2.4 Sustainable transportation

Current transportation is not considered sustainable in either developed or developing nations (Aftabuzzaman and Mazloumi, 2011). This is because the current transport arrangements are diminishing the non-renewable petroleum reserves, are having a global atmospheric impact, and a local air quality impact (Black and Nijkamp, 2002; Black, 2010; Wegener and Green, 2002).

Increasing motorised transportation increases the demand for petroleum products. Transportation is the world's leading consumer of oil and petroleum (Aftabuzzaman and Mazloumi, 2011). Incomplete combustion of petroleum fossil fuels in internal combustion engines produces a variety of pollutants such as carbon dioxide, carbon monoxide, oxides of nitrogen, volatile organic compounds and particulate matter (Al-Mofleh et al., 2010; Orubu, 2004; Wegener and Green, 2002). These pollutants not only negatively affect the health of humans but also the wider environment, as in the example of global warming. Motorised transport is a contributory factor to climate change and loss of biodiversity. The latter would be due to the effect of land clearing for transportation, accessing raw materials and the effect of pollutants, such as acid rains that are slowly diminishing the forests (Aftabuzzaman and Mazloumi, 2011; Al-Mofleh et al., 2010; Black, 2010; Fenger, 1999).

In Thailand, the increase in economic activities caused a significant increase in motorised transport, especially motorcycles ridden by those unwilling or unable to purchase car (Pongthanaisawan and Sorapipatana, 2010). However, as the average incomes increase, the number of cars also increases. The trend in private transportation ownership, for both motorcycles and cars, increases as the level of GDP increases, driven by increases in economic development. Similarly, the increase in GDP also triggered increases in the number of vehicles and automobiles in China and Pakistan (Ahmed et al., 2008). Increases in income not only stimulate the increase in private transport ownership but inspire the wish for more comfortable, convenient and flexible private transport, rather than being obliged to use over-crowded buses.

Therefore, sustainable transportation is very important, not only to achieve cleaner growth of development, but also directly and indirectly to maintain human health. Sustainable transport systems would reduce dependence on the finite supply of non-renewable materials, which would eventually reduce the combustion engine's negative impact as well as enhance the positive impact of development and economic activities. By enhancing the positive impact of a sustainable transport model, society would have a cleaner environment due to lower emission rates and a healthier lifestyle potentially involving more physical activities such as walking and cycling to the workplace.

Despite the fact that motor industries are pushing towards the development and production of greener vehicles (e.g. better fuel efficiency; hybrids, electric), this may not be sufficient to reduce the unsustainable effects of transport. The number of cars, trip frequency, journey distance, and time of journeys are increasing, both in the developed and developing nations (Köhler et al., 2009; Nykvist and Whitmarsh, 2008). Therefore there is also a need to develop mass transit systems, i.e. public transportation, as options to reduce the total number of vehicles on the road and to improve the mobility of low income populations.

2.4.1 Definition

There is no single commonly accepted definition of sustainable transport. Black (2010, pg. 3) quotes Black (1999): sustainable transport is *"...transport that satisfies the current transport and the mobility needs without compromising the ability of the future generations to meet these needs".* Bearing such a definition in mind it is fair to suggest that sustainable transportation should aim not only to create transportation systems that are clean and efficient, but should only try to support development that is beneficial to society. It is generally accepted that sustainable transportation is similar to sustainable development, where these two concepts focus to find the balance between economic, environment and social variables for the good of present and future generations.

Sustainable transportation should aim at promoting better transportation systems and options, and should enhance the positive impact, direct or indirectly, of transportation while reducing the negative impact while, at the same time, not limiting the growth of economic development. Sustainable transportation will not only investigate the technology and techniques that are compatible to current mobility conditions, but will also examine ways to provide management and policies in order to achieve sustainable transportation.

Therefore, there is a need make transport systems that are in accord with the needs and demands of the society towards sustainability. This not only includes the use of technological innovation and change, but also involves novel management approaches (Köhler et al., 2009; Nykvist and Whitmarsh, 2008). Management approaches include policies, as well as the

involvement of different key players (stakeholders such as the community and academics), and especially the participation of the public in issues relating to sustainability.

Sustainable transportation is not only beneficial towards the preservation and protection of the environment. The concept could boost economic activities, as well as social well-being. Shiftan et al., (2003) defined nine sustainable transportation development goals in their research. By these goals alone, several benefits of sustainable transportation could be identified. However, Shiftan et al., (2003) indicated that coordination, or a lack thereof, is the main barrier to the implementation of sustainable transportation development.
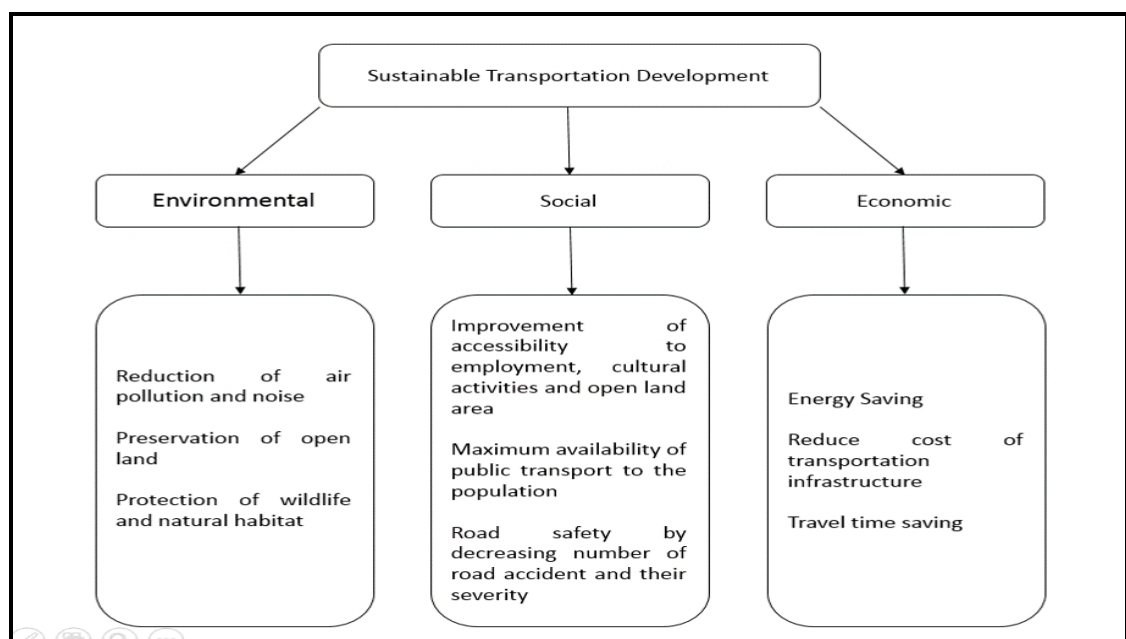
Figure 2.4.1 Sustainable Transportation Development Goal, as mentioned by Shiftan et al., (2003).

2.4.2 Challenges and barriers to sustainable transportation

There are some challenges towards sustainable transportation. Despite the reduction in the environmental consequences, sustainable transportation can be viewed as a potential barrier to economic growth. Employment in transportation industries is vital to the economies of some developed and developing nations (Economist Intelligence Unit, 2010; Geenhuizen et al., 2002; Han, 2010; Köhler et al., 2009; Wegener and Green, 2002). Litman and Burwell (2006) mentioned that some countries minimise energy prices, encourage manufacturing and

use less resource consumption in order for transportation to be sustainable. However, not all nations, especially the developing ones, are able to meet these criteria.

One of the challenges towards sustainability is the control of pollution emissions into the environment. As mentioned earlier, transportation emits greenhouse gases such as carbon dioxide. The increase in transport demand, increase in public and private transportation due to increasing demand and population, tend to slow the movement of traffic (Pacione, 2005). Researchers have shown that transportation contributes to air pollution, and the slow movement of traffic could trigger more polluting emissions into the environment (Al-Mofleh et al., 2010; Gorham, 2002; Orubu, 2004; Wegener and Green, 2002). Thus, the longer the period of congestions and jams, the more pollutants would be emitted into the environment. Reducing the pollution requires a comprehensive strategy, involving multiple stakeholders such as policy makers, technological experts, and the public (Zusman et al., 2012). An example of ways to control pollution emission (by transportation sector) is the use of cleaner fuels and vehicles (Bree et al., 2010; Nykvist and Whitmarsh, 2008; Köhler et al., 2009; Herran and Matsumoto, 2012). Competition with new and cleaner technologies might affect the economies of the developing nations, particularly if they are unable to compete with the advanced technologies from other richer nations. Furthermore, implementation barriers such as financial resources and coordination of the relevant institutions (Herran and Matsumoto, 2012) might slow the up-scaling of technologies.

Another barrier towards sustainable transportation is the general attitude towards public transport, which tends to be negative when compared with attitudes about cars. Banister (1996) indicated that people are reluctant to use non-motorised transport and later added (Banister, 2008) that even when public transport is good, people tend to find reasons for using cars. This preference may in part be due the fact most current public transport systems are outperformed by cars (Kennedy, 2002).

Beirão and Cabral (2007) indicated that public transport should be designed to offer the services required by customers. In addition, Beirão and Cabral (2007) indicated that improvements in public transport's image and level of services may attract potential users to their public transport system. Hiscock et al., (2002) also identified that sustainable transportation may be achieved if public transport offers benefits that are similar to the

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service offered by cars. However, the majority of public transport does not, and perhaps cannot, satisfy the needs towards sustainability, as mentioned by Beirão and Cabral (2007) and Hiscock et al., (2002). The majority of the complaints from multiple study sources indicated that public transport systems and services are mostly unreliable, are irregular, infrequent and time consuming; the latter referring both to waiting periods and the time taken to reach the destinations (Bahrum, 2008; Bandial, 2010; Jong, 2009; Oxford Business Group, 2008; Sadikin, 2009; Shahminan and Noor, 2010; Shen, 2011; Shim, 2010). There is still a lack of awareness concerning transportation (GEF-STAP, 2010) as public transport is viewed as a service for the lower classes (Bahrum, 2008; GEF-STAP, 2010) or second class citizens (Hine and Scott, 2000). These authors also indicated that there is a perception that businessmen take trains in their suits and cleaning ladies take the bus.

One of the most important barriers to sustainable transportation is the cost. The first issue is funding. Scaling up funds designated for low-carbon investment requires financial help (such as from private sector investment) and/or a commercially attractive project (UNEP and Partners, 2009). The funding also includes large and long-term intensive investment in infrastructure (Herran and Matsumoto, 2012; GEF-STAP, 2010). Furthermore, not all countries could afford the funding and thus may need help from international institutions. Funding may be needed not only for building and constructing the project, but also for the human resources with appropriate skills to develop and implement the technology associated with, and needed for, sustainable transportation (GEF-STAP, 2010; Herran and Matsumoto, 2012).

Second is the barrier caused by the unintegrated long term transport policy planning resulting from the involvement of numbers of transportation actors who which have different interests and visions. In the city of Tbilisi (Grdzelishvili and Satre (2011)), the government has removed other public transport options, such as electric trolley buses, and people are left with conventional and mini buses. The bus services did not match the travel needs of the people in Tbilisi, thus promoting the use of cars. However, the increase in car use and car ownership has created the inevitable problem of traffic congestion, particularly as the road infrastructure cannot accommodate the increasing number of vehicles using it. The collective impact of the transport policy in Tbilisi has caused increases in both fuel consumption and pollution.

Despite several measures to improve public transport, one of the challenges is that people in Tbilisi have developed car-oriented behaviour (thus breaking the car-oriented behaviour is considered challenging and especially when the transport options are not as attractive as the use of personal cars).

One of the less researched barriers to a sustainable transport system is the physical aspect of a country's geography. Such physical barriers, according to Banister (2005), include the limited land for the introduction of 'park and ride' due to the large land area required, and hilly terrain, as also mentioned by Buys and Miller (2011) that causes cycling to be considered as impractical to be promoted as a practical mode of non-motorised transport. Therefore, only options for sustainable transportation should be reviewed that are practical in those areas (such as the use of an overhead monorail in Kuala Lumpur).

One of the challenges to sustainability, which tends to be ignored, is the need to reduce traffic accidents and fatalities. Traffic accidents are often the by-product of poor road design, limited investment in infrastructure and the conflict between road users, especially when there is an increase in vehicles on the road. In such conditions, pedestrians and cyclists lacking cycling and walking paths, are exposed to the danger of oncoming cars.

With the growing demand for vehicle-based mobility, the number of road accidents has become an increasingly important issue. The World Health Organisation (2013) has estimated that annually, about 1.3 million are killed in traffic and over 50 million are injured. The organization also warned that with the increase in the number of emerging economies, traffic accidents would be in the top 5 leading causes of mortality worldwide by 2030 For example, Malaysia has the highest road fatality risk in the ASEAN countries (Abdul Manan and Várhelyi, 2012). Although the scope of this thesis does not cover the issue of traffic accidents, it is noted that with the over-emphasis on road construction and road widening, especially in developing countries such as Malaysia (Abdul Manan and Várhelyi, 2012), Thailand (Pongthanaisawan and Sorapipatana, 2010) and Pakistan (Ahmed et al., 2008), the

investment for non-motorised transport tends to be neglected. As a result this has caused both cyclists and pedestrians to be exposed to a higher risk of traffic fatalities[5].

The case of richer nations is applicable in Brunei, in order to promote sustainable transportation and reduce traffic fatalities. Accident fatalities in richer countries are decreasing but they are increasing in the lower income countries (Gilbert and Perl, 2010). This is due to the fact that the investment in transport-related infrastructure also includes infrastructures that support non-motorised transport activities. Gilbert and Perl (2010) indicated that in the USA the road use account for 80 percent fatalities (with only 15 percent involving pedestrians or cyclists), while about 50 percent of road use fatalities in Delhi, India involved both pedestrians and cyclists.

Along with the higher rate of safe non-motorised transport activities, better public transport services tend to reduce individuals' dependence on cars, thus reducing the number of cars on the roads. Furthermore, the use of public transport, a behaviour not widely adopted by Bruneians, could reduce both traffic accidents and the resulting fatalities. The introduction of the Bus Rapid Transit system in Bogota, Columbia, saw 88 percent reduction in the traffic fatalities (Santos-Reyes et al., 2014). In Mexico, the Bus Rapid Transit system, launched in 2005, has not only improved mobility by up to 50 percent but has also reduced traffic accidents by 30 percent (Santos-Reyes et al., 2014). People tend to believe that the drivers of public transport vehicles are highly skilled and the physical appearance of public transport would reduce traffic-related fatalities (Hiscock et al., 2002). Thus, the rate of traffic fatalities is lowered (especially in countries where public transport is considered more advanced and developed) compared to the poorer countries (Gilbert and Perl, 2010; Lu et al., 2011; UN Human Settlement Program, 2007). (Please refer to figures 2.4.2 (a), (b) and (c) on how developed and fast developing nations with good public transport services has lower traffic mortality).

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[5] In Brunei, the previous Minister of Energy indicated that cycling and walking activities could not be done on Brunei roads and that the bus infrastructure is considered poor (Oxford Business Group, 2008). Brunei is actively developing (and widening) its road network to ensure the smooth flow of traffic. Thus, non-vehicular activities (cyclists and pedestrians) are exposed to dangers especially from high speed oncoming cars.

However, in some developing nations, such as Thailand (Pongthanaisawan and Sorapipatana, 2010), as well as in Beijing and Karachi (Ahmed et al., 2008), the disproportionate investment (investing more on road infrastructure favouring the cars) causes an increase in car use (in support of traffic flow) and the development of infrastructure for non- motorised transportation is overlooked; an omission which is to be regretted where the majority of the population relies on walking, biking and the bus system. Gilbert and Perl (2010) indicated that over 50 percent of the road fatalities occurring in India involve pedestrians and cyclists. Furthermore, non-motorised transport activities are usually performed by low-income group members (Ahmed et al., 2008; Wegener and Greene, 2002)[6].

In China, traffic-related accidents not only involve pedestrians and motor vehicles, but also involve other users such as accidents between pedestrians and cyclists (Lu et al., 2011). These accidents are not only caused by exposure to vehicles but are also due to poor infrastructure design and insufficient implementation measures to improve pedestrians' safety. The widening of roads also causes safety concerns to other motorists, such as motorcyclists. The case of Malaysia is considered applicable: in 2009 the most frequent traffic collisions were between motorcycles and passenger cars (28 percent), motorcycle with motorcycle (25%) and single accidents (25 percent) (Abdul Manan and Várhelyi, 2012).

Therefore, car users appear to have inadequate knowledge about the rights of motorcyclists, as well as pedestrians and cyclists. This lack suggests that the roads, particularly in developing countries, are designed to favour the car and are therefore unfriendly to motorcyclists, cyclists and pedestrians. Educating the motorcyclists, cyclists and pedestrians about their safety, such as helmets for motorcyclists and cyclists and crossing the road safely for pedestrians, is considered inadequate to reduce the traffic fatalities. Therefore car users (particularly drivers) should be given adequate education on accident prevention and smart driving behaviour to reduce accidents.

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[6] UN Human Settlement Program (2007) indicated that despite the use of public transport in developing nations, the poorly constructed road design also contributed to the rise of traffic accidents. Therefore, investment in road infrastructure focusing on the needs of all users is essential not only to increase the number of public transport users (and reduce car use), but also to enhance the safety of non-motorised transportation activities. The UN Human Settlement Program also praised Singapore for its effective land use design and transport policy that reduced the number of car journeys and the quantity of traffic congestions.

Figure 2.4.2 (a), shows a decreasing trend in road traffic death in Australia and the United Kingdom (six deaths per 100, 000 in Australia and three deaths per 100, 000 in United Kingdom). Figure 2.4.2 (b) indicates a decreasing trends in road traffic deaths in Singapore, while Malaysia shows stable yet high fatalities trends. Figure 2.4.2 (c) also indicates that there was a decreasing trend (but high) in traffic road deaths in Qatar and UAE, despite a slight increase shown by Egypt. This indicates that the developed nations and fast developing nations have fewer deaths per 100,000 people, as compared to the other developed countries. Thus, this indicates that developed countries and fast developing nations with good public transport services, as well as non-motorised transport, tend to have lower trends in road traffic deaths compared to less developed nations; especially those where travel behaviour is supported by cars and the public transport systems are not fully utilised, as in Egypt, Qatar and the UAE.

Figure 2.4.2 (a) Trends in road traffic deaths in Australia and United Kingdom Source: WHO[7] (2013).

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[7] Further report on 'Global status report on road safety 2013: Supporting a decade of action' is available at WHO website at http://www.who.int/violence_injury_prevention/road_safety_status/2013/en/
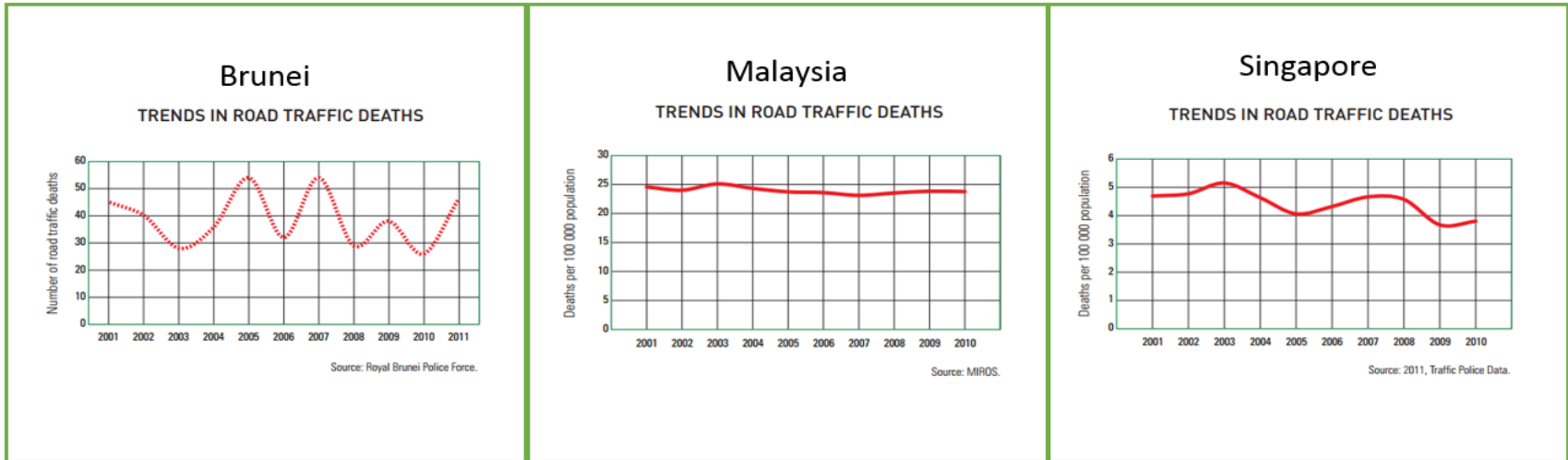
Figure 2.4.2 (b) The trends in road traffic deaths in Brunei, Malaysia and Singapore Source: WHO (2013).
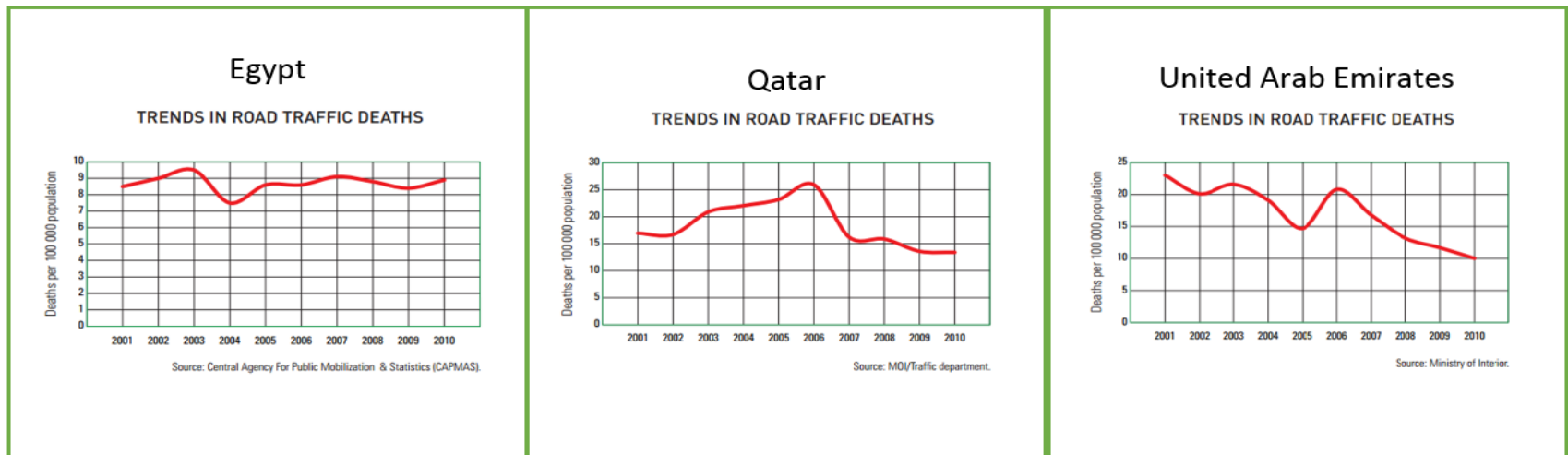
Figure 2.4.2 (c) The trends in road traffic deaths in Egypt, Qatar and United Arab Emirates Source: WHO (2013)

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2.4.3 Barriers towards sustainable transportation: Qatar as an example

Qatar is one of the countries in the Middle East, blessed with non-renewable industries. In 2013, Qatar was placed 33rd, out of 140 countries, in the High Development Index (HDI). Qatar is also experiencing the challenges associated with attempts to promote sustainable transportation. Qatar is a car dependent nation (Shaaban and Khalil, 2012), due to the increase in the population, growth in its economic activities (Shaaban and Khalil, 2012; Planells and Griffin, 2014) and historical lack of public transport investment (Planells and Griffin, 2014).

Most of the Qataris do not use the bus system (Oxford Business Group, 2009), partly because the Qataris citizen does not pay for water and electricity (Richer, 2004), and has a tax free income (Planells and Griffin, 2014). Such a system results in Qatar's citizens having high purchasing power, easily enabling them to buy a car (Planells and Griffin, 2014). Furthermore, personal transportation is considered affordable amongst the Qataris, and bus services only attract the low income expatriate workers (Shaaban and Khalil, 2013; Planells and Griffin, 2014). The buses being used by the low income expatriate population are considered unreliable, despite being both affordable and clean; in particular they lack adequate shading and cooling; both essential due to the weather conditions in Qatar (Shaaban and Khalil, 2013). Furthermore, some areas are not public transport friendly, with poor and/or limited access (some new housing areas are not accessible by public transport), bus services are infrequent, and there are either few or no direct routes to passengers' destinations, so obliging them to take multiple journeys (Gulf Times, 2015). Thus, buses are seen to have serious disadvantages, and so encouraging or developing a positive attitude towards the use of buses is considered challenging, especially as the car is highly regarded, easily affordable and meets the travel needs for the Qatari people.

School children in Qatar, according to RAND (2012), are mostly driven to school either by parents or the family's driver, particularly because children prefer to use a car rather than a school bus. Furthermore, parents are comfortable driving their children to school. This experience will serve to foster the car culture amongst the younger generation in Qatar, and

particularly in Doha. Youngsters, as noted by Steg (2005), perceived cars as exciting thus, with the case in Qatar, the behaviour towards cars would further help to develop a car culture in the future, making such car-oriented behaviour hard to break.

The car culture in Qatar's youth presents a problem, especially towards road safety. Research indicated that traffic accidents in Qatar increased more than 5 times from 1996 to 2013, with an average of 14 percent increase per year (Walker, 2015). The study also indicated that 90 percent of the traffic deaths involve male drivers aged between 20 – 30 years. Novice drivers with less than four years' driving experience are those with the most critical accidents; Kovessy (2014) indicated that 97 percent of traffic deaths in 2010 were men. Shaaban (2013) indicated in his study that drivers using a phone while driving in Qatar (11.4 percent) is higher compared to Canada (five percent) and the US (eight percent). The study also indicated that about 20.2 percent of the drivers under 25 (in Qatar) use cell phones while driving. Kovessy (2014) also reported that research at the University of Michigan's Transport Research Institute reveals that Qatar residents are 5 times more likely to die in a vehicle crash than from a stroke. The report also indicated that road death numbers were higher than deaths from heart disease. The use of mobile phones and poor or dangerous driving habits are some of the causes of traffic accidents (Walker, 2015). Planells and Griffin (2014), in the Qatar Construction News added that road conditions (situations and design) added to the causes of traffic accidents.

Traffic congestion is another problem. According to the Qatar Ministry of Interior, in June 2013 there were 876 000 cars in the nation. 1533 school buses and 153 public buses also use the roads in Qatar (Planells and Griffin, 2014). Furthermore, as the number of vehicles on the road increases, including the number of taxis, the traffic congestion is expected to become worse, especially due to the limited land available for new roads, increases in transportation demands and the behaviour of Qataris who do not fully, or ever, utilize the bus system. In 2009, the United Nations (ESCWA, 2009) indicated that Qatar has limited funds towards sustainable transportation and a lack of regulatory capacity to manage the transportation system; points supported by Rizzo (2014). According to Shaaban and Radwan (2014), there

were major improvements in bus system seen during the 2006 Asian Games; however, several planned services were neither implemented nor utilized.

Shaaban and Radwan (2014) and BQ (2014) identified several projects associated with rebuilding the Qatar transport system, especially in Doha. Qatar is to invest in buses (400 buses to 2,000 in a 5 year plan), will increase the local roads to 34,000 kilometres by 2020 (currently 9500 km), increase bridges from 160 to 200 by 2020 and build 32 tunnels (BQ, 2014). However, the sustainable transportation vision is considered challenging, especially due to the local car-culture and increase in population due to immigration; partly the resulting of mega projects, especially Qatar hosting the Football World Cup in 2022 (Rizzo, 2014). Shaaban and Khalil (2012) indicated that the New Metro System in Qatar, which is expected to be completed by 2026, needs several policies in place, in order to support the project's development. This includes the utilization of land-use (such as the use of Transit Oriented Development), accessibility (such as suitable location of stations that provide comfort for users) and transit service (such as high quality stations and improving the speed and reliability of each and every trip). However, much of the transportation literature on Qatar inadequately discusses the role of the education and awareness of its citizens in order to improve the current image of bus services and also to break the attitudes and behaviour of both Qataris and members of the high income expatriate population, towards public transport. This initiative is necessary in order to persuade those individuals to use the New Metro System in the future, as well as to reduce the car dependencies for the sake of public transport sustainability.

The use of non-motorised transportation in Qatar is restricted due to the weather conditions (Shaab and Khalil 2013) and these activities are not supported by sidewalks, cycle paths or appropriate crosswalks). Planells and Griffin (2014), quoted from the Qatar Construction News, indicated that not all roads in Qatar are pedestrian friendly as they do not have pedestrian paths. In some areas pedestrians could not safely use the pedestrian path as it is either interrupted by the many construction sites or the parallel parking, as is allowed on some divided urban roads that pedestrians and road users tend to share, making pedestrians vulnerable to car-related accidents.

Thus, the main issues pertinent to sustainable transportation are the traffic accidents and fatalities, the incidence of which Qatar officials are working hard towards lowering. However, the behaviour towards cars and public transport, road network design and the limited funds and regulations focused on sustainable transportation are also increasingly important issues in Qatar, as the small nation attempts to reduce its car dependency culture and to utilize more sustainable mobility. The barriers to sustainability in Qatar would be similar in Brunei[8] and further discussion concerning the similarity will be presented later in this thesis.

2.5 The role of stakeholders

Progress towards sustainable transportation requires judgements and input from various groups, in order to explore the environmental, social and economic impact of transportation and proposed changes to the transportation sector (Litman, 2014). Engagement with stakeholders provides the opportunity for policy makers to explore the perspective and knowledge relevant to transportation, discuss sustainable solutions and options in order to

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[8] Masdar City (located in United Arab Emirates, 17 kilometres from Abu Dhabi) is one city said to employ an eco-city concept. Masdar city is planned to be the first ever zero carbon / zero waste city. However, there are several limitation in building this project. Premalatha et al., (2013) indicated that the initial budget has been increased from USD 22 Billion to USD 24 billion. The city was supposed to be fully developed by 2016; however, due to several problems, including a financial crisis in 2010, (Alusi et al., 2011), the city is now set to be finalized in 2021 – 2025 (Alusi et al., 2011), (although Premalatha et al., 2013 indicated that the city would be finalized between the year 2025 – 2030). Despite the increase in budget, several projects including plans for power on-site, the exclusive use of renewable energy and computer-driven personal transit pods have been altered and the project is now being toned town and there is also a possibility of downsizing the project. The use of Personal Rapid Transit (PRT) is considered expensive as the battery operated vehicles in the PRT emit higher greenhouse gas compared to the fuel efficient gas-driven cars (Premalatha et al., 2013). Thus, this system is considered impossible to be implemented by developing nations, which have problems with technical, resource and financial capabilities. The model of Masdar city could be copied once the construction is completed, and after taking into account the results of a cost - benefit analysis.

improve the applicability of the solutions and to reduce any potential conflict which may arise (Bose, 2013; Karner and Niemeler, 2013; Litman, 2014; Shi and Zhou, 2012).

2.5.1 Government

Headicar (2009) indicated that any nation's government has diverse responsibilities which are divided into several sub-divisions with different visions and objectives. There are also some overlapping responsibilities, such as in transportation matters. In the UK, transportation is handled by several departments such as the Department of Transport, the Department of Energy and Climate Change and the Home Office (Headicar, 2009). In Japan the Environmental Agency (emission regulations), the Ministry of Transportation (vehicle inspection and maintenance programmes) and the Ministry of Trade and Industry (industrial policy and strategic legislation) are responsible for the drafting and implementation of policies to promote new environmental friendly vehicle technology and regulating vehicle emissions on a national scale (Åhman, 2006). The success of Japanese automobile manufacturing industries, in terms of creating alternatives to conventional vehicles, is seen to have evolved from the technological, rather than the policy side.

One of the main roles of government is regulation; in particular setting the legal framework within which an activity operates. Regulatory purposes are important in order to create sound regulations. Weak or inconsistent policy and regulations may hinder investors from financing public transport due to their low confidence in the government, as well as hindering the diffusion of cleaner technology (Browne et al., 2012). Sorda et al., (2010) indicated that government policies have driven biodiesel development in the US, through subsidies and incentives such as tax exemptions. The measure was taken to reduce fuel dependency by 30 percent in the US by 2030, compared to the 2004 level. Hira and Olivera (2009) also indicated that the development of the ethanol industry in Brazil was primarily driven by the government of Brazil. Historically, the Brazilian government has enforced several policies to develop the production of alcohol-fuelled cars, such as reducing the registration tax, a longer payment period for the car, along with a smaller down payment. Hira and Olivera (2009) added that the Brazilian government not only invested in the infrastructure and long term

research and development on ethanol vehicles, but also supported the industry by providing finance and investment for research and development, during the early stages and during the market crisis (1985 - 2002).

Furthermore, government has a role in funding infrastructure and services, including the transportation sector. An example of this is the role of the Irish government towards sustainable transportation in Dublin (Transportation Research Board, 2009). The burning of fossil fuel in transportation operations is one of the factors that contribute to the carbon dioxide emissions in the Republic of Ireland. One of the objectives of the programme was to transform the current public transport system in the greater Dublin area and particularly the improvement of rail services. The Irish Government funded 34 billion euros towards the 10 years Transport 21 programme in Dublin. One of the objectives of the programme was to transform the current public transport system in the greater Dublin area, especially the improvement of rail services. In addition, a stronger transportation system in Dublin was derived from the strategic planning, infrastructure services and transport measures, together with the participation of consultants and spearheaded by the government.

Government subsidies are important as without them, the cost of alternative to car (such as buses or greener alternative such as electric cars) would be uncompetitive compared to fossil fuels cars. The Japanese government assisted and supported the bus industries in Japan (Sakai and Shoji, 2010) due to the declining bus passenger numbers, caused by increasing private transport use. On the other hand, in Switzerland (Geenhuizen, 2002), the role of government includes the coordination and subsidisation of a pilot programme and subsidy for electric vehicle purchase. Due to the establishment of a Clean Air Act, the use of electric vehicles was favoured by the act, as electric vehicles offer nearly zero emissions.

2.5.2 Public transport operators

The majority of the empirical literature quoted in this study indicates that the increase in car use and ownership, and the decrease in the use of public transport, are due to the perceived low quality and quantity of public transport offered to its potential users.

One of the roles of public transport operators (public and private sector operators) is to provide good quality reliable service to the population. These services may include public transport for social benefit as well as environmental initiatives. The Stagecoach group (2010), a private bus company in the UK, invested in new buses and trains with better environmental performance profiles to ensure a better experience for users. SBS Transit Singapore (2011) is driven by customers' needs and so offers safe, comfortable and reliable services, with 10 minutes or less waiting time. The provider also ensures the service is affordable, user friendly and safe; with sufficient information available to the users, provided by service boards, service centres, websites and a toll free hotline). The service provider also fitted their new buses with the Euro V engines for their road-based public transport system, which have excellent emission performances. In Canada, the Canadian Urban Transit Association (2005) indicated that the Canadian transit system has started purchasing hybrid diesel-electric engine buses to reduce fuel usage by 50 percent. The association also indicated that the Canadian transit system will operate natural gas-powered buses, biodiesel powered buses and wind-generated electrical energy for its light rail system in Calgary.

There are many activities being done by public transport operators to attract more passengers to use public transport. Apart from improving the quality of the services, including frequency and punctuality, public transport operators should conduct programmes and initiatives to attract more passengers such as the Travel Behaviour Programme (Tourism and Transport Forum, 2009). The Stagecoach group (2010) had the initiative to change the perception of the public towards public transport by giving awareness and information on the reality of alternative options for travelling. In Munich, Germany (Transportation Research Board, 2009), the public transport service provider, which is owned by the city, started the 'Mobility Management for New Residents' campaign, involving consultation and information about the transportation options in the region. It was concluded that the campaign increased public transport use by seven percent, thereby further reducing carbon dioxide emissions. The campaign has now been expanded to include all new residents in Munich.

Furthermore, public transport operators conduct their own research in order to improve the quality of their services and reduce of pollutant emissions (Tourism and Transport Forum, 2009; The Canadian Urban Transit Association, 2005). The Stagecoach group (2010) has conducted research on customers' experiences of using public transport, as well as trials and development of new low carbon technologies. The public transport service operators in Munich, Germany (Transportation Research Board, 2009) tested hybrid bus technology; an initiative which may be expanded in the future. Thus, private companies running for-profit services have an interest in increasing the use of public transport, quite apart from its environmental and social functions; i.e. as part of economic sustainability.

2.5.3 NGOs

In addition to government departments and bus operators, non-government organisations have taken a keen interest in sustainable transportation. In 2009, the Brussels Declaration, organised by the World Health Organisation, compiled 33 recommendations from NGOs to governments (WHO, 2009). These were categorised into 5 subject areas, as illustrated in Table 2.5.3.

Subject Area	
General Approach	The road is a public domain as well as a network to link people.
Prevention	It is our duty to reduce road casualties to as close to zero as possible.
Post-Crash Response	Serious post-crash response is vital component of effective road safety policy and includes; immediate rescue intervention, thorough investigations, criminal and civil proceedings if appropriate, long term rehabilitation and support.
Worldwide learning	It is essential to return to sustainable mobility modes in face of the enormous cost in human lives and the effect of pollution on climate change.
Joint Initiative and actions	NGOs offer government their cooperation, expertise and joint initiatives, in return for partnership, securing funding and support their work.

Table 2.5.3 The Brussels Declaration (WHO, 2009).

However, the role of NGOs is diverse, involving a range of activities such as participation in educating the community, via media and community development. NGOs are also involved in providing informal education, especially concerning the environment, and raising awareness of the community towards environmental issues. For example, NGOs are raising awareness of the younger generation in China, through informal education in schools, through activities and via summer camps (Jia-nan, 2012). NGOs also increase awareness of the public through programmes to improve knowledge by informally educating society (Çubukçu, 2010) or through media, Internet and TV programmes (Jia-nan, 2012). The progressive result would encourage more people to get involved in public participation (Jia-nan, 2012).

Furthermore, NGOs also represent the community and help carry out projects. In Ecuador (Raberg and Rudel, 2007), the NGOs were presented with ideas from the poor communities towards saving the remaining mangrove forest from development. One of the results was that NGOs were able to save the mangrove forest from being converted into shrimp ponds by entrepreneurs. Furthermore, NGOs also set up community based projects in the Czech Republic (Beckmann et al., 2002). The role of NGOs in the Czech Republic was to promote active involvement in sustainable development and create awareness of, and education about, this concept. With the cooperation of locals, NGOs are able to create tourism industries, where the initiative boosts the local economy through the creation of jobs, income generation and attracting funding to develop tourism infrastructures.

NGOs can also attract funding from other international NGOs towards education projects. An example of this cooperation was that of the German environmental NGO 'Save Our Future' (SOF) which sponsored the antelope project in China (Jia-nan, 2012). The project was to educate students in rural areas via environmental education. Thus, NGOs could educate people about sustainable transportation issues. This is because NGOs usually have strong relationships with locals (Beckmann et al., 2002; Raberg and Rudel, 2007) and tend to have a good leadership (Barr et al., 2005). Government, public transport operators and other institutions could use the NGOs to build bridges with local society, and also give and receive useful service to and from society (Barr et al., 2005; Çubukçu, 2010). Furthermore, NGOs

could reach vulnerable groups (Barr et al., 2005), poor communities (Raberg and Rudel, 2007) or communities living in rural/remote areas (Barr et al., 2005; Jia-nan, 2012). This suggests potential to increase the awareness of transportation issues and to promote active public participation in any transport development process, especially those vulnerable populations affected by the transport development project.

2.6 Public participation

2.6.1 Advantages of public participation

Public participation in decision making processes creates advantages for various stakeholders, especially community members. Studies in both developed and developing countries have indicated that public participation in the decision making process not only provides information to the public but also allows the participants to have a say in the decision making process, as the decisions affect their daily lives (Okello et al., 2009; Yung and Chan, 2011). Studies stress that public input could influence decisions concerning the project. The role of public participation is now becoming important in policy and decision making. The process of public participation is not only important and a must as part of the legal requirement in Environmental Assessment (Barrow, 1999; Dovers 2005; Portman, 2009; Saarikoski, 2000), but also other environment-related management strategies such as Waste Management Strategy (Saarikoski, 2000), Water Resource Management in the Haine River Basin, China (Jingling et al., 2010) and in the Regional Forest Programmes in Northern Finland (Saarikoski et al., 2010).

For example, Forest Programmes in Finland (Saarikoski et al., 2010) include participation by other stakeholders, including members of the public, in the form of private forest owners. The Forest Councils are made up of individual members, the majority being males with either university or vocational school level education. Every three years, the council members are appointed; however, the councils are lacking young adults and individuals from outdoor activities. The public participation process is important in the planning and implementation strategies for Regional Forest Programmes (RFP). For instance, the RFP

outlines policies including strategies to protect biodiversity, which cover the privately owned forest. However the private owners of the forest are less concerned with the programmes but are more concerned with their own management strategies, such as preserving certain forests for recreation. The public participation process is designed to resolve any mismatched interests regarding the forest usage. This includes the public hearing and meeting processes, via which the public have the opportunity to express their thoughts on the issues of forest management, in order to have a final RFP.

Public participation can improve the management and administration of certain issues in a number of ways. The process will help the public to acknowledge, familiarise with and understand the extent of the issues that are being brought up. This will serve to reduce or identify conflicts (Jingling et al., 2009), as well as improving the validity, quality and fairness of the processes (Jingling et al., 2009; Laurian and Shaw, 2008) by providing transparency in decision making (Laurian and Shaw, 2008; Portman, 2009). Public participation in debate will reduce the potential negative effect of the project (Portman, 2009; Saarikoski, 2000) due to any mismatch of interests (Saarikoski et al., 2010). This is because a public participation process will involve all stakeholders that are affected by the projects, such as the local government, councils, entrepreneurs, scientists and the community (Jingling, 2010; Laurian and Shaw, 2008, Okello et al., 2009, Yung and Chan, 2011; Saarikoski, 2000). These stakeholders have different interest representing different public opinions and views about the project (Gauthier et al., 2011; Saarikoski, 2000; Yung and Chan, 2011); therefore all the issues that should be taken into consideration are not overlooked (Laurian and Shaw, 2009; Portman, 2009). This transparency will eventually increase the awareness of the public, and especially those who are involved in a project, through the interaction and exchange of ideas and learning between the government, society and local community (Laurian and Shaw, 2008; Portman, 2009; Saarikoski, 2000). Although the ultimate decision will not please all the stakeholders, the public's involvement is important, especially in order to achieve better decision in any projects.

There are some methods that are being used to involve the public in decision making. Such methods include public meetings (Saarikoski, 2000), public consultations (Jingling et al., 2010; Okello et al., 2009; Yung and Chan, 2011) workshops (Laurian and Shaw, 2008; Portman, 2009; Yung and Chan, 2011), survey feedback gathered from questionnaires, interviews and internet surveys (Jingling et al., 2010; Portman, 2009; Saarikoski, 2000; Saarikoski et al., 2010), and public hearings (Portman, 2009; Saarikoski 2000; Saariskoski et al., 2010).

Public participation in debates about transportation will serve to provide information to communities about the changes in the transportation conditions and how any changes will affect each transportation user. With less collaboration and participation from the community, transport planning will not be totally successful as the concerns, needs and demands of the public may well not be satisfied. This is because the process of debate will give an insight into the differences in transportation users, their characteristics and behaviour towards the use of private and public transport. Moreover, people with no cars, or no access to cars, are likely to have different views towards any transportation changes. Thus there is a need to review and consider the input from, and concerns of, the public (Wahl, 2013) and this input may well suggest some revisions of the proposed transportation changes (Zhong et al., 2008).

2.6.2 Weaknesses and critiques of public participation

Despite the opportunities and advantages offered by public participation to improve the decision making process, there are several weaknesses. One of the problems is the public themselves. In decision making, or any activities that involves the process, there is a question of who the public are? 'The public' consist of many groups and levels of community with different social backgrounds, educational backgrounds, cultures, values and norms (Gauthier et al., 2011; Jingling, 2010; Laurian and Shaw, 2008; Saarikoski et al., 2010; Yung and Chan, 2011). The problem with involving the public is also due to each individual's level of awareness, education and knowledge of the topic(s) being debated or discussed. For example, regarding the issue of the Queens Pier in Hong Kong (Yung and Chan, 2011), the public

were not given sufficient information about the project and conflicts arose due to the argument between stakeholders with different interests. In Kenya (Okello et al., 2009), members of the public were unaware of some of the projects, especially concerning Strategic Environmental Assessment, they lacked knowledge of what was happening, were unfamiliar with the process and their roles; all of which caused them to be passive participants. Therefore, the issues of delivering adequate information on certain issues and the benefits of actions designed to facilitate the public participation process, are considered important factors for the success of public participation.

In addition, along with the stated issue(s), there is also the problem of who should represent the public. In the case of Waste Management Strategy in Finland (Saarikoski, 2000), the series of meetings and discussions were considered unfair because stakeholder with expertise dominated the discussion and the Pirkanmaa Chamber of Commerce, which represented the local households, residents and entrepreneurs, decided not to be involved after attending several meetings. Furthermore, in the Northern Finland Regional Forest Programme (Saarikoski et al., 2010), there were only few groups that represented the public, causing the forest council to be unhappy with the outcome of the process. The recreational interest group and youth group did not participate in the process and due to the low attendance; the public hearing was abandoned. The two Finland examples were dominated by different groups with different interests.

Furthermore, project proponents were also sceptical when the issue of public representation was brought up. This is because the public (or other group of locals) were often represented by pressured representatives (Gauthier et al., 2011), groups with different interests. This might lead to a mismatch in the public participation process and could eventually lead to conflict (Gauthier et al., 2010; Saarikoski, 2000; Saarikoski et al., 2010; Yung and Chan (2011).

2.7 Gaps in sustainable transportation

One of the major gaps in the transport literature is how to translate the theory of sustainable transportation into practice, especially in developing countries (missing in any serious focus on addressing the issue of acceptability by the affected society, would thereby affect the promotion of equality). However, this thesis not only identifies the barriers to establishing sustainable transportation, but also the geographical conditions of the nation (such as in this case Brunei, is rich with oil and gas and the bus ticket for a single journey (regardless of zone or destinations) is BND $1.00 (£ 0.48) or BND $0.50 for children, the elderly and students in school uniform (£ 0.24).

One of the knowledge gap priorities is to understand the demographic change that that results from the impact of access to efficient urban transport. For example, several literature sources identified the growing numbers of the elderly that could influence the mobility pattern. This study however, includes the increase in the young generation which, together with the older generation could shape the new pattern and demand for mobility. Secondly, the understanding of the change is considered inadequate, as literature reviews tend to focus on the social acceptability and public transport infrastructure related to changes. This thesis identifies the key drivers and barriers to understanding and promoting change in mobility, including the role of stakeholders, the physical land constraints and government regulatory policy. Third, this thesis will examine the strengthening of transport policy by involving the public.

2.8 Conclusion

This chapter has discussed the issues associated with transportation sustainability. It was clearly observed that transportation has different impacts on a nation's economic development, society and environment. Through transportation, the public have maximised their benefits such as increased job creation, improved their socio-economic status and maximised their travel through increases in accessibility. However, there are also some

negative impacts from transportation, particularly towards the environment, that challenge the nation on its vision towards sustainability. Transportation presents a challenging path towards sustainability and since people are dependent on transportation, any changes towards sustainability will have certain impacts on the populace. Hence, this chapter has examined evidence drawn from relevant transport-related research literature on ways other nations deal with the problems of transportation; including the issues of people's perceptions, and equity. This chapter also discussed briefly the concern over unsustainable transportation and the benefits and challenges (including the role of stakeholders and public participation process) of trying to attain sustainability in a nation's transportation sector. Such a focus in the unsustainable transportation (including benefits and challengers) will eventually help the Bruneians to be aware of their unsustainable transportation behaviour and to develop and adopt any potential transportation behaviour and options that are beneficial to their society and economy while reducing the negative impact on the environment. Moreover, with the support from the public, the initiatives and programmes moving towards sustainable transportation could be a good sign for success.

The existing transportation infrastructure (especially in Brunei) mainly favours vehicles such as cars, motorcycles and buses: this model is considered unsustainable. Therefore, the world is confronted with the need to develop the road infrastructure which favours sustainable mobility, such as the introduction of systematic public transportations, as well as routes for walking and cycling. However, these developments raise financial needs in terms of the expansion of roads for use by cars, cycles and pedestrians; public transport infrastructure consisting of bus lanes and train routes, and service maintenance. Often, by creating new management and policies, these problems are partially solved in the short term. However, in the long run, these management and policy initiatives may generate other problems that tend to be even more complex.

Chapter 2 has identified details relevant to the issue of sustainability towards transportation, including the potential and barriers, such as negative perceptions towards public transport, lack of visions towards sustainable transportation; and the role of stakeholders, such as public and NGOs, towards sustainability. This chapter indirectly indicated that transition towards

sustainability is complex. This leads to the questions of how should transition occur? Chapter 3 of this thesis identifies the concept of Socio-Technical Transition (STT) as one of the types of transition towards sustainable transportation. Chapter 3 also identifies the influences towards sustainability, the factors that causes transition to be difficult and the innovation that could be used towards attaining that desired sustainability.

Chapter 3: Socio-Technical Transitions Theory

3.0 Background

Society is increasingly facing on-going problems that cannot be solved by current management strategies and policies. The search for sustainability has challenged us in several ways, such as in the sectors of energy and transportation. There are issues concerning how to promote the concept of sustainability in everyday life. These issues emerge because one of the aims of sustainability is to safeguard the environment and harmonise it with society. However, economic pressures can often make the route to sustainability difficult.

Over the past ten years, the Socio-Technical Transition (STT) literature has explored many such systems in order to theorise how they have brought or may produce change in a sustainable direction. This chapter introduces the definition of transition and the need for transition towards sustainability. This is followed by an introduction to the concept of STT as the theoretical perspective adopted in this thesis to achieve sustainability. Next, this chapter will discuss the term 'Multi-Level Perspective' (MLP) and how this concept might be used in order to proceed with STT. This chapter also includes the responses (advantages, disadvantages and literature gaps illustrated by several transition literature reviews) towards the MLP and STT, as well as the MLP in transportation sectors.

3.1 Definition of transition

The term 'transition' simply means the process or a period of changing from one state or condition to another (Longman Dictionary, 2008). However, this definition does not precisely describe the term 'transition' for this study because the definition is considered too

broad. There is a need to specify the word in terms of transition towards sustainability, covering all aspects of societal and economic changes towards a better environment.

Rotmans and Loorback (2009, pg. 185) identified transition as *"structural change in a societal (sub) system that is the result of a co-evolution of economic, cultural, technological, ecological and institutional developments at different scale level"*. Kemp (1994) indicated that transition is simply change, rather than modification. This is based on his definition (pg. 1024) as *"a change in our basic technologies of production, transport and consumption rather than modification of existing products and processes or the adoption of end-of-pipe technologies"*. The two definitions hint that "change" is an important ingredient in transition and its essence is found in the technological changes.

Several articles have indicated the importance of technology in assisting these changes, as defined by Elzin and Wieczorek (2005) and Geels (2006). Geels (2006, pg. 1002) indicated *"transition from one techno economic paradigm to another are complex and co-evolutionary processes. A new technology emerges in a world that is still dominated by the old paradigm, and demonstrates its advantages by one or a few sectors"*. Despite stressing the importance of technology, this research also indicates that there is a need to use interdisciplinary approaches to obtain information, as the change will involve multiple stakeholders. This is because transition is said to shape the agenda of change, opportunities for learning, replacement of existing systems and interactions between the key players: community, the government, NGOs and others (Geels and Kemp, 2007; Genus and Coles, 2005; Smith et al., 2005; Verbong and Geels, 2007). Furthermore, the definition is considered to be goal-oriented, in this case, towards sustainability. Therefore, transition is often associated with sustainable development. This is particularly true since, although the path in the right direction is unknown, the process of transition will give information to the actors, both individuals and organisations, about the acts that could, would, might and should be carried out in order to achieve the desired goals based on the success and failure experiences of historical projects (Köhler et al., 2009; Shove and Walker, 2010).

Historic transitions have been identified and analysed in a number of areas, including mobility (Bree et al., 2010; Köhler et al., 2009); energy (Raven and Geels, 2010); research and development in technology (Genus and Coles, 2008); and the system of governance (Köhler et al., 2009; Shove and Walker, 2010). An example from the transportation sector is the transition from horse-drawn carriages to the internal combustion engine based transportation system (Geels and Kemp, 2007). A more recent transport example is the on-going automobile transformation from the use of non-renewable energy (such as petrol) to greener automobiles such as hydrogen and battery-powered electric vehicles (Bree et al., 2010; Nykvist and Whitmarsh, 2008) and hybrid and fuel cell vehicles (Köhler et al., 2009). Analysis of these three articles ((Bree et al., (2010), Köhler et al., (2009) and Nykvist and Whitmarsh (2008) identified the following issues that are beneficial for clarifying the potential for the transition process in Brunei:

1. The pathways of transition that might take place (involving technological changes, society, rules and economic incentives)

2. Commitment of relevant authorities to transition (such as government, NGOs, car manufacturers and the private sector)

3. Identifying the changes and conditions required by countries that initiate transition

4. Enhancing the transition process by analysing the long-term impact of technological transition and changes in the social acceptance of transition

5. Identifying the important agents of change that are often neglected

An important consideration for sustainability is how a transition might be initiated. Transition might be sparked or initiated by the current environmental conditions of the country, such as high carbon dioxide emissions due to high-energy consumption by the housing and transportation sectors. Concerns over the environmental conditions may result in people agitating for change. Actors, such as members of the community and the environmental movement, might pressure the relevant actors to change to more sustainable uses of energy. This may put sufficient pressure on the country's government to consult with

other stakeholders, investigate the problem, and consider the pathways to addressing the issues (Heiskanen et al., 2009).

An example to illustrate the spark for the transition process is the concern of Dutch hygienists, who initiated the shift from cesspools to a hygienic integrated sewer systems in the Netherlands between 1870 and 1930 (Geels and Kemp, 2007). The group of hygienists, consisting of Dutch doctors, investigated the relationship between bad hygiene and disease associated with cesspools and other domestic organic waste. The doctors, and some city engineers, lobbied for sewer systems. The experimentation with alternatives was undertaken from 1870 to 1890 by the city government. Three alternatives were tested: the barrel-collection system; the Pneumatic Liernur system; and the sewer system. The barrel-collection system and the Liernur system were gradually phased out. The sewer system was promoted through lobbying by doctors and several city engineers, together with the role of public authorities, in improving urban life thereby causing individuals to change to the sewer system, which was also easier to use. The changes were also brought about by the conditions of life in the Netherlands, as well as strategies by the concerned actors, to ensure that the system was accepted.

From the evidence of this case study in the Netherlands, there is a need to focus on the combination of regimes (actors, government and governance), technological innovations and socio-cultural behaviour of the community, in order to bring about change. The reason for this is that issues and problems may involve complexity and the policy improvement may be insufficient to effect change without technological improvement (Nykvist and Whitmarsh, 2008). However, technological innovation cannot, by itself, bring about change (Geels, 2002) and therefore provides only partial answers to sustainability problems (Bree et al., 2010). In addition, the lobbying from both environmental groups and industries may make the public uncertain about which path to support (Dovers, 2005), or whether the action is even needed. This may result in muted or divided public voices and participation.

Today, society is facing the issue of growing demand for mobility for both people and goods. The ownership and use of vehicles such as private cars is tending to increase (Dargay et al., 2007), especially in Asia and Latin America (Sperling and Claussen, 2004). OECD nations,

such as the USA, are expected to experience a slight increase in vehicle ownership while non-OECD countries will have faster rates of growth, mostly due to the increase in incomes (Dargay et al., 2007). As mentioned in chapter two, there is a need for sustainable transportation, but the issues involved are complex (Geels, 2006). They may involve the interaction between different stakeholders, as well as the cost and availability of the technology and the cost of the implementation of any developments.

The social component of the transitional issues includes society as a stakeholder in an environmental issue. Raven and Geels (2010) indicated that the societal groups involved in the biogas developments in Denmark and the Netherlands include universities, research institutions, technology suppliers, farmers, ministries and other groups. Representatives of the various groups have their own agendas and goals and their own ways of trying to motivate changes. Government, for example, may introduce legislation (and Acts) or provide economic incentives for change. Research institutions may play an important role in giving feedback and educating the populace. In the case of biogas development in Denmark and the Netherlands, the governments have provided aid such as economic incentives via a subsidy scheme and investment grants. The research institutions have provided feedback and assisted the technological providers to deal with the corrosive effect of hydrogen sulphides that damaged the gas engines and transport pipes (Raven and Geels, 2010). Therefore, the multiple stakeholders may enhance the understanding of the problems and transitional issues, generating options and problem-solving frameworks and reducing uncertainty[9].

3.2 Socio-Technical Transitions

A Socio-Technical Transitions (STT) refers to the change in both technology and institutions to achieve the necessary requirements and needs of the societal functions and systems in order to produce a better result (Geels, 2002; 2004; 2010a; Smith et al., 2005). In recent

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[9] However, complexity arises in terms of competency and efficiency, especially in deciding who should represent the stakeholders, such as the public and the NGOs, and who should manage the transition (Renn, 2006). Thus, represent one of the gaps in the transition literatures (As mentioned in Chapter 3.4).

years, the concept of STT has emerged in the academic literature as a framework for the study of complex sustainability issues, in both developed and developing nations, including the Asian nations (Berkhout et al., 2009) as well as Denmark and the Netherlands (Raven and Geels, 2010). Nykvist and Whitmarsh (2008) stated that incremental technology and policy instruments are needed along with social and technical developments to achieve the desired result, such as using policies in support of biofuels to solve transport problems. STT ensures improvements in the efficiency of products and services for consumers; for example improvement in public transport through the use of ICT, along with greener fuel use and new practices and initiatives to encourage more people to use public transport, thus reducing traffic-related problems.

STT theory is also being used to explore the role of stakeholders, such as various government departments and others. The transition might help these stakeholders to coexist and have a shared vision (e.g. compromise the vision by negotiating an agreed modification of their interests) of a sustainable future by identifying the type of role the stakeholder might play towards sustainability. Although the involvement of various stakeholders may lead to complexity, due to different visions and expertise (Renn, 2006), cooperation between stakeholders may help in analysing the future directions that point towards sustainability. The stakeholders might persuade or initiate the change(s) and the relevant institutions may either support or decline the changes. The managers of the transition may take into account the social aspect of the transition as well as the technological and economic aspects in order to balance the transition (Genus and Coles, 2008; Heiskanen et al., 2009; Raven and Geels, 2010; Shove and Walker, 2007).

3.3 Multi-Level Perspective (MLP)

The MLP within STT research focuses on technology-in-context and emphasises the co-evolution of technology and society (Geels, 2005). The three levels in the MLP, as illustrated by Geels (2002) in figure 3.3 (a) are: the landscape, the regime and the niches. These three levels interact with one another.

The landscape tends to be the combination of factors that might influence transition. It tends to force the actors and institutions to adapt to landscape pressures and gives the niche level the opportunity to develop new technologies and innovation (Bree et al., 2010; Geels, 2002; 2010). The landscape consists of conditions, environment and pressures for transition. This includes slowly changing factors, such as environmental problems, demographic problems, economic development and many more. Jacobsson and Bergek (2011) believed that the MLP in the landscape level identifies the weakness in the system being investigated and indicates the existing problems that need to be solved and turned into actions in order for a transition to occur.
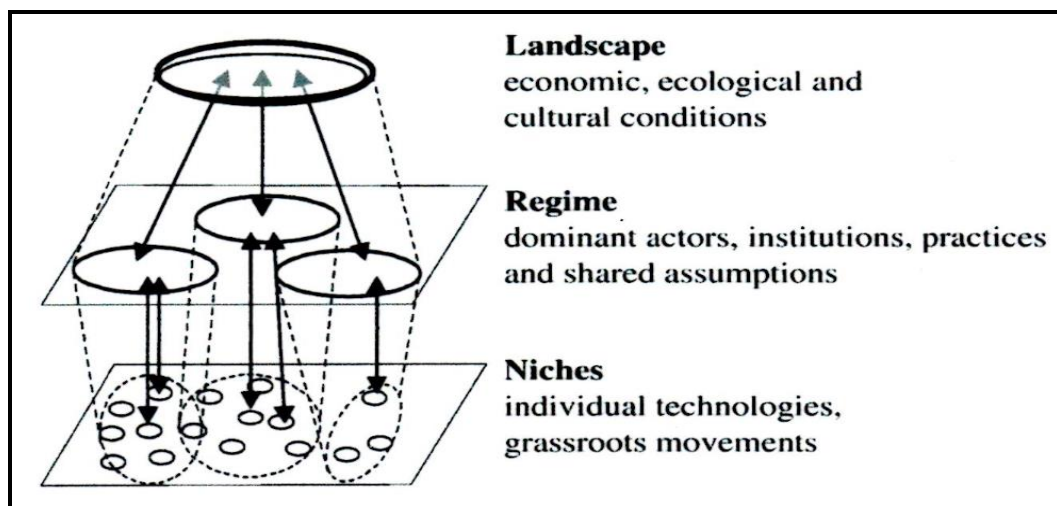
Figure 3.3 (a). The Multi-Level Perspective (Geels, 2002).

For example, in the Netherlands, (during the 1870s – 1930s period), cities and people began to experience landscape pressure to respond to the disease emanating from the bad smell of the unhygienic use of toilets (Geels and Kemp, 2007). Human excreta and domestic waste were the largest waste streams in Dutch cities, and people used streets and canals as "toilets". The regulations to stop this "unhygienic behaviour" were less successful due to lack of policing. The continuation of the problems blocked water circulation in the canals (due to accumulation of waste) and caused problems in the supply of fresh water. These landscape pressures were translated into problems by actors such as hygienists and doctors, and these hygienists and the relevant authorities, particularly engineers and city councils, sought to solve these problems.

Verbong and Geels (2007) also indicated several factors that played important roles in the energy transition in the Dutch electricity system (1960 – 2004). The external pressure of the oil peak crisis, in 1973, sparked pressures for diversification of energy resources and energy efficiency. The landscape pressure caused the Dutch government to initiate an Energy White Paper (1974) with the aim of reducing dependency on oil and the environmental impact caused by the inefficient use of fossil-fuel energy.

The regime level refers to the dominant set of rules that dominate the activities or systems and its actors (Köhler et al., 2009). The regime also includes institutions, beliefs and everyday practices. The regime is in most cases stable and will resist any changes. The regime can be categorised into several groups. For example, Geels (2004) categorised the regime into five: technological regime, user and market regime (i.e. supply and pricing of energy such as petrol), socio-cultural regime (i.e. awareness and consumption pattern in energy), policy regime (i.e. governance in energy sectors) and science regime (i.e. research and development and technological development).

The changes in the regime may depend on the actors in order to respond to the pressure (Geels, 2004). The actors are the group of organisations and social groups involved in the socio-technical system (Bree et al., 2010), such as research institutions, financial institutions and government, as well as consumers, producers and distributors. The actors may act to address the problems. The actors constitute many stakeholders such as the government, engineers, planners, policy-makers, users, society and other non-government organisations. For example, in the mobility regime, car manufacturers are a key component of the existing dominant regime. Car manufacturers may actively seek to prevent changes through the use of new transport energies and technologies (for example promote the development of hybrid technology and clean fuel in order to emphasise that their car are green and thus making modal shift to public transport a challenge, especially to the addicted car users). However, car manufacturers are not the only actors in the mobility regime. The regime is also developed by the socio-cultural regime (e.g. cars are a symbol of freedom, whereas buses are for low-income earners) and the policy regime (such as a subsidised petrol policy favouring the use of cars).

Finally, niches provide society with the locations and opportunities for learning (Geels, 2002; Genus and Coles, 2008) by exploring the innovations and technologies in small-scale experiments (Heiskanen et al., 2009; Rotmans and Kemp, 2008). Successful experiments may be scaled up or, conversely, experiments may be abandoned should they fail (Rotmans and Kemp, 2008). Niches are given protection from market pressures (Köhler et al., 2009) such as through resources, funds, and policy (Genus and Coles, 2008).

In the Dutch hygiene example (Geels and Kemp, 2007), there were several niches during the transition to sewer systems from cesspools. In terms of technology, the Dutch government attempted several techniques to combat wastewater problems, such as improving water circulation and pumping new fresh water into the canals. However, two new niches (in terms of technology) were practised: the barrel system and the Pneumatic Liernur system. The barrel system was chosen because the community could earn money by selling the wastewater for fertiliser. The Pneumatic Liernur system was also tested in a small-scale project and expanded in Leiden and Amsterdam. However, due to its high cost and complexity, the Liernur system was only used in Amsterdam until 1916.

In terms of cultural and behaviour niche change, the populace was becoming more aware of cleanliness and the fact that wastewater presented a health hazard. Furthermore, the populace called for more active public authorities, holding the government, which initially ignored the niche, responsible for improving living conditions. The interaction between the hygienists, other stakeholders in the regime and the niche technologists, resulted in the gradual changes to the sewer systems in early 20th century Holland.

Niches provide the opportunity for transition processes (Geels, 2002) by providing alternatives in terms of technologies, innovations and product-to-service shift (Nykvist and Whitmarsh, 2008); the governance regime will determine the best option to use (Geels, 2010). In the UK, researchers have run a computer simulation to analyse personal transportation behaviour to determine the technologies suitable for development (Köhler et al., 2009). The researchers' results suggest that 1) fuel cell vehicles (FCV) may dominate the transportation options after 2030, and 2) bio fuels and the internal combustion engine (ICE-

electric hybrid) are the main alternatives for transportation, as the technologies have already been developed and may fit into the current infrastructure in the next $10 - 30$ years.

In addition, by virtue of its protection, a niche can provide steps to more sustainable practices. For example, this may include improving the acceptance of car usage reduction by a change of attitude, such as the acceptance of car-pooling and other sustainable travel plans, new sets of innovation and technologies such as modern public transportation with better services operated by electricity, or a new set of management parameters, such as smarter choice which reduces car use and promotes non-motorised transportation.

The community and other actors may put pressure on the regime to improve or reduce the problems of the landscape; for example reducing environmental degradation due to pollution from transportation and industries. The regime might adjust the system to reduce the pressure. Should the problems be unmanageable, the regime might create the opportunity for the actors in the niches to develop alternative technologies to reduce the problems, and thus the pressure on the regime. The niche would come up with some alternatives and the regime would then select the appropriate alternative(s) and strengthen the usage with rules, ensuring that the community followed and used the alternative technology. The process of change to the landscape may be slow or fast, depending on how the regime reacts to the landscape and how the community accepts the alternatives.

These studies indicate that the process of transition might be fully assessed, adopted, understood and learned by using the MLP. The process of change is analysed through the three levels of transition: niche, regime and landscape. The changes in these case studies were analysed and the practices and outcomes presented, thus providing useful insights that might be incorporated into the current research.

3.4 Response to MLP

The majority of the STT literature is based on the national scale and is largely conducted in the developed Western nations. For example, the transition literature specifically analyses the transition of a country such as the Netherlands or the UK. However, there is a need to

compare the transition process in these countries with that in other countries. This is because these nations have differences in geographical conditions, such as resources, economy and type of government. Studies based on the national scale are problematic because each country, or even each case, has its own interpretation of transition (Genus and Coles, 2008) due to its specific social and cultural environment (Heiskanen et al., 2009). Furthermore, the national scale of the projects in the majority of the literature involves large funding and negotiation amongst levels of local and national governments, as well as the need to offer economic incentives such as subsidies. However, developing nations may not have the opportunity to employ these technologies due to limited government budgets.

The transition process should be based on several factors, such as a mixture of a top-down steering network, multi-level governance and participation of stakeholders (Shove and Walker, 2010). Heiskanen et al., (2009) mentioned that transition management should emphasise both the top-down and the bottom-up approaches. However, problems arise in deciding what constitutes the governance and the actors in the governance (Shove and Walker 2007), especially in determining who are the actors in the regime. A majority of the literature studies indicated that the mixture of governance comprises local, central and federal government with, in some cases, other bodies, such as the involvement of the EU in the hydrogen niche formation in the UK. Thus, an insufficient number of transition studies have been carried out in countries governed solely by central government, such as Brunei's monarchical system, where there is no shift in power resulting from elections and voting. Therefore, this research seeks to reduce the gap (as majority of the case studies are based on voting system by which the government may change within 5 years through public voting) by explaining the similarities and differences in the transition scenario based on differences in geographical ruling. This will give an idea of the success and failure of transition to those in the government with respect to the economic development, technological level, funding, research and development.

As mentioned earlier, Jacobsson and Bergek (2011) believed that MLP is a tool for identifying the weakness in the system for transition. It indicates the existing problems that need to be solved and turned into actions in order for a transition to occur. However, there is

a gap in the literature in that the majority of it fails to identify the role of the community in identifying the problems. Hence, this raises the question of who selects the problems, who translate the issues into problems, and how the community experiences the problems.

Some of the developing nations are poor, have a lack of resources and are dependent on aid from other nations or international banks, such as the World Bank and ADB. According to Jasinski (2000), lack of finance is the most significant barrier to the transferability of technology. This may involve both a lack of investment in research and development and the high cost of purchasing new technology, which is another barrier to the transfer of technology. Some of the technology may be applicable in both the developed and rapidly developing nations. However, some developing nations have to reinvent the technology due to a lack of capacity regarding knowledge transfer of the technology, as well as maintenance resources. As a result, the development of the reinvented technologies may impose a burden on the developing nations and become a hurdle to adoption of the technology. The reinvention of the technologies capable of adoption in developing nations needs funding in terms of research and development. In small cities in Egypt (Shaalan, 2013), the issue of transferability of technology in waste management is considered relevant. This is because each municipality in Egypt receives a share of the national budget but this investment is for local development projects, rather than for priority development (such as waste management). Furthermore, each municipality lacks both technical and administrative expertise, since the salary structure does not attract qualified staff, thus they have only a limited capacity to attract the private sector to invest in waste management projects.

Heiskanan et al., (2009) agreed that policy learning may encourage countries to try out solutions to their existing problems, but the transfer of knowledge is only possible between compatible countries with similar systems of governance and policy styles. The whole model may not work in a developing country. However, it may be possible to take an idea relating to a policy or a policy instrument, without taking the whole approach. The majority of the transition theories are tested in developed countries; hence, there are limits to many developing countries' ability to follow the steps of the developed country. The questions of transferability of lessons, and generalisation of case studies, are highly relevant to a

comparison of the developing nations. Brunei lacks appropriate education, knowledge and technological innovation for transitions. The new technology, such as the Alternative Fuel Vehicle (AFV), is based not only on the technology itself but also on the need for skilled manpower. In both developed countries and rapidly developing nations, students at school level have been exposed to ICT use and these skills are further developed in their tertiary education, such as at university. While there may be people with skills in the developing nations, they have limited opportunities to develop computer skills, and this forms another barrier to the transferability of technology.

At the niche level, the majority of the literature emphasises the development of technological innovation for transition. For example, the growth of hybrid cars is based on consumer satisfaction, where car manufacturers tend to increase their competitive advantage by enhancing the technology and improving the design. The niche should involve the long-term replacement of the existing regime (Park, 2013). This requires assistance in terms of subsidies and other economic incentives. Sierzchula et al., (2012) indicated that there is a need to explain and educate the consumer on the cost of vehicles and the total cost of the ownership of the vehicles. However, this thesis believes that this is incomplete as a policy and that the technology causes the actors in the niche to emphasise the technological advancement that might be developed to challenge the existing regime, thus promoting a 'techno fix'. Sierzchula et al., (2012) also indicated that the demand for Alternative Fuel Vehicles (AFV) might collapse. Furthermore, the majority of the literature emphasises technological development, on the assumption that this will bring more benefits to society and the nation. However, even developed nations face unsuccessful adoption or challenges to the adoption of the technology[10] as it is not a straightforward process and the technological

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[10] In December 2010, the German federal government introduced a regulation increasing the percentage of bio-ethanol in the gasoline blend to 10% (E10). Due to this simple technological shift, the government overlooked the cost of the technological change by providing only limited investment. However, not all cars were able to use the gasoline. Furthermore, due to the negative responses by many stakeholders, the community started to return to the previous gasoline. Among the reasons for the refusal to use E10 are the fact that E10 increases the fuel consumption, fear of engine damage caused by E10, adverse environmental impact, and the notion that it is unethical to use biofuel when food sources are scarce (Rauch and Thöne, 2011).

shift may not work. Thus, the uncertainties of the technology may hinder the developing nations' attempts to follow the model.

Therefore, this thesis calls for more research or emphasis on the non-technological niches, such as user preferences, changes in behaviour and social learning, which have so far tended to be neglected. This thesis will incorporate the role of the societal aspect of the transition such as reducing dependence on the car culture, to which end social learning such as increased awareness and the perceptions of using the bus, better bus services and route networks, and financial incentives, might be used to increase bus use. Furthermore, by highlighting the role of society in bottom-up governance, it may be possible to help individuals identify their preferred choice of transportation options and services, such as commuting mode of choice, in order to substitute cars with public transport.

Certain aspects of the model can be analysed by academics to identify the potential for certain issues to be translated into problems by analysing the associated social issues. Furthermore, Hermans (2013) indicated that research with knowledge institutes is most influential in facilitating social learning by bringing various stakeholders, such as farmers, scientists and society in the Netherlands, together in the transition management stage. One of the factors that may bring about transition or transformation is negotiation (Geels and Kemp, 2007). Academics might negotiate with society by presenting the social issues of the problems and the need for transition. Academics might set out the nature of the problems, build the shared long-term vision with the agreement of society and aid the process of change by creating the learning opportunities for change (Kemp et al., 2007; Domènech et al., 2014).

The application of the MLP in the analysis of STT has been based on historical case studies, an approach considered inadequate, partly because the project selection was made by the proponents of the MLP (Genus and Coles, 2008). Thus, the issues of robustness, interpretation and the clarity of the study are still in question. However, Geels (2010a) argued that the approach is acceptable as the transition studies approach is a form of illustration and exploration rather than an example of systematic research. Thus, the application of historic case studies may be beneficial for other aspects of transition, such as network analysis. This study will use historical case studies for several reasons. One of the reasons is that Brunei has

been trying to develop low-carbon transportation, such as the current franchise buses, to reduce the over-dependence on car use. However, the majority of the bus users are non-Bruneians. Thus, the historical case study will help to identify the important agents of change, such as transportation actors and the promotion of public participation, which tends to be neglected in Brunei, which produces collaboration among these actors thereby enhancing the transition process by analysing both the technological and non-technological niches of transportation.

3.5 Socio-technical transitions in transportation

Whitmarsh (2012) stated that the MLP could be used to understand the social and cultural aspects of using the car and to predict the changes needed to support a transition to a sustainable society. Nykvist and Whitmarsh (2008) use the MLP to analyse the existing mobility system in the UK and Sweden and focus on the innovation of transport technologies, modal shifts and demand management. Geels (2012) uses the MLP to make an assessment of the drivers of, and barriers to, a transition towards low-carbon transport systems. Thus, the use of the MLP may be beneficial for analysing a potential transition towards a low-carbon emissions scenario in Brunei, by identifying the current perceptions and behaviours of the Bruneians concerning buses and cars, and assessing the drivers of, and barriers to, transition in the Brunei context.

3.5.1 Transportation landscape

Some actors in the landscape, such as the environmental movement and the community, do not have the power to promote change. For example, the community consists of many groups with different values and opinions. Community members, unaware of their right to be involved in public participation, have no engagement with, or knowledge of, public participation and do not see themselves as having the power to act (Gaventa, 2012). Furthermore, Avelino (2009) indicated that weaker actors tend not to participate in the

transition process[11]. Penna and Geels (2012) indicated that social movements are struggling to initiate public demand for air pollution from cars to be placed on the national agenda (especially in the USA national agenda by which there are strong resistance towards green transportation from the car industries). This is because the industries create uncertainty about the problems and use the public participation platform as their defensive approach to encourage people to disregard air pollution issues. One of the defence approaches was to form alternative solutions but tackle the technical feasibility and emphasise the cost of the alternative solutions, in order to downplay the air pollution issues Furthermore, Ricci et al. (2010) also indicated that there are people in Teesside, South West Wales and London who are not familiar with hydrogen-based technology and its possible development. However, people in Teesside and South West Wales acknowledge that large-scale hydrogen development could improve the economy by providing new jobs and regenerating obsolete industrial sites. Therefore, lack of information is a major barrier to the actors in the landscape, especially members of the local community, participating fully in the promotion of change.

However, they might apply some pressure on the government to designate an issue as a problem. Gaventa (2012) indicated that citizen engagement might have many advantages; for example by making the government acknowledge and respond to issues it has previously ignored. Therefore, by creating pressure, more people might acknowledge the problems and together demand some changes to the regime (Geels 2002; 2004; 2005; Penna and Geels, 2012) especially to the government (Gaventa, 2012; Ricci et al., 2010). Then, as pressures are translated as problems, relevant authorities may take the necessary actions to reduce those problems (Penna and Geels, 2012). For example, Geels (2012) identified discussion of climate change, peak oil and ICT as the landscape pressures that might be translated into actions towards mobility transitions.

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[11] Avelino (2009) used the expression 'were afraid to open their mouths' to illustrate how the weak actors tend not to participate or become involved in transition management projects.

Geels (2012) emphasises discussion on climate change and peak oil as the transportation pressures that might be translated into actions towards a transition to low-carbon transportation. Furthermore, Geels (2012) added that the increase in the use of ICT, especially for E-commerce, might facilitate the change towards low car use in the future.

The landscape development may come from a country's participation in local and regional treaties and policies, such as the Kyoto Protocol, to reduce carbon emissions. This involvement may pressure the regime, especially the government, into reducing carbon emissions under the specification for standard limits. But various actors, such as research institutions and energy and transportation personnel, might provide information on the current carbon emissions in each sector and translate the landscape pressure into problems. In the EU, the increase in transportation is translated into problems, in that carbon emissions are projected to rise. These pressures are focusing the perceptions of the political leaders and have motivated a change in the energy policy landscape (Kern, 2012). Thus, with the new landscape pressure, some governments may revise their intentions by promising to further cut carbon emissions[12].

On the other hand, increased awareness of, and education on, environmental problems would increase communities' desire for green mobility and motivate actors in the landscape, such as the NGOs, to pressure the regime to formulate better policy strategies to reduce the environmental burden. This accumulation of pressure would demand that the government communicate with other actors to address these problems.

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[12] For example, carbon emissions in Brunei are caused by transportation and the generation of electricity used in government buildings and houses. Furthermore, in Brunei high car ownership and low usage of public transportation are other factors causing high carbon emissions in transportation sectors. During the UNFCCC conference in 2010 (UNFCCC, 2010), Brunei agreed to implement measures to reduce greenhouse gases and committed itself to scaling down the energy intensity by up to 25 per cent (using the 2005 benchmark) by 2030. In 2014, however, Brunei reaffirmed its commitment to a 63 per cent reduction in its total carbon emissions by the year 2035 through the implementation of Brunei Vision 2035 (using the 2009 baseline from the business-as-usual scenario) (Haris, 2014).

Peak oil, leading to an increase in fuel prices and the lack of transportation options, may burden people, especially low-income families (Litman, 2010). Because of peak oil, many nations have taken steps in terms of technological aspects, investigating alternative fuels such as natural gas-based fuels and electric cars, and policy, such as land use planning, in moving towards sustainable transportation (Aftabuzzaman and Mazloumi, 2011). Peak oil may affect future mobility behaviour, such as reducing car use and developing more fuel-efficient vehicles, thus leading to strong policy action towards renewable alternatives (Geels, 2012).

3.5.2 Regime in transportation

Actors such as governments and research institutions might analyse the changes at the regime level towards sustainability (Kemp et al., 2007; Domènech et al., 2014). For example, a government might employ researchers from either academic institutions or from consultancies to examine the perceptions and behaviour of the communities towards public and private transportation. The study might include the current situation of the transportation infrastructure, road conditions, the positive and negative perceptions of public and private transportation, and possible options in terms of mode of transportation and management. The research would provide feedback and a list of options (or upgrade service) and alternatives that favour the users (Geels 2002; 2004; 2005; 2010b) so the future transportation meets the needs and demands of the society.

Geels (2012) indicates several regimes in transportation, such as a cultural preference for cars, attitudes and behaviour towards cars and public transportation, and the physical landscape such as the separation of work from homes that leads to the increase in mobility. Cohen (2012) identified the mass marketing of cars, leading to the creation of recognisable brands of car becoming the signifiers of social status, as an important component of the regime.

The current public transport infrastructure is considered another regime. It is common to hear that public transportation does not meet people's needs and demands. Public transport is not the preferred mode of transportation due to many factors such as poor regularity and

frequency, inadequate security and little information (Beirão and Cabral, 2007; Belwal and Belwal, 2011; Buys and Miller, 2011; Gardner and Abraham, 2007; Hiscock et al., 2002; Stradling et al., 2007; Wall and McDonalds, 2007). GEF-STAP (2010) indicated that subsidies and the pricing system favour the development of car ownership, while some large cities, such as in Thailand (Bangkok) (Pongthanaisawan and Sorapipatana, 2010), China (Beijing) and Pakistan (Karachi) (Ahmed et al., 2008), are focused on planning for automobiles, and supporting private traffic, rather than on non-motorised and public transport. This further boosts the car ownership regime and creates an aversion to the use of public transport. Thus, it can be identified that some of the current rules are influencing the unsustainability of the current mobility model that renders public transport unpopular and underused.

Perceptions and behaviour of people concerning transportation are also part of the mobility regime. Most of the perceptions of public transport tend to be negative. However, an understanding of this regime may provide ideas on ways of improving the perception of sustainable transportation and the usage of public transportation. An example would be to create ways of changing travel behaviour amongst the potential green travellers group. This includes changes in two groups; the addicted car user and the reluctant public transportation user.

The first stage of the potential solution would be to improve the image of, and service provided by, public transportation. The case of Brisbane (Buys and Miller, 2011) is relevant, as the public transportation there is considered reliable, and there are other options such as making the area suitable for walking and cycling. The second stage would be to offer fare promotion tickets for a certain period of time; a trial of price concessions for the new residents in Brisbane was one of the alternatives used to encourage public transport take-up in Brisbane (Buys and Miller, 2011)).

Furthermore, Fujii and Kitamura (2003) indicated that a one-month free bus ticket encouraged the habit-change of car users and increased the bus use, even after a month of the free bus tickets. Thøgersen (2009) also indicated an increase in public transport use after a month long free travel card in Copenhagen. It was stated that after a month long free travel

card, there was a 10% increase in public transport use in the short time (previously 5 percent) and 7 percent six months later. This example might introduce the positive side of public transportation to both groups (public transport and car user group). In addition, it may reduce the likelihood of the 'reluctant public transport users' becoming 'addicted car users' if the reluctant public transport users have the opportunity to gain access to cars, with a resulting increase in car ownership. Furthermore, postgraduate students at the Universiti Kebangsaan Malaysia (UKM or in English, the National University of Malaysia) indicated that if there are reductions in travel time, travel cost and waiting time, as well as improvement to the bus stops, they would consider switching their mode of transport from cars to buses (Mohammed and Shakir, 2013).

An increase in public awareness does not necessarily contribute to low-carbon practices (Kern, 2012). In raising awareness and encouraging practices, the government, through various actors such as the media (newspapers, television, bloggers and websites), NGOs and research institutions, might co-operate to raise people's awareness, especially by targeting the 'the addicted car users' and 'the reluctant public transport users' groups to make them aware of the importance of sustainable mobility and the use of public transportation.

3.5.3 The niche

The government and public transport providers might invest in new public transport technologies to support the development of sustainable transport modes. The niche level might borrow technologies from other countries and further develop those technologies that are compatible with the local environment (resources and manpower). For instance, as mentioned earlier, Germany has a good public transport service and infrastructure (Buehler and Pucher, 2011). A developing nation might learn from the success of such projects in other countries, enabling it to renovate the system and technologies so that its public transport technologies are compatible with the current conditions of the country. Geels (2012) indicated that the niche-innovation has the potential to contribute to low-carbon transition.

Niche – Innovation	Contribution to low-carbon transition
1. Intermodal travel	New (integrated) modest transport
2. Cultural and socio-spatial innovation	Reduced travel distance, new ownership styles
3. Public demand	Reduced car use, behavioural organisational change
4. Public transport innovation	Modal shift
5. Information and communication technologies	
a. Intelligent transportation system (ITS)	Technical efficiency measures
b. Tele-working, tele-shopping etc	Reducing travel needs (substitutions)
6. Green propulsion technologies	More efficient fulfilment of existing travel needs

Figure 3.5.3 Overview of niche-innovation (Geels, 2012, p. 476).

Vergragt and Brown (2007) also indicate that governments can exercise their power to facilitate the development of niches by providing incentives and subsidies. Additionally, governments might regulate air quality, fuel type and pollutant emissions from automobiles. This may lead to less radical solutions, such as the development of non-motorised transportation (walking and cycling) and improvements in public transportation. The government might also influence the radical niche, such as redesigning the infrastructure and land use to reduce travel demand and promote the reliance on ICT, for example by tele-shopping and e-conferencing. This may lead to collaboration amongst the transport actors and other actors, who directly and indirectly influence the transportation scenario.

3.5.3 Common problems

Despite the positive promise of the move towards low-carbon transportation, there are several common problems that may occur. One such problem is that of choosing which technology to use. Geels (2012) indicated that green propulsion technologies are improving but car manufacturers do not currently know which technology to develop. Ho et al., (2014)

indicated that the trend in fuel cell technologies involves the researcher first needing to find systematic ways of producing technological innovation and enhancing performance. After the performance reaches an acceptable level, research needs to shift towards reducing the cost in order to prepare the technology for commercialisation. An example of this is Toyota; this Japanese company was derided for developing hybrid technology in 1997, as the cars were considered too complex and expensive, but the unexpected success of the technology caused other car manufacturers to develop their own hybrid models (Geels, 2012). Conversely, Geels (2012) indicates that the biofuel technologies face a dilemma over future development due to concerns over biofuel production, labour and the food riots[13] in 2007. Vergragt and Brown (2007) indicated that the hydrogen fuel cell technology is facing financial difficulties. Hydrogen fuel cells are considered expensive compared to traditional combustion engines. Furthermore, the issues in generating hydrogen have still not been resolved as the production of hydrogen uses electricity, whereas renewable energy should be used for sustainability.

Substitutions for the use of cars are also facing a dilemma, as these are thought to be insufficient in terms of meeting travel demands, such as acceptable journey times (Geels, 2012; Vergragt and Brown (2007). Geels (2012) indicated that transportation substitution

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[13] It was stated that the foot riots in 2007 is caused by dramatic increase in food prices causing economic, political and social instability in both poor and developed nations. The initial causes of the increase in food process includes unseasoned droughts in the grain producing nations and raising oil prices (causing the increase in transportation related cost). Furthermore the increase in the use of biofuels in developed countries particularly in USA and European nation (in order to promote non-petroleum energy) caused the competition for motorist for transportation (cereals for biofuel crops) and the poor for their survival. Additionally, President Bush called for the increase in the ethanol productions for vehicles in the USA caused farmers to switch to biofuel crops. The increasing demand for cereals in India and China causes more crisis in the food supply. For further readings:

1. Global food crisis looms as climate change and fuel shortage bite by John Vidal at http://www.theguardian.com/environment/2007/nov/03/food.climatechange,

2. A political Economy of the Food Riot by Raj Patel and Philip McMichael http://rajpatel.org/wp-content/uploads/2009/11/patel-mcmichael-2010Review321.pdf,

3. Foods vs Fuel: Diversion of crops could cause more hunger, by David J. Tenenbaum at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2430252/

might involve planning, especially in terms of providing park-and-ride facilities. Transportation substitutions may involve multiple actors, such as engineers, land planners and economists. However, the involvement of several actors (despite having huge advantages) may also create problems (Renn, 2006). This is because different actors may do things differently (Hendriks, 2009). According to Walker and Shove (2007), different actors may identify the sustainable form of transportation substitutions, type of technologies and pattern of consumption. However, too many options for substitution may create delays in the investment, for example in terms of which substitutions should be considered (Hendriks, 2009).

3.6 Theory of Planned Behaviour and Practice Theory

3.6.1 Theory of Planned Behaviour

The Theory of Planned Behaviour, aims to expand the Theory of Reasoned Action. The Theory of Planned Behaviour investigates how behaviour is performed and linked with intentions (Ajzen, 1991; Al-Chalabi, 2013). It is assumed that the model would help to predict behaviour by combining the person's intention and perceived behavioural control. The Theory of Planned Behaviour, according to Ajzen (1988), consists of three elements: attitude towards behaviour; subjective norms, and perceived behavioural control. The theory states that individual behavioural intentions could be shaped by these three stated elements, then the intentions later influence the person's behaviour.

The attitude towards behaviour refers to the personal evaluation of a particular behaviour; whether the behaviour is positively or negatively valued. It is also reflected by certain outcomes associated with different behaviour. Then, when the outcome of the behaviour is desirable, it will show a positive result, whereas the undesirable outcome reflects a negative result. For example, a person might want to use the bus to get to work. That person might ask himself, is it okay to use the bus? Is it good or bad to use the bus?

Norms tend to exert social influence or social pressure; whether people will approve and perform such behaviour or not. This reflects a person's beliefs about how the behaviour would be approved by people, or not; or whether the behaviours are performed by the majority of people. Using the similar example, the person who might want to use the bus to work would ask himself: what would others think if I use the bus to get to work? The majority of the users are foreigners, will my family approve of me using the bus? What will happen to my reputation?
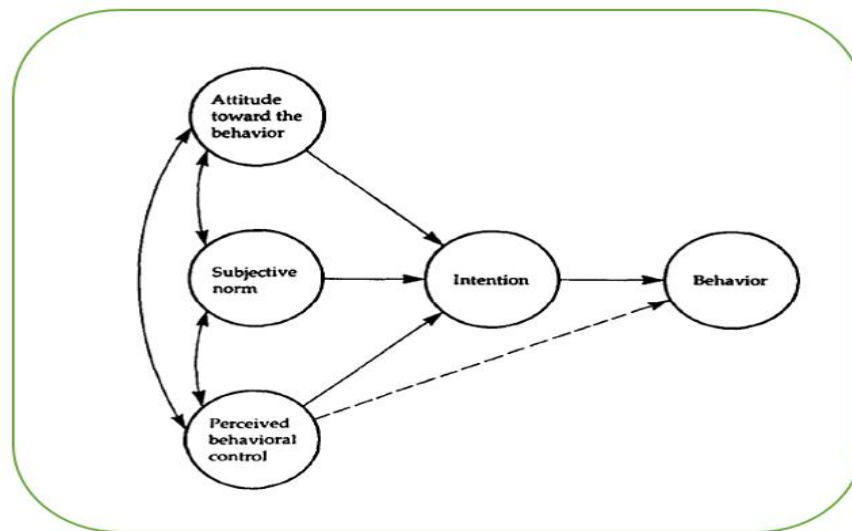
Figure 3.6.1 The Theory of Planned Behaviour (Ajzen, 1991, p. 182).

Perceived behavioural control reflects the perceived ease or difficulties of using or performing a particular behaviour. It is the perceptions of how easy or difficult it would be in order to carry out that behaviour. The perceived behavioural control consists of two components: availability of resources needed to engage in the behaviour (including money and time) and the person's self-confidence in their ability to conduct the behaviour (Chiou, 1998). For example, the person considering using the bus might face difficulties such as services not being available in his housing area or no there being no direct route to his workplace, causing him to travel longer compared to the use of a car. Of course, a person needs to have the money, resources and confidence to use a car for employment travel, rather

than using the bus[14]. By referring to the Figure 3.6.1, the perceived controlled behaviour could also be directly linked to the behaviour. This is when the perceived behavioural control is related to the self-efficacy or confidence, by which the person perceives they have the ability to perform that behaviour (World Bank, 2010).

Intention refers to the indication of an individual's readiness to perform a specific behaviour. This is the combination of the attitude, social norms and perceived control behaviour.

"*Intentions are assumed to capture the motivational factors that influence a behavior; they are indication of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behavior. As a general rule, the stronger the intention to engage in a behavior, the more likely should be its performance*". (Ajzen, 1999, p. 183).

The model indicated that if the intention is low and the person believed that they do not have the capacity to perform, the role of perceived behavioural control could directly influence the behaviour.

ABC, or the 'attitude, behaviour and choice' framework, facilitates study of the social aspect of the community in the move towards transition. This framework is part of the Theory of Planned Behaviour and it depends on the values and attitudes (A) which are believed to drive the kind of behaviour; (B) the individual chooses; (C) to adopt. DEFRA has used this framework to analyse pro-environmental behaviour (Shove, 2009). DEFRA uses the public understanding, attitudes and behaviour, identifies behaviour goals, and draws conclusions on the potential for change across a range of behaviour groups (Shove, 2009, 2010). In this framework, the responsibilities for pro-environmental behaviour are placed on the individuals, as they themselves will make the decisions on their chosen options and behaviour. This is because the individual is the consumer, who uses the products or services offered by the government and the industries.

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[14] Ajzen (1991) given the example of two people have equally strong intention to learn and try skiing. Ajzen (1991) indicated that the person with low self-esteem (low confidence) tend to fail compared to the person with high confident.

Shove (2010) is not a proponent of this ABC framework. First, due to the placing the responsibility of change onto an individual's shoulders. Shove (2010) argues the validity of individual behaviour to adopt the sustainable. It was seen that policy makers view individuals as having the ability, the knowledge and the resources in making their choices; thus it is possible to change their attitudes and behaviour towards a more pro-environmental lifestyle. However, not all individuals have the required knowledge and capability to make the right decisions towards sustainability. Several studies indicated that there are positive correlations between pro-environmental behaviour and the person's level of education. For example, those with higher levels of education are likely to recycle (in Ontario, Canada, according to Ferrara and Missios, 2005), or likely to participate in water saving behaviour in Devon, UK (Gilg and Barr, 2006) or to have higher levels of environmental concern in China (Xiao et al., 2013). It is necessary to study the pro-environmental behaviour of those with lower education levels or who have not received any formal education and it leads to the question of what type of information is available to the individuals that will ensure their attitudes and behaviour are pro-environment? Further, what steps are to be taken to encourage those who are neutral or non-pro-environment to change their attitudes, behaviour and decision to choose greener or sustainable options (such as are there any policy that would act as pull or push factors towards sustainability)?

In addition, placing the burden of adopting a pro-environmental attitude on the individual, leads to the questions of 'are consumers able to act out their pro-environment attitudes?' How can the community encourage people to adopt a more sustainable way of living? This is related to another of Shove's opposition argument to the ABC framework. She argues that policy makers avoid making difficult policy changes and infrastructure and rely on the intervention appeals by the community. She argues that environmental policy fails to change an individual's behaviour. Policy models are keen on highlighting that the damage is the consequence of individual actions and keen to reinforce the idea of attitudes that drive the behaviour towards lifestyle choice by restudying the attitude towards climate change. Thus, it was pointed out that policy makers will continue to encourage and support pro-environmental behaviour as their mitigation strategy. Thus, those with non-pro-environmental behaviour are persuaded with information about the change and the anti-environmental individual, who was

unwilling to behave in a sustainable manner, might turn to technology in order to be pro-environment. Stewart et al., (2011) studied the residential water consumptions though the shower monitors in Gold Coast City, Queensland, Australia. The study findings revealed that the majority of the participants were aware of the importance of water conservation and indicated their willingness to reduce their water consumption from showering activity.

The study revealed that reduction of water consumptions is achieved, but in the very short time. This is because, in the long term behaviour, the study indicated that people will revert to their old showering habits, thus indicating the inconsistency of perceived water use behaviour and perceived behaviour. Thus, this study also reflects the fact that the intended behaviour change may not be achieved and its authors called for further research into changing routine behaviour that may have the potential to achieve long-term water saving goals. These findings support the arguments by Shove that study of individual behaviour and lifestyle would go without boundary and thus, by referring to the Steward et al. study, the policy makers are keen to invest in intervention by investing in the achievement of short term results. Thus, Shove (2010) argues that policy makers and governance should avoid making difficult policy changes and thus divert attention away from change that is not parallel with the ABC model.

An historical study is also mentioned by Shove (2010 pg. 3) when she stated that:

"*As this catalogue suggests, there is no obvious limit to the number of possible determinants and no method of establishing their history, their dynamic qualities, their interdependence or their precise role in promoting or preventing different behaviours. As James Blake (1999) observes, this feature leaves policy makers free to focus selectively on those barriers which are unrelated to the role or previous effects of policy itself.*"

"*In the present context the crucial point is that history matters, generating pockets of stability and pathways of innovation and effectively shaping behaviour in ways that figure not at all, or not at all explicitly, in the ABC.*" (Shove, 2010, pg. 5).

Shove indicated that historical studies are included as one of the interdisciplinary approaches to understand about the ways of life and how they change, as illustrated in the transition management literature. Studying the past is necessary as it would further explain how people behave and how the behaviour evolved as time progressed (refer to the transition from cesspools to hygienic integrated sewer systems in 19th century Holland). Thus, technological innovation only provides a partial answer to sustainability; the historical case study focuses on socio-cultural behaviour of the community, as well as on the combination of regimes and technological innovations, and so would redefine the policy framing from focusing on individuality and product innovation.

Essentially, the attitude of using cars has helped Bruneians to participate in transport-related activities, especially those related to employment and leisure. With their limited services, buses are seen to make a negative contribution towards mobility, especially in terms of getting to work or school on time; a situation which has developed a negative attitude towards switching from cars to buses. Furthermore, car use offers freedom to travel, to arrive on time, and greater accessibility without having to make multiple stops in order to reach the desired destinations (as happens when using the bus in Brunei), thus reinforcing positive attitudes towards car use. During the mini-exploratory activities (part of the current research, mentioned in Chapter 4.4), numerous negative factors were revealed by both Bruneians and non-Bruneians (either car or bus users) on the current condition of bus services in Brunei. When asked about the positive factors about bus services in Brunei, the only identified factor was the cost of bus tickets, although the majority of the bus users think that multiple destination travel is more expensive, compared to the use of cars. Thus, this bus situation has fostered a negative attitude for the Bruneians, and some non-Bruneians, regarding the use of buses in Brunei.

The majority of the non-Bruneian bus passengers indicated that not having a car is one of the factors that forced them to use the bus. For the Bruneians participants (mini-exploratory activities), the use of buses is considered un-Bruneian, and mixing with low-income non-Bruneians would tarnish their reputations. Furthermore, using the bus would make other people think that the passenger could not afford to own a car, thus harming their social status.

As for school students, the majority of their parents do not allow them to use the public bus, the school bus, or walk or cycle to school, thus further influencing the younger generation to use cars in the future.

It can be deduced that by the over dependence on cars for travelling, Bruneians might perceive that they have control of their transportation activity. Furthermore, available resources such as salaries with no personal tax, low cost insurance and road tax, and heavily subsidised fuel (petrol and diesel) cause the car in Brunei to be easily affordable. Additionally, it is considered easy to travel by car with little effort and more convenience, particularly when compared to the use of buses. Furthermore, the road design in Brunei has targeted car use, thus taking a bus ride is considered hard and difficult to do. Bruneians have the confidence, in terms of safety, to use their own car. Mini-exploratory activities revealed that participants provided abundant responses as to why using buses in Brunei would be a difficult task. Even the non-Bruneians identified the problems of accessing information and travel times, especially during the peak hours, as the main barriers to using the bus.

Thus, the intention for bus use behaviour in Brunei, according to this ABC model, is considered low and thus reflects the lack readiness of Bruneians to change from travelling by cars to becoming bus passengers. Despite some Bruneians indicating their willingness to try, however, negative attitude towards buses are the norm and the barriers to bus use in Brunei would provide a challenge to changing car-oriented behaviour to public transport-oriented behaviour.

3.6.2 Theory of Practice

Theory of Practice is a social science framework which offers ways of understanding and explaining how human activities are shaped or being shaped by social situations. The theory is focused on the practice of doing and saying. The theory was drawn by Bourdieu (practices and habit) and Giddens (saturation theory). Later, Schatzki and Reckwits contributed to the development of the theory of practice by analysing the practices.

The theory is different from the Theory of Planned Behaviour in which practice theory departs from individual theory, where individuals are responsible for their actions, the burden of change being placed on the shoulders of individuals (Spaargaren, 2011). Furthermore, Spaargaren (2011) indicated that an individual's thinking and doing are shaped by fellow citizens, whereas the theory of practice tends to be specifically focused on what the individuals do, say, feel and mean to do (Warde, 2005).

Watson (2012 p. 489) indicated that:

"practice approach deployed for and through a focus on the details of doing, the role of embodied knowledge and skills, of routine and habit, and the affective experience of being and doing in the world."

Reckwits (2002, p. 250) indicated that:

"A practice is thus a routinized way in which bodies are moved, objects are handled, subjects are treated, things are described and the world is understood. To say that practices are "social practices" is indeed a tautology: A practice is social, as it is a "type" of behaving and understanding that appears at different locales and at different points of time and is carried out by different body/minds."

Readings from Ropke (2009), Watson (2012) and Warde (2005) reveal that the essence of the theory of practice is that the theory does not start from the assumption of explaining an individual's decision making. Instead, the theory begins with history, by which it analyses the practices from the history of the practices and how they develop over time. Practices are developed over time by practitioners engaging in what they do. As the practice began to diffuse, society tried to make the behaviour well known. The practice is later taught to the beginner (young or novice) to improve the practice performance so the practices are protected and nurtured. However, new practices emerge and practices tend to change over time. Innovations are required for new practices to emerge and the stability of these new practices are diffused and taken up by the society.

In relations to theory of practices and consumptions, Strengers (2010) believed that looking into the reasons why people consume energy it is more important to look towards behaviour change, rather than reviewing the household as the consumer of aggregated resources. Strengers (2010 pg. 7) also indicated that *"Practices are created, sustained and transformed through their reproduction in everyday life."* Thus, changing people's behaviour through learning their practices is the critical element in reducing the negative environmental effects of transportation. Strengers (2010) identified four component concepts in everyday life related to practices.

1. Practical Knowledge

   Practical knowledge illustrates the skill required for a particular practice to be done. It is the product of social history (by individual experiences) which are common with the same society (with the same practices).

2. Common Social Understanding

   Common understanding about being accepted or not.

3. Rules

   Rules of social life that have to be observed. It is also known as the mandatory aspect of the practices which must (or must not) be done. Rules can contribute to reconfiguration and continuation of practices.

4. Material Infrastructure

   Technologies, infrastructures and systems which make practices possible to be done.

Strengers (2010, pg. 16) illustrated that

"… 'Crises' occur when there is a shift in the composition of a practice. Even seemingly individual 'crises', such as an illness in the household, may lead to modified comfort and cleanliness practices which emerge out of: common understandings about health, hygiene, cosiness and 'wellness'; practical knowledge about how to maintain these understandings;

available material infrastructures such as 'hot water bottles', heaters or baths; and rules about how to care for a person with a particular illness."

Thus, in relation to transportation, a crisis could cause transformation of practices. For example, an oil crisis could lead to modified practices in the use of cars. The increasing cost of fuel leads to travelling by car becoming more expensive, and it makes sense that travelling by bus is cheaper. This conclusion leads to the common understanding that it is socially accepted to use the bus as the rules governing the practice of the excessive use of cars must no longer be followed. This would eventually reconfigure the bus practices, which were being practiced previously, and the rules would lead to the continuation of the bus travelling behaviour. Then, the availability of the material infrastructure, such as a bus service and infrastructure, as well as the technology, would make the practice of using the bus happen.

Gilbert and Perl (2010) wrote a book on the transport revolution in which they introduced several concepts in order for a transport use transition to occur. Some of the key concepts are the changes in behaviour, risk taking investment and the role of governance for a (transport) revolution to take place. Thus, the authors tended to reject the theory of planned behaviour (individualism, based on table 3.6.3) and seem, at least partially, to support the practice theory.

The authors also indicated that substantial change is needed and chose 2025 as the year in which transportation would be consuming less oil, especially as a result of redesigning the transport system. Thus, changing or shifting everyday practices to be more sustainable would create substantial change, compared to the shift or change of individual behaviour towards sustainability. The book uses oil peak and oil prices in order to create the 'crises'. The authors believed that the amount of oil available for use after about 2012 is progressively declining and stated that the world oil production is peaking. Furthermore, the uncertainty of oil prices would also affect people's economic and social lives[15].

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[15] The book concentrates mainly on the effect of high oil prices. The book indicated that the US housing sectors faced problems due to the high oil prices. This includes the household budget and house marketing (due to interest). The fall in oil prices also has negative effect, especially for the oil-producing nations. For the drop in

The 'crises' could transform our practices from the excessive use of cars (fuelled by oil) to a green transport alternative. With the depletion of oil, the cost of transportation would increase. People would modify their travel patterns and behaviour to respond to the increased oil prices. However, modifying travel patterns is not enough; thus shifts and breaks in everyday travel patterns would shift travel behaviour from cars to green alternatives, including the use of non-motorised transport. With the crisis and the practical knowledge of the need to reduce the cost of travelling, it would promote social understanding that it is acceptable to use the car less and later study the transport behaviour and attitudes that are proscribed in response to the crisis.

The use of the theory of practice is useful in facilitating the change. Warde (2005) indicated that practice theory tends to be specific regarding what individuals do, say, feel and mean to do. Shove (2010) also indicated that studying history leads to the use of history to study practice. History would help to analyse the development of the practices and how they developed over time. Such a focus would also lead to an understanding of how people conserve the reproduction of their behavioural practices and pass them on to their future generations. The conserving and reproducing of practices lead to social transformation. The role of governance, including risk-taking investment, in providing alternatives to cars generates the 'available material infrastructure' for attitude and behaviour to change.

Gilbert and Perl, (2010) highlighted that major improvement, in terms of investment and risk-taking, would be required in order to launch revolutionary new modes and/or systems of mobility. Gilbert and Perl (2010) use the success of the high speed train in France as a case study on how revolution can trigger the reinvention of obsolete transport; in this case a rail-track-based high speed train. Thus, a transport revolution could reinforce the concept of mobility options that are declining or facing huge competition from other modes of transport, especially cars. This is considered problematic, especially for theory of planned behaviour to work.

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oil prices in 2014, Brunei faces a budget deficit for fiscal year 2015/2016 and in the new fiscal year, the total government revenue will drop by $1.572 billion (Shahminan, 2015).

Furthermore, Gilbert and Perl (2010) highlighted the role of governance, especially the role of government, towards reorganizing transportation and weigh the importance of changes in technology which carries the same weight as organizational change, in order for a transport revolution to take place. By using Table 3.6.3, the Social Practice Theory targets the socio-technical systems (rather than individual choices) as the intervention target and using the technology and market to determine the fate (success and failure) of green products and ideas. Furthermore, according to Spaargaren (2011), the Dutch policy makers were aware that the Theory of Planned Behaviour was a weak predictor for actually performed environmentally-friendly behaviour and turned to other concepts (e.g. systematic system) for transition to occur.

Individualist paradigm (socio psychology/economics)	Systemic paradigm (sociology/science studies)
Individuals and their attitudes are key units of analysis and policy	Producers/states and their strategies are key units of analysis and policy
Behavioural change of individual is decisive for environmental change	Technological innovation within the production sphere is decisive for change
Individual choices are the key intervention targets (micro level)	Socio-technical systems are the key intervention targets (macro-level)
End-users/consumers determine the fate of green products and ideas	Technologies and markets determine the fate of green products and ideas
Key policy instruments and approaches: social (soft) instruments (persuasion through information provision)	Key policy instruments and approaches: the use of direct regulation targeting providers (law, market based instruments)

Table 3.6.3 Individual Paradigm versus Systemic Paradigm (Spaargaren, 2011, p. 814).

Practice theory is a good starting point for improving our understanding of how everyday lifestyle and behaviour could lead to more sustainable way (such as recreating the habit towards water efficient usage). However, by referring to Table 3.6.3, the use of technological innovation, markets and law and market- based instruments might not be accepted by society (non-technological factors, such as mixed use development mentioned by Hickman (2013) (in Givoni and Banister, 2013) is also needed for transportation transition to occur) Furthermore, the practice theory does not emphasise the individuals-with-capabilities that would be useful in order to determine the niche for low carbon transportation. Thus, depending on the Practice Theory for transition to low carbon transportation in Brunei is considered insufficient.

3.6.3 Theory for low carbon transition

Reading from both books (Gilbert and Perl, 2010 'Transport Revolutions: moving people and freight without oil' and Givoni and Banister, 2013 'Moving towards low carbon mobility') this researcher concluded that there are five key elements that are needed for transition to low carbon transportation in Brunei. The five elements are:

1. Leadership

   The transportation sectors in Brunei are handled by various departments from different ministries (for example, the Land Transport Department from the Ministry of Communications and the Department of Roads from the Ministry of Development). Despite the involvement of various government departments, the transport system in Brunei is still struggling to keep up with the current demands and public transport is struggling to keep up with the current needs of the Bruneians. Thus, (see chapter 10), new leadership in transportation in needed, whereby a new body is proposed to handle all the transportation sectors. The new leadership in the transportation sector in Brunei also needs e participation from all stakeholders, which bring up the second element: partnership.

2. Partnership (public-private partnership)

   Macmillen (2013) indicated that a fresh transport policy towards transportation might come from the transport sectors. Furthermore, the involvement of various transport and non-transport stakeholders might formulate better policy strategies that would have higher chances of success, compared to focusing on the policy formulated by the government. Additionally, as mentioned by Gilbert and Perl (2010), the involvement of other stakeholders such as through the public-private partnerships, would reduce the burden of the government in financing the projects as well as a new approach towards low carbon transition in Brunei, especially using the experience of franchise bus companies in Brunei, which have been in operation for more than 17 years.

3. Non-technology

The new leadership, as well as partnerships, especially if working on transport policy, calls for both technological and non-technological transition in transportation. Gilbert and Perl (2010) emphasise focus on electric vehicles as the major mode of future transportation that would replace the use of oil. However, the emphasis on technology is insufficient, especially in Brunei. Thus the combination of non-technological factors, such as mixed use development mentioned by Hickman (2013) (in Givoni and Banister, 2013) is needed in order for an environment-friendly transition to occur.

4. Future society and transportation

Both books explore the future of society and its transportation needs and demands; particularly the current trends in transportation. Gilbert and Pearl (2010) touch on the issue of car ownership, its relationship between residential density and car travel, and the distances travelled by car and freight. By exploring the current society and the existing transport conditions, the future society's transportation system and model could be predicted. It might help to reinvent the social practices that are more towards the use of public transport, before the car replaced public transport as the preferred mode of transportation. Furthermore, the use of technology and other renewable energies such as biofuels and natural gases, hydrogen and electricity, widely mentioned by Gilbert and Perl, (2010) might help towards initiating a low carbon transition in Brunei, moving away from oil-based fuels.

5. Experience

Experience from other countries regarding transport sector issues is beneficial to Brunei. Chapter 1 in Gilbert and Perl (2010) extensively examines past transport revolutions, especially in Europe and Japan. Also explained is how the public-private partnership has helped to regenerate the development of high-speed rail in France. Furthermore, the free month-long travel card, as mentioned by Al-Chalabi (in Givoni and Banister, 2010), helped to increase the public transport ridership in Copenhagen. Thus, learning from the reported experience in transportation case studies would be

beneficial to achieve a successful environmentally-friendly transportation transition in Brunei.

The five key elements from the two books have further motivated the researcher to use the transition management approach to tackle the transport situations in Brunei. Furthermore, this thesis does not believe the sole use of the theory of planned behaviour (such as the ABC framework) and the theory of practice, to be sufficient for the transition to low-carbon transport in the Brunei context[16]. The reader is referred to the chapter 3.5 for the reasons justifying the use a MLP of the STT for studying low carbon transport emissions in Brunei.

However, the researcher believes that these frameworks might be used to identify some potential changes in low-carbon transportation users. It might also provide some suggestions on the management and policy towards the transition of different groups. The frameworks might be used, for example, in questionnaire surveys and interviews to investigate the current attitudes and behaviour of the locals (practice theory) or, by using perceived behavioural theory, to improve the level of environmental awareness or to create more low-carbon initiatives that include technology and infrastructure with regard to low-carbon transportation. The results might be translated into strategies and policies to reinforce attitudes, behaviour and lifestyle choices (Shove, 2009; 2010) concerning low-carbon transportation. Furthermore, the framework would help to identify the level of services demanded by customers, such as the young and the elderly. The framework might also help to improve the buses' image (Beirão and Cabral, 2007; Hiscock et al., 2002) in order to attract potential bus users in Brunei. It would break the old unsustainable habit and create

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[16] By reading the books "Transport revolutions: moving people and freight without oil" and "Moving towards low carbon mobility", this researcher concludes it is important to shift our transportation behaviour towards more green practices. Both books emphasize the role of governance in terms of decision making and investment, the role of technology as well as reinventing the old, more sustainable travel practices. However, this research believed that transition management is the best framework for initiating a low carbon transport transition. This is because, transition management could combine the two theories into one and may compensate for the weakness of both theories.

new sustainable ones. It would also give the transportation sectors ideas about investing in sustainable transportation options[17].

3.7 Conclusion

This chapter has discussed how the transition process, through the STT concept, might be used as a method of analysing the potential use of low-carbon transportation in Brunei. Yet, there are still some weaknesses in, and criticisms of, the use of MLP for the transition process, as already mentioned in this chapter.

However, studying the successes and failures of previous projects and studies on the use of the MLP may provide insights into things to do and things to avoid before, during and after the transitional processes. Those insights may eventually provide lessons on, and alternative approaches to, the possible transition processes, especially for the transportation sectors.

The STT concept can be applied in the Brunei transportation context. Despite the fact that Brunei is considered a new country, only gaining independence in 1984, and with limited experiences of transition processes when compared to other countries, the process might still be applied. Considering the current situation in Brunei with its high carbon emissions per capita, with growing support in society for green notions, and with the government's initiative to reduce energy consumption, mainly through the Energy Department of the Prime Minister's Office (EDPMO), it seems that a low-carbon transport transition, or at least an enhancement of the perceptions and behaviour towards one, might be achieved. One of the aims of this study is to understand how the transition concept and MLP need to be adjusted for application in a developing-country context. The other key contribution of this study will be to better understand and integrate the role of the public in the MLP.

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[17] The combination of, for example Bus Rapid Transit (as a result of reinventing the bus behaviour through Practice Theory) and the use of technology for shopping (intervention resulted from the ABC framework) would be beneficial in reducing the over dependence on cars and thus reduce the carbon emission from car-based activities in Brunei.

Chapter 4: Research methodology and design

4.0 Background

This chapter describes the methodology used in this research study and explores the research designs, methods and the procedures for collecting the data. Also discussed are the ethical aspects of collecting the data, the limitations and problems encountered during the data collection process, and approaches to finding solutions to these problems. It is necessary to acknowledge that the aim of this research study is not to offer the government or any interested party a solution to the problem of how to develop low-carbon transportation. However, this study seeks to identify the current transportation issues in Brunei to help create an understanding of transport-related issues. For instance, the government of Brunei has offered public transportation, via non-government organisations, to the community and has improved services and the infrastructure of public transportation. However, *The Brunei Time*s (Shen, 2011) indicated that 70 per cent of the bus passengers in Brunei Muara are from the immigrant population, which makes up about 27% of people in Brunei (Department of Statistics, 2012)). What are the reasons for this? Is the government not doing enough to promote the use of public transport or does the community not wish to use public transport? Hence, this research study employs mixed methods, uses survey questionnaires administered in the four districts of Brunei, as well as interviews to identify the issues behind the transportation conditions in the nation.

4.1 Research

Research is a process of gathering valuable information to find answers to questions that might increase the understanding of the topic, issues and problems being studied (Burns, 2000; Creswell, 2008; Gilbert, 2008; Kitchin and Tate, 2000; Matthews and Ross, 2010). Research can be conducted in several ways. It may involve human participation, such as by asking questions via questionnaires and interviews, listening to the experiences of the participants and observation. The gathering of information may lead to new information, thus creating a better understanding and improving our knowledge of various topics (Creswell, 2008). This is achieved by analysing the data and evaluating and interpreting its significance (Kitchin and Tate, 2000), thus helping us to see the issues from different angles.

4.2 Methodology and research design

4.2.1 Pragmatist paradigm

The researcher argues that it is important to learn from Bruneians' and non-Bruneians' perspectives, as they will provide valuable insights into how Bruneians view cars and public transportation. However, there is a significant lack of research on transportation sectors in Brunei, especially research investigating the behaviour and perceptions of Bruneians regarding modes and systems of transportation. The researcher believes that the use of qualitative and quantitative methods is important to understand the sustainability issues relevant to transportation in Brunei, as previous studies in this field have been inadequate. Thus, this study adopted a pragmatist paradigm to describe the behaviour and perceptions of Bruneians regarding sustainability in transportation.

The adoption of this paradigm is based on the view of Klenke (2008 p. 26), who stated: "*Pragmatism supports the use of both qualitative and quantitative methods because the complexity of the context in which they work demands multiple methods*". Furthermore, "*Individual researchers have a freedom of choice. In this way, researchers are free to choose the methods, techniques, and procedures of research that best meet their needs and purpose.*

Creswell (2009, p. 11) added: "*The pragmatist researchers look to what and how to research, based on the intended consequences – where they want to go with it.*"

Four Worldviews	
Postpositivism	**Constructivism**
Determination	Understanding
Reductionism	Multiple participant meaning
Empirical observation and measurement	Social and historical construction
Theory verification	Theory generation
Advocacy/Participatory	**Pragmatism**
Political	Consequence of actions
Empowerment issue-oriented	Problem-centred
Collaborative	Pluralistic
Change-oriented	Real-world practice oriented

Table 4.2.1 Philosophical worldviews (Creswell, 2009, p. 6).

The use of the pragmatist paradigm will help to create a better and deeper understanding of the Bruneian perspective on transportation and promote behaviour and perceptions that may more readily accept better transportation in Brunei, especially by creating awareness and targeting the younger generation, while improving the bus services and facilities. Thus, the mixed-methods approach is considered suitable for this research as the pragmatic paradigm and mixed methods will "*… open the door to multiple methods, different worldviews and different assumptions, as well as different forms of data collection and analysis.*" (Creswell, 2009, pg. 11).

4.2.2 Research design

Research design is an important consideration in determining the strategy of the research. The research design helps researchers to integrate all parts of research methods and the steps of acquiring and analysing data, such as data collection, data analysis, methods of acquiring data and reporting the data, in order that the research might address the research questions systematically (Bryman, 2004; Burns, 2000; Gorard, 2010; Kitchin and Tate, 2000). This is necessary as the research design addresses the issues of data collection methods, sampling, and question design, which are important for the accuracy of the data.

This study uses a multi-method or mixed methods design involving the use of both qualitative and quantitative methods to provide a comprehensive and in-depth understanding of the study topic. In addition, photos and secondary data are used to support the primary data. The information gathering strategies will include the use of survey questionnaires and interviews, along with photos taken by the researcher, secondary data source such as books[18] and government leaflets, as well as newspapers[19]. PASW (18) software will be used to analyse the quantitative data and NVIVO 9 software will be used for the interviews.

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[18] This thesis also uses The Report, published by the Oxford Business Group. The Oxford Business Group is a research-publishing firm founded in 1994 by Oxford graduates, based originally in the university town. The Group published authoritative reports and online economic briefings covering 34 countries around the world (Oxford Business Group, 2013). The Report: Brunei Darussalam 2008 also includes the interviews from the key role players in Brunei including His Majesty, The Sultan of Brunei, Brunei government ministers and managing directors of Brunei Shell Petroleum, the CEO of Brunei Methanol Company and CEO of Standard Chartered Bank.

[19] Brunei has two English newspapers: *The Borneo Bulletin* and *The Brunei Times*. This thesis uses more online articles from *The Brunei Times* as this newspaper allows users to read previous articles. The use of articles from *The Borneo Bulletin* is limited.

4.2.3 Research questions

Research questions serve as a guide to undertaking the research (Matthews and Ross, 2010), emphasising the purpose of the study (Creswell, 2003). The research questions that framed the study (based on the study aim[20]) were as follows:

1. What are the political, social and economic contexts of ground transportation in Brunei?

2. What steps have been taken in Brunei to promote sustainable transport (at both regional and national levels of governance)?

3. What is the attitude and behaviour of people in Brunei to different transport options (especially cars and buses?

4. What does the MLP of the sustainable transport system consist of in the Brunei context?

Certain impacts of research activities may contribute academically, environmentally, economically and socially especially to Brunei. This is because research gives us information about the topic being studied, such as the attitude of car owners to the use of public transport. It is considered important to conduct research on transportation, especially people's perceptions and behaviour regarding the use of public and private transport systems. Transportation should offer comfort, convenience and services to people. For example, in terms of the social approach, transportation offers greater mobility, which increases accessibility to meet the requirements of daily life. However, transportation also presents significant challenges to sustainability, as seen in traffic jams, environmental degradation and pollution.

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[20] The aim of this thesis is to assess the suitability of the sustainability transition theory for analysing the development of low-carbon transport in Brunei.

Given that the aim of this research is to examine why people prefer to use either cars or buses, based on their perceptions, norms, culture and socio-economic backgrounds, it is appropriate to collect primary data via a survey of the public. This will provide information for decision-making, such as on the funding for public transportation (Buehler and Pucher, 2011), car ownership restrictions (Seik, 2000), and the chance to improve perceptions of public transport services, which tend to be negative, (Belwal and Belwal, 2011; Bureau and Glachant, 2011; dell 'Olio et al., 2010) by creating a better public transport image and improved services and infrastructure in the future.

Due to the limited research conducted in Brunei in the transportation-carbon-related field, this research study hopes to initiate more researches, especially in the following areas:

1. Establishing the link between transport and a sustainable economy and society

2. The involvement of environmental and human factors in transport planning

3. Promoting the use of green transportation

4. Understanding the current trends and future transportation sector moves towards sustainability

5. The role of technologies in greener transportation.

4.2.4 Mixed-methods design

Mixed methods use both qualitative and quantitative methodologies employed to gather information (Bryman, 2004; Creswell, 2003), or two or more qualitative/quantitative methods (Alexandra et al., 2008). Due to the complexity of transportation issues and the lack of published information on transportation in Brunei, it is hoped that the combination of quantitative and qualitative methods will provide enough information to address the research questions. Furthermore, Creswell (2009, p. 4) stated that mixed methods *"involve the use of both approaches in tandem so that the overall strength of a study is greater than either qualitative or quantitative research."*

The first stage of the research was the quantitative method, employing a questionnaire survey. 500 sets of self-completion survey questionnaires were distributed in the four districts of Brunei. The respondents were selected from different areas such as residential areas, marketplaces, recreational areas, government and private sector offices, and academic institutions. This study then used a qualitative interview method for the second stage of data collection. 30 participants were recruited for the interview process; 26 of whom successfully completed the interviews. The third stage of the research was to integrate the findings from the quantitative survey questionnaire and the qualitative interviews.

4.2.5 Quantitative methods

Quantitative methods tend to collect information and then transform it into numerical data (using coding), before using mathematics to explain that data (Muijs, 2011). A quantitative method is defined as a method of gathering data using specific techniques to convert them into numerical values[21]. The data are quantified using coding and are given numerical representation. An example is the use of Likert scales. Bryman (2004), Burns (2000), and Procter (2008) indicated that Likert scales can be used to measure attitudes to a particular subject, i.e. the level of agreement and disagreement on a certain subject or topic. The Likert scale[22] used here is a 5-point scale, and participants may choose 1 for strongly satisfied and 5 for strongly dissatisfied. The scale will help summarise and describe the data in numbers such as perceptions, opinions, feelings, attitudes and other aspects of social realities.

An example of quantification of the data was the performance ratings of public transport qualities in Britain (Johnson et al., 2008). The perception of performance is translated into a number, with good performance as 1 and bad performance as 4. The study revealed that the

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[21] For instance, under the gender category, male participants are coded as 1 and female participants are coded as 2; participants who do not wish to specify their gender are coded as 3, and 99 is used for missing data.

[22] An example of a Likert scale (in answers) is as follows: very satisfied is coded as 1, satisfied as 2, non-user is coded as 3, dissatisfied as 4, very dissatisfied as 5 and missing data as 99.

public felt that the car was the safest while the bus was the least safe, and the level of comfort provided by the car was greater than that provided by buses and the metro.

Questionnaires have been widely used to collect data in research (McLafferty, 2010). The questionnaire survey is useful for gathering people's attitudes, behaviour, opinions and interactions on several issues (McLafferty, 2010; Parfit, 2005). The questionnaire might look at the attitude and behaviour of a certain group regarding specific issues, in this case transportation issues, such as the attitudes of the young and elderly to public transport. The questionnaire might be employed to gather information on Bruneians' attitudes and opinions on transportation and to indicate how strongly they agree or disagree with particular transportation statements. There is a lack of research on transportation topics in Brunei, therefore questionnaires are beneficial for gathering large amounts of data and are capable of reaching people living in both rural and urban areas.

Brunei still lacks published research on, and is still new to, environment-transportation issues. Thus, it would be advantageous to use this method to gather a large sample of information that has not yet been published by government sources. Therefore, a survey might be used to generate information about the attitude and perceptions of the community on the issue of transportation, particularly car ownership and public transportation use, associating variables such as age, income and level of education with behaviour regarding car and public transportation use.

Questionnaires are usually kept simple (McLafferty, 2010; Parfit, 2005) to make them easier to understand and to respond to (Bryman, 2004). The cost of a self-completion questionnaire survey is considered cheaper than conducting interviews, as it avoids the cost of providing food, drinks and complimentary gifts (Bryman, 2004; Parfit, 2005; Simmons, 2008). In addition, the questionnaire survey is not time-consuming for either the researcher or the respondent. The researcher might distribute a large quantity of questionnaires; 500 in this current case (Bryman, 2004). In addition, the questionnaire instructions advise the respondents on the anticipated amount of time required to complete the questionnaires, which will be shorter than interviews and focus groups (Bryman, 2004; Kitchin and Tate, 2000). The researchers do not have to use complicated coding, unlike for interviews and focus

groups (Simmons, 2008), and computer programmes speed up the data entry and analysis (Bryman, 2004; Simmons, 2008). The questionnaire survey eliminates the problems of interviews, such as issues of confidentiality (Kitchin and Tate, 2000; Simmons, 2008), and the respondents can answer the questions at their own pace and at a time convenient to them (Bryman, 2004), although coding survey responses can be time-consuming.

However, there are some disadvantages of questionnaire surveys. One problem is the response rate. The respondents are not obligated to answer the questions, and they are free to withdraw from the survey process. Some evidence of the low response rate in transportation surveys is provided by Abrahamse et al. (2009) in British Columbia, Canada (47 per cent via survey distribution), Bergstad et al. (2011) in Sweden (40.3 per cent), Buys and Miller (2011) in Brisbane, Australia (28 per cent) (and using another 24 interviews), and Loukopoulos et al. (2005) in Gothenburg, Sweden (52.5 per cent via email).

Unlike in interviews, the respondents may not know how to answer the questions or they may be confused by them (Bryman, 2004; Cloke et al., 2004), thus causing them to refuse to return the survey. In addition, the survey is unable to collect information on particular issues in addition to what is dealt with in the questions (Bryman, 2004); respondents reply only to what they are asked. Interviews provide a more suitable forum for collecting in-depth information. Because of these issues, qualitative methods are used to fill in the gaps in this data gathering process. In short, the quantitative questionnaire survey yields data that can be analysed to predict the relationships between the variables of the subject, while the qualitative interview method can effectively explain those relationships and interpret the patterns and trends.

For example, Fujii (2006) used questionnaires to measure pro-environmental behaviour in terms of behavioural intention, perceived ease of implementation, environmental concern and attitudes to frugality in the Japanese cities of Tokyo and Toyohashi. One of the findings was that there was no significant relationship between environmental concern and attitude to frugality with the intention of reducing auto mobility. Therefore, qualitative methods such as interviews could be employed to understood or explain the reasons for the absence of this relationship. Quantitative methods may be useful for measuring attitudes and behaviour

regarding cars and buses and people's views on Brunei's current transportation management and policy. Qualitative methods may be useful for explaining the reasons for high car ownership in Brunei, people's attitudes and behaviour regarding cars and buses, and the current management and policy employed in the transportation sectors in Brunei, which are not publicly shared, such as on the Internet, by the relevant authorities.

The survey questionnaires (self-completion) were distributed in the four districts of Brunei. The participants were selected from different areas such as residential areas, marketplaces, recreational areas, government and private sectors and academic institutions. The respondents were mostly aged above 18 years and were either employed (government, non-government and self-employed), students, or not working - including retired persons, housewives, those looking for jobs and those not working for other reasons. The questions investigated their attitudes and behaviour regarding their chosen mode of transport and other transportation options. The respondents were asked about the purpose of their journeys (e.g. education, employment and daily activities), travel patterns, private and public transport usage, bus usage and perceptions of buses, their hopes for improvements in transportation and the type of low-carbon transportation they may be willing to use in the future.

This study used self-completion questionnaires with a 'drop and pick up' strategy. This method is considered low-cost (Simmons, 2008) as 500 sets of questions can be administered in four districts (a total of 125 sets of survey questionnaires were distributed in each district). The main reason for the selection of 500 sets of questionnaires and a 'drop and pick up' approach was to ensure a high number of returned questionnaires.

In the survey questionnaire, participants were given guidance notes and the researcher's contact details. This was done to inform the participants about the objective of the questionnaire survey and to explain that they were entitled to withdraw from the process without any consequences. The guidance notes also advised the participants on how long it was likely to take them to complete the survey questionnaire. In the event of the participants

having any ethical concerns about the survey questionnaire, the researcher included the contact details of the Ethical Officer, Department of Geography[23], University of Hull, UK

4.2.6 Qualitative methods

Qualitative methods seek to explore the reasons for, and the meaning of, problems and issues that occur (Bryman, 2004; Creswell, 2003; Kitchin and Tate, 2000; Matthews and Ross, 2010; Valentine, 1997). Methods used to obtain qualitative data include interviews (face-to-face, group or telephone), observations, language-based approaches and audio-visual materials (Bryman, 2004; Creswell, 2003; Matthews and Ross, 2010). The format of the questions for acquiring data, such as interviews and focus groups, tends towards open-ended questions. The data produced by qualitative methods are in the form of text and are not translated into numbers for the purpose of statistics, graphs and figures. Through this method, participants used their own words to express their views and understanding about the topic. The information gathered by qualitative methodology, especially through interviews, may produce unexpected results (Burns, 2000) as participants use their own experiences to answer the interview questions. An example of such an unexpected result was that environmental concern is not a major motivation to switch from car use to another mode of transportation in Porto (Beirão and Cabral, 2007) and Brighton and Hove (Gardner and Abraham, 2007).

However, qualitative methods have a major weakness in that more time is required to collect data, analyse them and deduce the results (Burns, 2000; Cloke et al., 2004; Dunn, 2010) compared to the use of quantitative methods. Time is required for the pre-data collection (setting the time and date), data collection interview sessions which, depending on the questions, may take from half an hour to an hour to complete, analysis of the data using Nvivo to transcribe and analyse it, and interpretation of the results.

Initially, the study planned to use a focus group (another qualitative research method). This involves one or more group discussions in order to identify perceptions, feelings and behaviour regarding a particular topic or issue (dell'Olia et al., 2011; Sarantakos, 2005). This

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[23] Department of Geography is now known as Department of Geography, Environment and Earth Sciences.

method is conducted using a workshop-style methodology (dell'Olia et al., 2011). The focus group would explore new issues and information on perceptions of the choice or mode of transportation, particularly in Brunei. A focus group also allows the participants to express their views in their own words (Hine and Scott, 2000), especially based on their experience (dell'Olia et al., 2011). This method encourages brainstorming and discussions that would provide dynamic, high-validity data and strong evidence (Sarantakos, 2005), which favours the Bruneian context. Thus, a focus group would yield a large amount of rich data in a short time (Hine and Scott, 2000; Sarantakos, 2005). The data would be in the form of 'group opinion' input (dell'Olia et al., 2011).

However, although a focus group might yield important data and information, this method was not used. One of the problems in conducting a focus group is to assemble the participants at an agreed time, date and place. In Brunei, the working days for the government sector[24] are Monday to Thursday and Saturday: thus Fridays and Sundays are free days. In the private sectors[25], the working days are Monday to Friday, with some companies working a half-day on Saturday, leaving Sunday as the only day on which to gather the participants. However, Sunday is the best day for the Bruneians to spend time with their families or engage in social activities. During the mini-exploratory activities[26], participants were asked whether they favoured focus groups or interviews. It was found that none of the people consulted preferred focus groups due to the above-mentioned time constraints. This was consistent with Hine and Scott (2000), who found that people in the Glasgow city area were reluctant to participate in a focus group. Despite 13 people agreeing to participate, only three turned up for the focus group.

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[24] Government offices operate from Monday to Thursday and Saturday: 7.45 am – 12.15 pm and 1.30 pm – 4.30 pm.

[25] Private sectors operate Monday to Thursday from 8.00 am – 5.00 pm, and Friday 8.00 am – 12.00 pm and 2.00 pm – 5.00 pm.

[26] Undertaken from September to October 2012, during the summer vacation, before the actual data collections were to be done. One of the aims of the activity was to identify the suitable methods for the data collection.

Due to this limitation, this research study used qualitative interviews. This was done to gain an understanding of the trends, attitudes, behaviour and perceptions of the locals concerning carbon-transport issues. The interview questions deal with the current and future management of transportation, research and development, and initiatives, promotions and future directions for greener mobility. The interviews allow the participants to express their feelings on the issues under investigation. They will generate extra information that might be considered new to the topic (Bryman, 2004; Hoggard et al., 2002; Kitchin and Tate, 2000; Valentine, 1997). The main aim of using in-depth interviews is to understand, explore and seek answers to the questions, especially those considered sensitive issues for the participants (Dunn, 2010; Hoggart et al., 2002), regarding the use of transportation in Brunei.

One of the main foci in the interviews is to explore the reasons for using private cars and barriers to the use of public transportation in Brunei. This also includes the perceptions of the services and infrastructure offered by cars and buses to the community. Questions for the policy-makers include those about the current issues of development of public transportation in Brunei and their plans to increase bus usage while not restricting the use of cars.

Interviews have been used to gain an understanding of attitudes and behaviour regarding transportation. An example of this approach is the study examining the attitudes to public transport and private cars by Beirão and Cabral (2007). In their study, they sought to understand the attitudes and perceptions of the public regarding public transportation. A significant finding was that concern for the environment might motivate a shift in transportation from cars to public transport. This paper demonstrates that the use of interviews will help find answers to 'how', 'when' and 'who' questions that could not be explored through a survey questionnaire.

In order to obtain valid and useful information, the interviewer should retain the interviewee's confidence not only during the early stages of the interview but throughout the whole interview process (Cloke et al., 2004; Hoggart et al., 2002). Cloke et al. (2004) stated that consistency in the interview may be lost if the participants provide answers they think the interviewer wants to hear. Bias may be introduced if the interviewer does not take considerable care (Dunn, 2010) about asking and replying to queries from the interviewee.

For example, the interviewee may ask about the interviewer's perceptions of cars before the interviewee answers the questions. It is possible that the participants will provide answers similar to those given by the interviewer. This will not reflect the real attitudes of the participants to transportation. In addition, the interview sessions are time-consuming (Burns, 2000) and transcribing each interview can take several hours (Cloke et al., 2004). Dunn (2010) stated that a 60-minute interview would take a fast typist about four hours to transcribe.

Nevertheless, interviews allow the participants to express their answers in their own words (Valentine, 1997). Participants' satisfaction and dissatisfaction, for example, can be seen as sensitive matters with respect to transportation choices and governance (Beirão & Cabral, 2007; Gardner & Abraham, 2007; Kopnina, 2011). Interviews offer flexibility to discuss this issue and provide confidentiality for participants' answers. In addition, the interviewer can ask supplementary questions to clarify the participants' answers (Hoggart et al., 2002; Valentine, 1997) in order to gain a greater understanding of their views. This will produce rich and varied data in a less formal setting as the interviewer has the freedom to explore particular issues compared to the use of questionnaires (Kitchin and Tate, 2000).

This study identified 40 potential participants[27] for the interview process. However, the study subsequently managed to recruit 30 participants although only 26 interviews were successfully completed, as the remaining four participants changed their minds and declined. The reasons for declining to participate are discussed later in this section. The respondents' ages ranged from 20 to 70 years. The interviews took one hour on average and were recorded and fully transcribed. The interviews were analysed using the Nvivo 9 software.

The participants were grouped into five categories: policy-makers who were mostly from the government sectors; public transport bus and taxi operators; non-government organisation personnel (NGOs), and members of the community. Interviews were also conducted with car dealers who sell hybrid cars. A number of members of the community volunteered to be

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[27] The participants' experiences in the transportation sector ranged from 5 years to 20 years and are discussed in sub-chapter 4.6.2.

interviewed as a result of taking part in the mini-exploratory activities and the survey questionnaires (who volunteered to participate in the interviews). Their contact details were divided into six categories: (1) government employees, (2) private employees, (3) self-employed, (4) students, (5) those looking for jobs, and (6) retired personnel.

The number of interview participants in this study was considered sufficient, since Creswell (1998) indicated that up to 30 people may be sufficient for interviews: up to 10 people for phenomenology and 20-30 people for grounded theory. Furthermore, Beirão and Gardner (2007) recruited 24 participants in Porto for three groups of users: public transport users, car users and both types of users. Gardner and Abraham (2007) recruited 19 private car commuters for their study in Brighton and Hove. In addition, Hine and Scott (2000) conducted a total of 32 in-depth interviews for both car users (Edinburgh) and public transport users (in Edinburgh, Glasgow and Dunfermline) in Scotland. Additionally, the interviewees hold high ranks in the transportation-related departments and have vast experience in transportation sectors. The number of interviewees was also based on the funds available for the research;[28] the researcher had to take into account the locations, mode of transportation, funds required for the survey questionnaire and return tickets from London to Brunei, as well as the timeframe for completing the study[29].

However, to recruit interviewees such as government officials belonging to institutions, the researcher had to approach the institutions through letters (posted or delivered by hand), and the interviewed participants were selected by the head of department. Figure 4.3 (a) and (b) indicates the route to the interview process. Additionally, the researcher included a letter explaining the interview process, such as the objective of the interviews. These letters were sent to the head of department/head of institution. The participants from the institutions were

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[28] The Government of Brunei paid £ 1500.00 per year (Bench Fee) to the Department of Geography for the use of the researcher to undertake the study. This fee does not include the maintenance fees (which are paid monthly by the Government of Brunei) and course fees (paid yearly to the University).

[29] The researcher was given three years (with an additional 6 months) scholarship by the Government of Brunei to complete the study.

head of departments, senior officials, or team members with experience in transportation-environment-business matters.
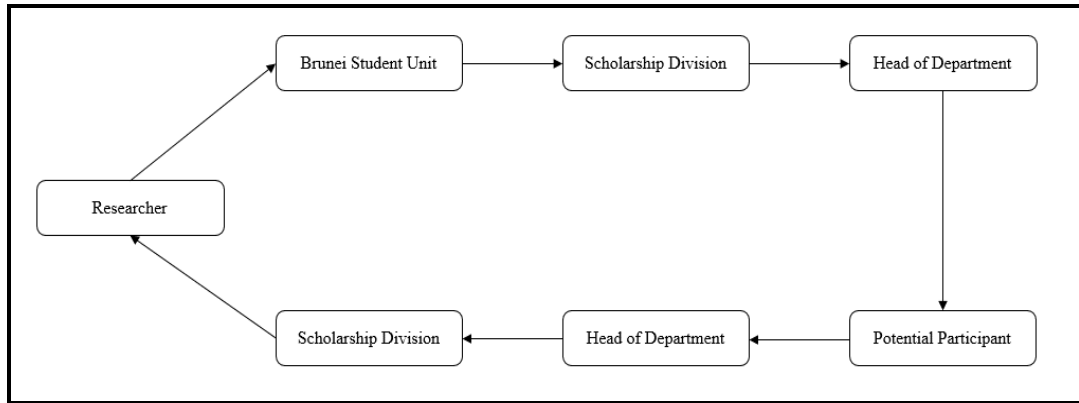
Figure 4.3 (a) Route to interviewing participants in the government sectors.
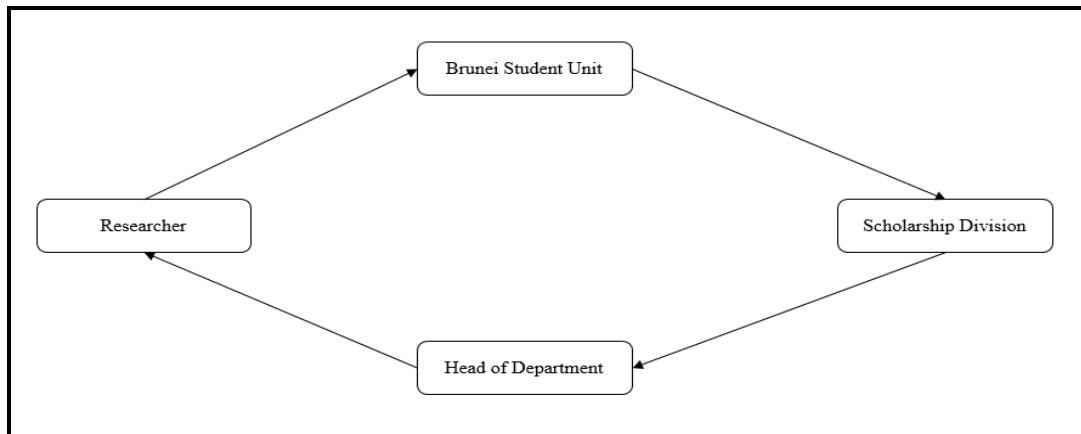
Figure 4.3 (b) Route to interviewing participants in the non-government sectors.

4.4 Mini-exploratory activities

Several steps were taken before the actual questionnaire surveys were distributed to the public. The formulation of the survey questionnaire started with the aims and the research questions, as discussed in chapter 1. The researcher went to Brunei (from September to October 2012) to familiarise himself with the transportation environment in the country, particularly the use of public transportation. The mini-exploratory research involved

discussions with the locals and immigrant nationalities about the topic in relation to cars, public transportation and carbon emissions.

The researcher rode the buses in two ways: first as a normal passenger and secondly as a researcher. The researcher had never ridden on public buses in Brunei before. The researcher rode the franchised buses in Brunei Muara and Belait district (the only two districts where franchise buses are operated) and inter-district buses that connect Brunei Muara district with Tutong and Belait districts.

At first, the researcher felt awkward as he was often observed by other passengers, who mostly immigrant users, despite sitting at the back of the bus. The researcher found that none of the passengers was Bruneian, but were mostly Indians and Indonesian immigrant workers, from the first stop until the final stop. Upon arriving at Bandar Seri Begawan bus station, the bus driver (a Bruneian) asked the researcher whether he was a Bruneian. The researcher had the opportunity to spend time with the bus driver during his rest break. The bus driver indicated that the majority of the passengers are from the immigrant population, and those Bruneians who use the buses are mainly the elderly. There were some students riding the bus, but they were mostly on their way home from school.

The mini-exploratory research was considered essential for the researcher in order to draft questions to be asked in the survey questionnaires and during the interview processes. In addition, riding the bus along with the immigrants gave insights into how to interact with potential participants. Passengers were either members of the low-income immigrant population or the local elderly population. Once the ideas were formulated, the survey questionnaire and questions for interviews were developed.

The questionnaire underwent several trials. The questionnaires were distributed amongst selected students (both Bruneian and international students) studying in the University of Hull, as well as selected Bruneian students living in Brunei Hall in London, either permanently or in transit. The researcher also asked some Bruneians who work/live in the UK to give some feedback on the questionnaires. The criteria needed for feedback concerned the clarity of the questionnaire, any confusing terms, the comprehensibility of the questions, and the time taken to complete the survey questionnaire (McGuirk and O'Neill, 2005; Parfit,

1997). Upon receiving the feedback, the researcher improved and revised the questionnaire and conducted a second trial. The participants in this trial agreed to treat it confidentially and refrain from distributing the questionnaires to other people.

The questionnaire survey was divided into seven sections. Section 1 investigates the respondents' backgrounds including gender, residential district, age, employment, salary and number of people in the household. Sections 2 and 3 investigate car ownership and public transport ridership. Participants who do not use public transport were able to skip section 3 and proceed to section 4, which is about their travel behaviour and perceptions of cars, public transport and sustainable transportation. Section 5 is about their awareness of issues related to transportation and carbon. Section 6 is about their awareness of the management and policy on transportation issues in Brunei, while section 7 contains more open-ended questions on additional information they may wish to share about transportation-related issues locally and internationally.

The interview process also followed the steps for preparing the survey questionnaire. First is the pre-testing of the questions. The questions were developed and tested with a number of Bruneian students living in Hull and Brunei Hall in London, as well as Bruneian nationals working/living in the United Kingdom. The main aim of the pre-testing is to obtain feedback on the questions in terms of clarity and to ensure that they are easy to understand and not offensive. Another aim of the pre-testing was to prepare the researcher to be confident and well equipped before the actual interviews were conducted.

His experiences of riding the buses also gave the researcher the idea of preparing the questions (survey questionnaire and interviews) in two languages: Malay and English. Although the researcher had intended to prepare the questions in Indonesian, Tagalog (Philippines) and Hindi (Indian language), he decided to use only Malay and English as the majority of bus passengers understand either Malay or English or both. Furthermore, the researcher was aware of the complexity of transcribing data rendered in unfamiliar languages into English. The main language of the interview is English; however, the researcher also prepared the questions in Malay. The questions in the English and Malay languages were similar and were checked by three individuals: a Bruneian undergraduate student studying

English Literature and two Malay teachers working in Brunei (Teaching English as a Second Language (TESL) with teaching experience of between 7 and 10 years).

4.4 Procedure for data collection

Various procedures must be followed before data collection can proceed. One regular procedure that must be undertaken is to gain ethical clearance from the Ethics Officer, Department of Geography, University of Hull. The code of ethics had to be completed and forwarded to the ethical officer to be approved. The documents needed for the approval were as follows:

1. Code of ethics (Appendix 4)

2. List of questions for survey questionnaire (Appendix 5)

3. List of questions for interviews

Upon approval by the Ethics Officer, the researcher had to prepare a letter of validation to be addressed to the Brunei Student Unit (Appendix 1) based in London. The Brunei Student Unit indicated that the letter should contain the supervisor's approval (Appendix 2) for this researcher to undertake the data collection, a sample of questions from the survey questionnaire, a sample of the interview questions, an approved research proposal, the proposed title of the research study, an informed consent letter addressed to the heads of government departments (in Brunei) and interviewees and a list of addresses of the interviewees. The letter should include the objective of using these methods and the significance of the research. The letter addressed the importance of concealing the names and occupations of the participants as well as other matters that needed to be kept confidential. The letter was sent to the Brunei Student Unit in London and later forwarded to the Scholarship Division, Ministry of Education of Brunei. The Division prepared the consent letter (Appendix 3) along with letters to the relevant bodies: government departments and private sectors, including car dealers and public transport operators for interview purposes. The participants involved with both research instruments were given the contact details of the

researcher and the university's ethics officer in the event of any questions or enquiries arising before, during and after the study or to discuss the ethical procedures of the research study. Due to unavoidable circumstances (discussed in sub-chapter 4.7), the interviews had to be postponed and were only carried out in late April, 2012.

Upon arriving at the agreed time and place for the interview, the researcher having been contacted via phone or by letter, the objective of the study was briefly explained to the participant, who then signed the consent form. The audio recorder (Dictaphone) was tested and positioned between the researcher and the interviewee, and the interview commenced. However, not all participants wished to be audio-recorded, although they agreed that the researcher would be permitted to write down all the information and data produced during the interview. When the interview had concluded, the researcher spent a few minutes in conversation with the interviewee before leaving the venue. The researcher had offered the interviewees the transcription of the conversation to give them the opportunity to validate it and make amendments. However, only a few participants asked for a copy of the transcription, as the majority of the interviewees were satisfied with all their answers.

The survey questionnaire was distributed between 15 April 2012 and 1st June 2012. At the end of the survey questionnaire period, a total of 428 sets of questionnaires were received. The interview process stretched from April to August 2012. The first interview was conducted on 20th April 2012 and the final one was conducted on 20th August 2012. A total of 40 letters were distributed for the interview processes; 30 interviewees responded to the letters and 26 participants successfully participated in the interview process.

4.5 Process of interviews and questionnaires

4.5.1 Questionnaire survey

The locations for conducting the survey were categorised into six places. These places were considered the most likely to produce the highest possible number of returned survey questionnaires.

1. Work sites (including offices)

2. Campus and universities (include café, library and around the campus)

3. Centres of attraction at weekends (such as recreational areas)

4. Public libraries

5. Cafés and restaurants

6. Community centres (including mosques, prayer centres and community halls)

In addition, some café owners were willing to place the survey questionnaire in their cafés. The survey questionnaires were placed near the counter and near the magazine section, enabling customers to complete them voluntarily. The researcher also appreciated the actions of the heads of campus clubs and organisations, who volunteered to help to hand out the survey questionnaires amongst their club members. Because of these strategies, the response rate for the survey questionnaires was considered very high ($428 / 500 = 85.6\%$).

Respondents to the survey questionnaires were selected; all were aged 18 and above. Their age was verified before the questionnaires were given to them, and the instructions on the front sheet of the questionnaire also specified that it was intended for participants aged 18 and above. One of the reasons for selecting people aged 18 years and above was concerned with the ethical clearance. Under the Ethical Procedure for Research in the Department of Geography (The University of Hull, 2012), there are several measures to deal with people under 18 years old for research: informing the participant about the nature of the research,

ensuring that the participant understands the research issues, and obtaining a consent form from their guardian.

The researcher believed that it would take a significant amount of additional time to complete the ethical procedures and was aware that the funds available to complete the thesis were limited. In addition, persons aged 18 and above may be more likely to provide better-quality data on matters of transportation, especially as they are considered old enough to make their own decisions in their lives. White (2014, pg. 3) quoted *The Electoral System in Britain* by Professor Robert Blackburn, indicating than *"...many 16 – 17 years old are unlikely to have gained the necessary political maturity to be able to express a considered political judgement.*" The researcher believed that the age of 18 years and above can be considered a mature age. This belief was based on the fact that Bruneians aged 18 and over are able to vote for heads of village (CIA, 2011) and are able to apply for a car driving licence (Amirruddin, 2010). Thus, their input on transportation in Brunei will be of a high quality and they may express their views based on their experience (such as driving).

4.5.2 Interview process

Although the researcher proposed that the interviews be conducted at or near to the interviewees workplaces (such as in their offices), the participants were free to choose a location for the interview. The venues proposed for the interviews, especially the participants' offices, were selected to reduce any disruption that might be caused by the interview process. However, the researcher thought that the participants would be more comfortable with the venue if they chose their own preferred location. The majority of the interviews were conducted at the participants' workplaces (offices) and on university campuses. The other venues were cafés/restaurants near to the participants' homes. The cost of food and drinks was met by the researcher out of the bench fees.

The participants for the interviews were mostly chosen by the heads of various government departments. For the public transport operators, the interviewees were the heads of the operations (CEO, owner and manager). Public participants were selected, and participants

who agreed to be interviewed were given the researcher's contact details in order to set up interview appointments (date, time and venue).

Before the interview process was conducted, approval and authorisation letters were issued by the Ministry of Education to be sent to the various departments and public transport operators. In addition to the letter, the researcher also provided the head of the department with the following:

1. Ethical clearance form from the Department of Geography (now Department of Geography, Environment and Earth Sciences), University of Hull, UK,

2. Topic of the research (as requested by the Ministry of Education to all participants in research study),

3. Consent form (to be filled in by the interviewee),

4. Questions for interview (if requested by the head of department).

4.6 Responses

4.6.1 Questionnaire survey

A total of 428 questionnaires (out of 500) were completed by participants from the four districts of Brunei. The majority of the participants were Bruneian (82.9 per cent). Other nationalities participating in this survey included Indonesians (20 participants), Filipinos (20 participants), Malaysians (nine participants), Thai (one participant), Indian (one participant), Pakistanis (eight participants), Bangladeshis (seven participants), British (five participants) and Australians (two participants). These other nationalities are categorised as the immigrant population (N-Bru).

There were slightly more females (51.6 per cent) than males (48.4 per cent) participating in the survey questionnaire. Participants living in Brunei Muara district (37.9 per cent) provided the highest number of responses while the lowest number of responses came from Temburong (18.5 per cent). It was impossible to restrict or equally divide the questionnaires

by district. This is because participants may live in Brunei Muara but commute every day to other districts (such as Belait) for work purposes. Brunei Muara has the highest population in Brunei, whereas Temburong is the least populated district. Furthermore, all the main government offices, all the universities and most of the tertiary institutions (technical and vocational institutions) are located in Brunei Muara.

There were several reasons for the low number of responses from the immigrant population (N-Bru). One of main reasons was the language barrier. The survey questionnaires were prepared in Malay, the official language of Brunei, and English. Of the 500 sets of questionnaires, 200 sets were printed in the English version (for those who preferred to use the English language).

A few of the participants from the immigrant population were illiterate (who could not read or write or both), but they were willing to answer the survey. To this end, the researcher had to read the questions to the participants and tick the boxes according to their answers. In addition, the researcher had to explain some of the questions to the immigrant nationalities, as some of the participants only understood the Bruneian '*slang*' language and knew little of the Malay language.

Another reason for the low participation of the immigrant population was the socio-cultural difference. According to one of the participants from Indonesia, most of the Indonesian workers in Brunei come from the rural areas of Indonesia, and the researcher had to 'fit in' before they were willing to participate. Handing the survey questionnaires to the immigrant nationalities, especially the low-income earners, was a complicated matter. In order to get them to answer the questions, researcher had to get along with them, gaining their trust and maintaining their confidence during the whole process, as illustrated by Cloke et al. (2004) and Hoggard et al. (2002). There were several occasions when the researcher had to sit and converse with them, finally managing to obtain completed surveys from them a week later.

As confirmed above, the survey was only for those aged 18 and above. The participants' ages were grouped into four ranges: Young Generation (YG 18 – 25 years old), Mid Generation I (MG I 26 – 35 years old), Mid Generation II (MG II 36 – 55 years old) and Elderly Generation (EG over 55 years old). In this survey, about half of the study population were in

the young age range of 18-25 years old (YG). The result indicated that participants aged 35 and below accounted for more than 78 per cent of the total questionnaire respondents. Thus, the responses are predominantly reflecting the views of the two younger age groups.

Please note that, in Brunei, salaries are described on the basis of monthly instalments, rather than per annum. The range of salaries in this survey includes the allowance received by students and retirees. The study categorised the salary incomes into four: low salary (LS) of below BND $1000, lower-middle salary (LMS) of BND $1000 - BND $2000, upper-middle salary (UMS) of BND $2001 - BND $3000, and high salary (HS) of more than BND $3000 per month. It was found that most of the participants received salaries of below BND $1000 per month (48.1 per cent). There is an overlap in the low salary group between students and low-income earners. Because of this, the researcher decided to categorise the occupations into eight categories.

The eight categories were: student, working (government sector), working (private sector), self-employed, retired personnel, not working, looking for a job, and housewife. However, for analysis purposes, these groups of participants were categorised into just three: Working (W), Non-Working (N-W) and Students (Stu). Of the 428 participants who completed the questionnaire, 53.5 per cent were working (W) participants, 38.3 per cent were students (Stu) and 8.2 per cent were non-working participants (N-W).

The study also indicated that the majority of the participants did not use public transport. Only about 19 per cent of the participants used public transport (PT User). The majority of the participants (using the public transport) were from the immigrant population (non-Bruneians). Four in five of the participants in this study are not public transport users (N-PT User).

4.6.2 Interviews

There were 26 participants interviewed for this study. The age range of the interviewees was between 20 and 70 years. Participants involved in the transportation area (such as government officials, public transport operators, car dealers and NGOs) have 5 to 20 years'

experience in their current jobs. Participants in the interviews were divided into several categories: public transport operators, government officials (involved in transport-environment issues), car dealers (dealing in hybrid cars), NGOs and the community. The interviewed participants were as follows:

- Two students: a female Bruneian and a male international student studying in Brunei,

- One participant who was looking for a job

- Two retired participants: a male and a female

- Those working in the government sector (eight participants), private sector (two participants), self-employed (two participants), NGOs (two participants), and car dealers (two participants)

- Five public transport operators

Amongst these participants, five have experience of using the bus service: two participants who used to use the bus services, two participants who use the bus if their cars need to be serviced, and one participant who is dependent on the bus service (international student).

4.7 Problems, limitations and solutions

Several problems and limitations arose during data collection: before, during and after the data collection processes. There were just a few limitations in the survey methods. Despite the high per cent of female participants, it was very difficult to find females over 40 years of age who were willing to participate in the survey questionnaire. In addition, a majority of the older generation were not willing to answer the survey questionnaire. However, they were willing to talk about their experiences of cars and buses. It was also quite hard to recruit immigrant nationalities, especially low-income immigrant workers. The researcher had to spend time with some of these participants in order to persuade them to answer the survey questionnaire. There was also a language barrier especially some of the immigrant workers were only familiar with the Bruneian slang and some did not know how to read and write.

In order to obtain feedback from both the older generation and the immigrant population, the researcher used the survey questionnaire to ask them about transportation in Brunei. For the higher-income immigrants, the researcher negotiated with staff working in cafés to collect the survey questionnaire. The researcher approached the participants, then introduced and explained the study. Overall, the participants agreed to fill in the survey (the researcher did not set a time limit, and the immigrant nationalities could simply leave the questionnaires on the table to be collected by the staff in the cafes).

There were several problems and limitations with the interviews. However, not all of these problems have solutions. There was a misunderstanding over the topic of STT. The problem started when the researcher read the letter addressed to him from the Ministry of Education. The letter stated the name of the researcher, university, topic of research and the summary of research to be undertaken. The researcher had briefly explained the topic's objective in writing. It was presumed by the interviewee (a senior officer with an engineering background) that the technical part of the 'STT' would involve the technical side of transportation such as the engines. The researcher had to explain the meaning of STT. Having eventually understood the meaning of 'technical', the interviewee agreed to continue with the interview.

In one of the ministries, the researcher was directed from one department to another due to incorrect information from the Human Resource Department of that particular ministry. This was due to the mission and vision of the department not being related to the research study. It was fortunate that the department involved in the study objective was in the same building. The researcher had to wait an hour before the officer in charge had any free time. Since this occurred at the last minute, the researcher had to briefly explain the objective of the study. The officer was very helpful. There were some areas that are not handled under his department. For this reason, after the interview the officer voluntarily set up meetings with officials from two other departments (via phone calls) under the same ministry. One of the departments was in the same building, and another department was located in the head office, in Berakas. The researcher managed to interview the department representative (in the same building), in the afternoon. The department officer in the headquarters agreed to be

interviewed two days later. In terms of ethical procedures, the interviewees agreed to be interviewed and had no problem with last-minute interviews. However, one of the officers who promised to return the consent form the next day lost the form but gave verbal consent.

The interview process was supposed to consist of one-to-one interviews. However, one of the public transport operators was only willing to be interviewed with one of the CEOs[30] present in the sessions. During the interview, the CEO asked how the interview would help their company to expand their business and requested that the results on the attitudes and perceptions of Bruneians regarding buses, and the recommendations to improve the public transportation, should be sent to their company. The research was funded by the Government of Brunei under the Ministry of Education, thus the manager needed to seek approval from the ministry in order to obtain the results. Initially, the CEO was present only as an observer and did not interrupt during the interview. However, as the interview went on, the CEO decided to join in. Despite the presence of two interviewees, the researcher managed to separate the data collected from the manager and the CEO. The CEO was also given the consent form to fill in (although he only gave verbal consent).

One of the public transport operators cancelled the interviews twice due to unforeseen circumstances involving the participant's family and company matters. This created difficulties in rearranging a new interview, resulting in the interview being conducted in the final week before the researcher had to return to the United Kingdom.

Two would-be-participants cancelled their interviews. One of them decided to cancel the interview as he had been called upon to pick up a passenger from the airport. The researcher had difficulties rearranging the appointment; hence, the interviewee had to be eliminated from the interviewee list. Another participant decided to withdraw from the process after reading the transcript of the interview. The participant feared that his identity would become known, and some of the data he had provided were incorrect. Because of this, he decided to withdraw.

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[30] Initially the Chief Executive Officer (CEO) only present as an observer, but later as an interviewee.

There was a technical error involving the letter from the researcher and the Brunei Student Unit based in London, to the Scholarship Division under the Ministry of Education. Because of this technical error, the Scholarship Division had to reissue letters and forward them to several ministries. In order to speed up the process, the researcher agreed to deliver the revised letter(s) from the Ministry of Education to the relevant departments, by hand. This caused some delays and two of the interview sessions had to be postponed due to this error. However, the two prospective interviewees did participate, as they had been approached by the researcher during the mini-exploratory activities.

One of the departments arranged pre-interview sessions to discuss the topic. However the majority of the questions being asked were no longer of relevance to their department and were now handled by a new department that was just being established. The researcher had to go to the Ministry of Education, ask for a letter of approval, and hand the letter in to the new department. However, since the department was said to be understaffed and currently busy with departmental matters locally and internationally, the department did not contact the researcher, so no interview took place.

4.8 Conclusion

The chapter has discussed the selection of the research methodology and design, as well as the use of mixed methods, to acquire as much information as possible. The chapter also identified the selected participants for both questionnaires and interviews, as well as the preparation which was required, prior to the data collection activities. The researcher also obtained approval to proceed with the study from the sponsor, the Ministry of Education, Brunei), the University of Hull Ethics Officer (by following the procedures listed on the ethical form and approved by the officer's signature), as well as the participants. Despite all these preparations, the study encountered several problems. Some of them were managed successfully, and overall the researcher was satisfied with the outcomes in terms of the response rate for both the survey and interview processes.

Chapter 5: Potential for change towards sustainable transportation

5.0 Background

The main agenda in Brunei, regarding energy, is to reduce its consumption and ensure the sustainable use of energy in the future. This includes the transportation sectors. The transportation landscape in this chapter includes population growth, growth in the number of vehicles, economic development and environmental factors.

This chapter aims to examine how the current transportation system might be shifted towards transition. The growing concern over the growth in the population, the number of vehicles and their effect on economic development and the environment, may put transition on the national agenda. However, these issues need to be emphasised in order to raise the level of concern in society and thus create a policy to halt the unsustainable use of transportation in Brunei.

5.1 Population growth

The population in Brunei is increasing. In 2008, the population of Brunei was 375 000, increasing to 399 800 in 2012. The population density in 2012 was 69 persons per square kilometre (Department of Statistics, 2012). The settlements in Brunei are concentrated around the coastline facing the South China Sea. The interior of Brunei consists mostly of forested areas. The population density in Brunei is considered low. However, in Brunei Muara, the population density is 500 persons per square kilometre, according to the Bruneian Statistical Book (Department of Statistics, 2012). The population of Brunei is concentrated in Brunei Muara district (home to more than 71 per cent of the Bruneian population). Bandar

Seri Begawan, the centre of government, commerce and business and higher-education institutions (universities and most of the colleges), is located in the Brunei Muara District. The Brunei Muara district offers opportunities for economic activities, jobs and business. The Brunei Muara district is seen as having better infrastructure, which has encouraged people either to move to Brunei Muara district or to travel there for economic and educational purposes. This may increase the need for transportation within, as well as to and from, Brunei Muara.

The largest district in Brunei is Belait. However, most of the land area is forested. Most of the developments in Belait District are concentrated near the coastline area. Belait district is synonymous with oil and gas, which are extracted onshore and offshore. Currently, the downstream economic activities (methanol industries) are located in Belait district, causing people from other districts to travel to the Belait district for employment purposes.

With the increase in population, along with the small and limited land area of Brunei, there will be increasing need for the individual consumption of energy, especially fossil fuels and electricity.

"60 per cent of our energy utilisation is mainly from homes. The use of energy in Brunei is growing. The major influence of this growing energy [usage] is from electricity and transportation."

Interviewee 19: Male: 36 – 55 years old: Government sector

In Brunei, the government provides a National Housing Scheme for low- and medium-income families and eligible government employees. In order to reduce the compactness (such as housing density and business and industrial areas) in the capital city and in Brunei Muara district, the government has shifted the housing scheme away from Bandar Seri Begawan to the other districts. The purpose is to reduce the compactness of Brunei Muara, shift business and industrial areas to other districts (and away from the capital city), and create jobs in each district, near to the settlements. This will eventually reduce the need to commute to Brunei Muara for employment. However, not all of the housing settlements – the homes provided by the government or privately owned new houses away from Brunei Muara

district - are equipped with good transportation facilities, such as better roads and better public transport facilities, particularly bus stops that provide shade and shelter.

The car allows greater access to travel and enables housing to be developed outside the established city areas. As new housing schemes in Brunei are to be located outside Bandar Seri Begawan, the distances from homes, workplaces, and activities such as shopping, leisure and recreation are growing, thus making the car the most efficient mode of travel. Furthermore, compared to Brunei's three other districts, Brunei Muara has better infrastructure and services, such as better road transport, better access to employment and education, leisure activities, opportunities for socialising, and shopping. The distance travelled will increase, as will time spent on the road. Additionally, not all areas are equipped with public transport services and infrastructure. There is no public transport in Temburong district. The franchised bus services only operate in Brunei Muara and Belait. The inter-district buses run from Tutong to Brunei Muara and from Belait to Brunei Muara (via Tutong roads). Some of the areas have below average accessibility, thus causing increased demand for private transport. Thus, the uneven distribution of economic activities and housing projects will shape the increasing trend in mobility.

"Development in Brunei Muara has been already compact, we acknowledge Brunei Muara is an urban footprint area and the land is already a constraint. So our proposal is to have second growth in Sungai Liang [in Belait District]. We also pushed the needs of building a bridge to connect Brunei Muara and Temburong so we hope the developments are not concentrated in Brunei Muara, like Belait is industries, Tutong for Harbour, and Temburong for Ecotourism so like each district is self-sustaining. So people could move from one district to another or maybe migrate from one district to another district for employment."

Interviewee 22: Female: 36 – 55 years old: Government Sector.

The population density in Brunei is considered low. A number of interviewees indicated that houses in Brunei are relatively far apart compared to the houses in other countries, such as in parts of Europe. In addition, although the houses in Brunei's housing schemes (Figure 5.1) are relatively close to each other, resulting in higher population density compared to non-housing settlement areas, the houses are still considered far apart.

The Department of Housing, under the Ministry of Development has awarded a construction contract for the development of the country's first high-rise apartments for housing applicants under the National Housing Scheme (Wong, 2014). The apartment housing price, under the National Housing Scheme, according to the Minister of Communication, is not as expensive as the single house. Furthermore, the vertical housing is designed with green building concepts that allow tenants to save energy and water (Rajak, 2015). The high rise vertical apartment is considered one of the potential solutions to house Bruneians, as the waiting list for housing applicants is increasing, thereby lengthening the time it takes to be allocated a house this scheme.

Housing	Demand 2011	House completion by 2017
Brunei Muara	25797	10676
Belait	5499	3970
Tutong	2011	2258
Temburong	439	408
Total	33746	17312

Table 5.1 Housing demand in 2011 and the number of houses expected to be completed by 2017

Source: Oxford Business Group, 2013, pg. 6).

It was also revealed by the Bandar Seri Begawan Master Plan (Shen, 2014) that the redevelopment of public housing into high-density housing, complete with amenities and walkable (and pedestrian friendly) neighbourhoods, was supported by 95 per cent of survey respondents. However, only 40 per cent were willing to switch to a denser living environment (characterised by semi-detached houses, townhouses and low-rise condominiums) and another 18 per cent would not want to live in a slightly denser living environment.

"The houses in Brunei are quite big, spacious compared to houses in other countries. So like, it is not practical I think to have bus stops every 100 metres, unless the bus stops are like just a pole, stating it is a bus stop with a yellow box line. But like at the housing area, they should have like a bus stop every 100 metres because the houses are built nearer to each other."

Interviewee 2: Female: 18 – 25 years old: Student.

The low population density, especially outside Brunei Muara district, along with the spread of economic developments (and job workplace) make non-motorised transportation, such as cycling and walking, less attractive than travelling in an air-conditioned vehicle, be it car or bus. Also non-motorised trips tend to be longer, thus making car use more attractive. Furthermore, because of these housing arrangements, it is rather challenging for the government to build bus stops, as some of the routes are not profitable and there is less bus usage.
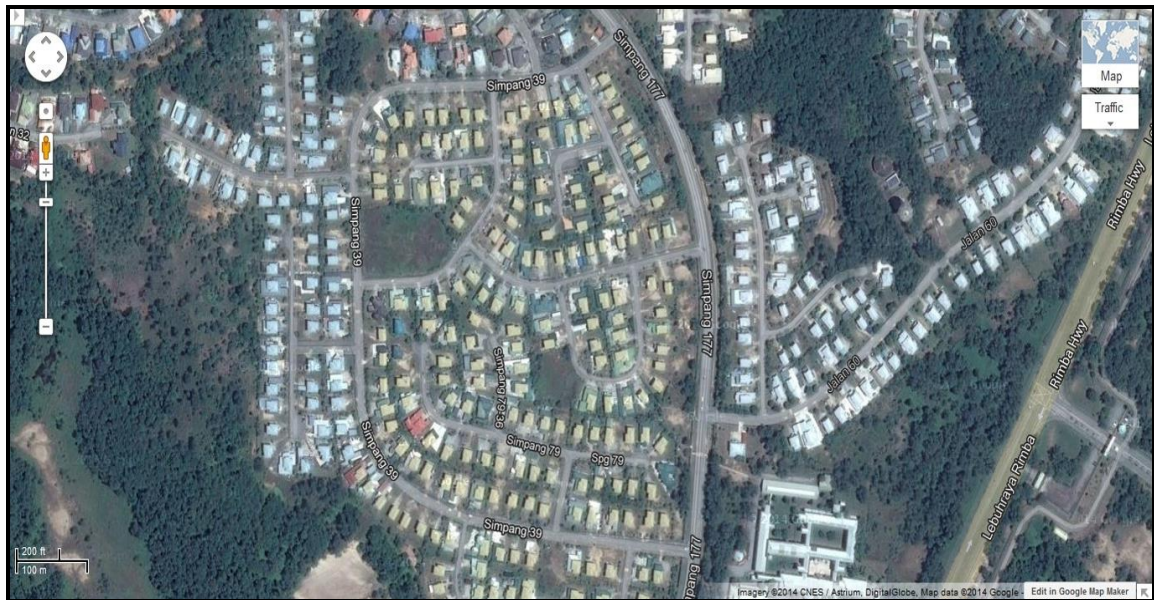
Figure 5.1(a) Aerial view of one of the National Housing schemes in Rimba, Brunei Muara District. Source: Google Map (2013).

Although the buses in Brunei may stop along the route, despite the absence of bus stop signs, the majority of the interviewed participants thought that these practices are dangerous, not only to the car users behind the bus, but also to the passengers getting on and off the bus. Furthermore, one of the bus operators indicated that they would be penalised by the police for stopping at non-designated locations, even though they are on the bus route.

Figure 5.1 (b) View of one of the National Housing Schemes in Rimba, Brunei Muara District

Source: Researcher.

Figure 5.1 (c) View of one of the National Housing Schemes in Lambak, Brunei Muara District. The roads are equipped with pedestrian sidewalks, although they are not properly maintained. Source: Researcher.

Population growth and urbanisation are considered significant elements contributing to the increase in car ownership and mobility in Brunei. The interview data revealed that houses have been constructed, and are under construction, to suit the growing population, who favour single houses (thus leading to low density). Due to the limited land area of Brunei Muara, the resettlement housing schemes are planned for, and are under construction on, the outskirts of Brunei Muara and in the other districts, causing an increase in mobility needs.

The relocation of some industries and businesses to other districts, with the aim of reducing demands for mobility and ensuring that the districts are self-sufficient, may unintentionally further increase mobility, due to people's unwillingness to move to other districts. Also, the fact that the roads are of good quality, thus enables car drivers to commute to other districts every day. Furthermore, the lack of public transport services and infrastructure tends to make the car a 'must have' asset for these mobility needs. The increasing growth in the population and urbanisation, along with subsidised fuel and cheap electricity, may result in unsustainable patterns in energy consumptions (including the use of electricity and petrol) This population growth and the urbanisation conditions, including the housing settlements and schemes, may contribute to an increase in mobility and travel demands. This may, in turn, exert pressure for sustainable transportation, especially in the options of mode of transportation. Nevertheless, these factors at the level of this landscape may not greatly influence the promotion of transition to sustainability.

5.2 Growth in numbers of vehicles

Driven by urbanisation, and the counter-urbanisation strategy, the number of cars in Brunei is increasing. The increase in car ownership is also catalysed by several factors, such as government incentives and fewer public transport options. Furthermore, the preference for cars (discussed in chapter 8) is also influencing Bruneians to own cars.

Historically, the first footpath was constructed in 1907 to connect Brunei Town (now known as Bandar Seri Begawan) and the Residency Road. In 1914, a road known as '*plote scheme'*, about 60 miles in length (around 96.56 kilometres), was built to connect Brunei town with

Kuala Belait in Belait district. Presently, about 2713 kilometres of carriageway have been built throughout the country (Public Works Department, 2009). The best-developed road network is in the most populous district of Brunei Muara. There is a coastal highway that connects the three districts, the Brunei Muara, Tutong and Belait districts. The highway runs from Muara in the Brunei Muara district to Tutong and Kuala Belait in Belait district.

Road conditions in Brunei are considered good and safe for the motorist (based on the statement by the Deputy Prime Minister of Malaysia and the Global Competitive Index in 2010 – 2011). Sarawak State's Public Works Department stated that the Government of Brunei has spent a huge sum of money constructing the route, which he claimed was as solid as a bridge (Stephen, 2011)[31]. The Global Competitiveness Index in 2010-2011 (Martin et al., 2010; Schwab, 2010) ranked Brunei 33rd out of 139 states in the 'quality of roads' category.

Presently, however, the road infrastructure in Brunei targets the non-public-transport users, particularly car owners. It tends to facilitate car movements and has a lack of quality for pedestrians and cyclists, making walking and cycling unpopular, not least because of safety concerns among these users. Furthermore, Brunei's previous Minister of Energy (Oxford Business Group, 2008) remarked that cyclists and pedestrians could not use the roads. In addition, the infrastructure for bus services in Brunei is considered poor (Oxford Business Group, 2008); therefore, public transport uses the same roads, with no specific bus lanes, as are used by other vehicles. This is considered a problem as, instead of being a convenient way of travelling, especially during the peak hours, public transport may be delayed and it therefore may take longer to reach one's destination, compared to the use of private cars.

The car is considered important in Bruneian daily life. According to statistics, in 1926 there were only 21 vehicles in Brunei. The figure increased to 45 in 1928 and 73 in 1930. In the year 1950, there were 1550 vehicles, and ten years later the figure had increased to 7992 (Land Transport Department, n.d.). According to *The Brunei Times* (Bandial, 2012), the rate

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[31] The Deputy Prime Minister of Malaysia mentioned that the roads in Brunei are far better than those constructed in Sarawak, West Malaysia. The Deputy Prime Minister of Malaysia expressed his views at the Malaysian High Commission in Brunei during his visit to Brunei in January 2011 (Stephen, 2011).

of car ownership in Brunei is considered one of the highest in the world at 2.65 people per vehicle. This was confirmed by the findings of the World Bank (2011). Brunei is ranked third in the number of passenger cars[32] per 1000 and seventh in the number of motor vehicles[33] per 1000 (also refer to table 1.5 (a)). In addition, in 2004 a study revealed that every Bruneian adult over the age of 19 has one car (Jong, 2009).
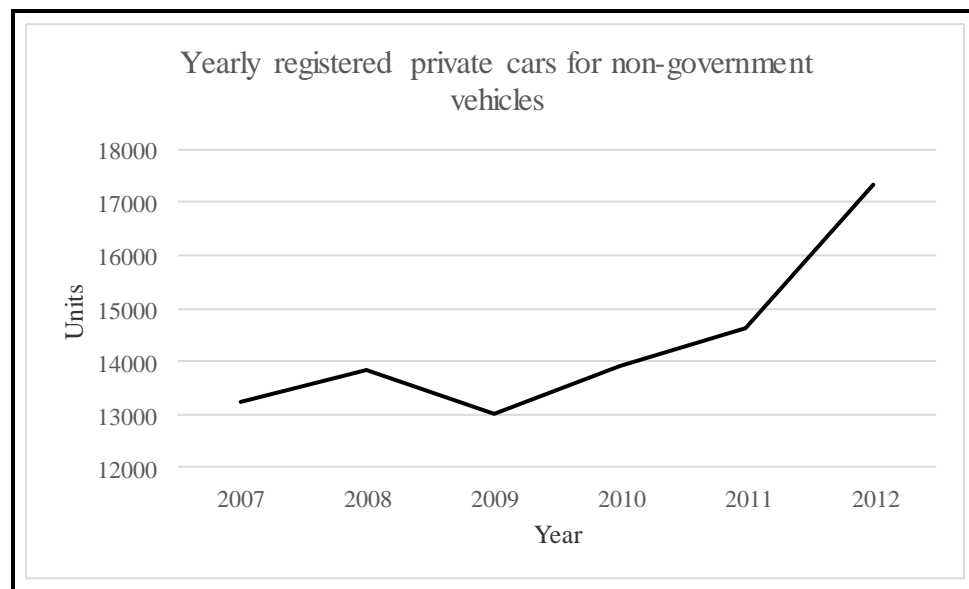
Figure 5.2 Yearly registered cars in Brunei. Source: Brunei Statistical Year (2011; 2012).

The number of registered cars in Brunei fluctuates (Figure 5.2 (c)). The number of cars registered with the Land Transport Department has been growing since 2009. The highest number of registered cars was noted in 2005 but the figure dropped drastically in 2006. One reason for this was the loan-capping directive by the Ministry of Finance in 2005 (No, 2011). Furthermore, because loans were capped, personal loans have been declining (Lawrey, 2010), and subsequently car sales also dropped in 2006 (Othman, 2006). Furthermore, the rise in car sales in 2005 was due to 'panic buying' by those worried about the possible

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[32] Passenger cars refer to road motor vehicles, other than two-wheelers, intended for the carriage of passengers and designed to seat no more than nine people (including the driver) (The World Bank, 2011).

[33] Motor vehicles include cars, buses, and freight vehicles but do not include two-wheelers (The World Bank, 2011).

reduction of car loan repayment periods from maximum of seven years to five years and the stringent credit checks to be enforced by the financial/lending institutions (Othman, 2006).

Car sales continued to increase after 2006 due to an increase in salaries, in the form of accelerated increments, in the public sectors, which were introduced on 15 July 2006 (Hab, 2014). Furthermore, the reduction in the number of car loan repayment instalments turned out to be a rumour. The government, thus, also creates the mobility pattern in Brunei. Furthermore, the majority of Bruneians work for the government due to the attractive incentives offered to staff in the government sectors. For example, the government provides homes and car loans at zero interest, which motivates, or at least helps, the staff working in the government sectors to buy cars.

"We are provided with car loans, so I think this is the reason, I would say, 99 per cent of the government staff have a car, or have access to cars. The car loan is without interest then cheap insurance; fuel is very cheap so this may explain why everyone has at least a car."

Interviewee 19: Male: 36 – 55 years old: Government Officer.

Brunei enjoys cheap petrol and diesel due to the government fuel subsidy. The retail price of petrol in Brunei is fixed. However, in 2008 the Government of Brunei, through the Energy Division of Prime Minister's Office (now known as The Energy Department at the Prime Minister's Office), introduced a new directive entitled "Third Additional Directive on the sales of Diesel and Motor Gasoline Premium 97 for Vehicles and Vessels Not Registered in Brunei". Sales of Super 92 (Ron 92) and regular 85 were restricted to foreign vehicles. Furthermore, the prices of Ron 97 and diesel were increased to BND $0.84 from BND $0.31 per litre for diesel and from BND 0.53 to BND $0.89 per litre for Premium 97 (Ron 97) (Abu Bakar, 2008). In March 2012, The EDPMO revised the retail petrol cost for vehicles not registered in Brunei. The new price for diesel is BND $1.06 per litre and for Premium 97 BND $1.10 per litre (Thien, 2012). One of the aims of the new retail price is to ensure that Brunei has a sufficient stock of petroleum products. The aim of the new directive was in line with the purpose of the subsidy, i.e. to reduce the burden on Bruneians.

However, one of the problems caused by the cheap retail price of petrol is the number of unnecessary journeys undertaken by some drivers.

"There are people who travel from Belait or Tutong to Brunei Muara for work. We have no problem with that. However, some of these people commute back for lunch, then commute back to Brunei Muara, and working then go back home in the evening. The youth, maybe you have heard of this, they live in Brunei Muara, drive to Tutong for morning tea, then drive to Belait for lunch, went to Brunei Muara for like bowling, football then went back home. At night, went to a cafe. So like, some of the Bruneians do not even care about petrol, it's cheap like mineral water is more expensive than our petrol."

Interviewee 23: Male: 36 – 55 years old: Government Officer.

Another problem associated with the increasing numbers of people and motor vehicles in Brunei is that of traffic congestion. Traffic congestion is caused by an increase in the population, leading to an increase in the numbers of cars and the need to travel. In Brunei, traffic congestion is worsening, especially in educational areas (schools and higher institutions) and the workplace. This may lead to people spending longer on the roads. Furthermore, all the public transport operators blamed traffic congestion for the problems of bus frequency. Traffic congestion makes the use of bus services in Brunei unattractive; hence people, including students, tend to use cars rather than buses. The increase in road traffic does not occur across the road network but takes place during specific hours. Most of the traffic congestion occurs in the morning, noon and afternoon, with less traffic congestion during the school holidays.

"I live in Jalan Tutong. It takes like more than an hour drive to Airport Lama[34]. But if there is like delay like car accidents or car breakdown, then I won't reach my office on time. But during the non-peak hours, like at night, it only takes like 15 minutes to reach the office. Nowadays the traffic jam is worsening. Hopefully, the plan to build a bridge that connects Lumapas and Bandar Seri Begawan will ease the traffic."

Interviewee 10: Male: 26 – 35 years old: Government Officer.

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[34] Airport Lama is situated in Berakas, where almost all the government main offices are situated.

The interviewees agreed that traffic jams are caused by the increase in the population and the number of motorised vehicles (including buses and goods vehicles). However, there are two distinctive issues of car ownership that lead to traffic congestion. The first is the use of the car to travel to the workplace, as almost all the government offices are situated in Berakas (better known as Airport Lama). Another cause of traffic congestion is the increase in the number of journeys combined with the decline in car occupancy. The majority of the interviewees mentioned the redistribution of workplaces (such as being transferred to another office, work promotions) and the presence of children attending schools.

"I think placing all government offices to Airport Lama is like a double-edge sword. As for work purposes are like, it is easier for us to go from one office to another office so like less time-consuming to travel. But the problem is, it is the centre for job, so like in the morning, people move to one direction, Airport Lama, so like traffic jam is like I don't know; now getting worse."

Interviewee 3: Male: 18 – 25 years old: Private sector.

"We share cars, I send my children to school, me and my wife head to Airport Lama. My wife's office is just in front of my office, like few minutes' walk. I was promoted and was transferred to another department. So like we have to use our own cars like if I drive my children to school, then send my wife to her office, I will be late. Traffic jam is like everywhere; sending my children, going to work. Then like today I send my children to school and my wife picks them up in the afternoon. Tomorrow, my wife, next day myself and going on and on. We used to share car to the office but now we don't."

Interviewee 11: Male: 26 – 35 years old: Government Officer.

The growth in the number of vehicles also affects the number of traffic accidents and traffic fatalities in Brunei Darussalam. However, the situation in Brunei differ from Qatar. In Qatar (as mentioned in Chapter 2), the increase in the number of vehicles correlates to the increase in traffic accidents and traffic fatalities. However, in Brunei, Table 5.2 indicated that road accidents had dropped to 489 cases in 2012, after almost 700 accident cases were recorded in 2010 and 2011. The number of deaths is also decreasing. The fall in the accident cases and

deaths, according to one of the interviewees, is because of the constant monitoring and education campaign by the joint enforcement forces (especially the Royal Brunei Police Force), as well as the improvement in the road conditions.

	2008	2009	2010	2011	2012
Accidents	515	608	698	699	489
Injuries	2775	3110	3414	3598	3310
Deaths	29	38	26	47	28

Table 5.2 Road accidents, injuries and deaths in Brunei Source: Department of Statistic (2012).

The growth in the number of vehicles on the roads in Brunei may have a strong influence at the landscape level on transition to sustainable transportation, especially due to the increasing level of traffic congestion. Land planning in Brunei tends to support the dominance of cars. In relation to population growth and growth in the number of vehicles, the expansion of development across Brunei away from Bandar Seri Begawan, and the housing development on the fringe of Brunei Muara and other districts, has resulted in longer journeys and increased demands for mobility. The franchised public transport services only operate in Brunei Muara and Belait districts, while inter-district buses run from Belait or Tutong districts to Brunei Muara. The buses in Brunei do not have their own special lanes, which makes the journey times even longer in terms of time taken to reach destinations.

Mobility demands in Brunei, especially for work-related trips, are matched by the use of cars, leading to the ownership of cars. The ownership of cars is fuelled by the heavily subsidised petrol, the low cost of car insurance and road tax, support from the government with car loans at zero interest for eligible officers, and promotions by car dealers encouraging the purchasing of cars. Furthermore, the inadequacy of immediate public transportation, such as buses, motivates people to own cars. This leads to traffic congestion. Worsening traffic congestion has led to people urging the government to find a better solution to personal mobility. This may have a strong influence on the transition to more sustainable transportation, such as the integration of land use plans and sustainable transportation policy.

5.3 Ground public transport

The ground public transport in Brunei consists of taxis and bus services. The number of taxis in Brunei is decreasing. The Ministry of Communications indicated that there were approximately 400 taxis operating in Brunei (Oxford Business Group, 2008). Yet, according to the Brunei Muara Taxi Driver Association, there were approximately 50 taxis operating; however, in 2008 there were only 30 individual taxis operating in Brunei (Sadikin, 2008). Furthermore, the number of taxis in Belait District is also decreasing.

"There were thirty plus taxis operated in Belait District, but now only eight taxis survive. I am not sure for next year and a friend of mine is planning to quit driving taxi."

Interviewee 13: Male: Above 55 years old: Public Transport Operators.

Bus services have been identified as an important mode of transportation, allowing the public to participate in employment, education, leisure and social activities. Without public transport, particularly bus services, many people, including those who cannot drive or who have no access to vehicles, would have problems pursuing economic and leisure activities, such as shopping or getting to work. Bus services complement the car as the bus allows users to travel from one place to another. The Ministry of Communication has provided two types of public bus services in Brunei: the franchise buses (better known as purple buses) and the inter-district buses. One of the roles of bus services in Brunei is:

"...to ensure the community has safe, efficient, accessible and secure communication so to enhance the national competitiveness and quality of life in today's knowledge-based economy. Furthermore, we aim to provide transportation infrastructure and services for the mobility of not only us, the humans, but also the goods here in Brunei and from neighbouring countries."

Interviewee 25: Female: 36 – 55 years old: Government Sector.

The number of buses in Brunei, including for private transportation and private rental (including school buses) is also increasing. Buses are hired for private functions such as weddings and holidays (to the neighbouring countries). The Ministry of Education has provided free school buses for the use of eligible secondary school students who are living far from their schools (Awang, 2007). Nevertheless, it was not clear how many school buses were hired by the Ministry of Education. However, according to one of the companies hired by the Ministry of Education, it is more profitable to rent buses for students than using them on public bus routes. Payments for school buses are at a fixed rate and the time of operations depends on the agreement with the Ministry of Education; usually for mornings and afternoons, although some companies are hired to provide school buses for afternoon classes.

"Most of our rented buses are being hired during the school holiday especially to Miri and Kota Kinabalu. For public transport, we have 16 buses."

Interviewee 26: Male: 35 – 55 years old: Public Transport Operators.

"We have increased number of buses we have so to ensure better frequency."

Interviewee 20: Male: 35 – 55 years old: Public Transport Operators.

Buses are the only widely-used form of ground public transportation in Brunei besides the motor car. According to interviewees from the Ministry of Communications and public transport operators, there were more than 3 million bus users in 2010. The former Minister of Communications indicated that the Bruneians are not taking advantage of the existing public transport services (Sadikin, 2010) and the majority of bus users are from the immigrant population (Shen, 2011).

The interviewee from the Ministry of Communications indicated that there are two types of public buses in Brunei: the inter-district buses and the franchise buses.

"Franchise buses are the famous purple buses. It is a tendered bus. The bus services have to compete in order to win the tender. Bus companies who won the tender will service the specific routes like Southern, Northern, Eastern, Western and Central and Business lanes route. The existing bus franchise bus is actually re-tendered so they could continue their

services. We already offered new tender, which is already being closed and now under assessment stage. The inter-district buses are not tendered buses so the buses are based on the age and performance quality of the buses."

Interviewee 21: Male: 36 – 55 years old: Government Officer.

There are six public transport operators of franchise buses operating in Brunei; five operators serve Brunei Muara district and one operator serves Kuala Belait town. The inter-district buses run either from the Belait district to the Brunei Muara district (via Tutong district), or from the Tutong district to the Brunei Muara district.
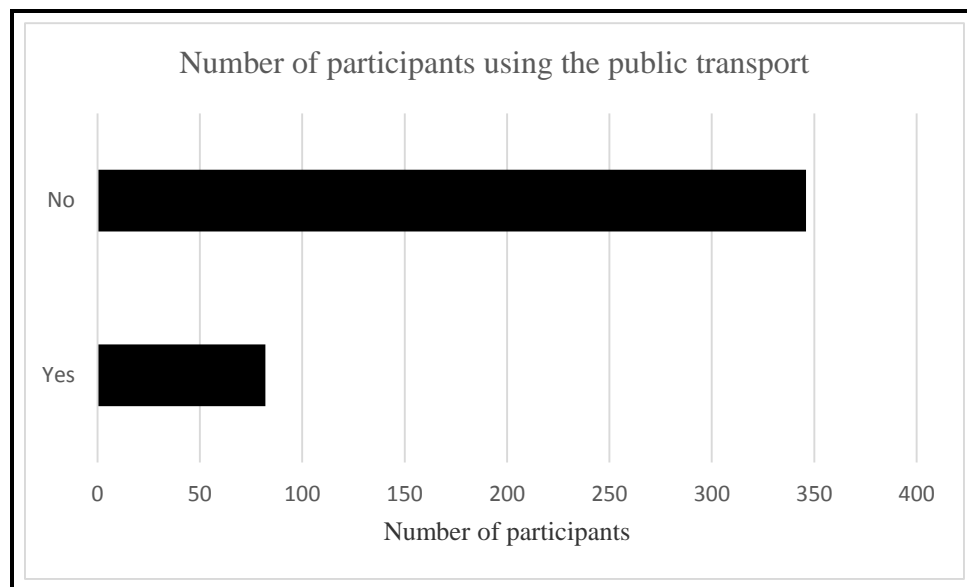
Figure 5.3 Number of participants using the public transportation in Brunei. Note: 82 participants (out of 428 participants use the public transport).

According to the survey questionnaire, out of 428 respondents, only 82 (19.2%) of the study cohort use public transport. The majority of those public transport users were from the immigrant population (56 per cent).

Some of the young generation in this survey commented that the bus services in Brunei are considered for the use of immigrant workers. Ten participants expressed their dissatisfaction with other Bruneians who look down on those who use the bus services. Two participants confessed that they look down on those who use the bus. The two quotations below are based

on the original quotations from the comments section in the survey questionnaires (which include the 'equals' sign (=) and capital letters).

"Apart from awareness, educate people that WE ARE STILL BRUNEIANS even though we use the bus, so STOP STARING AND MAKING FUN TO THOSE USING THE BUS! Seriously!"

Survey: Female: Bruneians: 18-25 years old: Student.

"People in Brunei including myself, would not even consider using the bus. Public transport in Brunei = for workers (Indian mostly)."

Survey: Male: Bruneian: 18-25 years old: Student.

The quantitative survey shows that the use of public transport is dominated by the low-income immigrant population, and most of these use the buses during the weekends (non-working days) for leisure activities. The Bruneian participants who utilise public transport are mainly from the younger generation with low incomes, and these are predominantly student respondents. A majority of the Bruneians use the services a couple of times a month. This confirms the view that public transport is a more popular mode of transportation for non-Bruneians than for Bruneians. The responses indicate that low public transport usage amongst the Bruneians may be due to their perception that public transport is for immigrant nationalities; in some cases, Bruneian respondents are deterred from using buses by their perception that other Bruneians do not think that Bruneians should be using buses.

There is a need to rebuild policies, with the aim of improving the almost-extinct taxi services in Brunei. Policies should also be aimed at increasing the number of people using buses, especially amongst young Bruneians. Reducing congestion may improve air quality, and efficient utilisation of bus services may provide a partial solution to traffic congestion problems. With increasing pressure from the public on the issue of traffic congestion, government and bus operators have an opportunity to improve the service coverage, compared to the existing service. It is also reasonable to hope that an efficient public transport system may attract more passengers. Passengers, while travelling on a bus, are able to pursue other activities such as reading, relaxing and interacting socially with other

passengers (Beirão and Cabral, 2007; Gardner and Abraham, 2007; Hiscock et al., 2002); something a car driver cannot do.

5.4 Economic development

The World Economic Forum (Martin et al., 2010; Schwab, 2010) categorised Brunei as a developing nation based on several indicators under the Global Competitiveness Index, such as institutions, infrastructure, macroeconomic environment, health, and primary education. On this Global Competitiveness Index, Brunei is ranked 28th out of 139 countries. The Brunei economy is under transition from stage 1 (low-cost efficiency in the production of commodities or low value-added products) to stage 2 (efficient productive practices in large markets) because Brunei's economy is dependent on the oil and gas sectors (Schwab, 2010).

However, it is unclear whether Brunei is a developed or developing country. Under the Human Development Index[35] (HDI), Brunei is categorised as a developed country based on the health, education and income indicators. Brunei is ranked 37th out of 169 countries. The Human Development Index for Brunei (from the 2013 Human Development Report) is 0.854 in 2010 and 2011 and 0.855 in 2012. The score achieved by Brunei placed the country in a very high human development category, distinguishing it as a developed country (United Nations Development Program, 2013).

It is important to understand the form of development in Brunei, as part of the context for improving the sustainability of transport. In addition, in order to compare the transportation sectors of Brunei with other countries, it is important to appreciate any differences in development levels.

Brunei's economy has been driven by the petroleum industries. Petroleum exploration began in 1899, and the first successful exploration was in 1929, in Seria, Belait district (Brunei Shell Petroleum Company Sdn Bhd., 2010). Brunei Liquefied Natural Gas (LNG) began its

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[35] This study quoted UNDP (2013), stating that "*HDI is a summary measure for assessing long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living.*"

operations in South West Ampa gas field (offshore) around thirteen kilometres from Kuala Belait. Brunei LNG was established in December 1969: operations only began in 1972 although the discovery was made in 1963 (Brunei LNG, 2011). The oil and gas industries contributed 57.5 per cent of GDP in 2000, rising to 66.6 per cent in 2007. In 2007, the two sectors accounted for 96 per cent of Brunei's total export revenue (Brunei LNG, 2011; Brunei Shell Petroleum Company Sdn Bhd., 2010).
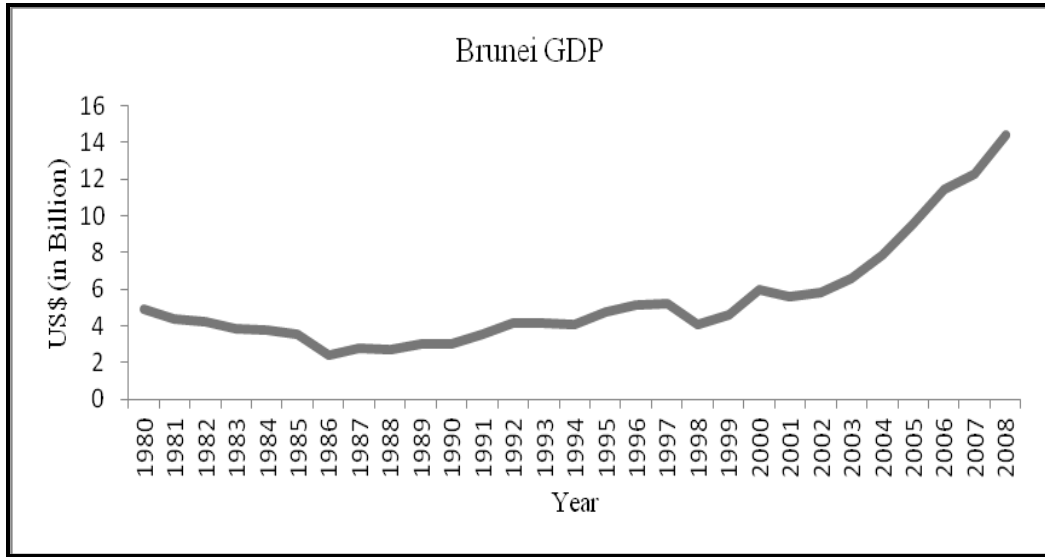
Figure 5.4 (a) Brunei's GDP Source: The World Bank (2011).

Brunei has been synonymous with petroleum since the first oil well discovery around 80 years ago and that of natural gas more than 40 years ago. With the growth in fuel demand, Brunei is making profits from petroleum products. Brunei is also experiencing economic growth. The increasing diversity of economic activities and the high GDP has led to a need for mobility, especially road vehicles (Dargay et al., 2007). Mobility is essential in order to participate in the economic development, especially as job opportunities through the creation of new economic activities are situated at some distance from housing areas. Dargay et al., (2007) also showed that the increase in economic growth and population may lead to an increase in the number of passenger cars.

The growth in incomes (personal and household incomes) generated by economic activities may well increase the number of vehicles on the roads. The demand for mobility may reduce the attractiveness of public transport and other modes of transportation (such as walking and cycling). In Brunei, in the past, having a car was considered a luxury. With the increase in job creation forcing people to travel further for employment, owning a car is now considered a necessity.

"I have applied for many posts in the government sectors, but when I got a job, the job was in Tutong (District). I have to take the job because higher salary, many benefits like housing scheme and more stable than in the private sector so like I have to have a car."

Interviewee 14: 26 – 35 years old: Government Sector.

However, the increase in economic activities and personal and family incomes, along with the low cost of acquiring a car thanks to low car insurance, road tax and fuel costs, means that the necessity of having a car is now slowly becoming a wealth indicator.

The increase in economic activities and transportation demand has led the government to expand the road infrastructure and build roads to ease traffic congestion. Roads in rural areas are being developed and improved to build linkages to employment and educational areas. However, the infrastructure development of public transport has not kept pace with Bruneians' mobility demands, and this may prevent public transport users from benefiting fully from any growth in economic activities. The increase in travel demands and the clearance of land for road-related infrastructure affect the environment, especially air quality.

The increase in economic activities and the demand for mobility causes increased consumption of petrol, especially Premium 97 and diesel (Figure 5.4 (b)). The consumption is expected to grow as the number of cars in Brunei, along with the need to travel, increases. If the consumption patterns continue to increase, one might expect two possible outcomes.
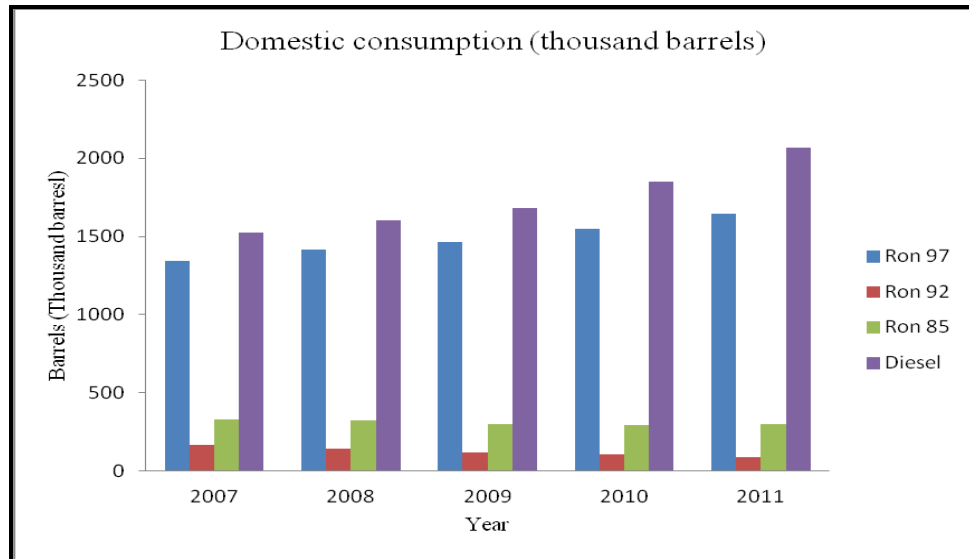
Figure 5.4 (b) Domestic consumption of petrol in thousands of barrels (Department of Statistics, 2012).
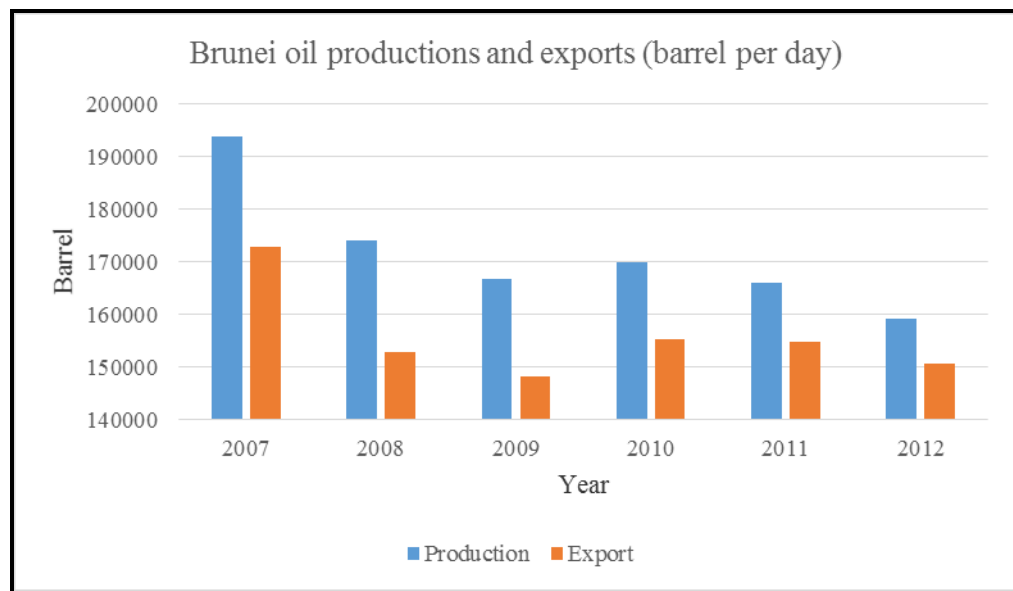
Figure 5.4 (c) Production and exportation of oil in Brunei in thousands of barrels (Department of Statistics, 2011; 2012).

The first concerns petroleum sales in both local and international markets. Brunei is an oil- and gas-producing nation, deriving more than 90 per cent of its GDP from this industry. With the increase in fuel consumption in Brunei, especially in the local transportation sector, there will be an increase in the volume of petroleum sold domestically and a corresponding decrease in petroleum available for sale internationally. Oil production and exports from

Brunei in barrels per day, as shown in figure 5.4 (c)), have decreased slightly since 2010 (Department of Statistics, 2012). In addition, the oil price internationally is considered inconsistent; hence, profits from the sales t will also be affected. Furthermore, there is still concern about how long Brunei will be able to continue to produce petroleum and be dependent on its petroleum industries as a source of income.

According to one of the officials from the EDPMO, the Brunei oil and gas industries will follow the Energy Whitepaper that is yet to be published. Under the Energy Whitepaper, Brunei is focusing on several goals:

1. The strengthening of the growth in the oil and gas activities (upstream and downstream).

   - Initiate exploration of new resources, local and outside Brunei; increase the downstream economic output

2. Safe and reliable supply of energy

   - The increase in the renewable energy use, reduce the energy intensity and secure supply of transport fuel

Secondly, the subsidy is considered a sensitive issue. The role of the subsidy, first introduced in 1978, has been to lessen the burden of the people living in Brunei (Mahmud, 2008). However, currently it can be deduced that the government of Brunei is now facing a challenge in dealing with the burden of Bruneian transportation trends. The government's expenditure on the fuel subsidy increased from BND $50 million in 2004 to BND $202 million in 2007, BND $340 million in 2008 and BND $365 million in 2011 (EDPMO, 2012; Masli, 2010a). To put this issue into some kind of perspective EDPMO (2012) indicated that the 2011 fuel subsidy might have been used to provide 22 new schools, 36 health centres, 5200 low-cost housing units, 307 km of roads, 180 thousand computers for schools, and 2500 scholarships for students to study abroad.
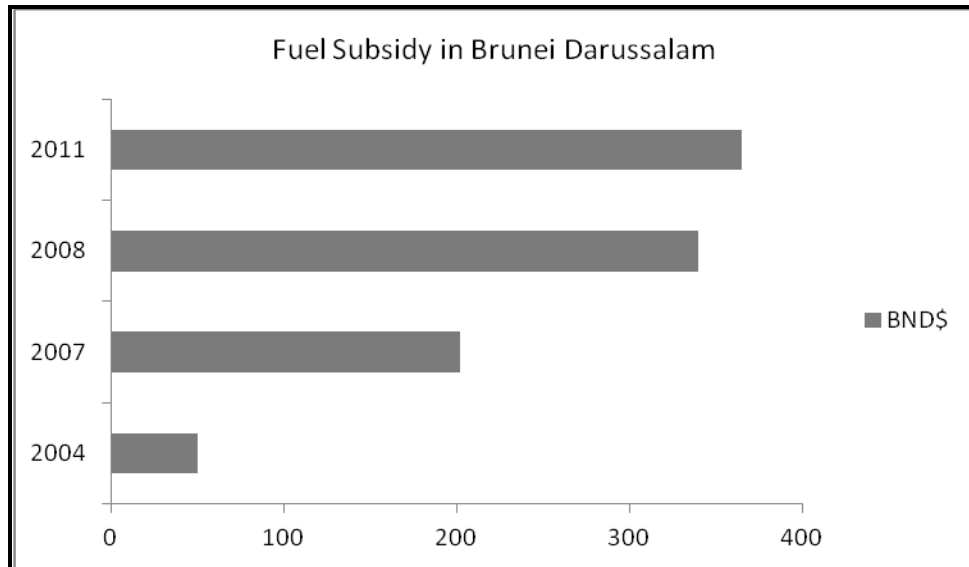
Figure 5.4 (d) Fuel subsidy in Brunei: Source EDPMO (2012b) and Masli (2010a).

The oil and gas industries have been playing a significant role in the economic development of Brunei: since the 1920s for oil and the 1970s for gas. Brunei's GDP per capita is amongst the highest in the world. With the net income from oil and gas industries, Bruneians are able to enjoy a high standard of living with free education and healthcare and no personal taxes; therefore most Bruneians can afford to own cars. However, there is an increasing domestic consumption of fuel (Figure 5.2 d), especially diesel and Ron 97 petrol, that would reduce the Brunei's income associated with the decrease in oil and gas export. The government is paying the price for the increasing the amount of subsidies to the road sector. This has prompted the government to educate the population on the additional expenditure it has incurred on subsidies alone. Furthermore, the government's initiatives, such as heavily subsidised petrol, make travelling by car more attractive than any alternatives on offer. Petrol, road tax and car insurance in Brunei are considered cheap. Additionally, with no personal income tax to pay, along with subsidies for staple foods and petrol, and privileges such as free education and healthcare, Bruneians have extra money in their pockets, and cars are perceived as cheap to obtain (similar to the situation in Qatar, as mentioned in Chapter 2). The increase in both the number of vehicles on the roads and the level of car ownership is causing frequent and worsening traffic jams. Although this factor will not have a strong

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influence on transition for the locals, the government is aiming to reduce expenditure and persuade local people to 'travel smart' and reduce the number of unnecessary journeys.

5.5 Environment

Brunei is not facing immediate environmental problems associated with transportation issues. However, climate change, global warming and carbon emissions are amongst the environmental concerns in Brunei. As development progresses, the impact on the environment from transport-related activities, especially on air quality, will increase. All the interviewees recognised the need to reduce carbon emissions. The interviewees also agreed that the demand for energy, especially electricity and automobiles, will continue to increase. Hence, there should be more initiatives to reduce carbon emissions.

Carbon emissions in Brunei, as reported by Brunei's newspapers as well as international newspapers and news reports, are a cause of concern to the public, especially the young. No academic literature or official documents indicate the current level of carbon emissions from the transport sectors in Brunei. A study to determine the carbon dioxide emission level is to be conducted (Department of Environment, Parks and Recreation), but no further media conferences have been scheduled to follow up this study. However, will draw on the study of the level of air pollutants during haze and non-haze periods in 1999. Although this study was done in 1999, the data was the only available published information relating to carbon emissions and other related pollutants, thus calling for more monitoring to be carried out in this field.

As shown in Figure 5.5, the mean concentration of carbon monoxide in milligrams per cubic metre (mg m^{-3}) was higher during the haze period. However, the mean reading was considered low when compared with the guidelines from both the WHO and the United States National Ambient Air Quality Standards. Brunei is the one of the world's largest carbon dioxide emitters per capita (19.8 metric tonnes in 2007 and 23.7 metric tonnes in 2009). The emissions are considered higher than the average non-OECD high-income country (14 metric tonnes per capita) and Australia (17.9 metric tonnes per capita) (Oxford

Business Group, 2013; No, 2010). The extent to which transportation in Brunei consumes energy is still unknown.

Pollutant	PM_{10} ($\mu g\ m^{-3}$)	SO_2 ($\mu g\ m^{-3}$)	NO ($\mu g\ m^{-3}$)	NO_2 ($\mu g\ m^{-3}$)	O_3 ($\mu g\ m^{-3}$)	CO ($mg\ m^{-3}$)
(a) *Haze*						
Range	1.2–999	0.78–87.3	6.8–97.2	5.8–99.1	5.1–99.9	1.2–21.9
Mean	109.9	7.27	19.9	41.5	63.2	4.20
S.D.	148.7	8.47	12.1	20.2	17.4	2.39
N	2032	2004	1922	1982	1749	2007
US NAAQS	150 (24 h)	365 (24 h)		100 (1 yr)	235 (1 h)	10 (8 h)
WHO guideline	70 (24 h)	100–150 (24 h) 350 (1 h)		150 (24 h) 400 (1 h)	100–120 (8 h) 150–200 (1 h)	10 (8 h) 30 (1 h)
No. of occasionsWHO guideline was exceeded	54	0		0	0	7 (8 h) 0 (1 h)
(b) *Non-haze*						
Range	9.0–393	3.6–23.3	6.6–90.4	3.6–99.4	1.4–97.0	0.6–2.77
Mean	20.4	5.24	20.8	28.6	48.5	1.29
S.D.	41.0	2.10	13.3	15.7	15.3	0.37
N	720	690	662	690	672	690

Figure 5.5 The concentration of air pollutants during haze and non-haze conditions in Brunei
Source: Radojevic and Hassan (1999).

Climate change and air pollution from transportation and electricity consumption are now becoming important issues in Brunei. Ground transportation is acknowledged by nearly 90 per cent of the participants in this survey to have an impact on the environment and to contribute to the highest carbon dioxide emissions per capita in Brunei, according to three quarters of the study population. However, less than 50 per cent of the surveyed participants are willing to use public transport voluntarily to reduce carbon emissions.

Sustainability has been one of the government's visions. During the United Nations Framework Convention on Climate Change (UNFCCC) conference in 2010, the Brunei Ministry of Development indicated that the country intended to implement measures to reduce greenhouse gases. Brunei is committed to scaling down energy intensity by up to 25 per cent (using the 2005 benchmark) by 2030, via the Energy Efficiency Conservation initiative (UNFCCC, 2010). Nevertheless, in 2014[36] Brunei reaffirmed its commitment to

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[36] His Majesty the Sultan of Brunei's decree during the summit's Plenary Session, during UN Climate Summit in New York, September 2014 (Haris, 2014).

reduce its total carbon emissions by 63 per cent by the year 2035 through the implementation of Brunei Vision 2035[37], using the 2009 baseline from the business-as-usual scenario (Haris, 2014).

Brunei is also committed to preserving 58 per cent of the forested areas for the Heart of Borneo project[38] (Piri, 2012). The commitment shown by the Government of Brunei has been praised by the World Wildlife Fund (WWF) Special Advisor to the HoB initiative, who commented that Brunei was the catalyst for the initiative to take off (Munn, 2012).

"The Heart of Borneo Project is seen to create more awareness to the Bruneians, especially amongst the school kids, teenagers and youths. Like Brunei is conserving more than half of the land area for this project so like, every development in Brunei should be carefully managed. So when Bruneians are aware of this, less cars will be used, then no need to have a major expansion for roads."

Interviewee 11: Male: 26 – 35 years: Government Officer (representing NGOs).

The policy from the Forestry Department (Table 5.5) could be seen as quite close to the reduction in carbon emission levels in Brunei. However, the carbon sink initiative from the forestry sector, is insufficient on its own, to reduce the carbon emissions in Brunei.

The impact on climate change of carbon emissions from vehicles and the resulting challenges to sustainability are recognised by the Bruneian government at the national, regional and international levels. The transportation sectors, together with electricity, are the top contributors to carbon emissions in Brunei and this fact is becoming part of the national

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[37] Brunei Vision 2035 (BEDB, n.d.):

1. the accomplishment of its well-educated and highly skilled people;

2. the quality of life (top ten using United Nation Human Development Index) and

3. the dynamic sustainable economy (top ten for income per capita).

[38] The Heart of Borneo project is a trilateral project signed by three nations, Indonesia, Malaysia and Brunei (countries that share the island of Borneo), in 2005. It aims to share responsibility for protecting the vanishing ecosystem of Borneo by managing the area sustainably (Heart of Borneo, 2012). More information can be found at http://www.heartofborneo.org/about-us/

agenda to reduce these emissions. The issues of carbon emissions and the environment are (at last) becoming important for the Bruneians, indicating the slow change in awareness of these problems. Brunei is actively involved in the initiative to reduce carbon emissions, especially in accordance with UNFCCC initiatives, and to preserve much of its forest for carbon sinks, as exemplified in the Forest Act 1934. International agreements and activities (e.g. UNFCCC and the Heart of Borneo (HoB)) are seen as efforts to promote a cleaner environment and reduce the carbon emissions per capita, and they further motivate both the government and the public to achieve sustainability.

Policy	Summary
Forest Act 1934	Protection of Brunei's forest and biodiversity.
National Policy on Forest 1986	Allocate 55 percent of the country's total land area as the national forest estate under the direct management of the Forestry Department
'1 tree felled plan 4' policy	Short term strategy to restore and conserve forest

Table 5.5 Policies from the Department of Forestry, Ministry of Industry and Primary Resources Sources: FAO (2010), Forestry Department Brunei Darussalam (2010) and Kon (2007).

5.6 Conclusion

Referring back to chapter 1, the research questions were framed in such a way as to determine the potential for the development of low-carbon transportation in Brunei. According to the interview data, the transportation scenario in Brunei is considered unsustainable. This negative situation is expected to continue, especially due to the increasing number of cars and increasing mobility needs. Thus, Brunei satisfies the unsustainable transportation criteria as mentioned by Black and Nijkamp, (2002), Black (2010) and Wegener and Green (2002).

This chapter identified the policies that are directly and indirectly linked to Brunei's current transportation situation and context. It also indirectly identifies several attempts by the Government of Brunei to move towards sustainable transportation, although the initiatives were seen as inadequate. Some of the transport policies are moving towards sustainable

mobility while others, despite aiming to provide a sustainable future in social issues such as reducing the gap between the rich and poor, by providing interest-free loans for cars and housing and heavily subsidising goods such as petrol, are moving in the opposite direction to sustainable mobility.

Car and house loans at zero interest, heavily subsidised fuel, low car insurance premiums and road tax, and transport allowances to students and government employees, may well have a direct influence on the growth of car ownership in Brunei. The limited options of public transportation, inadequate investment in public transport and non-motorised transport, the unattractive image of buses and their passengers, and the building and expansion of road infrastructure make public transport, particularly bus services, unattractive to the public, and they fail to meet the increasing demand for efficient travel (Köhler et al., 2009; Nykvist and Whitmarsh, 2008). This leads to negative transportation equity and fairness, especially for those on low incomes (Litman, 2012; Pacione, 2005; Welch, 2013; Welch and Mishra, 2013). The National Housing Scheme and the accelerated increment post-2006, were seen to have an effect on the extent of car ownership and travel needs in Brunei. With the increase in GDP, something also experienced by China and Pakistan (Ahmed et al., 2008), extra cash and no personal taxation, Bruneians can afford to own cars.

The government of Brunei is attempting to reduce carbon emissions and energy use. The interviewees agreed that building additional roads (for smooth traffic flow) and making vehicles cleaner will not be enough to reduce carbon emissions. Government officials from several ministries are working towards lower energy use and, especially, towards sustainability. This is considered relevant as Brunei has the highest carbon emissions per capita in the ASEAN region (Bandial, 2013). This may create a need for the development of low-carbon transportation. The Brunei Vision 2035, Heart of Borneo and UNFCCC, along with the current forestry policy, may pressure the government and the relevant stakeholders into improving the transportation sectors, moving towards low carbon emissions and promoting sustainability in transportation. The loan cap enforced by the Ministry of Finance in 2005 resulted in low sales figures and fewer cars being registered in 2005 than in previous years. The introduction of new parking fees and a reduction in the number of parking spots

along with half-price bus fares for children below the age of 12, students in school uniform and those passengers aged over 60, were seen to promote the use of bus services and/or promote car sharing/car-pooling among family members and close friends. Furthermore, the high domestic consumption of petrol/diesel and the increased expenditure incurred by the government of Brunei in paying the cost of fuel subsidies may improve attitudes to green transportation; such as more car-pooling, the use of bus services, and a reduction in unnecessary travel.

The collective pressure on current mobility in Brunei can be translated into action towards the transition to low-carbon transportation. However, the pressure might be considered insufficient unless the factors causing the unsustainability in mobility, such as the poor quality of bus services offered to the public and the psychological and behavioural preference for cars, are studied. Chapter 6 explores the role of key actors in transportation, while chapters 7 and 8 identify the attitude and behaviour of Bruneians regarding both private and public transportation. Exploring the attitude and behaviour of Bruneians with regard to these types of transport may prompt the relevant authorities to provide bus services of the quality required by the Bruneians (a large pool of potential passengers), from which they might derive similar benefits to those provided by cars.

Chapter 6: Role of transportation actors and niche development

6.0 Background

The purpose of this chapter is to distinguish the roles and activities of various transportation actors towards the growth of sustainable transportation in Brunei. This chapter explores current and future attempts to improve transportation in Brunei and to provide potential solutions for sustainable transportation.

6.1 Role of the public in decision-making

The survey participants were asked for their opinions on decision-making in transportation. The participants were presented with three scenarios:

1. In your view, should the community (for example, yourself) participate more in the sustainable transport initiative?

2. In your view, should the community (for example, yourself) participate more in the planning process of sustainable transportation policy?

3. In your view, should the government and the public transport operators invite the community (for example, yourself) to participate in developing public transport infrastructure and services?

Survey participants in this study thought that the community should be given more opportunities for consultation, especially regarding projects that may affect their daily lives. More than two thirds of participants thought that the community should participate more in terms of sustainable initiatives, planning for a sustainable transportation policy and the

development of public transport infrastructure and services. A minority of participants disagreed. The findings also indicate a high percentage of participants (25.0% to 32.2%) who were not sure whether the community should be more involved in public participation processes. The majority of the Bruneian participants agreed that the community should be more involved in the transportation agenda, whilst a majority of the non-Bruneians were unsure. The younger generation (18 – 35 years old) wanted the community to be more involved in a public participation process in transportation and sustainability issues.

Opinion	Yes	No	Unsure	Missing	Total
In your view, should the community (for example, yourself) participate more in the sustainable transport initiative?	65.7 (n=281)	5.4 (n=23)	27.6 (n=118)	1.4 (n=6)	100.0 (n=428)
In your view, should the community (for example, yourself) participate more in the planning process of sustainable transportation policy?	63.6 (n=272)	2.6 (n=11)	32.2 (n=138)	1.6 (n=7)	100.0 (n=428)
In your view, should the government and the public transport operators invite the community (for example, yourself) to participate in developing public transport infrastructure and services?	68.7 (n=294)	5.1 (n=22)	25.0 (n=107)	1.2 (n=5)	100.0 (n=428)

Table 6.1 (a) Opinions on community participation in transportation development, policy and initiatives.

The majority of the student population wanted the community to engage more with the transportation agenda in terms of initiatives, policy towards sustainability, and the planning and development of public transport infrastructures and services in Brunei. Furthermore, richer participants are inclined to believe that the government, public transport operators and other relevant agencies should involve the community more in their decision-making process towards sustainable transportation. Table 6.1 (b) indicates that seven in ten non-public-transport users would like the community to be more engaged in transport policy planning.

Moving from the survey to the interview process, the majority of the interviewees offered few comments on their role in public participation. Nevertheless, most of them commented that people should exercise self-initiatives for sustainability. Self-initiatives include car-sharing practices amongst family members and the reduction of unnecessary travel. Several interviewees believed that the community should follow the government's travel tips, such as

Energy Saving on the Road (EDPMO, 2012), published online[39] by the Energy Department of the Prime Minister's Office (EDPMO), Brunei. Furthermore, several interviewees believed that they should be given more options in sustainable transportation initiatives and hinted at the use of other low-carbon transportation such as hybrid cars and LRT (Light Rail Transit), rather than buses.

"Car-pooling or sharing a car amongst your family members is good. What we can do is maybe drive smartly. Like plan your journey to avoid traffic jam, avoid unnecessary travel and like service our car regularly. Not only cutting down the carbon emission, we are also promoting better travel pattern."

Interviewee 10: Male: 26 – 35 years old: Government Officer.

"Just follow the advice from the Energy Department like not using the air conditioner unless it is very hot, drive at a constant speed, right tire pressure, avoid unnecessary travel, service my car, remove all unnecessary items from my car. So if the community could practise these, it would be great. It is okay to use the bus, but for me, I rather buy a hybrid or share car than using the bus. Plus, I would support the government if they are planning to bring in electric vehicles like electric cars or bikes."

Interviewee 11: Male: 26 – 35 years old: Government Officer.

The interviewees indicated that they were not given much information on transportation issues; yet they noted that the government paid great attention to other environmental subjects, such as cutting down on the usage of electricity and water.

The most important cause of low public participation in Brunei is the low public interest. The majority of the interviewees indicated that lack of knowledge is the principal reason for their lack of interest in events, thus resulting in low public participation. One interviewee believed that, were the development to generate economic activities (such as direct and indirect job opportunities in the community), they would not question it.

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[39] http://energy.gov.bn/Download/ENERGY%20TIPS.pdf.

	Nationality		Gender		Generation			
	Bru	N-Bru	Male	Female	YG	MG I	MG II	EG

In your view, should the community (for example, yourself) participate more in the sustainable transport initiative?

	Bru	N-Bru	Male	Female	YG	MG I	MG II	EG
Yes	72.4 (n=257)	32.9 (n=24)	68.6 (n=142)	62.9 (n=139)	64.7 (n=134)	69.3 (n=88)	62.9 (n=15)	62.5 (n=15)
No	5.1 (n=18)	6.8 (n=5)	7.2 (n=15)	3.6 (n=8)	6.8 (n=14)	3.9 (n=5)	5.7 (n=4)	0.0 (n=0)
Unsure	20.8 (n=74)	60.3 (n=44)	21.7 (n=45)	33.0 (n=73)	26.1 (n=54)	26.8 (n=34)	30.0 (n=21)	37.5 (n=9)
Missing	1.7 (n=6)	0.0 (n=0)	2.4 (n=5)	0.5 (n=1)	2.4 (n=5)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=72)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)

In your view, should the community (for example, yourself) participate more in the planning process of sustainable transportation policy?

	Bru	N-Bru	Male	Female	YG	MG I	MG II	EG
Yes	68.7 (n=244)	38.4 (n=28)	69.1 (n=143)	58.4 (n=129)	63.8 (n=132)	64.6 (n=82)	62.9 (n=44)	58.3 (n=14)
No	2.5 (n=9)	2.7 (n=2)	2.4 (n=5)	2.7 (n=6)	4.3 (n=9)	0.8 (n=1)	1.4 (n=1)	0.0 (n=0)
Unsure	26.8 (n=26.8)	58.9 (n=43)	26.1 (n=54)	38.0 (n=84)	29.0 (n=60)	34.6 (n=44)	34.3 (n=44)	41.7 (n=10)
Missing	2.0 (n=7)	0.0 (n=0)	2.4 (n=5)	0.9 (n=2)	2.9 (n=6)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=72)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)

In your view, should the government and the public transport operators invite the community (for example, yourself) to participate in developing public transport infrastructure and services?

	Bru	N-Bru	Male	Female	YG	MG I	MG II	EG
Yes	73.5 (n=261)	45.2 (n=33)	70.0 (n=145)	67.4 (n=149)	68.1 (n=141)	70.9 (n=90)	68.6 (n=48)	62.5 (n=15)
No	5.9 (n=21)	1.4 (n=1)	4.8 (n=10)	5.4 (n=12)	7.2 (n=15)	5.5 (n=7)	0.0 (n=0)	0.0 (n=0)
Unsure	19.2 (n=68)	53.4 (n=39)	22.7 (n=47)	27.1 (n=60)	22.2 (n=46)	23.6 (n=30)	31.4 (n=22)	37.5 (n=9)
Missing	1.4 (n=5)	0.0 (n=0)	2.4 (n=5)	0.0 (n=0)	2.4 (n=5)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=72)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)

Table 6.1 (b) Thoughts on community participation in transportation based on nationality, gender and age generation.

	Job			Salary				Public Transport	
	Stu	W	N-W	LS	LM	LMS	HS	User	Non-user

In your view, should the community (for example, yourself) participate more in the sustainable transport initiative?

	Stu	W	N-W	LS	LM	LMS	HS	User	Non-user
Agreed	70.7 (n=116)	62.0 (n=142)	65.7 (n=23)	61.2 (n=126)	52.2 (n=35)	78.0 (n=71)	78.7 (n=48)	31.7 (n=26)	73.7 (n=255)
Unsure	7.9 (n=13)	4.4 (n=10)	0.0 (n=0)	6.8 (n=14)	4.5 (n=3)	3.3 (n=3)	3.3 (n=2)	7.3 (n=6)	4.9 (n=17)
Disagreed	18.3 (n=30)	33.6 (n=77)	31.4 (n=11)	29.1 (n=60)	43.3 (n=29)	18.7 (n=17)	18.0 (n=11)	59.8 (n=49)	19.9 (n=69)
Missing	3.0 (n=5)	0.0 (n=0)	2.9 (n=1)	2.9 (n=6)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	1.2 (n=1)	1.4 (n=5)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (82)	100.0 (n=346)

In your view, should the community (for example, yourself) participate more in the planning process of sustainable transportation policy?

	Stu	W	N-W	LS	LM	LMS	HS	User	Non-user
Agreed	68.3 (n=112)	60.3 (n=138)	62.9 (n=22)	60.2 (n=124)	49.3 (n=33)	72.5 (n=66)	78.7 (n=48)	36.6 (n=30)	69.9 (n=242)
Unsure	4.9 (n=8)	1.3 (n=3)	0.0 (n=0)	3.9 (n=8)	3.0 (n=2)	0.0 (n=0)	0.0 (n=0)	2.4 (n=2)	2.6 (n=9)
Disagreed	23.2 (n=23.2)	38.4 (n=88)	34.3 (n=12)	32.5 (n=67)	47.8 (n=32)	27.5 (n=n=25)	21.3 (n=13)	58.5 (n=48)	26.0 (n=90)
Missing	3.7 (n=6)	0.0 (n=0)	2.9 (n=1)	3.4 (n=7)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	2.4 (n=2)	1.4 (n=5)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (82)	100.0 (n=346)

In your view, should the government and the public transport operators invite the community (for example, yourself) to participate in developing public transport infrastructure and services?

	Stu	W	N-W	LS	LM	LMS	HS	User	Non-user
Agreed	70.7 (n=116)	67.7 (n=155)	65.7 (n=23)	64.6 (n=133)	56.7 (n=38)	79.1 (n=n=72)	80.3 (n=49)	45.1 (n=37)	74.3 (n=257)
Unsure	8.5 (n=14)	3.5 (n=8)	0.0 (n=0)	8.3 (n=17)	1.5 (n=1)	3.3 (n=3)	1.6 (n=1)	2.4 (n=2)	5.8 (n=20)
Disagreed	17.7 (n=29)	28.8 (n=66)	34.3 (n=12)	24.8 (n=51)	41.8 (n=28)	17.6 (n=16)	18.0 (n=11)	52.4 (n=43)	18.5 (n=64)
Missing	3.0 (n=5)	0.0 (n=0)	0.0 (n=0)	2.4 (n=5)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	1.4 (n=5)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (82)	100.0 (n=346)

Table 6.1 (c) Thoughts on community participation in transportation based on job classification, range of salary and public transport usage.

"If you can see, Bruneians are invited to attend the dialogue like the EIA dialogue or participate in… for example participate in the questionnaires for Bandar Seri Begawan Master Plan. But young generation are not really interested because it is too complicated for them so the majority of the young generation involves in the planting trees, and cleaning beaches are now getting popular for these young generations. Plus like who are we to involve in the planning process? Not all of us are like familiar with all the technical stuffs."

Interviewee 4: Male: Above 55 years old: Retired.

6.2 Role of NGOs in sustainable transportation

The role of the NGOs has been acknowledged by the government, especially in building cooperation between the government and other stakeholders, principally the public, and in conducting research studies on various issues, notably sustainability. One of the interviewees, representing one of the NGOs in Brunei, indicated that there are several active NGOs with different aims and objectives, most of them addressing the issues of sustainability relating to such topics as health, poverty and environment.

The NGOs in Brunei have become increasing popular with the younger generation and students. Amongst the activities organised by the NGOs to improve the environment are the cleaning campaign (beaches and rivers), Earth Hours, planting trees and other awareness programmes. However, one of the interviewees from the EDPMO indicated that NGOs in Brunei do not match the requirements for sustainable transportation. Yet, one of the interviewees representing one of the NGOs in Brunei believed that NGOs might play an important role in promoting the use of buses in Brunei or other options such as walking and cycling. This might be achieved through the continuous awareness programmes that are usually provided by the NGOs.

Another NGO interviewee indicated that awareness of the importance of a green environment is increasing in Brunei, especially concerning the issue of carbon emissions. However, the interviewee was not ready to use the bus in the near future due to the current condition of the bus service. The main problems concerned regularity, safety and having to take multiple

buses to reach destinations, thus making the journey time longer compared to the use of car. Nevertheless, NGO group emphasised green behaviour, especially in attitudes to energy conservation, and stressed the conservation of energy in travelling, as mentioned and advised by the EDPMO. The functions of NGOs in Brunei are still restricted (especially they are limited in the number of members and NGOs in Brunei is only heard recently), and they need capital and support to work effectively. The members of the NGOs, depending on the nature of their work and vision, should be knowledgeable about and familiar with the application of technology. By acquiring these skills, they will optimise their contribution to the community.

One of the interviewees, representing the EDPMO, indicated that raising awareness is considered important in order to change behaviour towards low-carbon transportation, especially among the young generation and students. Encouraging change in transportation attitudes in the long term will create a sustainable community, by reducing reliance on motorised transportation. This was confirmed by representatives from one of the NGOs.

"The role of NGOs could act as the catalyst or driving force for better public support such as for the government initiatives. The NGOs can initiate better public participations as we attempt to increase the knowledge on certain matters. Members in NGOs have different background, thus we have different ideas to deliver to the government. Furthermore, we concentrate on this issue and the government has to take care of several issues. So we can respond quickly and we can help to voice the thoughts from the community."

Interviewee 17: Male: 26 – 35 years old: NGOs.

6.3 Role of public transport operators towards sustainable transportation

The role of public transport operators is not solely to operate a profit-driven business but to support the government's initiatives and vision to provide safe and alternative modes of transportation to the populace. The main role of the public transport operators emerging from the interviews, is to provide services that are regular, frequent, punctual, comfortable and safe. Additionally, the public transport operators tend to have their own initiatives to promote the use of buses in terms of research studies, such as strategic bus stops and user statistics.

Also the operators wish to rebrand the image of their bus services by addressing problems such as physical conditions and an effective ticketing system.

The majority of the immigrant workers in this study choose buses as the cheapest transportation option. Buses are considered the lifeline of these immigrant populations, especially those with no or limited access to cars, in order for them to participate in many activities, such as education, employment, social and leisure activities. The migrant workers, in turn, are providing a source of cheap labour to the Brunei economy.

6.3.1 Frequency and punctuality

One of the aims of public transport is to maintain the frequencies of the buses. According to the bus operators, the government wishes the buses in Brunei to be more frequent. In response to the demand for a frequent service, the majority of the bus operators decided among themselves to target frequencies of about 20 minutes. The bus operators have also increased the number of buses they run in order to accomplish their self-set target.

The majority of the bus services start their operations as early as 5.30 in the morning, although some buses start slightly later at 6.00 am, with final bus services being at 7.30 pm. Therefore, the bus is not convenient for some people, especially those travelling to work who must use two buses, such as from home to Bandar Seri Begawan, and then from Bandar Seri Begawan Bus Station to the workplace and educational institutions[40]. Traffic jams and lack of punctuality of bus services are other factors deterring Bruneians from using the bus services, despite the early start to operations.

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[40] The school day in Brunei for primary and secondary levels starts at 7.15 am and continues until 12.30pm. For the afternoon sessions, the secondary schools work from 12.30pm to 5.30 pm (CfBT, 2011). Therefore students, as well as school teachers and non-teaching staff, have to arrive at school early.

According to the bus operators, various issues affect the punctuality of their service operations. The majority of the operators[41] blamed traffic congestion as the cause of their punctuality problems. All of the bus operators acknowledge that the increasing number of cars in Brunei is the major cause of traffic jams. The traffic jams are worst during peak hours. One of the bus operators identified three periods of peak hours: 6am – 8am, 11.30am – 2.00pm, and 4.00pm – 6.00 pm. The period of 6am – 8am is when people start their journeys for education and employment purposes, while 4.00 pm – 6.00 pm is the period of travelling home from employment. The period of 11.30 am – 2.00pm is the lunch break and the time for picking up children from school.

According to the bus operators, there are also some unanticipated incidents that prevent punctuality and impede frequency. These include road accidents or breakdowns and mechanical problems with the buses. Mechanical problems can be prevented, especially with proper maintenance. There are also tyre punctures (for both the buses and the other vehicles on the roads). Road accidents, as well as cases of car breakdowns, are the main unanticipated cause of the lack of punctuality of bus services. Road accidents disrupt the flow of traffic, sometimes halting it entirely for a period of time before the police are able to manage the traffic and breakdown trucks manage to remove the damaged vehicles from the roads.

The bus operators expressed their concern about the punctuality and frequency of their services. According to them, they are able to deal with the mechanical problems of their vehicles but have no power to reduce road accidents. Furthermore, with the increasing number of cars, traffic jams are expected to worsen. Additionally, there are no dedicated lanes for buses, thus exposing them to the same traffic congestion experienced by other vehicles, inevitably lengthening journey times.

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[41] One of the bus companies, which operates the route from Seria to Bandar Seri Begawan, mentioned that the normal journey (with no traffic disruptions e.g. car breakdown or road accidents) from Seria to Bandar Seri Begawan takes between 2 hours 30 minutes and two hours 45 minutes on a normal day (non-peak hours).

6.3.2 Information and convenience

Another major constraint on the utilisation of buses in Brunei is the unavailability of bus timetables. One of the bus operators indicated that there is no need for a timetable, because the bus services they provide are frequent, operating every 20 minutes. Nevertheless, one of the bus operators made the opening move by providing realistic timetables, the regularity and punctuality of which are constantly reviewed, at every bus stop from which they run services.

"For the bus user's comfort, we should have bus timetable, but there is no bus timetable available. So for us, the timetable is important. We did make our own timetable. We printed the timetable, laminated these timetables and placed these timetables at the bus stops in our service routes. We wished to make a proper signboard just like in the UK about the bus timetable and map, but we need approval from the government. We have seek approval, but have not received and feedback yet."

Interviewee 26: Male: Above 55 years old: Public Transport Operators.

One of the bus operators acknowledged the problems of storage compartments, which are unavailable on most buses in Brunei. The bus operator provides temporary storage, in the form of a medium storage container with lid, for the use of bus passengers. In addition, every bus under their management is provided with fragrance to reduce odours. The bus operators were asked about people's criticisms of the cleanliness of the bus services in Brunei. All the bus operators indicated that their buses are cleaned every time they reach their final destinations. However, all of them agreed that the physical appearance of the buses, and hygiene concerns, cause people to believe that the buses are unclean. All the bus operators indicated that they could not control people's behaviour in terms of cleanliness while using the bus. However, they stressed that the seats, which are covered in leather, are cleaned and wiped with disinfectant products.

6.3.3 Safety

All the public transport operators indicated that the safety of the passengers is their main priority. Their bus drivers are constantly briefed on safety while driving the bus, obeying the bus speed limit and ensuring that passengers are seated before the vehicles accelerate. However, despite the briefings, problems still arise. Despite the continuous surveillance by the bus operators, some of the bus drivers tend to neglect safety. Five interviewees stated that several bus drivers do not follow the speed limit, especially at accident black spots.

One of the bus operators indicated that their buses are constantly being monitored. The bus operators' managers and officials constantly carry out planned and unplanned monitoring of their buses by following them in other vehicles.

"We, and other officers from this company, constantly followed our buses from behind. If our buses exceed the speed limits, or are not following our rules and guidelines, we would meet the driver, when they reached the final destination and advise them to follow the rules and guidelines. If the driver is constantly not following the rules and guidelines, the driver would be given a warning and further actions would be taken against the driver. We would not tolerate it if the drivers keep on breaking our rules and are not obeying the rules and laws of the roads. We promise to provide good services including safety so if our drivers did not put safety as their top priority, so like if something happen, our reputation will be tarnished."

Interviewee 20: Male: Above 55 years old: Public Transport Operators.

6.3.4 Self-initiative

The majority of the bus operators indicated that they are concerned about the limited number of bus stops in Brunei. Although the Ministry of Communications, along with the Ministry of Development, has built bus stops, they are considered insufficient. One of the reasons for this is that bus stops are permanently removed from the roadside after road reconstruction/repairs. The construction workers do not put back the bus stop signs. Thus, the bus operators are

hoping the government will recheck the number of bus stops from time to time, so as to ensure that the missing stops are restored.

One of the bus operators indicated that they are willing to provide bus stops as they have identified strategic locations for them on their permitted routes. They were not sure which department to contact, and because of this the bus operator has sought written approval from several departments they perceived capable of advising them on whether they might provide bus stops. Nevertheless, they are still waiting for responses.

According to the official from the Ministry of Communications, the cost of building a sheltered bus stop (including the body and roof) may be up to BND $5000[42]. However, the bus operators planned to follow in the footsteps of the UK.

"Like in UK, the place where I used to visit, not all bus stops have roof, just like a pole indicating that it is a bus stop, with timetable, then just a yellow box for the bus stops. So maybe we provide additional bus stops like 50 – 100 meters or maximum 200 meters apart."

Interviewee 18: Male: Above 55 years old: Public Transport Operators.

All the bus operators agreed on the issue of revising bus fares, especially for students. Currently, the fare for students in school uniform is BND $0.50; hence, they are not entitled to half-price fares if they are not wearing school uniforms, especially when travelling for leisure activities. Two of the franchise bus operators indicated that students should be entitled to half-price fares provided they have a valid student card. Furthermore, one of the bus operators indicated that they plan to introduce a special promotion for students, in the form of semester bus tickets, to enable students to travel by bus at cheaper rates. They also wished to introduce special cheaper fare bus passes for frequent bus users, as compared to the current fares.

Additionally, one of the bus operators indicated that the current fares should be revised, based on zoning and the distance the passenger is travelling.

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[42] BND $5000 = £ 2427.18.

"Let say there are potential bus stops in Bandar Seri Begawan, like 15-20 minutes' walk to the centre of Bandar Seri Begawan. So like instead of like for example, we can reduce the fare from 1 dollar to 30-50 cents. Then maybe using zone like this zone to this zone 30 cents, additional zone 50 cents, something like that."

Interviewee 20: Male: Above 55 years old: Public Transport Operators.

A future initiative for the bus operators is to rebrand their buses. They welcome any initiatives from the private sectors to promote their companies by placing their advertisements in the buses or having their company logos and advertisements painted on the exterior of the buses. This will improve the image of the buses and serve as another option to attract more bus passengers in the future. These plans are aimed at increasing bus usage and attracting the young generation and students to become bus users. The only obstacle was the fact that the routes in Brunei (franchise buses) are managed by six bus operators, and cooperation between these bus operators, as well as approval from the ministries, are required in order to proceed with the plan. One of the bus operators indicated that not all the operators are interested in this scheme. Discussions on rebranding the buses were held with the Ministry of Communications, and the rebranding will proceed for the new bus tenders, which are now under review.

Immigrant nationals in Brunei have been successfully encouraged to use the bus services. Along with the cheap bus fares, some of the public transport operators also carried out a ridership survey. The survey aims to identify the number of journeys passengers make per year as well as well as any weaknesses in order to improve the services. According to one of the bus operators and officials from the Ministry of Communications, the estimated number of bus riders in 2010 was about 3 million. When the researcher asked the bus operator to elaborate on the estimation of the number of bus users (the population of Brunei is less than 400, 000), the bus operator stated that the figure includes multiple trips by the bus users and by tourists. The bus operators also believed that the immigrant population (accounting for about 27 per cent of Brunei's population) is the major contributor to the increase in bus ridership, especially during the weekends and festive seasons. However, it was not known

whether the number of users in 2010 was based on the total ridership for the franchise bus or a combination of franchise and inter-district buses.

The bus operators also carried out several surveys to identify the strategic locations of potential bus stops. This was because the number of bus stops in Brunei is considered insufficient and the distances between them are too great. One of the public transport operators indicated that identifying the strategic locations will not only increase their profits but also attract more Bruneians to use their services[43].

However, one of the bus companies revealed that their public inter-district bus services do not currently provide much profit. The manager added that they had been considering terminating the bus services and concentrating on other businesses. The bus manager indicated that they may write a letter to the Ministry of Communications asking to withdraw their provision of the bus service as the inter-district bus service is not subject to the tendering process. Nevertheless, the company resolved to continue the services. The main reason for continuing the services is to provide transportation options for users with limited or no access to automobiles, and the manager considered it the company's social obligation as there is no alternative transport for the immigrant populations, elderly people and low-income Bruneians in their area. This was considered a decent decision. Although the decision is based on reducing the burden on the users, it will also prevent a shift from bus to car usage.

Nevertheless, the roles of public transport operators are restricted to providing the required services to the populace and the necessary information to the government, especially to the Ministry of Communications, on past, current and future trends in the bus industry. The public bus service infrastructure, such as bus stops, is provided by the government. Some of the bus operators are willing to provide some infrastructure in order to increase bus usage, without support from the government, in order to increase their profits and indirectly increase

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[43] One of the findings discussed by the bus company is that Bruneians do not wish to walk far from their homes. Thus, their current buses, which the bus company perceived as clean and regular, and the provision of bus stops nearer to the housing areas, will motivate the Bruneians to use the bus. The bus company's current target is to increase ridership amongst the young generation.

the number of potential bus users, especially from the young generation. High-quality services and practices by some of the public transport operators, and facilities for the users to lodge complaints about their services, would increase their competitiveness and potentially reduce the possibility of the current bus users, especially students and the young generation, shifting from buses to cars.

6.3.6 Future direction

The public transport operators in Brunei have a very limited strategy to support the development of bus services in order to bring about a shift from car to bus use amongst the general population. This is because these operators are only able to provide better services by improving the frequency, punctuality and comfort of the bus services and enhancing safety measures. However, the operators conducted several studies on the quality of their services, as well as the number of passengers in a year, and shared the information with the relevant authorities, such as the Ministry of Communications.

However, the main reason why the operators restrict their development, such as the use of more sustainable and low-carbon bus services, is the tendering quotation. The current franchise bus services have been retained for the second time and the result of the new tender will soon be announced. One of the operators has explored hybrid diesel buses and studied the potential of electric buses in the future, which they may use were they to be awarded the tender. The same bus operator then added that that, were they to win the tender process, they would invest in new buses, add additional routes, operate for longer hours depending on the demand (the use of small buses is preferred in areas of lower demand), and provide more bus stops.

6.4 Role of government towards sustainable transportation

Several ministries manage the issues of transportation-carbon emissions, including direct and indirect involvement. These ministries include the Ministry of Communications, Ministry of Development and EDPMO. Furthermore, the Ministry of Industry and Primary Resources

under the Forestry Department (responsible for carbon sinks, Heart of Borneo projects and the Forestry Act), the Ministry of Education (environmental-related school/college/university clubs and associations) and RIPAS hospital (under the Ministry of Health) also indirectly influence the transportation landscape, create awareness of carbon-related activities, increase awareness and knowledge of sustainability issues and promote positive attitudes and behaviour regarding transportation in Brunei.

In the government sectors, transportation is managed primarily by the Ministry of Communications, although it collaborates with other ministries. The government acknowledges that the shift towards low-carbon transportation is a challenging task. The government has been trying to use various policies and management strategies to tackle transportation issues. It is not only focusing on the importance of bus services as the main strategy to reduce carbon emissions but is also implementing and designing other strategies, apart from the bus services. Such initiatives are based not only on the use of alternative modes of transport but also on land-use plans, fuel quality improvements, road infrastructure and a change in attitudes, especially by car drivers and the young generation.

6.4.1 Government initiatives

Various ministries have a vision towards sustainable development, especially towards reducing carbon emissions. According to one of the interviewees, various collaborations are underway, especially towards green initiatives. One of the green initiatives is to reduce the environmental impact of the daily activities of the ministry. The initiatives apply not only to transportation but also to other sectors such as energy. It was indicated that the green initiatives are not only focusing on the improvement of public transportation but are also exploring other low-carbon transportation options in Brunei.

The survey participants were asked whether they were satisfied with the government's initiatives to reduce carbon and to promote sustainable transportation. Nearly half of the Bruneian participants were unsure whether they are satisfied with the initiative to reduce carbon emissions, while more than two thirds were unsure whether they are satisfied with the

promotion of sustainable transportation by the government. Only a small minority of the Bruneian participants (7.9 per cent) were satisfied with the initiative to promote sustainable transportation by the Brunei government.

The survey questionnaire respondents were asked whether they were aware of any government initiatives to reduce carbon emissions and promote sustainable transportation. It was found that nearly 45 per cent of participants were aware of the initiatives to reduce carbon emissions, compared to almost 30 per cent who were unsure and 22.7 per cent who were unaware of any initiatives. However, the majority of the participants were unsure about the initiatives to promote sustainable transportation, compared to 40.9 per cent who were unaware, and 15.2 per cent who were aware of any initiatives.

Nearly half of the Bruneian participants were conscious of such initiatives for carbon emission reduction by the government, whilst the majority of the non-Bruneians were unsure. Additionally, survey questionnaire respondents tended to be uncertain about any government initiatives towards sustainable transportation.

	Yes	No	Not Sure	Missing	Total
Are you aware of any government's initiatives to reduce carbon emission?	45.1 (n=193)	22.9 (n=22.9)	30.1 (n=129)	1.9 (n=8)	100.0 (n=428)
Are you aware of any government's initiatives to promote sustainable transportation?	15.2 (n=65)	40.9 (n=175)	42.3 (n=181)	1.6 (n=7)	100.0 (n=428)

Table 6.4.1 (a) Awareness on government initiatives on carbon emissions and sustainable transportation.

Among participants aged 18 – 55, the majority were aware of the initiative to reduce carbon emissions. However, the elderly generation was almost equally divided between those who were aware of, and those who were unsure about, the initiatives for reducing carbon emissions in Brunei. The younger generation and mid-generation II were largely unsure about such initiatives by the government towards sustainable transportation in Brunei. Table 6.4.1(b) also shows that mid-generation I and the elderly generation were largely unaware of such initiatives towards sustainable transportation by the government. It is interesting to note that none of the elderly generation reported knowledge of any initiatives towards sustainable transportation.

	Nationality		Gender		Generation			
	Bru	N-Bru	Male	Female	YG	MG I	MG II	EG

Are you aware of any government's initiatives to reduce carbon emission?

Yes	48.5 (n=172)	28.8 (n=21)	46.9 (n=97)	43.4 (n=96)	44.9 (n=93)	39.4 (n=50)	58.6 (n=41)	37.5 (n=9)
No	21.1 (n=75)	31.5 (n=23)	24.2 (n=50)	21.7 (n=48)	17.9 (n=37)	32.3 (n=41)	20.0 (n=14)	25.0 (n=6)
Not Sure	28.2 (n=100)	39.7 (n=29)	26.1 (n=54)	33.9 (n=75)	34.8 (n=72)	26.8 (n=34)	20 (n=14)	37.5 (n=9)
Missing	2.3 (n=8)	0.0 (n=0)	2.9 (n=6)	0.9 (n=2)	2.4 (n=5)	1.6 (n=2)	1.4 (n=1)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n==70)	100.0 (n=24)

Are you aware of any government's initiatives to promote sustainable transportation?

Yes	17.7 (n=63)	2.7 (n=2)	19.3 (n=40)	11.3 (n=25)	11.6 (n=24)	24.4 (n=31)	14.3 (n=10)	0.0 (n=0)
No	40.0 (n=142)	45.2 (n=33)	40.6 (n=86)	41.2 (n=91)	39.6 (n=82)	40.9 (n=52)	38.6 (n=27)	58.3 (n=14)
Not Sure	40.6 (n=144)	50.7 (n=37)	36.7 (n=76)	47.5 (n=105)	47.3 (n=98)	33.1 (n=42)	44.3 (n=31)	41.7 (n=10)
Missing	1.7 (n=6)	1.4 (n=1)	3.4 (n=7)	0.0 (n=0)	1.4 (n=3)	1.6 (n=2)	2.9 (n=2)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n==70)	100.0 (n=24)

Table 6.4.1 (b) Awareness on government initiatives based on nationality, gender and age generation.

	Job			Salary				Public Transport	
	Stu	W	N-W	LS	LM	LMS	HS	User	Non-user

Are you aware of any government's initiatives to reduce carbon emission?

	Stu	W	N-W	LS	LM	LMS	HS	User	Non-user
Yes	44.5 (n=73)	45.0 (n=103)	48.6 (n=17)	41.7 (n=86)	22.4 (n=15)	54.9 (n=50)	68.9 (n=42)	28.0 (n=23)	49.1 (n=170)
No	18.3 (n=30)	24.9 (n=57)	31.4 (n=11)	23.8 (n=49)	31.3 (n=21)	17.6 (n=16)	16.4 (n=10)	32.9 (n=27)	20.5 (n=71)
Not Sure	32.9 (n=54)	29.7 (n= 68)	20.0 (n=7)	31.6 (n=65)	44.8 (n=30)	26.4 (n=24)	14.8 (n=9)	39.0 (n=32)	28.0 (n=97)
Missing	4.3 (n=7)	0.4 (n=1)	0.0 (n=0)	2.9 (n=6)	1.5 (n=1)	1.1 (n=1)	0.0 (n=0)	0.0 (n=0)	2.3 (n=8)
Total	100.0 (n=164)	100 .0 (n=229)	100.0 (n=35)	100.0 (n=206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (n=82)	100.0 (n=346)

Are you aware of any government's initiatives to promote sustainable transportation?

	Stu	W	N-W	LS	LM	LMS	HS	User	Non-user
Yes	14.0 (n=23)	17.9 (n=41)	2.9 (n=1)	10.7 (n=22)	6.0 (n=4)	28.6 (n=26)	21.3 (n=13)	12.2 (n=10)	15.9 (n=55)
No	38.4 (n=63)	40.2 (n=92)	57.1 (n=20)	40.8 (n=84)	38.8 (n=26)	38.5 (n=35)	47.5 (n=29)	46.3 (n=38)	39.6 (n=137)
Not Sure	44.5 (n=73)	41.0 (n=94)	40.0 (n=14)	46.6 (n=96)	53.7 (n=36)	30.8 (n=28)	31.1 (n=19)	41.5 (n=34)	42.5 (n=147)
Missing	3.0 (n=5)	0.9 (n=2)	0.0 (n=0)	1.9 (n=4)	1.5 (n=1)	2.2 (n=2)	0.0 (n=0)	0.0 (n=0)	2.0 (n=7)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (n=206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (n=82)	100.0 (n=346)

Table 6.4.1 (c) Awareness on government initiatives based on job classification, range of salary level and public transport usage.

A higher percentage of non-working participants than members of other groups claimed a knowledge of government initiatives to reduce carbon emissions. However, this group contained the smallest percentage of those claiming to know about the government initiative towards sustainable transportation. More than half of the non-working group were unaware of such initiatives towards sustainable transportation. Furthermore, higher-salary earners tend to be aware of the government's initiatives to reduce carbon emissions as compared to lower-salary earners. However, a higher percentage of higher-salary earners indicated that they were unaware of government initiatives to reduce carbon emissions, whilst the majority of lower-salary earners were unsure about such initiatives.

Nearly half of the non-public-transport users were aware of an initiative to reduce carbon emissions, but almost 43 per cent were unsure about initiatives to promote sustainable transportation. Among public transport users, however, the majority were unsure about the government's initiative to reduce carbon emissions and about 46 per cent of these public transport users were unaware of such an initiative to promote sustainable transportation.

6.4.2 Attracting potential public transport users

Various departments, under the Ministry of Communications, are also moving towards green initiatives, mainly focusing on the improvement of public transportation. One of the aims is to encourage people to take public transport in the hope of reducing car usage or the number of cars on the road. The Ministry of Communications acknowledges the issues associated with, and problems of attracting people, especially Bruneians, to use buses. The ministry attempted to improve the services in terms of providing additional routes to increase connectivity, especially for the franchise buses. The bus operators, especially the franchise buses, are given permits to operate on certain routes (the existing zones are the northern, eastern, southern, western, central and business routes). The ministry has also held a number of meetings with the bus operators to discuss ways of improving the bus services and attracting more passengers; it has conducted research and surveys to identify new bus routes and to assess the provision of infrastructure such as bus stops. Furthermore, the ministry had opened a tender for public transport in order to improve the services, especially in terms of

reliability, timing, cleanliness and connectivity, and to ensure the new bus services are user-friendly, especially for disabled people.

The Minister of Communications took the initiative to ride the bus along with other officials in the Ministry of Communications. They rode the buses on different routes, starting from the Bandar Seri Begawan Bus Station. The minister and the officials identified certain problems and issues, especially the condition of the buses (such as interior and exterior conditions of the buses as well as the safety features such as the emergency exits and fire extinguisher), ticketing system and fare (such as passenger paid BND $1.00 regardless of destination) and little information on the bus services (Shahminan, 2011). This initiative, apart from enabling the officials to identify the problems by experiencing the services and having conversations with other bus users, was seen to promote the use of buses, especially franchise buses, in Brunei. It was seen as important to attract more passengers in the future, especially amongst the young generation and car users.

6.4.3 Collaborative work

Collaboration occurs not just within the transportation sector, but also with the Ministry of Education. An interviewee from the EDPMO indicated that introducing Energy Clubs in both primary and secondary schools, would work in three ways: (1) educating the students and making them aware of the importance of conservation, energy efficiency and environment; (2) allowing the students to practise energy-saving attitudes and behaviour at home and in class in order to encourage friends and family members to engage in energy-saving practices and (3) to help ensure that students are willing to adapt to the greener measures being implemented, especially by the government.

One of the collaborations between various ministries is the energy-saving guide (work, home, and road), as published on the website of EDPMO. According to the interviewees from the EDPMO, raising awareness and educating people on efficient energy saving on the roads may decrease the consumption of energy, thus reducing pollution emissions and possibly contributing to monetary savings. Interviewee 11, who is a car user, reported practising the

energy-saving guide on the road, published by the EDPMO, in order to reduce energy consumption and expenditure on petrol.

Currently, the regulations for periodic vehicle inspections apply to passenger cars more than seven years old. The inspection must be conducted annually, before a vehicle licence can be issued. Carbon emission is one of the factors inspected by the Land Transport Department. In addition, various departments are collaborating to detect any vehicle emitting black smoke or excessive pollution exceeding the allowable level, by conducting on-the-spot inspections on Brunei's major roads.

6.4.4 Niche development

As mentioned, the Government of Brunei is the key player in the transportation sector. The government tends to resolve transportation problems through policies and campaigns and encourages the public transport operators to improve the quality of their services to attract more passengers. However, in the past few decades, the Government of Brunei has tended to look for technological solutions to solve the transportation problems (hoping to motivate a modal shift to reduce the over-dependency on car usage). Another solution for transportation sustainability is the use of management and policy.

6.4.4 (a) Technological initiative

The government is in the process of improving petrol quality by following the European Union product specification standards. According to one of the interviewees, there is a huge gap between petrol quality in Brunei and that in Europe. Currently, Brunei is using Euro II specification, compared to Euro IV in European countries. Because of this gap, some diesel cars cannot be imported to Brunei. Despite the concern over pollution emissions, especially particulate matter, diesel engine vehicles are said to be of greater efficiency when compared

to petrol vehicles. Furthermore, unlike other nations, the pump price of a litre of diesel is much cheaper[44] than other type of fuel.

One of the initiatives to reduce carbon emissions is to encourage the use of low-carbon transportation. Hybrid technology cars are now becoming popular, despite costing more than conventional cars. Luxury hybrid cars (such as the Toyota Lexus Hybrid) are also becoming popular, especially among those looking for prestige low-carbon cars. The government has lowered the tax for hybrid cars to encourage Bruneians to purchase them.

"Yes, apart from the tax redemption, which is currently 5 per cent, maybe the government could lower the tax or no tax at all to promote more hybrids on the road."

Interviewee 9: Female: 36 – 45 years old: Car Dealer.

The Ministry of Communications, along with research institutions, particularly Institut Teknologi Brunei (ITB, or Brunei Institute of Technology in English), is conducting research on the use of electric vehicles, both cars and buses, in Brunei. The ministry has acquired an electric car, to study the feasibility of electric cars in Brunei as electric cars can be used in Brunei due to its small land area. However, certain factors may hinder the use of electric cars in Brunei, including the lack of electric car infrastructure and the climate of Brunei.

"The car was driven by one of our colleagues to Belait district from the Ministry of Communication head office in Berakas, Brunei Muara, for the roadshow. From the car manual book, the car with full charge should reach Belait District. On the way to the roadshow, there was heavy rain. So like our colleague had to switch on an air conditioner to reduce the mist on the wind screen, switch on the lights and use the wiper. He did follow the speed limit. But, because of the light and everything, the car's battery got flat at the side of the road. So like, the weather in Brunei is unpredictable, so without the charging facilities, the car is not suitable to be used in Brunei at the moment."

Interviewee 25: Female: 26 – 35 years old: Government Officer.

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[44] Diesel costs BND $0.325per litre; Premium 97 costs BND $0.547 per litre and Super 92 costs BND $0.535 per litre. (Masli, 2010a; Othman, 2010).

The Ministry of Development also plays an important role in reducing carbon emissions, especially from traffic congestion. One of the initiatives is to improve the road infrastructure such as creating more access, creating a smooth flow of traffic, and widening roads and flyovers. The ministry, through various departments, is also studying the timing of traffic lights to reduce congestion and is using traffic simulations to create a smoother flow of traffic. The ministry also collaborates with the Ministry of Health to promote park-and-ride parking systems which are now being implemented. The routes leading to the RIPAS Hospital in Brunei Muara district are considered congested. The park-and-ride facilities allow people to park their car at a designated area (the parking lot at Jame Asr Hassanil Bolkiah Mosque) and use the free bus to and from the hospital. The initiative, although still new, has been praised by several participants and interviewees, including car users, involved in this study.

6.4.5 (b) Land use

According to one interviewee, the Ministry of Development is also planning to intensify the policy of mixed-use development. In this type of development, housing settlements and other amenities such as commercial areas are created within easy walking distance of one another. By creating more mixed land use areas in Brunei, many activities such as shopping will be accessible by non-motorised forms of travel, such as walking or cycling. This will reduce future reliance on cars or buses. In the future, with the improvement in public transportation, the necessity to own or use cars will hopefully be reduced. The Ministry of Development through the Town and Country Planning (TCP) department, with some input from the relevant agencies, is planning suitable areas for public transport facilities, as well as pedestrian footpaths. However, it is up to the implementers to either follow the plans or amend them in accordance with their own needs.

The ministry also acknowledges the issues of land use and land areas in Brunei Muara administrative district. The land areas in Brunei Muara are considered compacted. Thus, the TCP proposed to shift developments to other districts. Such developments include housing settlements and economic activities. Several projects carried out by the Forestry Department

of the Ministry of Industry and Primary Resources are seen as important in developing land use patterns and reducing carbon concentrations in Brunei. The Greening of Degraded Lands project was seen to increase the knowledge and awareness of society's young generation (through the participation of youth groups, schools and NGOs). Although the project is not related to transportation, it will improve society's knowledge of the importance of carbon sinks and will have an impact on the public participation process, especially when considering the development of road infrastructure by clearing the forest.

6.4.5 (c) Transportation management and policy

The Ministry of Communications acknowledged the issues and problems associated with public transportation. The ministry has opened bus tenders (now closed and currently under review), as the current bus franchise has been in operation for more than 16 years. The interviewee from the Ministry of Communications did not specify the nature of the tenders. However, according to the interviewee, the tenders were flexible; thus, companies competing for the tenders were free to propose their own strategies for creating better services and infrastructure to attract more passengers. Companies competing for tenders should also propose their new routes that will service institutions including schools, colleges and universities, government health clinics and hospitals, business centres including shopping complexes, government housing schemes, and departure areas including the airport, covering the four districts of Brunei. The routes proposed by the companies should also avoid the existing congested routes.

The companies competing for the tenders should also identify several interchange stations to provide better connectivity, both within and between the districts. The frequency between buses on the same route, proposed by the ministry, was not more than 15 minutes, depending on the peak hours. The buses should be modern and user-friendly. Among the criteria for the buses are low floors, ramp access, spaces for wheelchair passengers, specific storage, and safety features including a 'black box' journey data logger, GPS Technology and CCTV. Furthermore, the ministry required the companies to provide website information specifying

their details, travel information and travel tips. The websites could be used not only to provide information but also to market the companies.

The ministry has also conducted some studies to identify bus routes and locations at which to build bus stops. The ministry will compare its results with the company that wins the tender, in order to create better connectivity, services and infrastructure.

The ministry also acknowledges the issues of taxis in Brunei. The taxi industry in Brunei consists of individual taxi operators. The ministry has opened a taxi franchise tender ensuring that just one company operates the taxi services in Brunei. Hence, the current individual taxi operators may join the company, and in future there will be better taxi services, such as a call centre and taxi meters.

6.5 Potential niches

Despite the current and future niche development planned by the government, the interviewees have suggested several niches that might be developed, which they perceived as promoting a low-carbon transportation transition. The potential niches are grouped into four categories: transportation options, infrastructure, awareness, and management and policy.

6.5.1 Transportation options

All the interviewees indicated that the current bus services do not satisfy the current transportation needs. The majority of the participants urged the government to create transportation options instead of restricting car use.

The transportation options discussed by the interviewees were electric vehicles including buses and private cars, mass transit transportation such as trains, mass rail transit (MRT), light rail transit (LRT). Also mentioned were double-decker buses, green buses and fuel-efficient vehicles. The interviewees also urged the government to improve fuel efficiency in line with the Euro Fuel Specification, in order that more fuel-efficient vehicles, especially diesel engine cars, might be imported into Brunei.

Several interviewees (from the Ministry of Communications, EDPMO, and NGOs) acknowledged the limited amount of land available for building special bus lanes. The participants also recognised that the contemporary problem of increasing traffic congestion makes the buses unattractive. Thus, these participants favoured overhead mass transit systems for Brunei.

6.5.2 Infrastructure

The majority of the survey questionnaire respondents commented that the bus infrastructure should be improved, especially its physical image, frequency, punctuality, comfort and safety. However, only a few of these participants thought that Brunei needs to improve its sidewalks and pedestrian access. Such improvements would enhance the safety of bus users, travelling to and from the bus stops. Furthermore, the participants would like the government to start providing cycle paths and equip the new buses in Brunei with facilities to carry bicycles.

The majority of the interviewees thought that the government should invest in electric vehicle infrastructure by providing fast recharge facilities. The facilities should be placed at petrol filling stations, government offices and commercial areas. Participants also thought that Brunei's small size makes electric cars feasible, as long as the infrastructure for charging is provided. The participants also acknowledged the importance of building a bus interchange to connect the four districts of Brunei. The interchange should have taxi stands and bus information, as well as convenience stores and ATM machines. One of the participants indicated that private sectors could use the interchange station to promote their companies and services through advertisements. Participants also thought that electric buses should be introduced in Brunei, with the bus interchange providing charging points.

Additionally, the participants thought that the technical schools in Brunei should offer more engineering courses on the new transportation technology. Thus, the skills could be used to implement the new green technologies. Furthermore, with the appropriate skills, the

maintenance and service of new green technologies would be feasible, timely (especially mechanical work from other countries and repair of vehicle body parts) and cost-effective.

6.5.3 Awareness

One of the key niche changes of importance in Brunei is the change in the mind-set of the Bruneians regarding their transportation culture. Transportation in Brunei is highly influenced by the institutions, such as the policy supporting car development; society's attitudes, behaviour, perceptions and pressure; and land use, accepting there is the need to have a car to participate in any activity.

Although the majority of the interviewees were unwilling to switch from cars to buses, these participants thought that the government should encourage students to cycle to school. The majority of the interviewees thought that this initiative may reduce traffic congestion, especially in the school areas, whilst improving the environmental awareness of non-motorised travel. Furthermore, the interviewees urged car users to share their cars with colleagues and family members on the journey to work, as most of the government offices are situated close to one another. This would further reduce traffic congestion and pollution from car engines.

Some of the interviewees were familiar with the energy conservation tips to be employed while driving, as published by the EDPMO. The participants are keen for this information to be shared more widely through the mass media, such as television and radio, and through social media such as Facebook and Twitter.

One of the public transport operators thought that the EDPMO should initiate a 'no car' campaign, especially during energy week. The department should collaborate with the bus industry to ensure that there are sufficient buses available to meet the needs of car users in terms of frequency and punctuality. This might be a window of opportunity for addicted car users to at least experience a bus journey, and it may motivate them to use the bus in the future (when the bus services are improved).

6.5.4 Management and policy

Nine suggestions were identified from the interview data regarding the possible niche that might enable the low-carbon transition to take place. The nine suggestions were classified into three areas: economic incentives, rules and regulations, and cooperation.

6.5.4 (a) Economic incentives

The majority of the interviewees would like the government to assist the public transport operators with investment and financial support. Assistance is required as the majority of the public transport operators are small companies, such as those built up through village cooperation. The financial assistance would provide more opportunities for these operators to improve their quality and thus attract more passengers. Despite the cheap bus fares, the majority of the participants believed that the fares are expensive, especially for multiple journeys. Thus, a ticket subsidy or new ticket fares, such as an all-day travel ticket, would further reduce travel expenses.

One of the initiatives for increasing the sales of hybrid cars was the government's 5 per cent tax reduction. The car dealers, as well as other interviewees, believed that tax reductions should be applied to other low-carbon-emission vehicles. One of the car dealers also commented that the government might reduce the price of low-carbon vehicles to attract more buyers in the future.

6.5.4 (b) Rules and regulations

Several interviewees indicated that the government should implement low-emission zones, especially in the capital city, town centres and near government offices. This will encourage people to service their cars regularly, thus ensuring that emission levels meet the guidelines set up by the Ministry of Communications through the Land Transport Department. Furthermore, the majority of the participants urged the government to set up roadside

inspections of vehicles that were observed to be emitting excessive pollutants and to apply stricter penalties to the offenders.

The public also commented on the old buses that are being used for inter-district journeys. The majority of the participants thought these old buses tarnish the image of Brunei, and they called for them to be phased out, with investment in new green buses. However, none of the interviewees favoured a policy to phase out old cars. This may be because students and low-income earners (including immigrant nationalities) have older or second-hand cars. Phasing out old cars may have negative social and economic impacts as the buses in Brunei are considered unreliable.

Several interviewees indicated that Brunei should cooperate with its neighbours (Singapore and East Malaysia) to develop mass transit transportation. During school vacations, roads leading to the neighbouring countries experience high traffic volumes. There is a strong demand for travel to the neighbouring countries. Thus, the majority of the interviewees suggested the development of a railway or high-speed train that would connect the three neighbouring nations of Brunei, Malaysia and Indonesia in the Borneo Island.

6.6 Conclusion

This chapter presents several key findings. It has identified certain policies in Brunei towards sustainability and several attempts that have been made to improve transportation towards low-carbon transportation in Brunei (question three of the research questions). These include identifying the barriers to, and opportunities for, sustainability.

First, the government is the main decision-maker in Brunei. However, other agencies such as NGOs and public transport operators, together with the public, provide valuable feedback to guide the government in its decision-making processes. Second, the public follows the advice of the government, such as the steps towards low energy utilisation on the roads. Third, people tend to be unsure about the public participation process, such as how to participate and the factors required for public participation processes. It was identified that the public are not very interested in transportation issues. However, despite the low level of interest, the

public believe they should be given more opportunities to be involved in decision-making on transport-related issues.

Fourth, the role played by NGOs in Brunei is still inadequate, but it is developing. There are no specific NGOs dealing with car-bus-carbon-related issues. The NGOs in Brunei are active in green initiatives for the environment and it was perceived that the role of NGOs is considered important in order to assist the government in its efforts to promote sustainable mobility.

Fifth, the role of public transport operators is to ensure that their services are frequent, punctual, comfortable and safe. Furthermore, the role of public transport operators also includes their own self-initiatives, such as research on their services, the results of which are used to improve their service quality. Additionally, the results are also shared with the relevant authorities, especially the Ministry of Communications (the Land Transport Department and Motor Transport Licensing Agency (MTLA)).

Sixth, whilst the public is aware of the role of government in initiatives to reduce carbon emissions, they are unsure about its role in sustainable transportation. The level of satisfaction with government initiatives on sustainable transportation is considered low. The carbon-transportation issues are managed by several ministries under various departments. Collaborative work amongst various ministries was carried out to attract more public transport users, increase awareness of the environment and reduce unnecessary travel. Additionally, the government is the main actor in the regime and niche development, when considering technological initiatives, management and policy.

These findings comprise the regime in the Brunei context. The regime in this chapter is composed of the technological, user and market regime dealing with the supply and pricing of energy; the policy regime handling governance in transportation sectors and the science regime involving research and development and technological development, as mentioned by Geels (2004). The government is providing the road infrastructure; however, the main emphasis is on car use, and there is limited infrastructure for bus services and a lack of non-motorised transportation. The cities, developments and housing settlements are tailored to the car. The bus operators form the regime and should lobby the government to improve the bus

services and infrastructure. However, people in Brunei and especially Bruneians themselves, have adapted their lifestyles to car use; furthermore, the infrastructure, rules and policy help to stabilise the car system, thus creating problems for the bus operators seeking to attract more users. However, in the science regime (such as research and development into hybrids and more efficient fuel technology), the emerging niche has made a slight crack but the momentum is not strong enough to influence the replacement of the regime. Car dealers have begun to realise the impact of climate change. Car dealers in Brunei are creating an awareness of climate change through their hybrid products, which are more eco-friendly and fuel-efficient than conventional cars. Sales of hybrids are increasing in Brunei and the government policy of reducing the import tax to 5 per cent for hybrids further constrains the initiative to promote bus services (despite the existence of low-carbon transportation).

There have been numerous attempts to improve the transportation sector in Brunei, particularly efforts at attracting more bus users. Several attempts have failed, but the government is willing to try new techniques and programmes to improve transportation in Brunei. Currently, Brunei is attempting two major niches, bus tenders and the Brunei Land Transport Master Plan. Making car fuels cleaner, improving the bus-related infrastructure and services by increasing the number of buses and the use of ICT in timetabling and bus information, and the introduction of electric vehicles, are amongst the technological innovations being attempted in Brunei. However, there are also non-technological innovations. These include attracting more people to bus services by improving the buses image, such as the minister riding the bus, raising awareness (on the importance of using the bus, reducing the excessive use of cars and to have planned journey so to reduce the traffic congestions) and continuously reviewing policy.

The next chapter analyses the attitudes and behaviour regarding the existing bus services in Brunei. The perceptions and behaviour reported may lead to a better understanding of why people have different opinions on buses. The chapter also will identify why Bruneians do not use buses, despite several initiatives by the transportation actors and stakeholders. This may lead to suggestions for improvements in bus services, ways of increasing the number of passengers and ideas on how to bring about a change or changes in travel behaviour.

Chapter 7: Buses and their Services: Public Perception and Behaviour

7.0 Background

This chapter presents the findings on people's attitudes and behaviour regarding bus services in Brunei. The findings are based on the survey questionnaire and interviews. This chapter aims to identify the attitudes and behaviour of Bruneians regarding bus services in Brunei. This has been done to identify and explain the complex travel behaviour that explains the reasons for the use or non-use of buses. Elements such as bus fares, tickets and services available to bus users will further explain the travel behaviour being investigated.

7.1 Motivation to use the bus services

32 out of 76 bus user respondents to the question[45] felt that the bus was their sole choice. More specifically, some chose the bus over their car (seven participants), some chose to use the bus (six participants), and some wished to save money (six participants). Majority of the participants do not use the buses (only 82 participants use the bus) thus reflects to the high number of missing responses. A majority of the non-Bruneians indicated that the bus service in Brunei was their only travel option. Among the Bruneian participants, the majority chose 'other motivations' for using the bus.

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[45] The question was 'What is your main motivation to use the bus?' This question was for the public transport users. There are 82 public transport users in this study (Figure 5.3) and only 76 participants attempted this question.

Sixteen passengers chose 'other motivation' as their answer and reported their own motivation for using the bus services. The majority of participants who chose 'another motivation' mentioned parking as their main motivation for using the bus services. The participants tended to use the bus because parking fees are expensive[46] and parking spaces are very limited.

Motivation	Frequency	Percentage	Valid Percentage	Cumulative Percentage
I prefer the bus over my car	7	8.5	8.5	8.5
I choose to ride the bus	6	7.3	7.3	15.9
The bus is my only option	32	39.0	39.0	54.9
To save money	6	7.3	7.3	62.2
Personal safety	1	1.2	1.2	63.4
Safety on the road	2	2.4	2.4	65.9
Convenience	5	6.1	6.1	72.0
Other	11	13.4	13.4	85.4
Missing	12	14.6	14.6	100.0
Total	82	100.0	100.0	

Table 7.1 Motivation to use the bus services in Brunei.

These results corroborate the findings from the interviews. The interview process in this study revealed several factors that caused people to use public transport in Brunei. These factors are categorised into three groups: limited/no choice, comfort, and cost. The interview results are based on comments by current bus users, occasional bus users and long-standing bus users). Also presented is information from bus operators, based on the complaints lodged with them, their own observations and experiences and those of their colleagues.

7.1.1 Limited/No choice

The interviewees indicated that those with no/limited access to cars tended to use the bus services for travelling in Brunei. These include students and immigrant nationalities working in Brunei. It was observed that the locals use the public transport if they have no other options, such as when sending their cars for maintenance or taking short trips. However, these types of bus usage tended to be on a temporary basis.

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[46] Parking fees in town centres are BND $0.50 per half hour (BND $ 1.00 = £ 0.48).

"When I have to send my car for service, and then I will use the bus."

Interviewee 14[47]: Male: 26 - 35 years old: Government Sector.

More than half of the interviewees (including all of the bus operators) indicated that immigrant nationalities use the bus because it is their only travel option in Brunei. Bus operators and bus users suggested that the immigrant nationalities live in Brunei on a temporary basis (based on the duration of their contracts); thus, buying a car is not considered cost-effective, leaving them with only the bus option.

"As a foreigner, bus is the only option. Unless you are in town or airport, then you can spot a taxi. But it is expensive."

Interviewee 15: Male: 18 - 25 years old: International Student[48].

People with health issues that prevent them from driving tended to use the bus. All the interviewed participants believed that the elderly generation, who no longer drive, have experienced a decline in their health conditions, such as the inability to see clearly, or the need to use a walking stick. Although they could afford to have a car, for safety reasons they tend to choose the bus over the car.

"It is about their health reasons like they cannot see clearly. So they can no longer drive their car. So it is hard for them to drive, and it is not safe. I know some of them. My elder brother for example, he can't drive because of his poor eyesight. Although he spends most of his time at home, taking care of his grandchildren, he uses bus especially if he's got a hospital appointment."

Interviewee 4: Male: Above 55 years old: Retired.

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[47] Interviewee 14 is using the bus on a temporary basis. He used to ride the bus every day since primary school. After securing a job, he bought a car and now only uses the bus if he needs to send his car for maintenance.

[48] Interviewee 15 is an international student, studying in one of Brunei's universities. He is living in student accommodation. The bus is his mode of transportation in Brunei, and he sometimes travels with his Bruneian friends.

7.1.2 Comfort for long journeys

All the bus operators indicated that, despite having access to cars, some elderly persons preferred to use the bus for long journeys. This was due to interlinked factors such as not wanting to drive for long distances and avoiding having to look for a parking place.

"Sometimes the locals [Bruneians], especially the elderly, are lazy to drive. One of the reasons is parking like so they drive from Bandar [Seri Begawan] to Seria. Then [there is] no parking again in Bandar [Seri Begawan], so better use bus."

Interviewee 6: Female: 35 - 55 years old: Public Transport Operator.

"Although I am the boss here, sometimes I use the bus to Bandar [Seri Begawan]. Rather than driving [my car], it's better to use the bus. Sometimes we are tired and sleepy, so it is good to use bus for long journey plus it is safe."

Interviewee 18: Male: Above 55 years old: Public Transport Operator.

7.1.3 Cost

One of the main motives for using the bus was related to cost factors. Both car and bus users regard cost as a factor that either motivates people to use the bus services or inhibits them from doing so. The interviewees tended to compare the cost of riding the bus with the cost of using their car.

The fare for a single trip is BND $1.00 for the franchise bus, BND $3.00 for the inter-district bus[49] (Tutong district to the capital city) and BND $6.00 from Seria/Kuala Belait to Bandar Seri Begawan. Children under 12 years of age, students in school uniform and people aged 60 and above are charged BND $0.50 per trip in the franchise bus.

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[49] BND $ 1.00 = £ 0.48. The town of Tutong is about 49.3 kilometres from Bandar Seri Begawan (40 minutes' drive via Muara –Tutong Highway). Seria is about 91.2 km from Bandar Seri Begawan (1 hour 15 minutes' drive via Muara-Tutong Highway and Seria By-Pass), approximately 2 hours 30 minutes by bus.

Furthermore, the cost of using the bus is considered cheaper for those who are in financial difficulties, such as low-salaried migrant workers, who have to divide their salaries into two, partly to cover the cost of living in Brunei and partly to send some cash back to their home countries. There is no minimum wage in Brunei; hence the bus is an attractive means of travel. Some elderly persons, as well as low-income immigrant nationals, perceive bus services to be cheaper after taking into account the associated costs of cars such as petrol, parking fees and servicing. The bus users thought that the ability to relax on the bus, instead of driving, and the freedom to do other activities, such as reading and enjoying the scenery, make the bus an attractive option.

Despite the cheap cost, students in tertiary education do not benefit from discounted fares as tertiary education students do not wear school uniforms. All the bus operators acknowledge the problems of fares and tickets for students, which do not benefit college and tertiary students or students travelling during the weekends or in their free time.

"If we are awarded the bus tender, we will introduce the student pass ticket so like, although you do not wear the school uniform, as long as you have a valid student card or prove that you are a student, you can apply for the student pass and be entitled to the student discount. But now, the government has set the price of 50 cents for students with school uniform, so we just follow [the price set by the government]."

Interviewee 26: Male: Above 55 years old: Public Transport Operators.

The cost of travel is considered one of the key influences on choice of mode of transportation. It can be deduced that there are both positive and negative responses to the cost of travelling by bus: non-Bruneians and public transport users tended to be positive while Bruneians and non-public-transport users tended to be negative. The majority of immigrant nationals use the bus, especially during the weekends[50] (days off work); hence, it

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[50] Holidays in Brunei are different from holidays in the UK; for example working days in Brunei for Government offices are from Monday to Thursday and Saturday, with days off on Friday and Sunday, while private-sector businesses work from Monday to Friday, with some companies working half a day on Saturday and taking Sunday off.

can be understood that the cost of travelling by bus is cheaper for them compared to the use of cars. However, locals, who tended to travel to many destinations in a typical day (such as sending children or siblings to school), indicated that the use of cars is cheaper.

Multiple transits resulted in bus fares being considered expensive. The affordability of car ownership and the low cost of car-associated expenses tend to make bus services appear relatively expensive in Brunei. However, the interviewees seem to ignore the combined cost of insurance and road tax when calculating the cost of acquiring a car. The yearly payment of these costs has caused people in Brunei to underestimate the total cost of running a car. One of the car users believed that people, including himself, use their yearly bonus to cover the cost of car insurance and road tax. Additionally, interviewees failed to mention other related costs of cars, such as maintenance, breakdown services and parking fees, in determining the true cost of travelling by car.

Interviewee 1[51] responded to a question on the cost of travel, presented in Figure 7.1.3 (a). The interviewee indicated his potential bus fares during the five school days. However, the activities during the five school days do not include other activities such as interviews, written tests for job offers and other activities (shopping and leisure activities). The interviewee indicated the maximum cost of fuel spend for seven days in a week, which includes unlimited activities, such as employment related travel and weekend activities.

The low cost of acquiring a car is another factor in the high rate of car ownership, despite the absence of a stable income: for example, students relying on monthly student allowances. Most of the participants who do not have a car are employed in the private sector, and the majority of the participants working in the government sector have at least one car. This is due to the privileges given by the government to people working in the government sector; benefits which are not offered to those working in the private sector. Moreover, special promotional deals offered by car dealers also motivate Bruneians to buy cars.

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[51] Interviewee 1 is currently unemployed and is still looking for a job. He used to ride public transport, especially buses, while studying in Brisbane, Australia. Now, his father has asked him to use his extra car to send his siblings to school, for interviews and tests for job vacancies, and for his hobbies. The costs of the car (including petrol) are covered by his father.

"If you work with the government, the government provides the facility to buy a car through a car loan with no interest so you can use the loan for like [car] down-payment… if you read today's newspaper, the Raya [festive month] special deal, you [can] get a car [with] cheapest price, no deposit, no payment for the first month and free car service for a year. Then, if you shop at maybe some shopping malls in Brunei during the festive season, you can join the lucky draws, grand prize is usually a car, so like this contributes to the increasing number of cars on Brunei roads."

Interviewee 4: Male: Above 55 years old: Retired.

Interviewees tended to report that having a car in Brunei, whether new or used, is affordable. The associated costs of running a car, including fuel, road tax and insurance, are considered affordable. Furthermore, students tend to prefer cars with diesel engines, as diesel[52] is the cheapest fuel sold in Brunei. Another interviewee indicated that some parents bought their children cars (new or used) to avoid having to drive them to college.

"First, it is cheap to get a car in Brunei, the price of the car, for me cheaper compared to in Malaysia and Singapore itself, tax, insurance, and petrol. I remembered when my son told me his friend bought a new car using his monthly allowances. I do not know how much they got [the allowance] but if a UBD [University Brunei Darussalam] student could afford to get a car, what about those who have a job? I mean the student receives [their] book allowance as few hundred dollars every year so this can be used for insurance and [road] tax so like what about those working in the government [sector] with [car] loans and everything?"

Interviewee 4: Male: Above 55 years old: Retired.

An interviewee emailed the interviewer his car expenses versus his wife's car expenses (both husband and wife work in the government sector). The costs are shown in Figure 7.1.3 (b). The monthly car loans are based on seven years of monthly payments. The monthly salaries do not include the monthly allowances provided by the government (such as subsistence and travel allowances) for working in the government sector.

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[52] Diesel is sold for £ 0.157 per litre, Ron 97 for £ 0.259 per litre and Ron 92 for £ 0.264 per litre.

Cost of using bus service

Monday, Wednesday and Saturday	Cost (BND $)	Total (BND $)	Tuesday and Thursday	Cost (BND $)	Total (BND $)
Sending siblings to school	2.00	6.00	Sending siblings to school	2.00	4.00
Going to the gym	1.00	3.00	Going to the gym	1.00	2.00
Home from gym	1.00	3.00	Home from gym	1.00	2.00
Fetching siblings from school	1.00	3.00	Fetching siblings from school	1.00	2.00
Home from school	2.00	6.00	Home from school	2.00	4.00
Total		21.00	Home to tuition class	3.00	6.00
			Home from tuition class	3.00	6.00
			Total		26.00
Cost of bus ticket			Cost of car (fuel)		
Expenses for 5 schooling days (Bus)	BND $47		Cost of fuel per week	BND $17	
One Month (assuming 4 weeks)	BND $235		Cost of fuel per day	BND $2.43	
A year	BND $2820 (£ 1362.32)		5 schooling days	BND $12.15	
			One Month (assuming 4 weeks)	BND $48.60	
			A year	BND $583.20 (£ 281.74)	

Figure 7.1.3 (a) Response from Interviewee 1 on bus fare and fuel cost.

	Husband	Wife
Monthly Salary (roughly)	£ 1,600.00	£ 1,200.00
Type of car	Lexus IS 300	Suzuki Swift
Monthly car loan	£ 350	£ 125
Car payment in a year	£ 4,200	£ 1,500
Petrol per month (maximum)	£ 40	£ 20
Petrol in a year (maximum)	£ 480	£ 240
Car Insurance per year	£ 250	£ 150
Road Tax per year	£ 20	£ 20
Car expenditure in a year	£ 4,950	£ 1,910

Figure 7.1.3 (b) Response from Interviewee 10 on car payments, fuel cost, road tax and car insurance in Brunei.

7.2 Bus infrastructure and services: reasons for the low bus usage

7.2.1 Services

Aspects of services in this study include frequency, cleanliness, reliability, and service coverage. Table 7.2.1 (a) presents the results obtained from the study of services. The overall responses indicated that the poor quality of services offered were perceived to be poor) in

Brunei were perceived to be in a poor condition) was one of the reasons for the low bus usage in Brunei. The overall responses indicated that the bus services in Brunei were perceived to be below an acceptable standard.

"In your opinion, people in Brunei do not use buses because:

1. The bus services are infrequent

2. The buses are not clean

3. The buses are not reliable

4. The destinations covered by the buses are inadequate"

Services	Agreed	Not Sure	Disagreed	Missing	Total
The bus services are infrequent (n=428)	83.4 (n=357)	9.1 (n=39)	7.5 (n=32)	0.0 (n=0)	100 (n=428)
The buses are not clean (n=428)	65.7 (n=281)	20.1 (n=86)	14.0 (n=60)	0.2 (n=1)	100.0 (n=428)
The buses are not reliable (n=428)	67.5 (n=289)	20.8 (n=89)	11.0 (n=47)	0.7 (n=3)	100.0 (n=428)
The destinations covered by the buses are inadequate (n=428)	78.7 (n=337)	17.5 (n=75)	3.3 (n=14)	0.5 (n=2)	100.0 (n=428)

Table 7.2.1 (a) Perceptions of bus services.

Approximately eighty-seven per cent of the Bruneian participants (users and non-users of public transport) rated the service frequency as unsatisfactory, as compared to sixty-six per cent of the non-Bruneian population. Table 7.2.1 (b) also indicates more than three-quarter of the Bruneians and the non-Bruneians. There was a mixed response from the non-Bruneians concerning reliability; 46.6 per cent thought the reliability was unsatisfactory, as did 71.8 per cent of Bruneians.

Responses from different age groups differ slightly regarding reliability, travel coverage and frequency: more participants aged over 35 years, compared to the younger generation less than 35 years old, believed that people do not use bus services because the services are infrequent, unreliable and the destination covered by the buses are inadequate.

	Nationality		Gender		Generation			
	Bru	N-Bru	Male	Female	YG	MG I	MG II	EG
The bus services are infrequent								
Agreed	87.0 (n=309)	65.8 (n=48)	81.6 (n=169)	85.1 (n=188)	84.5 (n=175)	78.8 (n=100)	87.1 (n=61)	87.5 (n=21)
Unsure	8.5 (n=30)	12.3 (n=9)	9.2 (n=19)	9.0 (n=20)	8.7 (n=18)	13.4 (n=17)	5.7 (n=4)	0.0 (n=0)
Disagreed	4.5 (n=16)	21.9 (n=16)	9.2 (n=19)	5.9 (n=13)	6.8 (n=14)	7.9 (n=10)	7.1 (n=5)	12.5 (n=3)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)
The buses are not reliable								
Agreed	71.8 (n=255)	46.6 (n=34)	71.5 (n=148)	63.8 (n=141)	62.3 (n=129)	66.9 (n=85)	78.6 (n=55)	83.3 (n=20)
Unsure	20.6 (n=73)	21.9 (n=16)	16.9 (n=32)	25.8 (n=57)	24.6 (n=51)	19.7 (n=25)	12.9 (n=9)	16.7 (n=4)
Disagreed	6.8 (n=24)	31.5 (n=23)	11.6 (n=24)	10.4 (n=23)	11.6 (n=24)	13.4 (n=13.4)	8.6 (n=6)	0.0 (n=0)
Missing	0.8 (n=3)	0.0 (n=0)	1.6 (n=3)	0.0 (n=0)	1.4 (n=3)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)
The destination covered by the buses are inadequate								
Agreed	78.6 (n=279)	79.5 (n=58)	83.1 (n=172)	74.7 (n=165)	73.9 (n=153)	77.2 (n=98)	91.4 (n=64)	91.7 (n=22)
Unsure	19.4 (n=66)	12.3 (n=9)	12.6 (n=26)	22.2 (n=49)	21.3 (n=44)	18.9 (n=24)	7.1 (n=5)	8.3 (n=2)
Disagreed	2.3 (n=8)	8.2 (n=6)	3.4 (n=7)	3.2 (n=7)	3.9 (n=8)	3.9 (n=5)	1.4 (n=1)	0.0 (n=0)
Missing	0.6 (n=2)	0.0 (n=0)	1.0 (n=2)	0.0 (n=0)	1.0 (n=2)	1.0 (n=2)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)
The buses are not clean								
Agreed	72.1 (n=256)	34.2 (n=25)	67.6 (n=140)	63.8 (n=141)	66.2 (n=137)	62.2 (n=79)	67.1 (n=47)	75.0 (n=18)
Unsure	19.4 (n=68)	24.7 (n=18)	14.5 (n=30)	25.3 (n=56)	19.8 (n=41)	22.0 (n=28)	18.6 (n=13)	16.7 (n=4)
Disagreed	8.5 (n=30)	41.1 (n=30)	17.4 (n=36)	10.9 (n=24)	13.5 (n=28)	15.7 (n=20)	14.3 (n=10)	8.3 (n=2)
Missing	0.3 (n=1)	0.0 (n=0)	0.5 (n=1)	0.0 (n=0)	0.5 (n=1)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)

Table 7.2.1 (b) Perceptions of bus services based on nationality, gender and age generation.

It was interesting to note that the non-working group contained the highest percentage of people who thought that the poor coverage, frequency, and reliability of bus services deter people from using the bus services in Brunei. Furthermore, richer participants tended to think that bus service infrequency, unreliability and lack of coverage deters people from using the bus. The participants were asked whether they agreed with the statement "The bus is not clean". It was identified that seven in ten Bruneian participants agreed, compared to three in ten non-Bruneian participants.

	Job			Salary			
	Stu	W	N-W	LS	LM	LMS	HS
The bus services are infrequent							
Agreed	85.4 (n=140)	80.8 (n=185)	91.4 (n=32)	83.0 (n=171)	71.6 (n=48)	91.2 (n=83)	88.5 (n=54)
Unsure	9.1 (n=15)	10.0 (n=23)	8.2 (n=1)	8.3 (n=17)	13.4 (n=9)	5.5 (n=5)	9.8 (n=6)
Disagreed	5.5 (n=9)	2.9 (n=21)	5.7 (n=2)	8.7 (n=18)	14.9 (n=10)	3.3 (n=3)	1.6 (n=1)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)
The buses are not reliable							
Agreed	65.2 (n=107)	67.7 (n=155)	77.1 (n=27)	61.7 (n=127)	55.2 (n=37)	82.4 (n=75)	80.3 (n=49)
Unsure	27.2 (n=43)	17.5 (n=40)	17.1 (n=6)	26.2 (n=54)	23.9 (n=16)	11.0 (n=10)	13.1 (n=8)
Disagreed	7.3 (n=12)	14.4 (n=33)	5.7 (n=2)	11.2 (n=23)	20.9 (n=14)	6.6 (n=6)	4.9 (n=3)
Missing	1.2 (n=2)	0.4 (n=1)	0.0 (n=0)	1.0 (n=2)	0.0 (n=0)	0.0 (n=0)	1.6 (n=1)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (n=206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)
The destination covered by the buses are inadequate							
Agreed	71.3 (n=117)	82.1 (n=188)	91.4 (n=32)	72.3 (n=149)	77.6 (n=52)	86.8 (n=79)	91.8 (n=56)
Unsure	25.0 (n=41)	13.5 (n=31)	8.6 (n=3)	22.8 (n=47)	17.9 (n=12)	11.0 (10)	6.6 (n=4)
Disagreed	3.7 (n=6)	3.5 (n=8)	0.0 (n=0)	4.9 (n=10)	3.0 (n=2)	2.2 (n=2)	0.0 (n=0)
Missing	0.0 (n=0)	0.9 (n=2)	0.0 (n=0)	0.0 (n=0)	1.5 (n=1)	0.0 (n=0)	1.6 (n=1)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (n=206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)
The buses are not clean							
Agreed	72.6 (n=119)	59.0 (n=135)	77.1 (n=27)	64.1 (n=132)	55.2 (n=37)	74.7 (n=68)	70.5 (n=43)
Unsure	18.9 (n=31)	21.8 (n=49)	17.1 (n=6)	20.4 (n=20.4)	20.9 (n=14)	16.5 (n=15)	23 (n=13)
Disagreed	8.5 (n=14)	19.2 (n=44)	5.7 (n=2)	15.5 (n=32)	23.9 (n=16)	8.8 (n=8)	6.6 (n=4)
Missing	0.0 (n=0)	0.4 (n=1)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	1.6 (n=1)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)

Table 7.2.1 (c) Perceptions of bus services based on job classification and range of salary

Three quarters of the elderly generation agreed that the bus services in Brunei are not clean and are not comfortable, and that these factors cause people to avoid using them. About two thirds of the young generation agreed with both statements. The Table (7.2.1 (c)) also shows that seven in ten students and non-working participants agreed with both statements. Richer participants (upper-middle and high-salary earners) were much more likely to agree with the statements compared to the other groups.

Factors	Nationality		Agreed	Not Sure	Disagree	Missing	Total
	Bruneian	Bus User	86.1 (n=31)	2.8 (n=1)	11.1 (n=4)	0.0 (n=0)	100.0 (n=36)
		Car User	87.1 (n=278)	9.1 (n=29)	3.8 (n=12)	0.0 (n=0)	100.0 (n=319)
The bus services are infrequent							
	Non-Bruneian	Bus User	50.0 (n=23)	15.2 (n=7)	34.8 (n=16)	0.0 (n=0)	100.0 (n=46)
		Car User	92.6 (n=25)	7.4 (n=2)	0.0 (n=0)	0.0 (n=0)	100.0 (n=27)
Total							100.0 (n=428)
	Bruneian	Bus User	69.4 (n=25)	16.7 (n=6)	13.9 (n=5)	0.0 (n=0)	100.0 (n=36)
		Car User	72.1 (n=230)	21.9 (n=67)	6.0 (n=24)	0.9 (n=3)	100.0 (n=319)
The buses are not reliable							
	Non-Bruneian	Bus User	39.1 (n=18)	13.0 (n=6)	47.8 (n=22)	0.0 (n=0)	100.0 (n=46)
		Car User	59.3 (n=16)	37.0 (n=10)	3.7 (n=1)	0.0 (n=0)	100.0 (n=27)
Total							100.0 (n=428)
	Bruneian	Bus User	88.9 (n=32)	8.3 (n=8.3)	2.8 (n=1)	0.0 (n=0)	100.0 (n=36)
		Car User	77.4 (n=247)	19.7 (n=63)	2.2 (n=7)	0.6 (n=2)	100.0 (n=319)
The destination covered by the buses are inadequate							
	Non-Bruneian	Bus User	69.6 (n=32)	19.6 (n=9)	10.9 (n=5)	0.0 (n=0)	100.0 (n=46)
		Car User	96.3 (n=26)	0.0 (n=0)	3.7 (n=1)	0.0 (n=0)	100.0 (n=27)
Total							100.0 (n=428)
	Bruneian	Bus User	75.0 (n=27)	8.3 (n=3)	16.7 (n=6)	0.0 (n=0)	100.0 (n=36)
		Car User	71.8 (n=229)	20.7 (n=65)	7.5 (n=24)	0.3 (n=1)	100.0 (n=319)
The buses are not clean							
	Non-Bruneian	Bus User	21.7 (n=10)	15.2 (n=7)	63.0 (n=29)	0.0 (n=0)	100.0 (n=46)
		Car User	55.6 (n=15)	40.7 (n=11)	3.7 (n=1)	0.0 (n=0)	100.0 (n=27)
Total							100.0 (n=428)

Table 7.2.1 (d) Perceptions of bus services from car and bus users in Brunei

The majority of Bruneian car and bus users as well as non-Bruneian car users thought that Bruneians do not use the bus services because the buses are not frequent. Half of the non-Bruneian bus users agreed with the statement. Furthermore, the majority of the Bruneian car and bus users, as well as non-Bruneian car users, thought that Bruneians do not use the bus services because the services are not reliable. 40 per cent of the non-Bruneian bus users disagreed.

The majority of the participants agreed that Bruneians do not use the bus services because of their limited service coverage. As for the cleanliness aspect, non-Bruneian bus users do not think cleanliness of the bus makes Bruneians do not use the bus. However, three-quarter of the Bruneian bus users thought that Bruneians do not use the bus because the bus is not clean.

7.2.2 Infrastructure

Lack of proper infrastructure for bus services, including bus stops that are too far apart from one another, as well as inadequate information, are considered major obstacles to attracting more bus users or potential bus users in Brunei.

"In your opinion, people in Brunei do not use buses because:

1. Bus infrastructure is inadequate.

2. Bus Stops are far from one another.

3. There is inadequate information about buses and their services."

	Agreed	Not Sure	Disagreed	Missing	Total
Bus infrastructure is inadequate	78.0 (n=334)	15.4 (n=66)	6.1 (n=26)	0.5 (n=2)	100.0 (n=428)
Bus Stops are far from one another	84.6 (n=362)	9.6 (n=40)	5.8 (n=25)	0.2 (n=1)	100.0 (n=428)
There is inadequate information about buses and their services.	85.7 (n=367)	9.1 (n=35)	5.1 (n=22)	0.9 (n=4)	100.0 (n=428)

Table 7.2.2 (a) Perceptions of the bus infrastructure

A very high percentage of the participants thought that Bruneians do not use the bus services because the bus infrastructure is inadequate and the bus stops are too far apart from one another. The study has found no distinctive differences between the attitudes of Bruneians and non-Bruneians to the bus infrastructure in Brunei. More non-Bruneians than Bruneian participants believed that the infrastructure is inadequate and that the bus stops are too far apart. However, 9 in 10 Bruneian participants (compared to 7 in 10 non-Bruneian participants) agreed that the inadequate information about buses tends to deter Bruneians from utilising the bus services.

More than 94 per cent of non-working participants tended to agree with the three statements, compared to the working and student participants. Although a high percentage of the student participants agreed with the statements, the percentage of this group, who were unsure about the three statements, was also high. Richer participants are more likely to agree with the above three statements.

More than 96 percent of the non-Bruneian car users agree to the three statements above. Bruneian car and bus users thought that the three factors cause Bruneians to not use the bus services. In terms of information, a very high percentage of the Bruneian car and bus users, as well as non-Bruneian car users, thought that the lack of information deters Bruneians from utilising the bus services. However, about half of the non-Bruneians bus users disagree with the idea that Bruneians do not use buses because of inadequate information relating to their services.

	Nationality		Gender		Generation			
	Bru	N-Bru	Male	Female	YG	MG I	MG II	EG
Bus infrastructure is inadequate								
Agreed	76.1 (n=270)	87.7 (n=64)	86.0 (n=178)	70.6 (n=156)	71.5 (n=148)	74.8 (n=95)	97.1 (n=68)	95.8 (n=23)
Unsure	17.2 (n=61)	6.8 (n=5)	9.7 (n=18)	21.7 (n=48)	22.2 (n=44)	15 (n=19)	2.9 (n=2)	4.2 (n=1)
Disagreed	6.2 (n=22)	5.5 (n=4)	4.3 (n=22)	7.7 (n=17)	6.3 (n=13)	10.2 (n=13)	0.0 (n=0)	0.0 (n=0)
Missing	0.6 (n=2)	0.0 (n=0)	0.6 (n=2)	0.0 (n=0)	0.6 (n=2)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)
Bus stops are far from one another								
Agreed	83.7 (n=297)	89.0 (n=65)	86.5 (n=179)	82.8 (n=183)	80.2 (n=166)	81.9 (n=104)	98.6 (n=69)	95.8 (n=23)
Unsure	10.1 (n=36)	5.5 (n=4)	8.2 (n=16)	10.9 (n=24)	11.1 (n=23)	11.8 (n=15)	1.4 (n=1)	4.2 (n=1)
Disagreed	5.9 (n=21)	5.5 (n=4)	5.3 (n=11)	6.3 (n=14)	8.7 (n=18)	5.5 (n=7)	0.0 (n=0)	0.0 (n=0)
Missing	0.3 (n=1)	0.0 (n=0)	0.5 (n=1)	0.0 (n=0)	0.0 (n=0)	0.8 (n=1)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)
There is inadequate information about buses and their services								
Agreed	89.0 (n=316)	69.9 (n=51)	85.0 (n=176)	86.4 (n=191)	83.1 (n=172)	83.5 (n=106)	94.3 (n=66)	95.8 (n=23)
Unsure	7.9 (n=25)	13.7 (n=10)	9.2 (n=16)	8.6 (n=19)	10.1 (n=21)	9.4 (n=12)	1.4 (n=1)	4.2 (n=1)
Disagreed	3.1 (n=11)	15.1 (n=11)	5.8 (n=12)	4.5 (n=10)	5.8 (n=12)	6.3 (n=8)	2.9 (n=2)	0.0 (n=1)
Missing	0.8 (n=3)	1.4 (n=1)	1.4 (n=3)	0.5 (n=1)	1.0 (n=2)	0.8 (n=1)	1.4 (n=1)	0.6 (n=2)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)

Table 7.2.2 (b) Perception of infrastructure based on nationality, gender and age generation.

	Job			Salary			
	Stu	W	N-W	LS	LM	LMS	HS
Bus infrastructure is inadequate							
Agreed	70.1 (n=115)	81.2 (n=186)	94.3 (n=33)	73.3 (n=151)	79.1 (n=53)	81.3 (n=74)	90.2 (n=55)
Unsure	24.4 (n=40)	10.9 (n=25)	2.9 (n=1)	20.9 (n=43)	16.4 (n=11)	6.6 (n=6)	6.6 (n=4)
Disagreed	5.5 (n=9)	7.0 (16)	2.9 (n=1)	5.8 (n=12)	3.0 (n=2)	12.1 (n=11)	1.6 (n=1)
Missing	0.0 (n=0)	0.9 (n=2)	0.0 (n=0)	0.0 (n=0)	1.5 (n=1)	0.0 (n=0)	1.6 (n=1)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)
Bus stops are far from one another							
Agreed	78.0 (n=128)	87.3 (n=200)	97.1 (n=34)	79.6 (n=164)	83.6 (n=56)	91.2 (n=83)	91.8 (n=56)
Unsure	12.8 (n=21)	8.7 (n=19)	0.0 (n=0)	11.7 (n=24)	11.9 (n=8)	4.4 (n=4)	6.6 (n=4)
Disagreed	9.1 (n=15)	3.9 (n=9)	2.9 (n=1)	8.7 (n=18)	3.0 (n=2)	4.4 (n=4)	1.6 (n=1)
Missing	0.0 (n=0)	1.4 (n=1)	0.0 (n=0)	0.0 (n=0)	1.5 (n=1)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)
There is inadequate information about bus and their services							
Agreed	84.8 (n=139)	85.2 (n=195)	94.3 (n=33)	81.6 (n=168)	76.1 (n=51)	95.6 (n=87)	95.1 (n=58)
Unsure	11.0 (n=17)	8.7 (n=18)	0.0 (n=0)	9.7 (n=20)	16.4 (n=11)	2.2 (n=2)	3.3 (n=2)
Disagreed	4.3 (n=7)	6.1 (n=14)	2.9 (n=1)	7.3 (n=15)	6.0 (n=4)	2.2 (n=2)	1.6 (n=1)
Missing	1.0 (n=1)	0.9 (n=2)	2.9 (n=1)	1.5 (n=3)	1.5 (n=1)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)

Table 7.2.2 (c) Perceptions of bus infrastructure based on job classification and range of salary.

More than 95 per cent of the elderly generation thought that the three factors mentioned were causing people to avoid the buses, and none of them disagreed with the statements. As for the young generation, despite the high percentage in agreement with the three statements, the percentage of those who were unsure was also considered high (ranging between 11 and 23 per cent), and was higher than the percentage who opposed the statement (ranging between five and nine per cent).

Factors	Nationality		Agreed	Not Sure	Disagree	Missing	Total
	Bruneian	Bus User	88.9 (n=32)	8.3 (n=3)	2.8 (n=1)	0.0 (n=0)	100.0 (n=36)
		Car User	74.6 (n=238)	18.8 (n=58)	6.6 (n=21)	0.6 (n=2)	100.0 (n=319)
Bus infrastructure is inadequate							
	Non-Bruneian	Bus User	82.6 (n=38)	8.7 (n=4)	8.7 (n=4)	0.0 (n=0)	100.0 (n=46)
		Car User	96.3 (n=26)	3.7 (n=1)	0.0 (n=0)	0.0 (n=0)	100.0 (n=27)
Total							100.0 (n=428)
	Bruneian	Bus User	94.4 (n=34)	2.8 (n=1)	2.8 (n=1)	0.0 (n=0)	100.0 (n=36)
		Car User	82.4 (n=263)	11.3 (n=35)	6.3 (n=20)	0.3 (n=1)	100.0 (n=319)
Bus stops are far from one another							
	Non-Bruneian	Bus User	84.8 (n=39)	6.5 (n=3)	8.7 (n=4)	0.0 (n=0)	100.0 (n=46)
		Car User	96.3 (n=26)	3.7 (n=1)	0.0 (n=0)	0.0 (n=0)	100.0 (n=27)
Total							100.0 (n=428)
	Bruneian	Bus User	91.7 (n=33)	5.6 (n=2)	2.8 (n=1)	0.0 (n=0)	100.0 (n=36)
		Car User	88.7 (n=283)	7.2 (n=23)	3.1 (n=10)	0.9 (n=3)	100.0 (n=319)
There is inadequate information about bus and their services							
	Non-Bruneian	Bus User	54.3 (n=25)	19.6 (n=9)	23.9 (n=11)	2.2 (n=1)	100.0 (n=46)
		Car User	96.3 (n=26)	3.7 (n=1)	0.0 (n=0)	0.0 (n=0)	100.0 (n=27)
Total							100.0 (n=428)

Table 7.2.2 (d) Perceptions of bus infrastructure from car and bus users in Brunei.

7.2.3 Cost

The cost of the bus services includes the monetary cost of using cars and buses, as well as the time spent on using cars and buses. There were mixed responses from the participants about the cost of using cars and bus services in Brunei.

"In your opinion, people in Brunei do not use buses because:

1. It is cheaper to use the car.

2. It could save time when using the car."

	Agreed	Not Sure	Disagreed	Missing	Total
It is cheaper to use the car	43.5 (n=186)	23.1 (n=99)	32.9 (n=141)	0.5 (n=2)	100.0 (n=428)
It could save time when using the car	86.9 (n=372)	7.2 (n=31)	5.4 (n=23)	0.5 (n=2)	100.0 (n=428)

Table 7.2.3 (a) Perceptions of the cost of travel.

Roughly four in ten participants indicated that the car is a cheaper way to travel and nearly one-third disagreed. However, a very high percentage of the participants indicated that they could save time by travelling by car compared to using the bus. Less than six per cent of the participants disagreed with the statement. Nearly half of the Bruneian participants agreed that travelling by car is cheaper than using the bus, although 3 in 5 non-Bruneians disagreed.

More than half of the participants aged over 25 years agreed with the statement; however, the majority of the young generation disagreed with the statement. Over half of the participants aged over 25 years agreed with the statement. About 42 per cent of the student participants disagreed with the statement compared to over 57 per cent of the non-working participants, who agreed. Furthermore, lower-salary earners and lower-middle salary earners tended to disagree with the statements.

In addition, students and the young generation tended to consider the bus the cheapest way of travelling, compared to the other respondents. Working and non-working participants tended to travel more than students, who spend more time in their institutions. In addition, as the age increased, the responsibilities also tended to increase. Such responsibilities may include travelling for employment purposes, socialising or family-related travelling. Thus, the multiple destinations to be covered in a day made the use of the car comparable to or cheaper than the use of buses. Despite this, about 66 per cent of upper-middle-income and almost 60 per cent of the high-income earners agreed that cars are cheaper to use; only 13 to 15 per cent disagreed.

	Nationality		Gender		Generation			
	Bru	N-Bru	Male	Female	YG	MG I	MG II	EG
It is cheaper to use the car								
Agreed	49.0 (n=174)	16.4 (n=12)	42.0 (n=87)	44.8 (n=99)	33.8 (n=70)	52.0 (n=66)	51.4 (n=36)	58.3 (n=14)
Unsure	23.1 (n=82)	23.3 (n=17)	19.3 (n=40)	26.7 (n=59)	28.0 (n=58)	18.9 (n=24)	21.4 (n=15)	8.3 (n=2)
Disagreed	27.3 (n=97)	60.3 (n=44)	37.7 (n=78)	28.5 (n=63)	37.7 (n=78)	28.3 (n=36)	27.1 (n=19)	33.3 (n=8)
Missing	0.6 (n=2)	0.0 (n=0)	1.0 (n=2)	0.0 (n=0)	0.5 (n=1)	0.8 (n=1)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)
It could save time when using the car								
Agreed	87.9 (n=312)	82.2 (n=60)	88.9 (n=184)	85.1 (n=188)	82.6 (n=171)	89.0 (n=113)	92.9 (n=65)	95.8 (n=23)
Unsure	6.5 (n=23)	11.0 (n=8)	6.8 (n=14)	7.7 (n=17)	11.6 (n=24)	3.9 (n=5)	1.4 (n=1)	4.2 (n=1)
Disagreed	5.4 (n=19)	5.5 (n=4)	3.4 (n=7)	7.2 (n=16)	5.3 (n=11)	6.3 (n=8)	5.7 (n=4)	0.0 (n=0)
Missing	0.3 (n=1)	1.4 (n=1)	1.2 (n=2)	0.0 (n=0)	0.5 (n=1)	0.8 (n=1)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)

Table 7.2.3 (b) Perceptions of the cost of travel based on nationality, gender and age generation.

	Job			Salary			
	Stu	W	N-W	LS	LM	LMS	HS
It is cheaper to use the car							
Agreed	35.4 (n=58)	47.2 (n=108)	57.1 (n=20)	33.5 (n=69)	29.9 (n=20)	65.9 (n=60)	59.0 (n=36)
Unsure	23.2 (n=38)	24.0 (n=55)	17.1 (n=6)	21.4 (n=44)	29.9 (n=20)	20.9 (n=19)	26.2 (n=16)
Disagreed	41.5 (n=68)	27.9 (n=64)	25.7 (n=9)	45.1 (n=93)	37.3 (n=25)	13.2 (n=12)	14.8 (n=9)
Missing	0.0 (n=0)	0.9 (n=2)	0.0 (n=0)	0.0 (n=0)	3.0 (n=2)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)
It could save time when using the car							
Agreed	81.7 (n=134)	89.1 (n=204)	97.1 (n=83)	81.6 (n=168)	89.6 (n=60)	91.2 (n=83)	96.7 (n=59)
Unsure	12.2 (n=20)	4.4 (n=10)	2.9 (n=1)	12.1 (n=25)	6.0 (n=4)	0.0 (n=0)	1.6 (n=1)
Disagreed	6.1 (n=10)	5.7 (n=13)	0.0 (n=0)	5.8 (n=12)	3.0 (n=2)	8.8 (n=8)	1.6 (n=1)
Missing	0.0 (n=0)	0.9 (n=2)	0.0 (n=0)	0.5 (n=1)	1.5 (n=1)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)

Table 7.2.3 (c) Perceptions of the cost of travel based on job classification and range of salary.

Turning now to the factor of time: when asked whether the use of the car could save time when travelling, 87 per cent of the participants believed that it could, while only about five per cent disagreed. The percentage of Bruneians agreeing with the statement was slightly higher (87.9 per cent) than the non-Bruneian participants (82.2 per cent). Additionally, male participants (88.9 per cent) were more likely to agree than female participants (85.1 per cent). The study identified that, as the age increased, the percentage of participants agreeing with the statements also increased. Furthermore, it is interesting to note that all (100%) of the participants aged over 55 agreed with the statement.

Student participants agreed that Bruneians do not use the bus because the car can save time in travelling. None of the non-working group disagreed with the statement. The same result is indicated for income range, where the percentage of participants agreeing with the statement increased as their incomes increased.

A high percentage (80.4 per cent) of the non-Bruneian bus users, as compared to 55.6 per cent of the Bruneian bus users, disagree with the idea that Bruneians do not use the bus services because travelling by car is cheaper. More than 50 per cent of the Bruneian users agreed with the statement while non-Bruneian car users either agreed with or were unsure

about the statement. In terms of time, a very high percentage of the participants thought travelling by car saves time.

Factors	Nationality		Agreed	Not Sure	Disagree	Missing	Total
	Bruneian	Bus User	27.8 (n=10)	16.7 (n=6)	55.6 (n=20)	0.0 (n=0)	100.0 (n=36)
		Car User	51.4 (n=164)	23.8 (n=76)	24.1 (n=77)	0.6 (n=2)	100.0 (n=319)
It is cheaper to use the car							
	Non-Bruneian	Bus User	4.3 (n=2)	15.2 (n=7)	80.4 (n=37)	0.0 (n=0)	100.0 (n=34)
		Car User	37.0 (n=10)	37.0 (n=10)	25.9 (n=7)	0.0 (n=0)	100.0 (n=27)
Total							100.0 (n=428)
	Bruneian	Bus User	91.7 (n=33)	5.6 (n=2)	2.8 (n=1)	0.0 (n=0)	100.0 (n=36)
		Car User	87.5 (n=279)	6.9 (n=21)	5.6 (n=18)	0.3 (n=1)	100.0 (n=319)
It could save time when using the car							
	Non-Bruneian	Bus User	73.9 (n=34)	15.2 (n=7)	8.7 (n=4)	2.2 (n=01)	100.0 (n=46)
		Car User	96.3 (n=26)	3.7 (n=1)	0.0 (n=0)	0.0 (n=0)	100.0 (n=27)
Total							100.0 (n=428)

Table 7.2.3 (d) Perceptions of the cost of travel from car and bus users in Brunei.

7.2.4 Social pressure against bus usage

The use of cars and public transportation, especially buses, may reflect the lifestyles of the users. Some people do not use the bus because they are embarrassed to do so, lest it affects their social status. Some are denied permission to use the bus services, especially by their friends and family; a case of social pressure shaping behaviour.

"In your opinion, people in Brunei do not use buses because:

1. They are embarrassed to use the bus.

2. Using the bus in Brunei would affect people's social status.

3. My spouse/parents/family/friends do not wish me to use the bus."

The present results indicated that more than half of the participants believe that people do not use the bus services in Brunei because they are embarrassed to do so, their social status would be affected and they are prevented from using the services by their family, friends and spouses. However, more than one-quarter of the participant disagreed with the role social pressure plays in bus using decisions.

	Agreed	Not sure	Disagreed	Missing	Total
They are embarrassed to use the bus.	57.0 (n=244)	16.6 (n=70)	26.4 (n=113)	0.2 (n=1)	100.0 (n=428)
Using the bus in Brunei would affect people's social status.	57.0 (n=244)	15.7 (n=67)	27.3 (n=117)	0.0 (n=0)	100.0 (n=428)
My spouse/parents/family/friend do not wish me to use the bus."	55.8 (n=239)	15.2 (n=65)	27.3 (n=117)	0.7 (n=1.6)	100.0 (n=428)

Table 7.2.4 (a) Perception of pressures not to use the bus.

Roughly three in five Bruneian participants agreed with the three statements, while one in five participants disagreed. However, more than 50 per cent of the non-Bruneian participants disagreed with all three statements. More male than female participants thought that people do not use the bus because they are embarrassed and their social status would be affected. However, more females than males thought people do not use the bus due to external pressures.

"...for female, it is not appropriate for a female to sit next to a male. It is socially and culturally unacceptable."

Survey: Female: Bruneian: 26 – 35 years old: Housewife.

"...my father bought me a car because he doesn't want me to mix with the foreigners."

Survey: Female: Bruneians: 18 – 25 years old: Student.

Just about half of the young generation thought people do not use the bus because they are embarrassed and their social status would be affected. However, among the elderly generation, more than 83 per cent agreed that people are embarrassed to use the bus, while 75 per cent of them also thought people do not use the bus because it affects their social status.

However, 59 per cent of the young generation, as compared to 54 per cent of the elderly generation, thought people do not use the bus due to external pressures.

More than half of the students and working participants in this study thought people do not use the bus because they are embarrassed and their social status would be affected. Interestingly, more than 80 per cent of the non-working group agreed with this statement. As for external pressures constraining people from using the bus, about 60 per cent of the student and non-working groups agreed, as did just over half of the working participants.

The results indicated that the richer participants thought that Bruneians do not use the bus services because they are embarrassed and their social status would be negatively affected. 71 per cent of the richer participants also thought that external pressures cause Bruneians to avoid using the bus. More than half of the participants among the low-income earners disagreed with the statements. It can be clearly seen that the richer participants are more convinced that people in general are embarrassed to use the bus. Furthermore, the idea that it affects one's social status is also increasing. These three factors are likely to occur, thus partially explaining the high percentage of those who thought Bruneians were pressured not to use the bus services.

Non-Bruneian bus users thought that embarrassment, the negative effect on social status and external pressure to own a car are not the reasons why Bruneians do not use the bus services. Bruneian and non-Bruneian car-user participants held opposing opinions.

	Nationality		Gender		Generation			
	Bru	N-Bru	Male	Female	YG	MG I	MG II	EG
Embarrassed								
Agreed	63.4 (n=225)	26.0 (n=19)	56.0 (n=116)	57.9 (n=128)	54.6 (n=113)	54.3 (n=69)	60.0 (42)	83.3 (n=20)
Unsure	15.5 (n=55)	20.5 (n=15)	14.0 (n=29)	18.6 (n=41)	21.3 (n=44)	12.6 (n=16)	11.4 (n=8)	8.3 (n=2)
Disagreed	20.8 (n=74)	53.4 (n=39)	29.5 (n=61)	23.5 (n=52)	24.2 (n=50)	32.3 (n=41)	28.6 (n=20)	8.3 (n=2)
Missing	0.3 (n=1)	0.0 (n=0)	0.5 (n=1)	0.0 (n=0)	0.0 (n=0)	0.8 (n=1)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)
Using the bus in Brunei would affect people's social status								
Agreed	62.5 (n=222)	30.1 (n=22)	59.4 (n=123)	54.8 (n=121)	51.7 (n=107)	57.5 (n=73)	65.7 (n=46)	75.0 (n=18)
Unsure	15.2 (n=54)	17.8 (n=13)	13.5 (n=28)	17.6 (n=39)	21.3 (n=44)	11.0 (n=14)	7.1 (n=5)	16.7 (n=4)
Disagreed	22.3 (n=79)	52.1 (n=38)	27.1 (n=56)	27.6 (n=61)	27.1 (n=56)	31.5 (n=40)	27.1 (n=19)	8.3 (n=2)
Missing	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)
My spouse/parents/family/friends do not wish me to use the bus								
Agreed	60.8 (n=216)	31.5 (n=23)	45.9 (n=95)	65.2 (n=144)	59.4 (n=123)	47.2 (n=60)	61.4 (n=43)	54.2 (n=13)
Unsure	16.1 (n=57)	11.0 (n=8)	14.5 (n=30)	15.8 (n=35)	18.8 (n=39)	15.0 (n=19)	8.6 (n=6)	4.2 (n=1)
Disagreed	21.7 (n=77)	54.8 (n=40)	36.7 (n=76)	18.6 (n=41)	19.8 (n=41)	37.0 (n=47)	28.6 (n=20	37.5 (n=9)
Missing	1.4 (n=5)	2.7 (n=2)	2.9 (n=6)	0.5 (n=1)	1.9 (n=4)	0.8 (n=1)	1.4 (n=1)	4.2 (n=1)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)

Table 7.2.4 (b) Perceptions of the pressure not to use the bus based on nationality, gender and age generation.

	Job			Salary			
	Stu	W	N-W	LS	LM	LMS	HS
They are embarrassed to use the bus							
Agreed	57.9 (n=95)	52.0 (n=119)	85.7 (n=30)	55.3 (n=114)	38.8 (n=26)	62.6 (n=57)	77.0 (n=47)
Unsure	17.1 (n=28)	17.9 (n=41)	2.9 (n=1)	16.0 (n=33)	13.4 (n=9)	18.7 (n=17)	16.4 (n=10)
Disagreed	25.0 (n=14)	29.7 (n=68)	11.4 (n=4)	28.6 (n=59)	46.3 (n=31)	18.7 (n=17)	6.6 (n=4)
Missing	0.0 (n=0)	0.4 (n=1)	0.0 (n=0)	0.0 (n=0)	1.5 (n=1)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)
Using the bus in Brunei would affect people's social status							
Agreed	54.3 (n=89)	55.0 (n=126)	82.9 (n=29)	51.9 (n=107)	41.8 (n=28)	65.9 (n=60)	80.3 (n=49)
Unsure	17.7 (n=29)	15.3 (n=35)	8.6 (n=3)	18.4 (n=38)	9.0 (n=6)	17.6 (n=16)	9.8 (n=6)
Disagreed	28.0 (n=46)	29.7 (n=68)	8.6 (n=3)	29.6 (n=61)	49.3 (n=33)	16.5 (n=15)	9.8 (n=6)
Missing	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)
My spouse/parents/family/friends do not wish me to use the bus							
Agreed	61.6 (n=101)	51.1 (n=117)	60.0 (n=21)	53.9 (n=111)	43.3 (n=29)	61.5 (n=56)	70.5 (n=43)
Unsure	20.1 (n=33)	14.4 (n=28)	11.4 (n=4)	19.4 (n=40)	10.4 (n=7)	14.3 (n=13)	4.9 (n=3)
Disagreed	18.3 (n=30)	34.5 (n=79)	22.9 (n=8)	24.8 (n=51)	43.3 (n=29)	24.2 (n=22)	23.0 (n=14)
Missing	0.0 (n=0)	2.2 (n=5)	5.7 (n=2)	1.9 (n=4)	3.0 (n=2)	0.0 (n=0)	1.6 (n=1)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)

Table 7.2.4 (c) Perceptions of pressures not to use the bus based on job classification and range of salary.

Factors	Nationality		Agreed	Not Sure	Disagree	Missing	Total
	Bruneian	Bus User	69.4 (n=25)	5.6 (n=2)	25.0 (n=9)	0.0 (n=0)	100.0 (n=36)
		Car User	62.7 (n=200)	16.9 (n=53)	20.4 (n=65)	0.3 (n=1)	100.0 (n=319)
They are embarrassed to use the bus							
	Non-Bruneian	Bus User	2.2 (n=1)	19.6 (n=9)	78.5 (n-36)	0.0 (n=0)	100.0 (n=46)
		Car User	66.7 (n=18)	22.2 (n=6)	11.1 (n=3)	0.0 (n=0)	100.0 (n=27)
Total							100.0 (n=428)
	Bruneian	Bus User	69.4 (n=25)	13.9 (n=5)	16.9 (n=6)	0.0 (n=0)	100.0 (n=36)
		Car User	62.1 (n=197)	15.4 (n=49)	22.6 (n=73)	0.0 (n=0)	100.0 (n=319)
Using the bus in Brunei would affect people's social status							
	Non-Bruneian	Bus User	0.0 (n=0)	21.7 (n=10)	78.3 (n=36)	0.0 (n=0)	100.0 (n=46)
		Car User	81.5 (n=22)	11.1 (n=3)	7.4 (n=2)	0.0 (n=0)	100.0 (n=27)
Total							100.0 (n=428)
	Bruneian	Bus User	41.7 (n=15)	2.8 (n=1)	55.6 (n=20)	0.0 (n=0)	100.0 (n=36)
		Car User	63.0 (n=201)	17.6 (n=56)	17.9 (n=57)	1.6 (n=5)	100.0 (n=319)
My spouse/parents/family/friends do not wish me to use the bus							
	Non-Bruneian	Bus User	8.7 (n=4)	10.9 (n=5)	76.1 (n=35)	4.3 (n=2)	100.0 (n=46)
		Car User	70.4 (n=19)	11.1 (n=3)	18.5 (n=5)	0.0 (n=0)	100.0 (n=27)
Total							100.0 (n=428)

Table 7.2.4 (d) Perceptions of pressures not to use the bus from car and bus users in Brunei.

7.2.5 Safety

Safety, when using the bus services, is among the issues that may constrain people from using the services. Roughly four in five participants commented that people do not use bus services in Brunei because they would be concerned about their personal safety and road safety if they did so.

"In your opinion, people in Brunei do not use buses because of:

1. Concern with personal safety when using buses.

2. Concern with road safety when using buses."

	Agreed	Not Sure	Disagreed	Missing	Total
Concern with personal safety when using buses	81.3 (n=348)	12.1 (n=52)	6.5 (n=28)	0.0 (n=0)	100.0 (428)
Concern with road safety when using buses	78.3 (n=335)	10.5 (n=45)	10.7 (n=46)	0.5 (n=2)	100.0 (428)

Table 7.2.5 (a) Perceptions of the safety features.

Bruneians are more likely to agree with the two statements compared to non-Bruneians. The study has shown that, as the age increased, the percentage of participants agreeing with the two statements increased. Surprisingly, all elderly generation respondents agreed with both statements.

The non-working group tended to be more negative about the safety issues of the bus services in Brunei. More than 90 per cent of the non-working participants agreed that they were concerned about personal safety and safety on the road while using the bus services. The results also indicated that higher-income earners (upper-middle and high-income earners group) are more likely to think that people are concerned with personal safety and safety on the road while using the bus services in Brunei.

A very high percentage of Bruneian car and bus users, and non-Bruneian car users, thought that personal safety and safety on the road issues cause Bruneians to avoid using the bus services. More than 58 per cent of the non-Bruneian bus users thought the same.

	Nationality		Gender		Generation			
	Bru	N-Bru	Male	Female	YG	MG I	MG II	EG
Concern with personal safety when using buses								
Agreed	83.1 (n=295)	72.6 (n=53)	78.3 (n=162)	84.2 (n=186)	77.8 (n=161)	78.0 (n=99)	91.4 (n=64)	100.0 (n=24)
Unsure	12.7 (n=45)	9.6 (n=7)	12.6 (n=26)	11.8 (n=26)	14.5 (n=30)	15.7 (n=20)	2.9 (n=2)	0.0 (n=0)
Disagreed	4.2 (n=15)	17.8 (n=13)	9.2 (n=19)	4.1 (n=9)	7.7 (n=16)	6.3 (n=8)	5.7 (n=4)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)
Concern with road safety when using buses								
Agreed	79.4 (n=282)	72.6 (n=53)	77.3 (n=160)	79.2 (n=175)	71.5 (n=148)	77.2 (n=98)	92.9 (n=65)	100.0 (n=24)
Unsure	10.7 (n=38)	9.6 (n=7)	7.2 (n=15)	13.6 (n=30)	14.0 (n=29)	11.8 (n=15)	1.4 (n=1)	0.0 (n=0)
Disagreed	9.3 (n=33)	17.8 (n=13)	14.5 (n=30)	7.2 (n=16)	14.0 (n=29)	10.2 (n=13)	5.7 (n=4)	0.0 (n=0)
Missing	0.6 (n=2)	0.0 (n=0)	1.0 (n=2)	0.0 (n=0)	0.5 (n=1)	0.8 (n=1)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)

Table 7.2.5 (b) Perceptions of the safety features based on nationality, gender and age generation.

	Job			Salary			
	Stu	W	N-W	LS	LM	LMS	HS
Concern with personal safety when using buses							
Agreed	82.9 (n=136)	78.2 (n=179)	94.3 (n=33)	79.1 (163)	80.6 (n=54)	83.5 (n=76)	86.9 (n=53)
Unsure	10.4 (n=17)	14.8 (n=34)	2.9 (n=1)	11.7 (n=24)	10.4 (n=7)	15.4 (n=14)	9.8 (n=6)
Disagreed	6.7 (n=11)	7.0 (n=16)	2.9 (n=1)	9.2 (n=19)	9.0 (n=6)	1.1 (n=1)	3.3 (n=1)
Missing	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)
Concern with road safety when using buses							
Agreed	73.8 (n=121)	79.0 (n=181)	94.3 (n=33)	74.8 (n=154)	70.1 (n=47)	85.7 (n=78)	88.5 (n=54)
Unsure	15.9 (n=26)	8.3 (n=19)	0.0 (n=0)	14.1 (n=29)	14.9 (n=10)	3.3 (n=3)	4.9 (n=2)
Disagreed	10.4 (n=17)	11.8 (n=27)	5.7 (n=2)	11.2 (n=23)	13.4 (n=9)	11.0 (n=10)	6.6 (n=4)
Missing	0.0 (n=0)	0.9 (n=2)	0.0 (n=0)	0.0 (n=0)	1.5 (n=1)	0.0 (n=0)	1.6 (n=1)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)

Table 7.2.5 (c) Perceptions of the safety features based on job classification and range of salary.

Factors	Nationality		Agreed	Not Sure	Disagree	Missing	Total
	Bruneian	Bus User	97.2 (n=35)	0.0 (n=0)	2.8 (n=1)	0.0 (n=0)	100.0 (n=36)
		Car User	81.5 (n=260)	14.1 (n=45)	4.4 (n=14)	0.0 (n=0)	100.0 (n=319)
Concern with personal safety when using buses							
	Non-Bruneian	Bus User	58.7 (n=27)	13.0 (n=6)	28.3 (n=13)	0.0 (n=0)	100.0 (n=46)
		Car User	96.3 (n=26)	3.7 (n=1)	0.0 (n=0)	0.0 (n=0)	100.0 (n=27)
Total							100.0 (n=428)
	Bruneian	Bus User	91.7 (n=33)	5.6 (n=2)	2.8 (n=1)	0.0 (n=0)	100.0 (n=36)
		Car User	78.1 (n=249)	11.3 (n=36)	10.0 (n=32)	0.0 (n=0)	100.0 (n=319)
Concern with road safety when using buses							
	Non-Bruneian	Bus User	58.7 (n=27)	13.0 (n=6)	28.3 (n=13)	0.0 (n=0)	100.0 (n=46)
		Car User	96.3 (n=26)	3.7 (n=1)	0.0 (n=0)	0.0 (n=0)	100.0 (n=27)
Total							100.0 (n=428)

Table 7.2.5 (d) Perceptions of the safety features from car and bus users in Brunei.

7.3 Current bus infrastructure and services: views from the public transport users

Fifteen scenarios concerning the bus services in Brunei were presented to the public transport users in this study. Participants were requested to indicate their level of satisfaction with the current services offered by the bus operators using a numerical scale, 1 being very satisfactory and 5 being very unsatisfactory. Participants could choose 3 for the statements about which they were unsure. For the purpose of statistical analysis this study used the term 'satisfaction' to include the combination of very satisfactory and satisfactory, and 'dissatisfaction' to include the combination of unsatisfactory and very unsatisfactory.

In this subsection, the groups of participants were divided into three categories: immigrant population, Bruneian non-students and Bruneian students. Bruneian students were the main bus users among the Bruneian participants. Therefore, treating them as a separate category would create a better understanding of the differing perceptions of students and non-students of the bus services in Brunei.

	Satisfactory	Not Sure	Unsatisfactory	Missing	Total
Cleanliness	68.3 (n=56)	7.3 (n=6)	12.2 (n=10)	12.2 (n=10)	100.0 (n=82)
Frequency	72.0 (n=59)	8.5 (n=7)	10.9 (n=9)	8.5 (n=7)	100.0 (n=82)
Reliability	68.3 (n=56)	9.8 (n=8)	11.0 (n=9)	11.0 (n=9)	100.0 (n=82)
Personal Safety	47.6 (n=39)	12.2 (n=10)	34.1 (n=28)	6.1 (n=5)	100.0 (n=82)
Safety on the road	46.3 (n=38)	9.8 (n=8)	37.8 (n=31)	6.1 (n=5)	100.0 (n=82)
Comfort	56.1 (n=46)	8.5 (n=7)	23.2 (n=19)	12.2 (n=10)	100.0 (n=82)
Information	32.9 (n=27)	7.3 (n=6)	47.6 (n=39)	12.2 (n=10)	100.0 (n=82)
Cost	84.1 (n=69)	4.9 (n=4)	2.4 (n=2)	8.5 (n=7)	100.0 (n=82)
Travel Coverage	40.2 (n=33)	7.3 (n=6)	39.0 (n=32)	13.4 (n=11)	100.0 (n=82)

Table 7.3 (a) Satisfaction of bus users with bus services in Brunei.

Further analysis indicated that the majority of the immigrant population expressed their satisfaction with the bus services, although they were dissatisfied with the information provided (Table 7.3 (b)). Furthermore, 41 percent of the non-Bruneian bus users were satisfied with the travel coverage provided by the bus services.

	Satisfactory	Not Sure	Unsatisfactory	Missing	Total
Cleanliness	76.1 (n=35)	8.7 (n=4)	4.3 (n=2)	10.9 (n=5)	100.0 (n=46)
Frequency	80.4 (n=37)	10.9 (n=5)	4.3 (n=2)	4.3 (n=2)	100.0 (n=46)
Reliability	69.6 (n=32)	15.2 (n=7)	6.5 (n=3)	8.7 (n=4)	100.0 (n=46)
Personal Safety	54.3 (n=25)	13.0 (n=6)	32.6 (n=15)	0.0 (n=0)	100.0 (n=46)
Safety on the road	52.2 (n=24)	13.0 (n=6)	34.8 (n=16)	0.0 (n=0)	100.0 (n=46)
Comfort	69.6 (n=32)	10.9 (n=5)	8.7 (n=4)	10.9 (n=5)	100.0 (n=46)
Information	39.1 (n=18)	10.9 (n=5)	41.3 (n=19)	8.7 (n=4)	100.0 (n=46)
Cost	84.8 (n=39)	6.5 (n=3)	4.3 (n=2)	4.3 (n=2)	100.0 (n=46)
Travel Coverage	41.3 (n=19)	8.7 (n=4)	37.0 (n=17)	13.0 (n=6)	100.0 (n=46)

Table 7.3 (b) Satisfaction of non-Bruneian bus users with bus services in Brunei.

The Bruneian non-student group expressed their satisfaction with the cleanliness, frequency, reliability, personal safety, comfort and cost of bus travel, but they too were dissatisfied with the information provided about the bus services. However, the factors of travel coverage and safety on the roads are rated neither satisfactory nor unsatisfactory.

		Satisfactory	Not Sure	Unsatisfactory	Missing	Total
Cleanliness	Student	38.1 (n=8)	4.8 (n=1)	38.1 (n=8)	19.0 (n=4)	100.0 (n=21)
	Non-student	86.7 (n=13)	6.7 (n=1)	0.0 (n=0)	6.7 (n=1)	100.0 (n=15)
Frequency	Student	52.4 (n=11)	9.5 (n=2)	19.0 (n=4)	19.0 (n=4)	100.0 (n=21)
	Non-student	73.3 (n=11)	0.0 (n=0)	20.0 (n=3)	6.7 (n=1)	100.0 (n=15)
Reliability	Student	61.9 (n=13)	4.8 (n=1)	14.3 (n=3)	19.0 (n=4)	100.0 (n=21)
	Non-student	73.3 (n=11)	0.0 (n=0)	20.0 (n=3)	6.7 (n=1)	100.0 (n=15)
Personal Safety	Student	23.8 (n=5)	19.0 (n=4)	38.1 (n=8)	19.0 (n=4)	100.0 (n=21)
	Non-student	60.0 (n=9)	0.0 (n=0)	33.3 (n=5)	6.7 (n=1)	100.0 (n=15)
Safety on the road	Student	33.3 (n=7)	9.5 (n=2)	38.1 (n=8)	19.0 (n=4)	100.0 (n=21)
	Non-student	46.7 (n=7)	0.0 (n=0)	46.7 (n=7)	6.7 (n=1)	100.0 (n=15)
Comfort	Student	23.8 (n=5)	4.8 (n=1)	52.4 (n=11)	19.0 (n=4)	100.0 (n=21)
	Non-student	60.0 (n=9)	6.7 (n=1)	26.7 (n=4)	6.7 (n=1)	100.0 (n=15)
Information	Student	14.3 (n=3)	4.8 (n=1)	57.1 (n=12)	23.8 (n=5)	100.0 (n=21)
	Non-student	40.0 (n=6)	0.0 (n=0)	53.3 (n=8)	6.7 (n=1)	100.0 (n=15)
Cost	Student	76.2 (n=16)	4.8 (n=1)	0.0 (n=0)	19.0 (n=4)	100.0 (n=21)
	Non-student	93.3 (n=14)	0.0 (n=1)	0.0 (n=0)	6.7 (n=1)	100.0 (n=15)
Travel Coverage	Student	33.3 (n=7)	9.5 (n=2)	38.1 (n=8)	19.0 (n=4)	100.0 (n=21)
	Non-student	46.7 (n=7)	0.0 (n=0)	46.7 (n=7)	6.7 (n=1)	100.0 (n=15)

Table 7.3 (c) Satisfaction of Bruneian bus users with bus services in Brunei.

Bruneian student participants were considered important in this survey, as they accounted for 58 per cent of the Bruneian bus users in this study. Furthermore, as they are young, it is possible that they will use the bus in the future, although the car is a more appealing mode of transportation to these young generations. Bruneian student participants expressed their dissatisfaction with five of the nine factors listed: personal safety, safety on the road, comfort, information and travel coverage. There were equal percentages of satisfaction and dissatisfaction on the issue of cleanliness. The only factors rated satisfactory by the students were frequency (just about 52 percent), reliability (about 62 percent) and cost (about 93 percent).

The current bus services in Brunei were considered to be satisfying the needs of the immigrant and Bruneian non-student participants: mainly housewives and retired personnel. However, the bus services failed to satisfy the needs of the students, who were the main Bruneian bus users in this study, especially in the aspect of safety.

7.4 Current bus infrastructure and services: views of interviewees

The interviewees commented on the current bus infrastructure and services in Brunei. The results of the interview process consist of input from car users including participants who used to ride the bus, bus users, and both. The results also include the views of government officials, NGOs, and public transport operators. Thus, the results from non-public contributors are based on their experience, observations, complaints from users and stories they have heard from people using the buses, such as friends and relatives.

7.4.1 Cleanliness

The majority of the interviewees indicated that the buses are not clean. However, when they elaborate on the term 'clean', the interviewees are not talking about rubbish or dust but, rather, about the physical appearance and odour.

"We always clean the bus every time they reach the stations. Upon reaching the stations, our drivers have 10 minutes' break, like going to the toilet or have a smoke break so we have cleaners at the stations to pick up the rubbish and sweep the floor. Early in the morning like before we start, and in the evening, after the last bus, we thoroughly clean the bus like clean the windows, mop the floors, wipe the seats and our drivers check the lights, tire pressures, indicators and engines."

Interviewee 12: Female: 36 - 55 years old: Public Transport Operators.

Two interviewees (including a bus operator) indicated that the passengers and the goods they bought contributed to the smells, which may put off some riders. Although the bus stops have covers, passengers have to wait at the side of the road, and are thus waiting in the sunlight. Furthermore, due to their small size, the buses do not provide a proper place to store any luggage, bags or shopping bags.

"Public bus is synonymous with odour. Like there are times when passengers complain to us that a few other passengers bought fertilizers, fish and like there is no space to put this stuff, so like the odour and the hygiene make people not to use the bus, not the cleanliness. There was one time when I was inspecting the bus, one of the passengers brought fish and meat and the whole bus smell fish. From that moment, we provide a medium storage container with lid for our passengers to store their items. We also put fragrances to eliminate the odour."

Interviewee 20: Male: Above 55 years old: Public Transport Operators.

7.4.2 Bus frequency

Interviewees indicated that the bus frequencies caused the Bruneians to opt out of the bus services. The majority of public transport users in the survey questionnaire indicated their high level of satisfaction with bus frequency (72 per cent table 7.3 (a)). Also, all of the bus operators indicated that bus frequency is not a problem, especially in areas with high demand (high number of passengers) or those leading to the city centre. However, the frequency and travel coverage factors were disagreed by the Interviewee 19.

"We do not have effective bus [services], as in Singapore like every 15 minutes. Our current transportation is only served from town to town, like from Belait to Bandar [Seri Begawan]. There is no bus [inter-district bus] from the village to the town as it has one route mostly main road."

Interviewee 19[53]: Male: 35 – 55 years old: Government Sector.

7.4.3 Convenience and comfort

Convenience and comfort may persuade people to use the bus. However, the majority of the participants in the survey questionnaires indicated that the comfort provided by the bus services is appalling. However, interviewees indicated that elderly people find the services a convenient way to travel, especially as they do not have to find parking spots.

"For the elderly people, they are usually going to the health centres. So like they have a car, but hard to get a parking spot, so like convenient for them to use the bus. Another normal day, they mostly spend their time indoors and during weekends and holiday mostly travel with cars."

Interviewee 11: Male: 26 - 35 years old: Government Sector.

Interviewees indicated that the bus services are uncomfortable and inconvenient. The car is viewed as a more comfortable and convenient way of travelling, especially when travelling with young children, travelling at night and on long trips. Furthermore, some of the buses are old and the seats are uncomfortable.

"And also, not to forget, change the seat cover, or all the bus seats, now we can feel the metal rod when we sit, and change the seat cushion. Since my primary school till now, they have not changed the seat."

Interviewee 14: Male: 26 - 35 years old: Private Sectors.

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[53] Interviewee 19 represents the Energy Department of the Prime Minister's Office (EDPMO). The interviewee used to work in a petroleum company before being transferred to the EDPMO.

The car is viewed as the most convenient mode of transportation. The convenience might be described in terms of ease of travel, especially for those working outside their locality and in terms of relaxation and comfort while driving to and from work such as no longer sending children to college (as their children use the parents car to drive to college). Furthermore the term convenience includes protection by avoiding their children from mixing with immigrant nationalities (especially low-income immigrant nationalities) and protecting their children (and themselves) from hot weather.

"I live in Bandar [Seri Begawan], and my job is in Belait [District], so I travel almost every day to Belait so easy for me to use the car. I can start my journey early in the morning. I usually stayed bit late in the office, to ease the traffic jam in the afternoon, so journey back from Belait is relaxing."

Interviewee 16: Male: 26 - 35 years old: Private Sectors.

"Bus is not appealing because, like, all the passengers are foreign workers."

Interviewee 2: Female: 18 - 25 years old: Student.

7.4.4 Information: timetables and maps

The majority of the interviewees who use the bus (including temporary users) are concerned about the bus timetables, which affect their journeys to their destinations. The bus services start and end early[54]. All of the bus operators are sceptical about extending their operating hours, and they all indicated that only a few passengers (sometimes none at all) use the bus later in the day. As for the inter-district bus, the bus schedules are not convenient for some interviewees, especially those who have to travel in the morning and those travelling to work outside their home districts. Furthermore, people tended to be unsure about which bus to take, as a result of the confusing service numbers with different routes being designated by numbers, due to a lack of information on the bus routes and which direction to take.

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[54] Franchise buses start as early as 6.00 am, continuing until 7.00 pm. Inter-district buses start as early as 5.30 am, continuing until 7.00 pm.

"If you use the bus to KB (Kuala Belait), what time will you reach KB? Using the bus, we have to make stops, then the buses are using the old roads, not the highway, so again not a good choice for me."

Interviewee 14: Male: 26 - 35 years old: Public Sector.

However, several interviewees had mixed feelings about the car. One interviewee was concerned about the traffic jams, and another expressed an interest in trying the bus should the services be improved.

"If there is a proper timetable [for bus service] at bus stops, I would love to use them. I do not think about parking my car, and like going to work by bus, then when there are traffic jams, I can sleep, relax and do other activities."

Interviewee 11: Male: 26 - 35 years old: Government Sector.

Figure 7.4.4 The public transport map and information on one of the routes in Bandar Seri Begawan bus station. Source: Researcher.

7.4.5 Safety

In Brunei, one of the distinctive features that attract people to use the bus is the notion that buses might stop anywhere, as requested by the passengers. However, according to the bus operators, this is against the law. The number of bus stops in Brunei is considered insufficient and they are too far apart. Furthermore, the drivers' attitude in not waiting long

enough for the passengers to hop on and off the bus is also criticised by bus and non-bus users, a point verified by the bus user, quoted below. Another issue was safety while using or waiting for the bus in Brunei. The safety issues include potential criminal acts and dangers posed by incoming cars and by animals (such as snakes and stray dogs).

"The bus will stop at wherever we want. It is good for the passengers but dangerous for other road users, especially car at the back of the bus. Although we do not hear the incident regularly, but safety first. Then I was once on the bus to the campus and someone fell because the driver didn't wait until everyone take their seat. The bus is not like standing height so like, I mean, imagine yourself staggering around and like struggling to find the seat and the bus is already in motion."

Interviewee 15: Male: 18 - 25 years old: International Student.

"Even my [house] maid is afraid to go to the Bandar [Seri Begawan] Bus Station. She always stops one stop before the station or hops on the bus one stop after the station."

Interviewee 10: Male: 18 - 25 years old: Government Sector.

Safety aspects motivated the people to choose the car as it is considered safer than buses. The majority of the interviewees and participants in the survey questionnaires commented that the safety issues involved in using the bus caused them to use their cars. One of the reasons is the difficulty in reaching the bus stops, as the roads in Brunei are not fully equipped with sidewalks. Therefore, walking at the side of the road towards the main roads or to the bus stops is considered dangerous.

"It is better, and easier for me to use my own car. I am old now, and if I have to use the bus, I have to walk to the main road. It's far and dangerous to walk to the main road."

Interviewee 4: Male: Above 55 years old: Retired.

Figure 7.4.5 (a) Condition of the main bus station in Bandar Seri Begawan Source: Researcher.

Figure 7.4.5 (b) Example of poorly maintained bus stops (fear of dangerous reptiles such as snakes)
Source: Researcher.

"Some sidewalks are not maintained as the grass is very long and sometimes I am afraid that there are snakes and like you never know there are snakes there or at the bus stops, then there are stray dogs like sleeping at the bus stops, especially early in the morning and in the afternoon. So like going to the bus stops we are exposed to like danger of like incoming cars then dangers from these animals. So I think the infrastructure and maintenance are not good in Brunei."

Interviewee 15: Male: 18 - 25 years old: International Student (also refer to Figure 5.1 (c)).

7.4.6 Verification from mini-exploratory activities

The researcher rode the buses in two ways: first as a normal passenger and secondly as a researcher. The researcher had never ridden a public bus in Brunei before. At first, the researcher felt awkward because he was often observed by other passengers (mostly non-Bruneian users) despite sitting at the back of the bus. The researcher found that none of the passengers were Bruneian (they were mostly Indian and Indonesian immigrant nationalities) from the first stop until the final stop. The researcher verified that the lack of bus stands/bus stops on the existing bus routes causes the bus to stop whenever a passenger wishes to disembark or board the bus, a theoretically illegal procedure reported by Malai Hassan, (2007a; 2007b). This causes other motorists behind the bus to stop.

Upon arriving at the Bandar Seri Begawan bus station, the bus driver asked the researcher whether he was a Bruneian. The researcher had the opportunity to spend time with a bus driver during his break. The bus driver (a Bruneian) indicated that the majority of the passengers are from the immigrant population, and the Bruneians who used the buses are mainly from the elderly generation. That was the reason the driver asked the researcher if he was a Bruneians, as he seldom sees a young adult Bruneian using the bus. Some students rode the bus, but they were mainly returning home from school. Some of the inter-district buses are considered old, unventilated and uncomfortable for long journeys. The seats in some of these buses (including some of the franchise buses) are old, and the researcher could also feel the metal rods under the seat cushion. (See also interviewee 14, pg. 212)

According to the observations and experiences of the researcher, although they are regularly cleaned, the buses in Brunei are not as clean and tidy as the bus services in Brisbane and the United Kingdom. Several bus drivers and their cleaners took the initiative to clean the buses, collect rubbish and sweep the floor upon arriving at the final stop. The bus operators do clean their buses regularly and provide a dustbin near the exit door. However, there were traces of saliva (some passengers seemed to spit in the bus), chewing gum on the floor, seats and walls of the buses, graffiti, and evidence of vandalism. The researcher also witnessed passengers bringing construction tools (such as hammers, saws and power drills) onto the buses and carrying these tools in their laps. Although the researcher felt safe while riding and waiting for the bus, the bus driver warned him to keep all his belongings safe as pickpockets were known to operate in the Bandar Seri Begawan bus terminal.

In terms of frequency, the buses to Bandar Seri Begawan from Jalan Tutong run every 5 – 10 minutes, since both franchise buses (two companies) and inter-district buses use this route. However, the bus frequency on other routes is between 20 and 40 minutes, with a lot of inconsistency, as timing is dictated by traffic conditions. One of the bus users told the researcher that there were times when he was waiting for more than an hour because the bus had broken down and there was no replacement. The researcher also verified that it was necessary to use two buses in order to go to the shopping areas in Gadong, Brunei Muara District. The two trips were from his home to Bandar Seri Begawan bus terminal and from the bus terminal to Gadong. The cost of the fare was BND $2.00 (one dollar for each single route) and the journey took more than an hour compared to 20 minutes by car. There was also a lack of information on which bus to use; there was no one in the bus terminal to consult and the researcher had to ask the bus driver which bus to use from point A to point B.

While riding the bus, the researcher felt safe, despite the awkward feeling of being observed by other users. The researcher expressed his concern at the way the bus driver picked up passengers at the side of the road (not at the bus stops) even though the traffic was congested. The researcher also heard cars sounding their horns, especially those tailing the buses. Based on the researcher's experience, when the driver decides to fill up the fuel tank, often during a long journey, the driver usually drops off passengers in the designated areas before refuelling

the bus. However, on one occasion, the bus driver drove to the petrol/diesel station and refuelled the bus while the passengers were still on board.

Figure **7.4.6 (a) Condition of one of the franchise buses in Brunei. Source: Researcher.**

Figure 7.4.6 (b) One of the franchise buses that do not meet the needs of disadvantaged people (e.g. disabled people) Source: Researcher.

Figure 7.4.6 (c) Some of the inter-district buses are considered old and unsuitable for long journeys.
Source: Researcher.

7.5 Conclusion

This chapter attempted to answer the research questions on the attitudes and behaviour of Bruneians regarding the use of public transportation. The main motivation for almost all the non-Bruneian population is that the bus services in Brunei are their only option. The Bruneian participants considered the parking-related problems as their main motivation to use the bus services. The main influences on the use of bus services in Brunei are the lack of alternative travel options, health factors, ease of travel, especially for the elderly generation, and cost. The majority of the Bruneians indicated that the main reasons for low bus usage are lack of cleanliness; low service quality including issues relating to frequency, comfort, reliability and travel coverage; insufficient infrastructure including too few bus stops and too little information; delays; the fact that it is cheaper to use cars, especially for multiple journeys; social pressure and safety.

There is a mixed attitude among the Bruneians to the current bus services in Brunei. Students tend to be more negative about the services and infrastructure compared to the other Bruneian users. Furthermore, the bus-user and non-user interviewees have relatively negative

thoughts on the current bus services and infrastructure. The overall assessment of the results was that the bus is not a popular mode of transport for Bruneians, while low-income non-Bruneians tend to use the bus services due to their limited options. The low ridership amongst the Bruneians corresponds to the level of service and infrastructure offered to them, as well as their negative perceptions of bus services.

One of the transport policies in Brunei, in terms of ticketing, is fare reductions for elderly people and students in school uniform. Although the bus operators indicated that the fare reductions for elderly people and students in school uniforms is a way of motivating people, and especially youngsters, to use the bus more frequently, this policy is considered insufficient in terms of sustainability, particularly increasing bus ridership and reducing traffic congestion and pollution by persuading people to make less use of their cars.

The insufficient policy for increasing the bus ridership (thus reducing car user and traffic congestions) will create pressure to achieve sustainability, especially in terms of safety issues. The current infrastructure is considered to favour motorised vehicles rather than non-motorised vehicles. Pedestrian access and sidewalks are considered limited, inadequate or unavailable, thus causing safety concerns about walking to and from the bus stops. This will limit the mobility of disabled persons, the elderly and young people. It seems that low-income Bruneian participants are being forced to buy cars in order to participate in employment.

Despite the negative perceptions and behaviour regarding bus services, there is some potential to develop sustainable transportation, particularly based on low-carbon vehicles. Some of the buses are considered old, especially the inter-district buses. This offers the relevant authorities an opportunity to invest in low-carbon mass transit, such as low-carbon bus services, which could offer reductions in time travel, travel cost and waiting time as well as the improvement in bus stops, both in frequency, maintenance and structure (Mohammed and Shakir, 2013). Along with education and awareness campaigns, and the existing fare reductions, mass transit may attract potential users while dissuading some of the current bus users from switching to cars.

Chapter 8: Public perceptions and behaviour relating to car ownership

8.0 Background

This chapter examines the data and issues relating to car ownership, decisions on car travel, use and purchase and the travel behaviour and expenditure of the study population. This chapter also investigates the number of cars currently owned by the participants and the number of cars in their households. Owning a car and having the option to travel by car, either as a driver or a passenger, may have some impact on people's use of public transportation.

8.1 Car ownership

The synopsis of this section is that more than 70 per cent of the study cohort (survey questionnaires) owned at least one car and about 19 per cent of the participants have more than one car. Participants who do not have cars were mostly from the young generation (especially students).

Car(s) owned	Frequency	Percent	Valid Percent	Cumulative Percent
0	126	29.4	29.4	29.4
1	244	57.0	57.0	86.4
2	46	10.7	10.7	97.2
3	4	0.9	0.9	98.1
More Than 3	8	1.9	1.9	100.0
Total	428	100.0	100.0	

Table 8.1 (a) Number of car(s) owned by the surveyed participants.

	Nationality		Gender		Generation			
	Bru	N-Bru	Male	Female	YG	MG I	MG II	EG
Car Ownership								
0	24.2 (n=86)	54.8 (n=40)	29.0 (n=60)	29.9 (n=66)	41.5 (n=86)	22.0 (n=28)	12.9 (n=9)	12.5 (n=3)
1	61.4 (n=218)	35.8 (n=26)	51.7 (n=107)	62.0 (n=137)	57.0 (n=118)	63.8 (n=81)	52.9 (n=37)	33.3 (n=8)
2	11.0 (n=39)	9.6 (n=7)	13.5 (n=28)	8.1 (n=18)	1.4 (n=3)	11.8 (n=15)	25.7 (n=18)	41.7 (n=10)
3	1.1 (n=4)	0.0 (n=0)	1.9 (n=4)	0.0 (n=0)	0.0 (n=0)	2.4 (n=3)	1.4 (n=1)	0.0 (n=0)
More than 3	2.3 (n=8)	0.0 (n=0)	3.9 (n=8)	0.0 (n=0)	0 (n=0)	0.0 (n=0)	7.1 (n=5)	12.5 (n=3)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)

Table 8.1 (b) Car ownership based on nationality, gender and age generation.

	Job			Salary				Public transport	
	Stu	W	N-W	LS	LM	LMS	HS	User	Non-user
Car Ownership									
0	43.9 (n=72)	20.1 (n=46)	22.9 (n=8)	48.1 (n=99)	35.8 (n=24)	2.2 (n=2)	0.0 (n=0)	65.9 (n=54)	20.8 (n=72)
1	56.1 (n=92)	59.4 (n=136)	45.7 (n=16)	49.5 (n=102)	62.7 (n=42)	72.5 (n=66)	52.5 (n=32)	31.7 (n=26)	63.0 (n=218)
2	0.0 (n=0)	17.0 (n=39)	20.0 (n=7)	1.0 (n=2)	1.5 (n=1)	23.1 (n=21)	36.1 (n=22)	1.2 (n=1)	13.0 (n=45)
3	0.0 (n=0)	1.7 (n=4)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	2.2 (n=2)	3.3 (n=2)	0.0 (n=0)	1.2 (n=4)
More than 3	0.0 (n=0)	1.7 (n=4)	11.4 (n=4)	1.5 (n=3)	0.0 (n=0)	0.0 (n=0)	8.2 (n=5)	1.2 (n=1)	2 (n=7)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (n=206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (n=82)	100.0 (n=355)

Table 8.1 (c) Car ownership based on job classification, range of salary and public transport usage.

Of the initial cohort of 126 participants (60 males and 66 females) who do not have a car, 86 were Bruneian and 40 were non-Bruneians. The majority of the participants who had no car were from the young generation, especially Bruneian student participants and low-income non-Bruneian participants. The majority of female participants had cars. None of the female participants had more than two cars. Of the 207 male participants, 107 responded that they had a car, 28 participants had two cars, four had three cars and eight had more than three cars.

The majority of the participants who do not have cars were from the young generation; nonetheless, more than 58 per cent of that group had at least one car. The majority of the elderly generation (EG) had at least one car and only three of them (12.5 per cent) did not have cars.

Table 8.1 (c) indicates that more than 56 per cent of the student population in this study have a car. The table also indicates that, of the 20 per cent of working category participants who do not have a car, the majority work in the private sector and are non-Bruneian. Participants who do not have cars are mainly low-salary (LS) earners with incomes of less than BND $2000 per month).

The participants were asked about the number of people in their household possessing a car driving license[55]. The overall response showed that the majority of the participants (60.5 per cent) reported more than three people in their households with driving licences. Only 3.7 per cent (16 participants) lived in households where no one had a driving license. Furthermore,

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[55] In this study, the number of cars is not the same as the number of driving licenses owned. This study agreed with Cullinane's (2002) finding that people have better chances of employment opportunities if they hold driving licences. Additionally, one of the reasons for including the number of cars in the household is that the study believes that the presence of cars in the household motivates car sharing in the family (Grdzelishvili and Sathre, 2011). Furthermore, in Hong Kong, participants who are more likely to get cars are those who have the experience of the having the benefit of cars (Cullinane, 2002) such as the parents send them to school during their school days as experienced by majority of primary school children in Dublin (Kelly and Fu, 2014). Thus, having good experience of not walking or cycling to school (and not arriving red-faced or sweaty (Simons, 2014)) might eventually promote the use of cars once they have the opportunities to drive and own a car in the future.

only 4.9 per cent of the participants indicated that there were no cars in their household. The majority of the respondents (67.8 per cent) had more than three cars in their household.
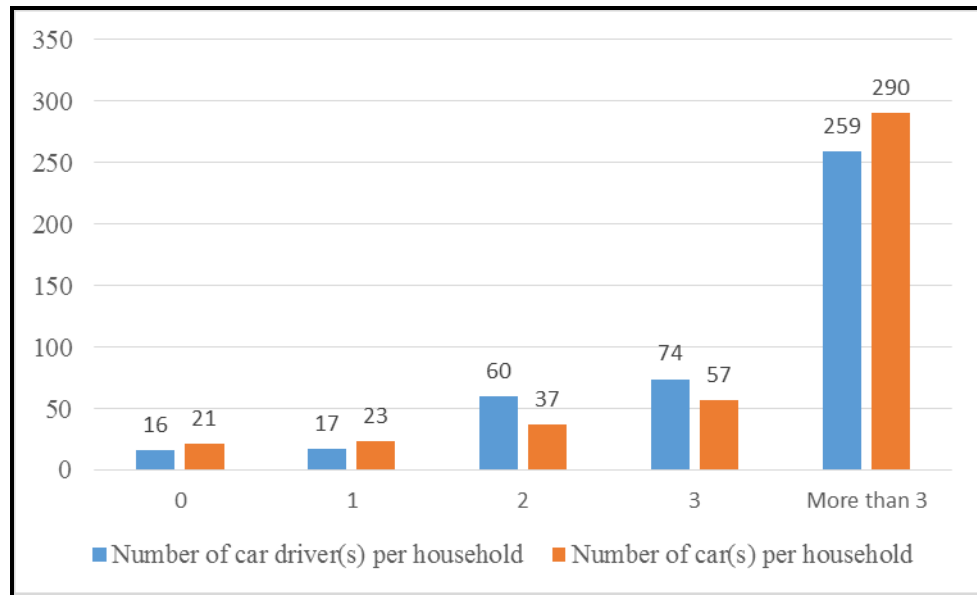
Figure 8.1 Number of car driver (s) and number of car(s) per household.

It was interesting to discover that some low-income and non-working participants, especially housewives, students and participants looking for jobs, were able to afford their own cars. The majority of the participants indicated that the low cost of acquiring a car was one of the motivating factors for having a car in Brunei. The cost of buying a car is not necessarily expensive; furthermore, car insurance and road tax are amongst the cheapest in the ASEAN region (Bahrum, 2008; Oxford Business Group, 2008). The recognition of the overall cost of acquiring a car may be viewed differently by the participants, especially the low-income earners. People have different perspectives on cars, especially according to their role in the household. Parents with school-age children value ease of travel); employees have more opportunity, as well as the need, to reach their workplace on time, so overcoming the problem of limited public transport services. However, there are several possible reasons, explained later in this chapter, for high car ownership amongst Bruneians.

8.2 Car purchasing behaviour in Brunei

This section explores the reasons for the high car ownership in Brunei. It includes the reasons why people have bought or wish to buy cars. This is considered important because intention to own a car, especially amongst the middle class and the young generation, may cause a rise in energy use and traffic congestion, leading to more public health problems, such as diseases related to the exposure to pollutants from cars and environmental problems, such as air pollution and destruction of land for road construction. The widespread use of cars may pose challenges to sustainability, especially as Brunei has a small land area with limited land available for development. The rates of car ownership and car ownership per capita are increasing (Bandial, 2011; The World Bank, 2011); a fact that may also restrict the development and expansion of public transport as the attitudes and behaviour of Bruneians are influenced by cars.

		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	Yes	115	26.9	26.9	26.9
	No	158	36.9	36.9	63.8
	Maybe	96	22.4	22.4	86.2
	Not Sure	53	12.4	12.4	98.6
	Missing	6	1.4	1.4	100.0
	Total	428	100.0	100.0	

Table 8.2 (a) Planning on purchasing a car.

It can be seen 36.9 per cent of the participants did not plan to buy a new car in the next 2-3 years[56]. However, the majority of those not planning to buy one already have at least one car. As for Bruneian students, only 37 indicated that they were not planning to purchase a car in the near future. The majority of them already had a car (25 out of 37 students), leaving just 12 who are not planning to buy one in the near future. It was not clear the reason behind this;

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[56] The question was: 'Are you planning to buy a car in the near future (within 2-3 year time)?'

however, there is the possibility that the students will still be studying (in 2 - 3 year time) or will get a car after acquiring a job or as part of their job.

Most participants working in government and private sectors did not wish to buy cars, while none of the retired personnel (and elderly generations) was planning to buy a car in the next 2-3 years. The results also indicated that students and participants who are looking for jobs were likely to buy new cars. Moreover, almost two thirds of the participants who were planning to buy a car were from the younger generation.
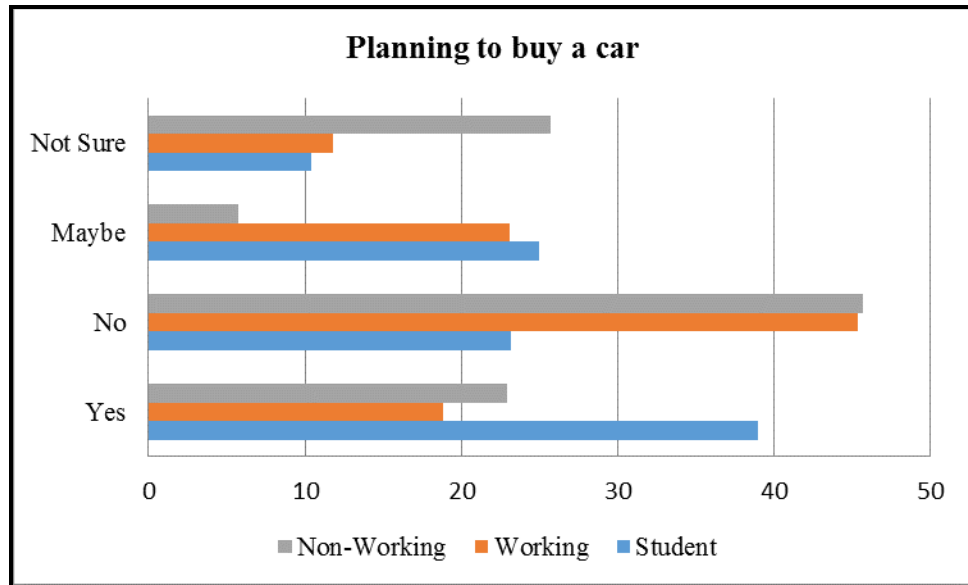
Figure 8.2 (a) Decision to buy a car by job categories.

Further exploration was carried out to identify the main criterion for choosing a car. A list of possible criteria was presented. In addition, the participants were asked to specify their own criterion, if it did not appear on the list. The majority commented that the cost was the main criterion for choosing a car, followed by lifestyle and comfort. The least chosen criterion was the environmental factor, chosen by 11 participants in this study. Thirteen participants chose 'other' as their answer but only seven specified their criteria. The responses were as follows:

1. Saving fuel (cost-related reasons)

2. Brands

3. Reliability and good quality

4. Can be used for both personal and business purposes

5. Dream car

6. Speed

7. Hobby (four-by-four forest adventure)

		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	Cost	161	37.6	37.6	37.6
	Comfort	69	16.1	16.1	53.7
	Good for the environment	11	2.6	2.6	56.3
	Lifestyle	76	17.8	17.8	74.1
	Engine Power	46	10.7	10.7	84.8
	Physical appearance of the car	51	11.9	11.9	96.7
	Other	13	3.0	3.0	99.8
	Missing	1	0.2	0.2	100.0
	Total	428	100.0	100.0	

Table 8.2 (b) Criteria for choosing a car.

The result indicates a strong tendency for Bruneian students to own cars, and only about 8 per cent (13 out of 164) of the student population in this study do not intend to buy a car in the near future. This indicates that once students graduate from their studies and/or enter the employment arena, they will be expected and expect to use cars. As discovered in previous chapters (chapter 5, 6 and 7), bus services are perceived as unsuitable for working purposes, especially for the Bruneians. Furthermore, the majority of the participants indicated their motivation to use cars for ease of travel and as a necessity for work and family-related activities. Additionally cost, lifestyle and comfort are the major criteria for choosing a car.
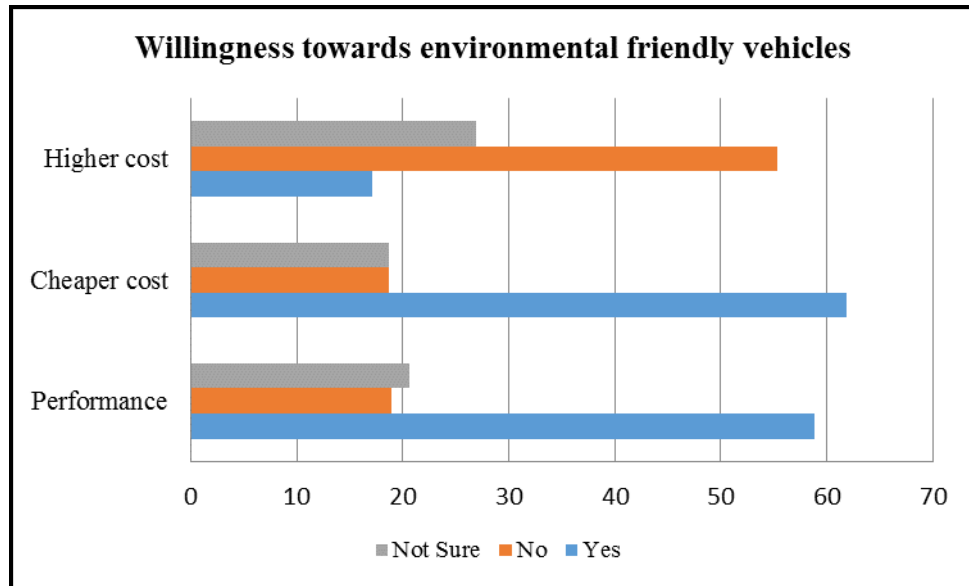
Figure 8.2 (b) Willingness to purchase environmentally friendly vehicles.

The survey questionnaire respondents were asked about their willingness to purchase environmentally friendly cars, such as hybrids, in the future. In this study, three scenarios were provided:

1. Would you be willing to purchase an environmentally friendly car (such as the hybrid car) in the future if the performance (such as horsepower, speed and acceleration) were similar to the conventional car?

2. Would you be willing to purchase an environmentally friendly car (such as the hybrid car) in the future if the cost were similar to the conventional car?

3. Would you be willing to purchase an environmentally friendly car (such as the hybrid car) in the future if the cost were more expensive, compared to the conventional car?

The majority of the participants would be willing to buy environmentally friendly cars, provided the performance and the cost were similar to conventional cars. However, more than half of the study cohort would not be willing to purchase these cars, should the cost be greater than for conventional vehicles.

Bruneians in this study were more willing to buy environmentally friendly cars, compared to the non-Bruneian participants. Non-Bruneian participants are willing to buy the cars if the costs are similar to the conventional cars. Male participants are more willing than females to buy environmentally friendly cars, provided that the performance and cost are similar to conventional cars. Female participants are more willing than males to buy environmentally friendly cars even if the costs are more expensive than those of conventional cars.

Students tended to be more willing to buy environmentally friendly vehicles provided the performance of the car and cost are similar to conventional cars. However, in the future, only a quarter of the student population commented that they would be prepared to purchase environmentally friendly cars.

Richer participants were more prepared to buy environmentally friendly vehicles if the performance and cost of the vehicles are comparable to conventional cars. Interestingly, bus users were more willing to buy environmentally friendly vehicles, compared to non-public transport users, providing the cost and performance of the car were shown to be similar to conventional cars. Two thirds of the non-public transport users were willing to buy such vehicles if their performance and cost were comparable to conventional cars.

According to interviewees representing car dealers, and government officials from the Ministry of Communications and the EDPMO, there were strong motives for people to purchase hybrid vehicles. Support for hybrid cars is growing amongst the population, as evidenced by the increasing sales of hybrid cars, despite their high cost. This view was supported by the hybrid car dealers who indicated that sales of hybrid cars are increasing, and that buyers are having to wait a few months to get a hybrid car[57]. According to the car dealers, the majority of the people coming to their showrooms to buy hybrid cars are doing so for fuel efficiency, and they are first-time buyers.

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[57] Waiting for new hybrid car shipment to arrive in Brunei.

	Nationality		Gender		Generation			
	Bru	N-Bru	Male	Female	YG	MG I	MG II	EG

Would you be willing to purchase an environmentally friendly car (such as the hybrid car) in the future if the performance (such as horsepower, speed and acceleration) were similar to the conventional car?

	Bru	N-Bru	Male	Female	YG	MG I	MG II	EG
Yes	65.1 (n=231)	28.8 (n=21)	61.4 (n=127)	56.6 (n=125)	62.3 (n=129)	57.5 (n=73)	57.1 (n=40)	41.7 (n=10)
Unsure	17.7 (n=63)	34.2 (n=27)	17.4 (n=36)	23.5 (n=52)	25.1 (n=52)	15.7 (n=20)	18.6 (n=13)	12.5 (n=3)
No	15.2 (54)	37.0 (n=25)	18.4 (n=38)	19.5 (n=43)	9.7 (n=20)	26.0 (n=33)	24.3 (n=17)	45.8 (n=11)
Missing	2.0 (n=7)	0.6 (n=2)	2.9 (n=6)	0.5 (n=1)	2.9 (n=6)	0.8 (n=1)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)

Would you be willing to purchase an environmentally friendly car (such as the hybrid car) in the future if the cost were similar to the conventional car?

	Bru	N-Bru	Male	Female	YG	MG I	MG II	EG
Yes	67.3 (n=239)	35.6 (n=26)	62.8 (n=130)	61.1 (n=135)	63.3 (n=131)	62.2 (n=79)	64.3 (n=45)	41.7 (n=10)
Unsure	15.8 (n=56)	32.9 (n=24)	17.4 (n=36)	19.9 (n=44)	23.2 (n=48)	14.2 (n=18)	15.7 (n=11)	12.5 (n=3)
No	16.1 (n=57)	31.5 (n=23)	18.4 (n=38)	19.0 (n=42)	12.1 (n=25)	23.6 (n=30)	20.0 (n=14)	45.8 (n=11)
Missing	0.8 (n=3)	0.0 (n=0)	1.4 (n=3)	0.0 (n=0)	1.4 (n=3)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)

Would you be willing to purchase an environmentally friendly car (such as the hybrid car) in the future if the cost were more expensive compared to the conventional car?

	Bru	N-Bru	Male	Female	YG	MG I	MG II	EG
Yes	19.4 (n=19.4)	5.5 (n=4)	14.5 (n=30)	19.5 (n=43)	19.8 (n=41)	18.1 (n=23)	11.4 (n=8)	4.2 (n=1)
Unsure	27.3 (n=97)	24.7 (n=60)	27.1 (n=60)	27.1 (n=60)	30.9 (n=64)	31.5 (n=40)	15.7 (n=11)	0.0 (n=0)
No	52.4 (n=186)	53.4 (n=118)	57.5 (n=119)	53.4 (n=118)	47.8 (n=99)	50.4 (n=64)	72.9 (n=51)	95.8 (n=23)
Missing	0.8 (n=3)	0.0 (n=0)	1.4 (n=3)	0.0 (n=0)	1.4 (n=3)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)

Table 8.2 (c) Willingness to purchase environmentally friendly vehicles based on nationality, gender and age generation.

	Job			Salary				Public transport	
	Stu	W	N-W	LS	LM	LMS	HS	User	Non-user

Would you be willing to purchase an environmentally friendly car (such as the hybrid car) in the future if the performance (such as horsepower, speed and acceleration) were similar to the conventional car?

	Stu	W	N-W	LS	LM	LMS	HS	User	Non-user
Yes	65.9 (n=108)	54.6 (n=125)	54.3 (n=19)	58.7 (n=121)	40.3 (n=27)	60.4 (n=55)	77.0 (n=47)	29.3 (n=24)	65.9 (n=228)
Unsure	20.7 (n=34)	22.3 (n=51)	8.6 (n=3)	21.8 (n=45)	26.9 (n=18)	16.5 (n=15)	16.4 (n=10)	31.7 (n=26)	17.9 (n=62)
No	9.8 (n=16)	22.7 (n=52)	37.1 (n=13)	17.5 (n=36)	29.9 (n=20)	26.9 (n=18)	4.9 (n=3)	39.0 (n=32)	14.2 (n=49)
Missing	3.7 (n=6)	0.4 (n=1)	0.0 (n=0)	1.9 (n=4)	3.0 (n=2)	0.0 (n=0)	1.6 (n=1)	0.0 (n=0)	2.0 (n=7)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (n=82)	100.0 (n=346)

Would you be willing to purchase an environmentally friendly car (such as the hybrid car) in the future if the cost were similar to the conventional car?

	Stu	W	N-W	LS	LM	LMS	HS	User	Non-user
Agreed	69.5 (n=114)	57.6 (n=132)	54.3 (n=19)	60.7 (n=125)	52.2 (n=35)	62.6 (n=57)	75.4 (n=46)	36.6 (n=30)	67.9 (n=235)
Unsure	16.5 (n=27)	21.4 (n=49)	11.4 (n=4)	19.9 (n=41)	23.9 (n=16)	15.4 (n=14)	14.8 (n=9)	30.5 (n=25)	15.9 (n=55)
Disagreed	12.2 (n=20)	21.0 (n=48)	34.3 (n=12)	18.0 (n=37)	23.9 (n=16)	22.0 (n=20)	9.8 (n=6)	32.9 (n=27)	15.3 (n=53)
Missing	1.8 (n=3)	0.0 (n=0)	0.0 (n=0)	1.5 (n=3)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.9 (n=3)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (n=82)	100.0 (n=346)

Would you be willing to purchase an environmentally friendly car (such as the hybrid car) in the future if the cost were more expensive compared to the conventional car?

	Stu	W	N-W	LS	LM	LMS	HS	User	Non-user
Agreed	25.6 (n=42)	10.9 (n=25)	17.1 (n=6)	19.9 (n=41)	17.9 (n=12)	14.3 (n=13)	11.5 (n=7)	12.2 (n=10)	18.2 (n=63)
Unsure	28.7 (n=47)	28.8 (n=66)	5.7 (n=2)	27.7 (n=57)	11.9 (n=8)	34.1 (n=31)	29.5 (n=18)	15.9 (n=13)	29.5 (n=102)
Disagreed	43.9 (n=72)	60.3 (n=138)	77.1 (n=27)	51.0 (n=105)	70.1 (n=47)	11.9 (n=8)	59.0 (n=36)	72.0 (n=59)	51.4 (n=178)
Missing	1.8 (n=3)	0.0 (n=0)	0.0 (n=0)	1.5 (n=3)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.9 (n=3)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (n=82)	100.0 (n=346)

Table 8.2 (d) Willingness to purchase environmentally friendly vehicles based on job classification, range of salary and public transport usage.

The motivation for buying environmentally friendly cars is not entirely to reduce the negative consequences of cars on the environment. It was noted that participants in this study tended to buy environmentally friendly cars if the performance and costs were comparable with conventional cars. However, if the prices of these cars are higher than conventional cars, the motivation to own these vehicles decreases. This suggests that the potential to achieve a low-carbon transition in Brunei, via low-emission vehicles, does not offer a simple alternative to the promotion of public transport. In both cases, the utility and cost need to be in line with car-based expectations.

8.3 Car ownership: motives for choices

Car ownership is important to the people living in Brunei, especially the Bruneians. Under this section, a list of 15 factors was presented to the participants via the survey questionnaire. The list of factors was then grouped into three categories: cost, ease of travel and pressure.

8.3.1   Cost

Under this category, the costs under investigation include car affordability and petrol price. Participants were asked about the extent to which they agreed with the following statements:

1. "Having a car is affordable in Brunei."

2. "Cheap petrol makes owning a car possible."

When the subject of car affordability was raised, roughly three in four participants commented that having a car in Brunei is affordable, while about eight per cent disagreed with the statement. About 55 per cent of the participants agreed that cheap petrol makes car ownership possible.

About 79 per cent of the Bruneian participants agreed with the statement that having a car in Brunei is affordable, although four per cent disagreed and a further 15 per cent were undecided. The result also showed that almost 59 per cent of Bruneian participants believed

that cheap petrol makes it possible to own a car. The non-Bruneian participants gave a slightly different response. More than half of them agreed that cars in Brunei are affordable while a third thought that cheap petrol makes it possible for them to own a car.

Factors	Agreed	Not sure	Disagreed	Missing	Total
Having a car is affordable in Brunei	74.3 (n=318)	16.6 (n=71)	7.9 (n=34)	1.2 (n=5)	100.0 (n=428)
Cheap petrol makes owning a car possible	54.7 (n=234)	21.5 (n=92)	23.1 (n=99)	0.7 (n=3)	100.0 (n=428)

Table 8.3.1 (a) Perception of cost towards car ownership.

The results also indicated that the non-working group tended to agree more with both statements compared to the working and student participants. Higher-salary earners (upper-middle-salary (UMS) and high-salary (HS) earners) tend to agree more with the two statements, although none disagreed with the car affordability statement, and only a minority of them disagreed with the statement on petrol price. The public transport users and car users had different views on petrol price. Thirty-nine per cent of the public transport users disagreed that cheaper petrol makes car ownership possible as compared to 35.4 per cent who agreed. About 60 per cent of the car users agreed with the statement. About 82 per cent of non-public transport users agreed that running a car is affordable as compared to 44 per cent of public transport users.

Participants who could afford a car, especially Bruneian participants, agreed that the affordability of cars in Brunei caused the rate of car ownership to be high. Despite the associated cost of cars, such as road tax, insurance, maintenance and petrol, Bruneian participants agreed that the car is affordable in Brunei. Furthermore, the cost of petrol, as one of the car-associated costs, is considered cheap. The result indicated that about three in five Bruneian participants agreed that the cheap petrol makes it possible to own a car.

	Nationality		Gender		Generation			
	Bru	N-Bru	Male	Female	YG	MG I	MG II	EG
Having a car is affordable in Brunei								
Agreed	78.9 (n=280)	52.1 (n=38)	73.4 (n=152)	75.1 (n=166)	67.6 (n=140)	76.4 (n=97)	87.1 (n=61)	83.3 (n=20)
Unsure	15.2 (n=54)	23.3 (n=17)	14.5 (n=30)	18.6 (n=41)	20.8 (n=43)	18.9 (n=24)	4.3 (n=3)	4.2 (n=1)
Disagreed	4.5 (n=16)	24.7 (n=18)	9.7 (n=20)	6.3 (n=14)	9.2 (n=19)	4.7 (n=6)	8.6 (n=6)	12.5 (n=3)
Missing	1.4 (n=5)	0.0 (n=0)	2.4 (n=5)	0.0 (n=0)	2.4 (n=5)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)
Cheap petrol makes owning a car possible.								
Agreed	58.6 (n=208)	35.6 (n=26)	55.1 (n=114)	54.8 (n=120)	50.2 (n=104)	56.7 (n=72)	65.7 (n=46)	50.0 (n=12)
Unsure	19.4 (n=69)	31.5 (n=23)	17.9 (n=37)	24.9 (n=55)	24.6 (n=51)	23.6 (n=30)	8.6 (n=6)	20.8 (n=5)
Disagreed	21.4 (n=76)	31.5 (n=23)	26.1 (n=54)	20.4 (n=45)	24.2 (n=50)	19.7 (n=25)	24.3 (n=17)	29.2 (n=7)
Missing	0.6 (n=2)	1.4 (n=1)	1.0 (n=2)	0.5 (n=1)	1.0 (n=2)	0.0 (n=0)	1.4 (n=1)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)

Table 8.3.1 (b) Perception of cost for nationality, gender and age generation.

	Job			Salary				Public transport	
	Stu	W	N-W	LS	LM	LMS	HS	User	Non-user
Having a car is affordable in Brunei									
Agreed	66.5 (n=109)	78.6 (n=180)	82.9 (n=29)	60.7 (n=125)	70.1 (n=47)	92.3 (n=84)	98.4 (n=60)	43.9 (n=36)	81.8 (n=282)
Unsure	24.4 (n=40)	12.2 (n=28)	8.6 (n=3)	26.7 (n=55)	11.9 (n=8)	7.7 (n=7)	1.6 (n=1)	26.8 (n=22)	14.2 (n=49)
Disagreed	6.7 (n=11)	8.7 (n=20)	8.6 (n=3)	10.2 (n=22)	16.4 (n=11)	0.0 (n=0)	0.0 (n=0)	26.8 (n=22)	3.2 (n=12)
Missing	2.4 (n=4)	0.4 (n=1)	0.0 (n=0)	1.9 (n=4)	1.5 (n=1)	0.0 (n=0)	0.0 (n=0)	2.4 (n=2)	0.9 (n=3)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (n=82)	100.0 (n=346)
Cheap petrol makes owning a car possible									
Agreed	47.6 (n=78)	57.6 (n=132)	68.6 (n=24)	46.1 (n=95)	47.8 (n=32)	71.4 (n=65)	65.6 (n=40)	35.4 (n=29)	59.2 (n=205)
Unsure	24.4 (n=40)	21.4 (n=49)	8.6 (n=3)	26.2 (n=54)	23.9 (n=16)	12.1 (n=11)	18.0 (n=11)	24.4 (n=20)	20.8 (n=72)
Disagreed	26.8 (n=44)	20.5 (n=47)	22.9 (n=8)	26.2 (n=54)	28.4 (n-19)	16.5 (n=15)	16.4 (n=10)	39.0 (n=32)	19.4 (n=67)
Missing	1.2 (n=2)	0.4 (n=1)	0.0 (n=0)	1.5 (n=3)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	1.2 (n=1)	0.7 (n=3)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (n=82)	100.0 (n=346)

Table 8.3.1 (c) Perception of cost based on job classification, salary and public transport use.

8.3.2 Ease of travel

Under this category, participants were asked whether they agreed with the following statements regarding car ownership:

1. "Easy to go shopping, socialising, and attending family activities with cars."

2. "Public transport restricts my mobility."

3. "More job opportunities and options if I have a car."

4. "Easy to send child/children to school."

The overall responses to the issues of accessibility and car ownership indicated that the participants were more inclined to have positive perceptions of cars and negative ones of buses. Public transport users agreed with the statements "Easy to go shopping, socialising, and attending family activities with cars" (87.8 per cent), and "easy to send child/children to school" (74.4 per cent). About 66 per cent of the public transport users agreed that public transport restricts their mobility, and just over 50 per cent of public transport operators agreed with the statement "More job opportunities and options if I have a car".

Factors	Agreed	Not sure	Disagreed	Missing	Total
Easy to go shopping, socialising, and attending family activities with cars.	95.8 (n=410)	1.9 (n=8)	1.6 (n=7)	0.7 (n=3)	100.0 (n=428)
Public transport restricts my mobility.	80.9 (n=346)	12.6 (n=54)	5.4 (n=23)	1.2 (n=5)	100.0 (n=428)
More job opportunities and options if I have a car.	73.1 (n=313)	20.3 (n=87)	5.6 (n=24)	0.9 (n=4)	100.0 (n=428)
Easy to send child/children to school.	89.2 (n=382)	6.5 (n=28)	2.3 (n=10)	1.9 (n=8)	100.0 (n=428)

Table 8.3.2 (a) Perceptions of accessibility offered by cars.

The overall responses to the issues of accessibility and car ownership indicated that the participants were more inclined to have positive perceptions of cars and negative ones of buses. Public transport users agreed with the statements "Easy to go shopping, socialising, and attending family activities with cars" (87.8 per cent), and "easy to send child/children to

school" (74.4 per cent). About 66 per cent of the public transport users agreed that public transport restricts their mobility, and just over 50 per cent of public transport operators agreed with the statement "More job opportunities and options if I have a car".

The responses were rather contradictory as the majority of the public transport users rated the factors of frequency, reliability and cost as satisfactory (Table 7.3 (a) in Chapter 7). This gives the impression that the public transport users prefer cars to buses and believe that public transport users are disadvantaged compared to the car users.

This view is considered true as the majority of the participants thought that a car offers accessibility for a variety of activities such as social activities (shopping, socialising and attending family activities), sending child/children to school, and providing a better chance of employment. Public transport, on the other hand, was thought to restrict the respondents' mobility. Bruneian participants tended to agree more with the five statements compared to the non-Bruneian participants. Female participants were more likely than males to emphasise the social benefits of car ownership and the use of the car to take children to school. The survey questionnaire does not indicate at what age the children are sent to school. However, according to the survey's comments section, some parents drive their children to kindergartens when they are just 3 years old, continuing to drive their children right up to university level. There were also circumstances in which university students pooled their cars with friends. Male participants were more likely to think that buses in Brunei will restrict their mobility and that the lack of a car will reduce their job options and opportunities. The car is also considered to offer greater flexibility and mobility compared to the bus. This is particularly true for the working community, as well as for non-working people who use the car for their daily activities, including looking for jobs. Cars allow the user to travel further or to more locations in the search for employment options and opportunities.

	Nationality		Gender		Generation			
	Bru	N-Bru	Male	Female	YG	MG I	MG II	EG

Easy to go shopping, socialising and attending family activities with cars

Agreed	97.5 (n=346)	87.7 (n=64)	93.7 (n=194)	97.7 (n=216)	96.1 (n=199)	94.5 (n=120)	97.1 (n=68)	95.8 (n=23)
Unsure	1.1 (n=4)	5.5 (n=4)	3.4 (n=7)	0.5 (n=1)	1.0 (n=2)	3.1 (n=4)	1.4 (n=1)	4.2 (n=1)
Disagreed	0.6 (n=2)	6.8 (n=5)	1.9 (n=4)	1.4 (=3)	1.9 (n=4)	1.6 (n=1)	1.4 (n=1)	0.0 (n=0)
Missing	0.8 (n=3)	0.0 (n=0)	1.0 (n=0)	0.5(n=1)	1.0 (n=2)	0.8 (n=1)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)

Public transport restricts my mobility

Agreed	83.7 (n=297)	67.1 (n=49)	82.1 (n=170)	79.6 (n=176)	77.8 (n=161)	77.2 (n=98)	90.0 (n=63)	100.0 (n=24)
Unsure	10.7 (n=38)	21.9 (n=16)	10.6 (n=22)	14.5 (n=32)	13.5 (n=28)	16.5 (n=21)	7.1 (n=5)	0.0 (n=0)
Disagreed	4.2 (n=15)	11.0 (n=8)	4.8 (n=10)	5.9 (n=13)	6.8 (n=14)	5.5 (n=7)	2.9 (n=2)	0.0 (n=0)
Missing	1.4 (n=5)	0.0 (n=0)	2.4 (n=5)	0.0 (n=0)	1.9 (n=4)	0.8 (n=1)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)

More job opportunities and options if I have a car

Agreed	76.1 (n=270)	58.9 (n=43)	76.3 (n=158)	70.1 (n=155)	74.4 (n=154)	68.5 (n=87)	80.0 (n=56)	66.7 (n=16)
Unsure	17.2 (n=61)	35.6 (n=26)	16.4 (n=34)	24.0 (n=53)	19.8 (n=41)	26.0 (n=33)	11.4 (n=8)	20.8 (n=5)
Disagreed	5.6 (n=20)	5.5 (n=4)	6.3 (n=13)	5.0 (n=11)	4.8 (n=10)	3.9 (n=5)	8.6 (n=6)	12.5 (n=3)
Missing	1.1 (n=4)	0.0 (n=0)	1.0 (n=2)	0.9 (n=2)	1.0 (n=2)	1.6 (n=2)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)

Easy to send child/children to school

Agreed	92.7 (n=329)	72.6 (n=53)	87.4 (n=87.4)	91.0 (n=201)	86.0 (n=178)	90.6 (n=115)	94.3 (n=66)	95.8 (n=23)
Unsure	3.4 (n=17)	21.9 (n=16)	8.2 (n=17)	5.0 (n=11)	7.7 (n=16)	5.5 (n=7)	5.7 (n=4)	4.2 (n=1)
Disagreed	2.0 (n=7)	4.1 (n=3)	1.4 (n=3)	3.2 (n=7)	3.4 (n=7)	2.4 (n=3)	0.0 (n=0)	0.0 (n=0)
Missing	2.0 (n=7)	1.4 (n=1)	2.9 (n=6)	0.9 (n=2)	2.9 (n=6)	1.2 (n=2)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)

Table 8.3.2 (b) Perceptions of accessibility based on nationality, gender and age generation.

	Job			Salary				Public transport	
	Stu	W	N-W	LS	LM	LMS	HS	User	Non-user
Easy to go shopping, socialising and attending family activities with cars									
Agreed	97.0 (n=159)	95.2 (n=218)	94.3 (n=33)	93.2 (n=192)	97.0 (n=65)	98.9 (n=90)	98.4 (n=60)	87.8 (n=72)	97.7 (n=338)
Unsure	0.6 (n=1)	2.2 (n=5)	5.7 (n=2)	2.4 (n=5)	3.0 (n=2)	1.1 (n=1)	0.0 (n=0)	6.1 (n=5)	0.9 (n=3)
Disagreed	1.2 (n=2)	2.2 (n=5)	0.0 (n=0)	3.4 (n=7)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	6.1 (n=5)	0.6 (n=2)
Missing	1.2 (n=2)	0.4 (n=1)	0.0 (n=0)	1.0 (n=2)	0.0 (n=0)	0.0 (n=0)	1.6 (n=1)	0.0 (n=0)	0.9 (n=3)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (n=82)	100.0 (n=346)
Public transport restricts my mobility									
Agreed	75.6 (n=124)	83.4 (n=191)	88.6 (n=31)	71.8 (n=148)	80.6 (n=54)	92.3 (n=84)	95.1 (n=58)	65.9 (n=54)	84.4 (n=292)
Unsure	15.2 (n=25)	10.9 (n=25)	11.4 (n=4)	18.9 (n=39)	13.4 (n=9)	5.5 (n=5)	1.6 (n=1)	22.0 (n=18)	10.4 (n=36)
Disagreed	6.7 (n=11)	5.2 (n=12)	0.0 (n=0)	7.3 (n=15)	4.5 (n=3)	2.2 (n=2)	3.3 (n=2)	12.2 (n=10)	3.8 (n=13)
Missing	2.4 (n=4)	0.4 (n=1)	0.0 (n=0)	1.9 (n=4)	1.5 (n=1)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	1.4 (n=5)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (n=82)	100.0 (n=346)
More job opportunities and options if I have a car									
Agreed	74.4 (n=122)	72.9 (n=167)	68.6 (n=24)	70.4 (n=145)	61.2 (n=41)	76.9 (n=70)	90.2 (n=55)	51.2 (n=42)	78.3 (n=271)
Unsure	17.7 (n=29)	21.8 (n=50)	22.9 (n=8)	25.7 (n=53)	19.4 (n=13)	18.7 (n=71)	4.9 (n=3)	39.0 (n=32)	15.9 (n=55)
Disagreed	6.1 (n=10)	4.8 (n=11)	8.6 (n=3)	2.9 (n=6)	17.9 (n=12)	3.3 (n=3)	4.9 (n=3)	9.8 (n=8)	4.6 (n=16)
Missing	1.8 (n=3)	0.4 (n=1)	0.0 (n=0)	1.0 (n=2)	1.5 (n=1)	1.1 (n=1)	0.0 (n=0)	0.0 (n=0)	1.2 (n=4)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (n=82)	100.0 (n=346)
Easy to send child/children to school									
Agreed	90.2 (n=148)	88.2 (n=202)	91.4 (n=32)	85.4 (n=176)	85.1 (n=57)	95.6 (n=87)	98.4 (n=60)	74.4 (n=61)	92.8 (n=321)
Unsure	4.3 (n=7)	7.9 (n=18)	8.6 (n=3)	9.2 (n=19)	10.4 (n=7)	1.1 (n=1)	0.0 (n=0)	20.7 (n=17)	3.2 (n=11)
Disagreed	3.0 (n=5)	2.2 (n=5)	0.0 (n=0)	3.9 (n=8)	0.0 (n=0)	2.2 (n=2)	0.0 (n=0)	3.7 (n=3)	2.0 (n=7)
Missing	2.4 (n=4)	1.7 (n=4)	0.0 (n=0)	1.5 (n=3)	4.5 (n=3)	1.1 (n=1)	1.6 (n=1)	1.2 (n=1)	2.0 (n=7)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (n=82)	100.0 (n=346)

Table 8.3.2 (c) Perceptions of accessibility by job classification, range of salary and public transport usage.

Another explanation for the increase in car ownership is the ability of the car to make journeys to work quicker and more convenient, especially for those involved with other clients, when time is considered valuable. For this reason, car sharing is not considered a good option and is thus not widely practised in Brunei; an outcome leading to an increase in car ownership. In brief, car ownership may ease the problems of travelling. In particular, it enables car users to be connected with family and friends who would otherwise be considered inaccessible and too far away to be reached using the buses. Public transportation users in this study also responded positively regarding the flexibility of cars for social activities. Public transport operators in Brunei have difficulties in attracting people to use their services as cars are much more convenient for travelling. Cars also offer participants ease of travel, especially when they need to carry necessary items for socialising, or shopping bags. Furthermore, the direct journeys offered by cars are advantageous compared to buses. The ease of travel with children may reflect the issue of security as school children have to mingle with strangers and not all educational institutions are connected with the bus services.

8.3.3 Pressures related to car ownership

The factors addressed in this subsection include the following:

1. "I am happier if I have a car."

2. "Car offers prestige and a symbol of status and success to the owner."

3. "Car protects me from undesirable weather."

4. "Pressure from family/friends to own a car."

About 90 per cent of the Bruneian participants agreed that they are happier if they own a car and stated that cars protect them from undesirable weather. On the other hand, seven in ten non-Bruneians agreed with the statements. Equally, seven in ten Bruneian participants, compared to 46.6 per cent of non-Bruneian participants, supported the statement that cars offer prestige, a symbol of status and success.

Factors	Agreed	Not sure	Disagreed	Missing	Total
I am happier if I have a car.	95.8 (n=410)	1.9 (n=8)	1.6 (n=7)	0.7 (n=3)	100.0 (n=428)
Car offers prestige and a symbol of status and success to the owner.	80.9 (n=346)	12.6 (n=54)	5.4 (n=23)	1.2 (n=5)	100.0 (n=428)
Car protects me from undesirable weather.	73.1 (n=313)	20.3 (n=87)	5.6 (n=24)	0.9 (n=4)	100.0 (n=428)
Pressure from family/friends to own a car.	89.2 (n=382)	6.5 (n=28)	2.3 (n=10)	1.9 (n=8)	100.0 (n=428)

Table 8.3.3 (a) Perceptions of factors promoting car ownership

60.3% of non-Bruneians disagreed that people are being pressured into owning a car, while 43.7 percent of Bruneian participants supported the statement. More female (89.1 per cent) than male participants (84.5 per cent) said they were happier if they own a car and that they are being pressured into owning a car. Non-public transport users tended to support the statements more than the public transport users. Some public transport users supported the statements, although about two thirds of them disagreed that people are being pressured into owning a car.

Participants aged over 35 are more likely than younger participants to agree with the statements, except for the notion of being pressured. Less than 50 per cent of participants aged under 56 agreed that people are being pressured into owning a car, while half of the elderly generation (EG) agreed with the statement. The table (8.3.3(a)) also indicates that only the young generation (YG) disagreed that people are being pressured into owning a car. It was noted that about four in five students, working and non-working, agreed that they are happier if they have a car and that cars protect them from undesirable weather. Higher-salary earners (UMS and HS earners) tended to support these two statements compared to the lower-salary (low salary (LS) and low-middle salary (LMS)) earners. The statement that cars offer prestige, a symbol of status and success was supported by about three in five of the student population, seven in ten working participants and four in five non-working participants. Less than 60 per cent of the lower-salary earners (low salary (LS) and low-middle salary (LMS) earners) supported the statement, while about four in five higher-salary earners (HMS and HS earners) supported the statement. Non-working participants agreed that people are being pressured into owning a car, while working participants disagreed.

	Nationality		Gender		Generation			
	Bru	N-Bru	Male	Female	YG	MG I	MG II	EG
I am happier if I have a car								
Agreed	90.4 (n=321)	69.9 (n=51)	84.5 (n=175)	89.1 (n=197)	86.0 (n=178)	87.4 (n=111)	88.6 (n=62)	87.5 (n=21)
Unsure	5.9 (n=21)	19.2 (n=14)	11.1 (n=23)	5.4 (n=12)	8.7 (n=18)	9.4 (n=12)	7.1 (n=5)	0.0 (n=0)
Disagreed	3.1 (n=11)	11.0 (n=8)	3.4 (n=7)	5.4 (n=12)	4.3 (n=9)	3.1 (n=4)	4.3 (n=3)	12.5 (n=3)
Missing	0.6 (n=2)	0.0 (n=0)	1.0 (n=2)	0.0 (n=0)	1.0 (n=2)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)
Car offers prestige, symbol of status and success								
Agreed	69.9 (n=248)	46.6 (n=34)	67.6 (n=140)	64.3 (n=142)	58.9 (n=122)	69.3 (n=88)	77.1 (n=54)	75.0 (n=18)
Unsure	14.4 (n=51)	35.6 (n=26)	17.9 (n=37)	18.1 (n=40)	21.3 (n=44)	16.5 (n=21)	14.3 (n=10)	8.3 (n=2)
Disagreed	15.2 (n=54)	17.8 (n=13)	13.5 (n=28)	17.6 (n=39)	18.8 (n=39)	14.2 (n=18)	8.6 (n=6)	16.7 (n=4)
Missing	0.6 (n=2)	0.0 (n=0)	1.0 (n=2)	0.0 (n=0)	1.0 (n=2)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)
Car protects me from undesirable weather								
Agreed	89.6 (n=318)	69.9 (n=51)	86.5 (n=179)	86.0 (n=190)	85.0 (n=176)	82.7 (n=105)	92.9 (n=65)	95.8 (n=23)
Unsure	7.6 (n=27)	27.4 (n=20)	10.6 (n=22)	11.3 (n=25)	11.1 (n=23)	15.7 (n=20)	4.3 (n=3)	4.2 (n=1)
Disagreed	1.7 (n=6)	2.7 (n=2)	1.9 (n=4)	1.8 (n=4)	2.4 (n=5)	1.6 (n=2)	1.4 (n=1)	0.0 (n=0)
Missing	1.1 (n=4)	0.0 (n=0)	1.0 (n=2)	0.9 (n=2)	1.4 (n=3)	0.0 (n=0)	1.4 (n=1)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)
Pressure from family/friends to own a car								
Agreed	43.7 (n=155)	27.4 (n=20)	40.6 (n=84)	41.2 (n=91)	36.7 (n=76)	43.3 (n=55)	45.7 (n=32)	50.0 (n=12)
Unsure	16.9 (n=60)	11.0 (n=8)	15.5 (n=32)	16.3 (n=36)	20.3 (n=42)	14.2 (n=18)	10.0 (n=7)	4.2 (n=1)
Disagreed	37.5 (n=133)	60.3 (n=44)	41.5 (n=86)	41.2 (n=91)	39.6 (n=82)	41.7 (n=53)	44.3 (n=31)	45.8 (n=11)
Missing	2.0 (n=7)	1.4 (n=1)	2.4 (n=5)	1.4 (n=3)	3.4 (n=7)	0.8 (n=1)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)

Table 8.3.3 (b) Perceptions of factors promoting car ownership based on nationality, gender and age generation.

	Job			Salary				Public transport	
	Stu	W	N-W	LS	LM	LMS	HS	User	Non-user
I am happier if I have a car									
Agreed	89.6 (n=147)	85.2 (n=195)	85.7 (n=30)	84.5 (n=174)	73.1 (n=49)	96.7 (n=88)	95.1 (n=58)	65.9 (n=54)	91.9 (n=318)
Unsure	6.7 (n=11)	10.5 (n=24)	0.0 (n=0)	8.3 (n=17)	17.9 (n=12)	3.3 (n=3)	4.9 (n=3)	18.3 (n=15)	5.8 (n=20)
Disagreed	2.4 (n=4)	4.4 (n=10)	14.3 (n=5)	6.3 (n=13)	9.0 (n=6)	0.0 (n=0)	0.0 (n=0)	15.9 (n=13)	1.7 (n=6)
Missing	1.2 (n=2)	0.0 (n=0)	0.0 (n=0)	1.0 (n=2)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.6 (n=2)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (n=82)	100.0 (n=346)
Car offers prestige, symbol of status and success									
Agreed	57.9 (n=95)	69.4 (n=159)	80.0 (n=28)	56.8 (n=117)	53.7 (n=36)	82.4 (n=75)	86.9 (n=53)	45.1 (n=37)	70.8 (n=245)
Unsure	21.3 (n=35)	17.0 (n=39)	8.6 (n=3)	23.8 (n=49)	26.9 (n=18)	7.7 (n=7)	3.3 (n=2)	26.8 (n=22)	15.9 (n=55)
Disagreed	19.5 (n=32)	13.5 (n=31)	11.4 (n=4)	18.4 (n=38)	19.4 (n=13)	9.9 (n=9)	9.8 (n=6)	28.0 (n=23)	12.7 (n=44)
Missing	1.2 (n=2)	0.0 (n=0)	0.0 (n=0)	1.0 (n=2)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.6 (n=2)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (n=82)	100.0 (n=346)
Car protects me from undesirable weather									
Agreed	87.8 (n=144)	84.7 (n=194)	88.6 (n=31)	83.5 (n=172)	76.1 (N=51)	93.4 (n=85)	96.7 (n=59)	70.7 (n=58)	89.9 (n=311)
Unsure	7.9 (n=13)	13.5 (n=31)	8.6 (n=3)	13.1 (n=27)	20.9 (n=14)	4.4 (n=4)	1.6 (n=1)	26.8 (n=22)	7.2 (n=25)
Disagreed	3.0 (n=5)	1.3 (n=3)	0.0 (n=0)	1.9 (n=4)	3.0 (n=2)	1.1 (n=1)	1.6 (n=1)	2.4 (n=2)	1.7 (n=6)
Missing	1.2 (n=2)	0.4 (n=1)	2.9 (n=1)	1.5 (n=3)	0.0 (n=0)	1.1 (n=1)	0.0 (n=0)	0.0 (n=0)	1.2 (n=4)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (n=82)	100.0 (n=346)
Pressure from family/friends to own a car									
Agreed	38.4 (n=63)	40.6 (n=93)	54.3 (n=19)	37.4 (n=77)	34.3 (n=23)	44.0 (n=40)	57.4 (n=35)	25.6 (n=21)	44.5 (n=154)
Unsure	21.3 (n=35)	12.2 (n=28)	14.3 (n=5)	19.4 (n=40)	10.4 (n=7)	18.7 (n=17)	6.6 (n=4)	7.3 (n=6)	17.9 (n=62)
Disagreed	38.4 (n=63)	45.0 (n=103)	31.4 (n=11)	41.3 (n=85)	50.7 (n=34)	37.4 (n=34)	34.4 (n=21)	65.9 (n=54)	35.5 (n=123)
Missing	1.8 (n=3)	2.2 (n=5)	0.0 (n=0)	1.9 (n=4)	4.5 (n=3)	0.0 (n=0)	1.6 (n=1)	1.2 (n=1)	2.0 (n=7)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (n=82)	100.0 (n=346)

Table 8.3.3 (b) Perceptions of factors promoting car ownership based on job classification, range of salary and public transport use.

8.4 Travel behaviour amongst the participants in Brunei

Travel behaviour covers the four main travelling activities: daily activities including employment and educational travel, leisure activities, shopping, and family gathering activities.

On the whole, the use of cars dominated the travel behaviour for work, educational and daily activities, leisure, shopping, and family gathering activities. None of the participants indicated that they used taxis for any of these activities. Bruneian participants were mainly dependent on cars, while there was a mixed response from the non-Bruneian participants. The lower-income non-Bruneian participants mainly use the bus services (except for travelling to work) while higher-income non-Bruneian participants are dependent on the use of cars. Car usage also dominates travel for leisure activities and family gathering activities. One of the main reasons is that parents wish to travel together with their family in a private space where they can talk with their family. Furthermore, it is considered cost-effective to use cars for travelling in a group or travelling with children, since the bus fare is BND $1.00 per single journey and there is no direct bus to many destinations, especially on journeys to the workplace (which necessitates changing buses at the Bandar Seri Begawan bus terminal).

Non-Bruneians tended to use the car for travelling to work (this includes company's car) The use of another mode of transportation such as walking, cycling and using company vehicles is very slightly higher (27.6 per cent) than the use of bus services for employment travel (26 per cent). The uses of bus services for non-Bruneians were concentrated on leisure activities, shopping, and family gathering activities. Moreover, it is noteworthy that the number of Bruneians using the bus for leisure, shopping and family gathering activities was very low. Most Bruneian respondents do not choose bus services for employment and educational travel, although 5.4 per cent said they do. However, despite this low percentage, some Bruneians (mainly students) opted to use the bus services for travelling to work, education and daily activities. This corroborates the finding in the previous chapter, that many students have no choice but to use the bus services.

The majority of student respondents indicated that they only use bus services for travelling to school. Twelve of them admitted as much, but none of them ride the bus for leisure, shopping and family activities.

From the Table (8.4 (b)), we can see that bus services were not the preferred choice for richer participants. The Table (8.4 (b)) indicates that none of the participants in these groups chose the bus for the four specified activities. Another surprising result to emerge from the *Table is that, despite earning low salaries, the participants still opted for cars for these four activities. More than 80 per cent of the participants on low incomes chose cars for these activities.

This study, although suggesting that the participants predominantly use cars, found that buses *do* attract other Bruneians for employment, education and daily activities. The results also show that the majority of the Bruneian bus users were students and members of the younger generation. This suggests that there is potential for the relevant Brunei authorities to attract the younger generation, especially students, to use the services. A combination of policies will be pivotal for attracting the younger generation to use the services.

However, the travel arrangements offered by some employers, especially to non-Bruneians, tend to restrict the use of the bus. Some of the non-Bruneians participants stated that their employers provide them with alternative (free) transportation to work, such as vans and mini-trucks. This appears a good approach by the employers to reduce traffic congestion (by car-pooling) and the cost of travel incurred by the employees.

	Nationality		Gender		Generation			
	Bru	N-Bru	Male	Female	YG	MG I	MG II	EG
Travel to work/school								
Car	93.2 (n=331)	46.6 (n=34)	82.1 (n=170)	88.2 (n=195)	87.0 (n=180)	82.7 (n=105)	85.7 (n=60)	83.3 (n=20)
Bus	5.4 (n=19)	26.0 (n=19)	11.6 (n=24)	6.3 (n=14)	8.2 (n=17)	7.1 (n=9)	11.4 (n=8)	16.4 (n=4)
Taxi	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Other	1.4 (n=5)	27.4 (n=20)	6.3 (n=13)	5.4 (n=12)	4.8 (n=10)	10.2 (n=13)	2.9 (n=2)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=207)
Leisure activities								
Car	98.9 (n=351)	47.9 (n=35)	88.4 (n=183)	91.9 (n=203)	92.8 (n=192)	85.8 (n=109)	87.1 (n=61)	100.0 (n=24)
Bus	0.3 (n=1)	43.8 (n=32)	9.7 (n=20)	5.9 (n=13)	4.8 (n=10)	11.0 (n=14)	12.9 (n=9)	0.0 (n=0)
Taxi	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Other	0.8 (n=3)	8.2 (n=6)	1.9 (n=4)	2.3 (n=5)	2.4 (n=5)	3.1 (n=4)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)
Shopping								
Car	99.4 (n=353)	52.1 (n=38)	88.9 (n=184)	93.7 (n=207)	94.2 (n=195)	86.6 (n=110)	88.6 (n=62)	100.0 (n=24)
Bus	0.3 (n=1)	39.7 (n=29)	8.7 (n=18)	5.4 (n=12)	4.8 (n=10)	10.2 (n=13)	10.0 (n=7)	0.0 (n=0)
Taxi	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Other	0.3 (n=1)	8.2 (n=6)	2.4 (n=5)	0.9 (n=2)	1.0 (n=2)	3.1 (n=4)	1.4 (n=1)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)
Family Gathering								
Car	99.4 (n=353)	49.3 (n=36)	88.9 (n=184)	92.8 (n=205)	93.2 (n=193)	86.6 (n=110)	88.6 (n=62)	100.0 (n=24)
Bus	0.3 (n=1)	42.5 (n=31)	9.7 (n=20)	5.4 (n=12)	4.8 (n=10)	11.0 (n=14)	11.4 (n=8)	0.0 (n=0)
Taxi	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Other	0.3 (n=1)	8.2 (n=6)	1.4 (n=3)	1.8 (n=4)	1.9 (n=4)	2.4 (n=3)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)

Table 8.4 (a) Choice of mode of transportation based on nationality, gender and age generation.

	Job			Salary				Public Transport	
	Stu	W	N-W	LS	LMS	UMS	HS	User	N-User
Travel to work									
Car	90.9 (n=149)	81.2 (n=186)	85.2 (n=30)	80.6 (n=166)	68.7 (n=46)	98.9 (n=90)	100.0 (n=61)	34.1 (n=28)	97.4 (n=337)
Bus	7.3 (n=12)	9.2 (n=21)	14.3 (n=5)	10.7 (n=22)	23.9 (n=16)	0.0 (n=0)	0.0 (n=0)	41.5 (n=34)	1.2 (n=4)
Taxi	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Other	1.8 (n=3)	9.6 (n=22)	0.0 (n=0)	8.7 (n=18)	7.5 (n=5)	1.1 (n=1)	0.0 (n=0)	24.4 (n=20)	1.4 (n=5)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (n=206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (n=82)	100.0 (n=346)
Leisure activities									
Car	98.8 (n=162)	82.5 (n=189)	100.0 (n=64)	87.4 (n=180)	79.1 (n=53)	98.9 (n=90)	100.0 (n=61)	52.4 (n=43)	99.1 (n=343)
Bus	0.0 (n=0)	14.4 (n=33)	0.0 (n=0)	8.7 (n=18)	20.9 (n=14)	0.0 (n=0)	0.0 (n=0)	40.2 (n=33)	0.0 (n=0)
Taxi	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Other	1.2 (n=2)	3.1 (n=7)	0.0 (n=0)	3.9 (n=8)	0.0 (n=0)	1.1 (n=1)	0.0 (n=0)	7.3 (n=6)	0.9 (n=3)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (n=164)	100.0 (n=164)	100.0 (n=64)	100.0 (n=164)	100.0 (n=164)	100.0 (n=164)
Shopping									
Car	99.4 (n=163)	84.3 (n=193)	100.0 (n=35)	89.9 (n=184)	79.1 (n=53)	100.0 (n=91)	100.0 (n=61)	56.1 (n=46)	99.7 (n=345)
Bus	0.0 (n=0)	13.1 (n=30)	0.0 (n=0)	7.8 (n=16)	19.4 (n=13)	0.0 (n=0)	0.0 (n=0)	36.6 (n=30)	0.0 (n=0)
Taxi	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Other	0.6 (n=1)	2.6 (n=6)	0.0 (n=0)	2.9 (n=6)	1.5 (n=1)	0.0 (n=0)	0.0 (n=0)	7.3 (n=6)	0.3 (n=1)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (n=206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (n=164)	100.0 (n=164)
Family Gathering									
Car	99.4 (n=163)	83.4 (n=191)	100.0 (n=35)	88.3 (n=182)	79.1 (n=53)	100.0 (n=91)	100.0 (n=61)	53.7 (n=44)	99.7 (n=345)
Bus	0.0 (n=0)	14.0 (n=32)	0.0 (n=0)	8.3 (n=17)	20.9 (n=14)	0.0 (n=0)	0.0 (n=0)	39 (n=32)	0.0 (n=0)
Taxi	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Other	0.6 (n=1)	2.6 (n=6)	0.0 (n=0)	3.4 (n=7)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	7.3 (n=6)	0.3 (n=1)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (n=206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	100.0 (n=82)	100.0 (n=346)

Table 8.4 (b) Choice of mode of transportation based on job classification, range of salary and public transport usage.

Figure 8.4 (a) Rural area road in Brunei without sidewalks (route used by inter-district buses) Source: Researcher

Figure 8.4 (b) Some roads in Brunei can be dangerous for pedestrians (route used by inter-district buses) Source: Researcher

Figure 8.4 (c) The majority of the roads in Brunei are dangerous for cyclists. Source: Researcher.

8.5 Travel expenditure in Brunei: Time and monetary cost

This study categorised travel expenses into three groups; time spent on the road on a typical day, weekly expenses on petrol/diesel, and weekly expenses on bus tickets. Overall, the majority of the participants spend less than 90 minutes of their time on the road on a typical day, spending BND $11 - BND $20 per week on petrol and not more than BND $5 on bus fares.

Table 8.7 (a) indicates that the majority of respondents claim to spend less than 90 minutes on the road on a typical day and spend BND $11 - BND $20 on petrol per week. It was noted that participants aged 18 – 55 spend 60 – 90 minutes on the road per day. This contrasted with the EG, the majority (54.2 per cent) of whom spend less than an hour of their time on the road every day. None of the elderly generation (EG) spend more than BND $40 per week on fuel. It was also noted that mid-generation II (MG1 II; 36 – 55 years old) tended to spend BND $11 - BND $30 on fuel per week (71.5 per cent).

	Nationality		Gender		Generation			
	Bru	N-Bru	Male	Female	YG	MG I	MG II	EG
Time Spent								
Below 60 min	28.2 (n=100)	34.2 (n=25)	28.0 (n=58)	30.3 (n=67)	30.4 (n=63)	25.2 (n=32)	24.3 (n=17)	54.2 (n=13)
60 - 90 min	43.9 (n=156)	45.2 (n=33)	45.2 (n=94)	43.0 (n=95)	41.5 (n=86)	49.6 (n=63)	47.1 (n=33)	29.2 (n=7)
90 - 120 min	14.9 (n=53)	16.4 (n=12)	14.5 (n=30)	15.8 (n=35)	15.5 (n=32)	15.7 (n=20)	15.7 (n=11)	8.3 (n=2)
More than 120 min	12.7 (n=45)	4.1 (n=3)	12.1 (n=25)	10.4 (n=23)	12.1 (n=25)	9.4 (n=12)	12.9 (n=9)	8.3 (n=2)
Missing	0.3 (n=1)	0.0 (n=0)	0.0 (n=0)	0.5 (n=1)	0.5 (n=1)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)
Bus tickets per week								
Below BND $5	47.2 (n=1)	56.5 (n=355)	39.2 (n=355)	74.2 (n=355)	47.1 (n=355)	58.3 (n=355)	40.0 (n=355)	77.8 (n=355)
BND $5 - BND $10	22.2 (n=355)	23.9 (n=355)	25.5 (n=355)	19.4 (n=355)	26.5 (n=355)	8.3 (n=355)	40 (n=355)	22.2 (n=355)
BND $11 - BND $15	11.1 (n=355)	8.7 (n=355)	15.7 (n=355)	0 (n=355)	5.9 (n=355)	16.7 (n=355)	13.3 (n=355)	0 (n=355)
Missing	19.4 (n=355)	10.9 (n=355)	19.6 (n=355)	6.5 (n=355)	20.6 (n=355)	16.7 (n=355)	6.7 (n=355)	0 (n=355)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=221)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)
Petrol per week								
Below BND $10	13.0 (n=46)	1.4 (n=1)	13.0 (n=27)	9.0 (n=20)	14.0 (n=29)	11.8 (n=15)	1.4 (n=1)	8.3 (n=2)
BND $11 - BND $20	43.7 (n=155)	21.9 (n=16)	38.2 (n=79)	41.6 (n=92)	43.0 (n=89)	35.4 (n=45)	38.6 (n=27)	41.7 (n=10)
BND $21 - BND $30	27.9 (n=99)	20.5 (n=15)	26.1 (n=54)	27.1 (n=60)	25.6 (n=53)	24.4 (n=31)	32.9 (n=23)	29.2 (n=7)
BND $31 - BND $40	6.2 (n=22)	4.1 (n=3)	7.7 (n=16)	4.1 (n=9)	2.9 (n=6)	7.1 (n=9)	10.0 (n=7)	12.5 (n=3)
Above BND $40	3.4 (n=12)	1.4 (n=1)	1.0 (n=2)	5.0 (n=11)	1.9 (n=4)	3.1 (n=4)	7.1 (n=5)	0.0 (n=0)
Missing	5.9 (n=21)	50.7 (n=37)	14.0 (n=29)	13.1 (n=29)	12.6 (n=26)	18.1 (n=23)	10.0 (n=7)	8.3 (n=2)
Total	100.0 (n=355)	100.0 (n=73)	100.0 (n=207)	100.0 (n=73)	100.0 (n=207)	100.0 (n=127)	100.0 (n=70)	100.0 (n=24)

Table 8.5 (a) Travel expenditure based on nationality, gender and age generation.

	Job			Salary				Public Transport	
	Stu	W	N-W	LS	LMS	UMS	HS	User	N-User
Time Spent									
Below 60 min	29.3 (n=48)	25.8 (n=59)	51.4 (n=18)	34.5 (n=71)	38.8 (n=26)	20.9 (n=19)	13.1 (n=8)	43.9 (n=36)	25.7 (n=89)
60 - 90 min	42.1 (n=69)	47.2 (n=108)	34.3 (n=12)	41.7 (n=86)	37.3 (n=25)	48.4 (n=44)	54.1 (n=33)	39.0 (n=32)	45.4 (n=157)
90 - 120 min	15.2 (n=25)	15.7 (n=36)	11.4 (n=4)	13.1 (n=27)	20.9 (n=14)	15.4 (n=14)	14.8 (n=9)	9.8 (n=8)	16.5 (n=57)
More than 120 min	12.8 (n=21)	11.4 (n=26)	2.9 (n=1)	10.2 (n=21)	3.0 (n=2)	15.4 (n=14)	18.0 (n=11)	7.3 (n=6)	12.1 (n=42)
Missing	0.6 (n=1)	0.0 (n=0)	0.0 (n=0)	0.5 (n=1)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0 (n=0)	0.3 (n=1)
Total	100.0 (n=164)	100.0 (n=164)	100.0 (n=35)	100.0 (206)	100.0 (n=67)	100.0 (n=91)	100.0 (61)	100.0 (82)	100.0 (346)
Bus tickets per week									
Below BND $5	38.1 (n=8)	54.9 (n=28)	70.0 (n=7)	61.8 (n=34)	30.4 (n=7)	100.0 (n=100)	0.0 (n=0)	52.4 (n=43)	0.0 (n=0)
BND $5 - BND $10	23.8 (n=5)	23.5 n=12)	20.0 (n=2)	16.4 (n=9)	39.1 (n=9)	0.0 (n=0)	0.0 (n=0)	23.2 (n=19)	0.0 (n=0)
BND $11 - BND $15	19 (n=4)	7.8 (n=4)	0.0 (n=0)	9.1 (n=5)	13.0 (n=0)	0.0 (n=0)	0.0 (n=0)	9.8 (n=8)	0.0 (n=0)
Missing	19 (n=4)	13.7 (n=7)	10.0 (n=1)	12.7 (n=7)	17.4 (n=4)	0.0 (n=0)	100.0 (n=100)	14.6 (n=12)	0.0 (n=0)
Total	100.0 (n=21)	100.0 (51)	100.0 (n=10)	100.0 (n=55)	100.0 (n=23)	100.0 (n=100)	100.0 (n=100)	100.0 (n=82)	0.0 (n=0)
Petrol per week									
Below BND $10	17.1 (n=28)	7.9 (n=18)	2.9 (n=1)	11.7 (n=24)	14.9 (n=10)	12.1 (n=11)	3.3 (n=2)	8.5 (n=7)	11.6 (n=40)
BND $11 - BND $20	43.3 (n=71)	33.2 (n=76)	68.6 (n=24)	42.2 (n=87)	37.3 (n=25)	37.4 (n=34)	37.7 (n=23)	22.0 (n=18)	44.2 (n=153)
BND $21 - BND $30	23.8 (n=39)	29.7 (n=68)	20.0 (n=7)	21.4 (n=44)	20.9 (n=14)	33.0 (n=30)	42.6 (n=26)	6.1 (n=5)	31.5 (n=109)
BND $31 - BND $40	3.0 (n=5)	8.7 (n=20)	0.0 (n=0)	1.5 (n=3)	4.4 (n=3)	11.0 (n=10)	14.8 (n=9)	2.4 (n=2)	6.6 (n=23)
Above BND $40	2.4 (n=4)	3.9 (n=9)	0.0 (n=0)	1.9 (n=4)	3.0 (n=2)	6.6 (n=6)	1.6 (n=1)	0.0 (n=0)	3.8 (n=13)
Missing	10.4 (n=17)	16.6 (n=38)	8.6 (n=3)	21.4 (n=44)	19.4 (n=13)	0.0 (n=0)	0.0 (n=0)	61.0 (n=50)	2.3 (n=8)
Total	100.0 (n=164)	100.0 (n=229)	100.0 (n=35)	100.0 (n=206)	100.0 (n=67)	100.0 (n=91)	100.0 (n=61)	82 (n=82)	100.0 (n=346)

Table 8.5 (b) Travel expenditure based on job classification, range of salary and public transport usage.

Students and the working group spend 60 to 90 minutes of their time, every day, on the road, while more than 50 per cent of the non-working group spend less than an hour on the road. Students, as well as working and non-working participants tended to spend BND $11 - BND $20 per week on fuel. None of the non-working group spends more than BND $30 per week on fuel. It was also indicated that more than 80 per cent of public transport users spend less than 90 minutes of their time on the road on a typical day. The majority of the public transport users did not answer the questions on petrol expenditure, which reflects the fact that these participants either do not use cars or are being driven by others. When the subject of bus tickets and fares was raised, the majority of the participants reported that they spend less than BND $5 on bus tickets per week and none of them spend more than BND $15 per week on bus fares.

The majority of the student population and government employees in this study indicated that they spend below BND $5 per week on bus tickets. The table (8.5 (b)) also indicates that seven in ten non-working participants spend below BND $5 per week and one in five non-working participants spends BND $5 - BND $10 per week on bus tickets. The Table (8.5 (b)) also shows that three in five low-salary (LS) earners spend below BND $5 on bus fares per week while two in five of those on lower-middle salaries spend BND $5 - BND $10 per week on bus tickets. The only participant in the upper-middle salary range (UMS) category spends below BND $5 per week on bus tickets.

In conclusion, the younger generation spend more time on the road on a typical day than the elderly generation (EG). The study also discovered that the majority of the low-salary (LS) earners spend below BND $20 per week on petrol, while the majority of higher-salary earners spend BND $11 - BND $30 on petrol on a weekly basis. Finally, fewer than 20 per cent of the participants in this study responded to the question on bus ticket expenditure; however, of those who *did* respond, the majority spend below BND $5 per week.

8.6 Conclusion

The car dominates travel patterns in Brunei, especially for working, education, daily activities and socialising activities (leisure, shopping and family gathering activities). Car ownership is perceived to be affordable, aided by the low cost of fuel. Furthermore, these perceptions are enhanced by the possibilities offered by cars such as employment, unrestricted mobility and comfort of travel, particularly for shopping, travelling with children, and protection from undesirable weather (Buys and Miller, 2011; Gardner and Abraham, 2007; Hiscock et al., 2002). This combination of factors is the reason for the high level of car ownership in Brunei, especially amongst the study cohort. The decision to use cars is mainly caused by three factors: enhancing safety and social status, cheaper cost especially for multiple destinations, although this notion is potentially based on people failing to fully appreciate the costs of car ownership as distinct from the costs of car usage, speed and convenience.

Bus services in Brunei are currently not a preferred choice of transportation. Furthermore, when having a car is so affordable and public transport tends to inspire negative perceptions of its services, potential users will be reluctant to reduce their car use. The present alternative (of low carbon transportation) is hybrid cars. Bruneians in this study were more willing to buy environmentally friendly cars, compared to the non-Bruneian participants. Non-Bruneian participants are willing to buy the cars if the costs are similar to the conventional cars. Male participants are more willing than females to buy environmentally friendly cars, provided the performance and cost are similar to conventional cars. Female participants are more willing than males to buy environmentally friendly cars, even if the costs are more expensive than those of conventional cars. Students tended to be more willing to buy environmentally friendly vehicles provided the performance of the car and cost are similar to conventional cars. However, in the future, only a quarter of the student population commented that they would be prepared to purchase environmentally friendly cars.

Although there is evidence that sales of hybrid cars are increasing, people are only interested in buying such vehicles if the cost is similar to that of conventional cars. Hence, it will be a challenging task to change the car culture towards a bus culture or at least engineer a shift from the current types of car to lower-carbon emitting vehicles.

This chapter indicates how the car in Brunei has changed from being just an entity to something that has created social, technical and institutional dependencies. The car was viewed as the dominant solution to the mobility problems of those living in Brunei. The Bruneians are considered to be 'locked into' this car system, as their lifestyles, attitudes and even income generation activities have co-evolved with the car system. The car is now associated with independence, freedom and success (Beirão and Cabral, 2007; Chee and Fernandez, 2013; Eriksson et al., 2008; Farber and Paez, 2009; Gardner and Abraham, 2007; Grdzelishvili and Sathre, 2011). Although there is a vision to break, or at least reduce the over-dependence on cars, the Bruneian habits and attitudes to change will be hard to break. Furthermore, the current public transportation system (as discussed in chapters 6 and 7) fails to meet the transport needs and demands of Bruneians (Beirão and Cabral, 2007; Hiscock et al., 2002). Thus, studying the car transport regime in Brunei might create an opportunity to disrupt the over-dependent-on-the-car lifestyle and allow other modes of transportation to 'fit in' with society, by either replacing conventional cars or competing with the current unsustainable transport system.

Chapter 9: Discussion

9.0 Background

The rapid development of transportation infrastructure favouring motorised transport, uneven development planning processes and the high rate of car ownership per capita in Brunei, has challenged the creation of a sustainable, environmentally friendly future. Vehicle ownership has been rapidly increasing since the 1960s and is expected to continue to grow in the future. The growth in the number of vehicles on the road is likely to have environmental and societal impacts. Such impacts include traffic congestion, air pollution, reduced energy security and destruction of land for road making and widening. Brunei is not adequately equipped with public transportation. Although Brunei has two kinds of public buses (franchise buses and inter-district buses), these services do not meet peoples' increasing travel needs. Due to the buses' limited connectivity and accessibility, cars are used for daily travel. Therefore, transportation issues are directly relevant to attempts to satisfy the mobility requirements in Brunei. This chapter examines the main findings that address the research questions.

9.1 Revisiting the research objectives

Given that more than 90 per cent of journeys in Brunei, for employment, education, daily activities, leisure, shopping and family gathering activities, are conducted by car this study has sought to examine whether Bruneians are overly dependent on automobile transportation at the expense of other potentially more sustainable alternatives, such as bus transit. More generally, the thesis has examined the institutional, cultural and developmental challenges confronting the introduction of such sustainable transportation modes in Brunei, a country whose economy has hitherto been heavily structured around the consumption and exportation

of cheap petroleum products. Thus, the thesis is guided by four research questions. In this chapter, three research questions are discussed, while the final research question (on MLP) is discussed in chapter 10.

9.2 What are the political, social and economic contexts of ground transportation in Brunei?

The scope of this thesis covers two modes of ground transportation: private and public. With regard to public transport, the thesis focused more on the bus services than on taxis for several reasons. First, none of the participants in the survey questionnaires use taxi services in Brunei; thus, the questions on taxis are left blank. Second, the number of taxis in Brunei is declining and, of the taxi drivers interviewed, only two successfully completed the interview as the others withdrew from the study.

In comparison with other emerging economies, such as Malaysia and Singapore, per capita car ownership in Brunei is high (Bandial, 2012; The Word Bank, 2011). About 70 per cent of the study cohort has at least one car, and of the 355 Bruneian participants about 75 per cent have at least one car. Bruneians who do not have cars are mostly students. However, the majority of these students are planning to buy a car in the near future. Even the majority of the low-income participants have at least one car.

The study indicated that car ownership is important to Bruneians. Nine in ten Bruneian participants thought that having a car made them happier. About two in five Bruneian participants thought that they were being pressured into buying a car. This may be due to the fact that having a car makes travel easy (especially with children and in undesirable weather) as buses tend to restrict people's mobility, and people tend to get more job opportunities if they have a car. Bruneians have positive attitudes and behaviour regarding cars. The car is thought to offer freedom to its users. Furthermore, the cost of acquiring a car is considered affordable. The benefits of car use in Brunei include ease of travel, especially when travelling for employment and travelling with children.

The majority of the students in Brunei travel to school by car. Parents are concerned with their children's safety and thus, walking and cycling to school is rare. There are some cases when students who had just gained their car license (passed their driving test), were asked by their parents to drive to college; especially parents who do not wish their daughters to mix with immigrant workers and strangers while riding the bus. These scenarios cause the young generation to develop a car-oriented lifestyle and attitudes, therefore inducing them to be comfortable in the use of cars.

In terms of alternative transportation modes to the car, about 10 per cent of Bruneians that they use the bus services. The services are not used frequently by the Bruneians, but the majority use the bus services more than once a month (according to the response options given to them: every day / weekdays / weekends / once a week / once a month / more than once a month). The majority of the Bruneian bus users are male (about 61 per cent). More than half of the users are young students (18 – 25 years old).

The non-Bruneians who use the services (once a week, especially during the weekends) are in the low-income category (the majority earning below BND $1000 a month). Due to the almost non-existence of taxis, and the high cost of the fares, the bus is their only available mode of transport, due to the cheap price of a single trip. The non-Bruneians rated the current bus services as satisfactory, although they considered the information about the bus services to be unsatisfactory.

Furthermore, there are several policies that directly and indirectly favour the development of cars in Brunei, thus causing public transport to be perceived as unattractive. The road infrastructure in Brunei also supports the development of car-oriented lifestyles; however, there are inadequate public transport options (only buses and limited number of taxis) and inadequate public transport infrastructures that would support the development of public transport in Brunei (further discussed in chapter 10). Non-motorised transportation is very much inadequate: cycling is almost impossible on Brunei roads due to safety concerns and lack of cycling lanes; also, many of the roads in Brunei are not equipped with pedestrian access. Due to the poor public transport services and infrastructure, low salary earners, and immigrant populations who are dependent on public transport, tend to miss the opportunities

to take advantage of the social and economic benefits of cars. Low salary earners are indirectly forced to own a car in order to enjoy these opportunities.

9.3 What steps have been taken in Brunei to promote sustainable transport at both regional and national levels of governance?

The Brunei government is committed to reducing carbon emissions and the impact of climate change in all sectors, and this is becoming the top national agenda item. Brunei is committed to reducing its total carbon emissions by 63 per cent by the year 2035, through the implementation of Brunei Vision 2035, using the 2009 baseline from the business-as-usual scenario (Haris, 2014). This will promote innovation and new technology towards green development and a reduction in energy consumption.

However, all the interviewees were aware of the difficulty of reducing carbon emissions in transportation. Currently, the government is emphasising energy and carbon reduction in the energy sectors and is reducing the use of electricity by revising the electricity tariff Bill and changing street lamps to more energy-saving models. The Energy Department of the Prime Minister's Office (EDPMO) has published energy saving tips[58] on its website, including energy saving on the roads. The tips are designed to promote the efficient use of cars by reducing the amount of energy and petrol usage, and to reduce carbon emissions through smarter driving attitudes; for example, by having fuel efficiency in mind when driving.

One of the important highlights of transport policy was the decision by the top management in the Ministry of Communications (including the Minister of Communications) to ride on the franchise bus in order to identify the problems and weaknesses of the bus services in Brunei (especially the franchise buses). This was seen as a way of assuring the public that future bus services would meet the travel demands of both immigrant nationalities and Bruneians. The initiative was also seen to improve the image of the bus, which is perceived by many Bruneians as a mode of transportation for the immigrant workers, by promoting the use of bus services to the Bruneians.

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[58] http://energy.gov.bn/Pages/Download%20Page.aspx.

In terms of investment in alternative infrastructure, the current road system is considered unsuitable for non-motorised modes of travel such as walking and cycling. Few of the roads in Brunei are equipped with cycle lanes and some of them have no sidewalks, thus making walking impossible or extremely dangerous. Furthermore, despite the government's investment in bus-related infrastructure and services, such as building more and better bus stops, these initiatives are considered insufficient to promote greater bus usage in the future.

The government has set cheaper fares[59] for children below 12 years of age, students in school uniform and for those passengers over 60 years old. This initiative was considered partially successful as the majority of bus users are the elderly and students. However, the gesture was considered insufficient to promote bus usage in the future, despite exposing the bus service to the young generation. Part of the problem is the fact that students with no uniforms, such as those at college and university, are not entitled to cheaper bus fares.

The experience of using public transport, such as buses, abroad does not seem to encourage people to use the services in Brunei. Car users, especially the younger generation, tend to compare the service level abroad with the services provided for them in Brunei. There is a need to increase the level and quality of bus services in Brunei, which at present are inadequate. This younger generation might help to change attitudes to public transport, especially by providing feedback on their experience of using public transport and their expectations of bus service quality, which may help to improve the image of the Bruneian bus services. However, the process of public participation, especially in transportation planning, is currently insufficient. Such feedback on the service quality is mostly discussed amongst the departments under the Ministry of Communications and the bus operators. The public has been restricted to answering survey questions on the type of transportation they wish to have in Brunei, especially during the drafting of Bandar Seri Begawan Master Plan.

The Government of Brunei has been attempting to improve transportation by moving towards sustainable transportation. None of the government officers was unwilling to disclose the past initiatives: the most popular attempt to disrupt car dependency and to educate people

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[59] BND $0.50 (£ 0.24).

about petrol was the No-subsidy Day[60] organised by the Energy Department. However, few motorists felt the pinch of the higher price as the initiative only lasted for a day and motorists had refilled their cars with petrol the night before the event.

Furthermore, the EDPMO and the Ministry of Communications are also planning to improve transport sustainability, especially by increasing awareness of sustainable mobility by reducing the energy use of driving; by identifying technological options such as improving fuel specifications and designing cleaner engines; and by researching new technologies such as electric cars. Collaborative work is also being done to improve transportation awareness and reduce unnecessary travel. One current collaborative effort is a study of the feasibility of Mitsubishi manufactured electric cars for use in Brunei.

The Ministry of Communications had awarded a new taxi franchise to replace the old unsystematic taxi meters in Brunei in 2009. However, the company that had been awarded the tender pulled out in 2010 and no reasons for this were stated by the representative from the Ministry of Communications. The ministry is still looking for a suitable candidate and the current taxi services in Brunei are provided by private taxi drivers.

The Ministry of Communications is currently in the process of reviewing the bus tender for the new franchise bus service. The new franchise will have better services and facilities (compared to the existing bus services) serving the four districts of Brunei. The Ministry of Communications is also in the process of drafting the Brunei Land Transport Master Plan, which is aimed at reducing car dependency and car use, as well as improving public transport by creating a more efficient transport network.

In terms of road safety and accidents, the roads in Brunei are considered safer, compared to the case in Qatar, (see chapter 2.5.4 above). However, the barrier for sustainable transportation in terms of road planning, road traffic, non-motorised transport options, and the alternative transport options to cars, remain the main barriers faced by both Brunei and

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[60] The No-subsidy Day Campaign took place on 24th May 2010, when all petrol stations sold car fuels (petrol and diesel) at unsubsidised commercial prices in conjunction with the Energy Day (Masli, 2010a; Othman, 2010).

Qatar. Furthermore, both governments face challenges to persuade their people to use the bus services and little improvements are seen (especially in the road planning where the Brunei Government through various ministry are planning to build more bus stops and rebrand bus services in order to persuade young generation to use the buses).

9.4 What are the attitudes and behaviour of Bruneians regarding the different modes of ground transportation?

A majority of the Bruneian participants who use the bus services rated the current bus services as satisfactory. This includes cleanliness, frequency and reliability. Bruneians rated the cost of bus tickets as very satisfactory but were dissatisfied with the bus information. However, there was a mixed response regarding personal safety while using the bus, safety of other road users, comfort, and travel coverage. Travel behaviour in Brunei is dominated by car usage. About 99 per cent of leisure activities, shopping and family gathering activities are performed by or involve a car; also cars are used for around 93 per cent of travel for education, employment and everyday activities. The majority of Bruneians spend BND $11 – BND $20 on petrol per week.

Despite rating the bus services in Brunei as satisfactory the Bruneian bus users) believed that Bruneians have negative thoughts on bus regularity and frequency, causing them to avoid the services. The Bruneian bus users believed that Bruneians perceived the current bus service in Brunei to be infrequent, unsafe, unclean, uncomfortable and unreliable. Moreover, it was found that Bruneians are embarrassed to use the bus as it affects their perceived social status. Furthermore, the bus services are thought to rely upon inadequate infrastructure, leading to the idea that cars save time compared to travelling on buses and that the bus stops are too far apart from one another. Additionally, it was perceived that travelling by car is cheaper. The interviewees indicated that people use buses for several reasons: limited or no travel options (such as being unable to drive and having poor eyesight), comfort, especially for longer trips (for the elderly generation), and cheaper fares for single trips.

The demand for hybrid cars (environmentally friendly vehicles) is increasing in Brunei, judging by the increased sales of hybrids. Participants in the survey questionnaires are willing to buy environmentally friendly cars provided that they offer a similar performance to conventional cars and cost less. Furthermore, hybrid sales are increasing, according to the car dealers. Some of the hybrid buyers are willing to wait several months for the shipment of hybrid cars to Brunei. Among the causes of the increase in hybrid sales is the drop in import tax (5 per cent) and the opportunity to save on travel expenditure by reducing petrol use.

9.5 Assessing the gap in sustainable transport literature

9.5.1 Demographic change

Chapter two identified the gap in studies of mobility patterns that tend to neglect the young and elderly generations. This study however, takes into account the increase in the young and elderly populations, which may shape the new transportation patterns and demands for mobility.

In Brunei, there are certain privileges for students who live far from their schools: they are provided with a transportation allowance[61] of BND $45 per calendar month or a free school bus service[62] (Awang, 2007; Hab, 2013; Roslina, 2008). However, some students opted to use cars. The selection of preferred mode of transport is strongly influenced by parents and family. This influence may have a positive impact on the status of cars (such as good perceptions of car use) and a negative impact on public transport (such as negative perceptions of bus use). Other possible modes of transportation to school/college include cycling and walking. However, these modes are normally used by students living near to school and college. There are however some concerns about students' safety. One reason is that the widening of roads tends to make walking and cycling unsafe (due to fast oncoming cars). Furthermore, not all roads in Brunei are equipped with sidewalks and cycle lanes, thus

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[61] BND $45 = £ 21.74.

[62] Applicable to secondary school students living more than eight kilometres from school.

rendering walkers and cyclists vulnerable to accidents. As road safety is becoming a concern, especially for parents, the interviewees suggested that children are being exposed to the chance of accidents during their journey to school, resulting in Bruneian parents being unwilling to allow their children to walk or cycle to school.

The case in Brunei is similar to the case in Dublin (Kelly and Fu, 2014) where 60 per cent of primary school children are driven to school. Primary students rarely walk to school if the distance is more than 2 km and cycling is not particularly popular due to high exposure to potential or actual accidents. Furthermore, the growth in car ownership also encourages the use of car for education travel (travel to school/college and university). In Britain, Mackett (2013) stated that the children's travel behaviour is informed by various factors: less choice on where to go, not allowed to travel unescorted by an older person, concern for children's safety, so causing a decrease in walking and cycling activities. These changes are the result of growth in car-oriented lifestyles, marked by increases in the number of mothers in employment and the change in attitude towards children's independent travel, mostly due to safety concerns. In Qatar, the Qatari students are either driven to school by parents or by drivers, resulting in a similar situation to Brunei's. However, in the case of Brunei, parents not only drive their children to primary school, but continue 'chauffeuring' right up to college and university level. This in turn obliges some parents to spend their lunch break fetching their children from school.

The current study indicated that, apart from travelling to school, students use cars for other activities, especially leisure activities. Students in this survey are aged 18 and above and the majority of the student population have their own cars. This is because few of the colleges (tertiary colleges and universities) are directly accessible by public transport. Furthermore, since public transport starts at about 5.30 or 6 in the morning and classes commence at 7.30, it is difficult to arrive on time if using the bus. This problem is predominantly caused by delays, especially traffic jams, as cars and buses share the same lanes. Bus delays (Buys and Miller, 2011; Gardner and Abraham, 2007; Grdzelishvili and Sathre, 2011) and irregular services (Chee and Fernandez, 2013; Danaf et al, 2013; Guiver, 2007; Grdzelishvili and Sathre, 2011) cause students to favour cars. Furthermore, in Beirut (Danaf et al., 2013), the

bus lanes are being used by other traffic and also being used for double parking, that causes the bus not to be favoured by university students. In addition, buses rarely following the designated routes and schedules further make the car an attractive mode of travel for tertiary students in Beirut.

It can be concluded that parents are unwilling to send their children to school by bus because the issues of safety, comfort and travel coverage are considered unsatisfactory. The issue of travel coverage also constrains these students from using the bus services, as there may not be a bus service from their home to their college/university. This may be the reason for the high car ownership, usage and dependency amongst students. Furthermore, cars are affordable, as mentioned by the two university students (one local and one international) who participated in the interview process. Fuel subsidies, student travel allowance[63], the lump sum cost of road tax and insurance (paid from their book allowances[64] or by their parents), and the student maintenance allowance[65] seem to make the cost of cars cheaper. Moreover, considering the pressure from parents to use the car to get to their place of learning, combined with the problems associated with public transport, the students are likely to rely on cars to travel. Simmons et al., (2014) also indicated that car use amongst the students and young adults in the City of Antwerp (Belgium) is influenced by their partner, being able to borrow a car from friends, partners and parents and the slow pace of travel when using public transport. Verma (2014) also indicated that the presence of car loans and financial schemes encourage young generations to own a car in India.

Although there are currently a few students who are willing to use the bus, due to a lack of alternatives, there are some concerns about future transportation behaviour, as the majority of the students rated the bus services as unsatisfactory. However, the combined factors of frequency, reliability and cost, which are rated as satisfactory, and the fact that the majority

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[63] BND $45 (£21.74) per calendar month.

[64] BND $600 (£289.86) per calendar year.

[65] BND $358 (£172.95) per calendar month.

of these students indicated that buses are their only option, are motivations for them to use the bus services.

There have been mixed findings on the subject of students' and young people's (including adolescents) intentions to buy cars. Cullinane (2002) indicated that the majority of university students in Hong Kong have no wish to buy a car in the next five years (65 per cent), although the percentage drops to 33 per cent in the next ten years. However, 41 per cent of the younger generation in Hong Kong (Cullinane, 2003), despite their low car ownership, indicated their intention to buy a car (although it was not a priority) and 27 per cent stated that they would buy a car as soon they could afford to do so. Moreover, a lower percentage of the young generation stated that they had no intention of buying a car in the next ten years (24 per cent). Danish adolescents (Sigurdardottir et al., 2013) showed a very high intention (80 per cent) to learn to drive and own a car. In the Bruneian case, there are some tendencies among Bruneian students to own a car. This is based on the fact that about 39 per cent of the Bruneian students intend to own a car; about 25 per cent indicated that they may do so and only 23 per cent of the students had no intention of buying a car in the next 2-3 years. Of this 23 per cent, about 66 per cent already have a car, thus indicating that only about 8 per cent of the students who do not own a car do not intend to buy one in the next 2-3 years. Therefore, there were some motivations for the student population to buy a car in the near future, as youngsters perceive cars as exciting (Steg, 2005).

One of the initiatives undertaken by the government is to reduce fares from BND $1.00 to BND $0.50 for students in school uniform. According to two of the franchise bus operators, the cheaper fare is also a motivation for parents to persuade their children to use the bus, especially for travelling home from school. The problem of traffic congestion in the school areas and the parents' inability to fetch their children from school (due to work commitments) are reasons why students are encouraged to use the bus. However, according to one of the bus operators, students not in school uniform are not eligible for these concessionary fares (especially for other activities apart from travelling to school). Thus, college and university students are unable to enjoy this privilege.

As one's age increases, one's ability to move will decrease. Thus, for the elderly generation, the ability to travel on a typical day will be reduced compared to the middle-aged and younger generations. Some reports indicated that, as people grow older, they will encounter exclusion and forms of discrimination in terms of transportation such as overcrowding, not adapting to the new bus system, inadequate routes, infrequent services, and security problems such as walking to the bus station or stop and getting on the vehicles (Fiedler, 2007; Olawole and Aloba, 2014;UNECE, 2009). Logically, when the elderly generation are unable to travel far, there is a need to cater for their needs, such as providing services nearer to where they live, thus reducing their travel distance. Furthermore, as their age increases, their reactions tend to be slower, making them more vulnerable to accidents. Hence, bus services must be made more appealing.

However, if the bus services in Brunei are not upgraded, these elderly generations will be disadvantaged in their attempts to experience the benefits of travelling. Safety factors such as personal safety and safety on the road, as well as destination covered by the buses must be taken into account. Three disturbing experiences were shared by the interviewees. One of the important complaints from the elderly generations to the bus operators is the attitude of the bus drivers. One of the bus operators mentioned that they drove too fast, constantly applied the brakes (making the elderly passengers dizzy) and started to drive off without checking that the elderly people were sitting down properly. Furthermore, bus operators expressed their concern over the safety of the elderly generation, as such passengers have to walk from their homes to the bus stops and from the bus stops to their destinations. Few of Brunei's roads have been designed to accommodate pedestrians, including the elderly generation, alongside cars passing by at high speeds, thus making the use of bus services a complex and challenging process for the elderly. First, they have to walk from their homes to the bus stops, although the system in Brunei informally allows the bus to stop anywhere provided the passenger signals them to stop. Second, the absence of sidewalks makes the walk to the bus stop dangerous, especially with cars passing by at high speeds. The transportation infrastructure in Brunei reduces the opportunities for both young and elderly generations to conduct day-to-day activities.

9.5.2 Key barriers in terms of social inequality and policy

The relationship between transport and inequality, especially for low-income earners, is an important issue in Brunei. The increasing use of cars (and travel needs), the process of urbanisation (leading to an increase in the distance of travel) and the limited amount of space for pedestrian and cycling activities, have collectively created problems for the lower-income community, both immigrant nationalities and local Bruneians. The process of urbanisation may have different effects on different sections of society, especially the young and elderly generations, people without cars and those unable to drive, and the low-income population. Thus, people with access to private cars, especially those more affluent, have the opportunity to choose the residential areas in which they wish to live, compared to the low- and medium-income earners, who are applying for homes in the National Housing Scheme, which are further from the workplace. Richer Bruneians have more opportunity to satisfy their travel needs related to both employment and leisure activities. For the reasons discussed, public transportation in Brunei, despite helping to provide access for non-Bruneians and low-income earners, is perceived as insufficient in that it does not meet their travel needs, nor enhance their freedom to travel. The population in Brunei is predominantly engaged in car-oriented activities. Due to its limited coverage, the reliance on public transport is also limited so creating a negative spiral; thus, the low-income populace have to buy cars in order to participate effectively in daily activities, including employment and education.

Social inequality also includes the expansion of development and housing away from Bandar Seri Begawan and Brunei Muara district. The National Housing Scheme is being built away from the capital city. The scheme aims to provide affordable and high-quality housing to eligible citizens (who have no land and come from low-income families) of Brunei. The development of the National Housing Scheme away from the capital city may promote automobile dependence and the reliance on private transportation may increase, due to the limited access to, and poor quality services of, public transport). As jobs become more distant from home, along with the increase in travel demand and car use, public transport becomes ever more unattractive. Because of these problems, lower-income populations have

to spend their money on cars (Ahmed et al., 2008), thus reducing their net incomes (Litman, 2014). This is a form of 'transport poverty', analogous to fuel poverty when households having to spend a disproportionate amount of their income on heating and lighting their homes.

This may corroborate findings from research in Beijing (China) and Karachi (Pakistan) (Ahmed et al., 2008), where the location of jobs away from homes causes public transport to become unattractive. Furthermore, the disproportionate investment in transportation in Beijing and Karachi (Ahmed et al., 2008) and in Thailand (Pongthanaisawan and Sorapipatana, 2010), which focuses on the development of highways to support traffic flow, has not only forced low-income earners to use or buy cars but has also caused people with limited or no access to cars and driving (such as the elderly generation, teenagers and people with health problems) to constrain their activities, causing them to be unable to fully participate in the many activities enjoyed by car users. Furthermore, Brunei's disregard for the importance of pedestrians and cyclists, a failing experienced by many cities such as in Beijing and Karachi (Ahmed et al., 2008), Tbilisi (Grdzelishvili and Sathre, 2011) and Brisbane (Buys and Miller, 2011). There is also the potentially dangerous challenge for would-be bus passengers of walking safely to and from bus stops (Guiver, 2007; Stradling et al., 2007) which also affects social equity by disadvantaging people reliant on public transport.

Income is one of the barriers to sustainable transport, and the income factor has caused high car ownership. In this study, there was a strong relationship between high income and car ownership. Ten out of 29 Bruneian participants with incomes of below BND $1000, and two out of 27 Bruneians with incomes of BND $1000 – BND $2000,[66] do not have a car. These figures does not include student participants. The Bruneian low-income earners in this study tend to be very dependent on cars, especially for the purpose of leisure activities, shopping, and family gatherings. This has increased car ownership.

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[66] BND $1000 – BND $2000 = £ 483.09 - £ 966.18.

The survival of buses in Brunei is dependent on the low-income immigrant and student population. The low-income earners in Brunei tend to be satisfied with the current bus services, but these services do not meet the demands of students. Therefore, a major upgrade in services and infrastructure is required in order to attract more passengers in the future, whilst dissuading the current bus user from switching from buses to cars, particularly the student population. These phenomena might be explained by the fact that public transportation in Brunei is still insufficient; hence, the low-income participants were forced to buy cars. In addition, Christie and Fone (2013) (car ownership study in Wales), Nolan (2010) (car ownership study in Ireland) and Scot-Parker et al. (2011) (young drivers and car ownership in Queensland) indicated that people living in the rural areas have higher car ownership than urban dwellers. This high ownership is associated with the lack of public transport services offered to the rural areas, which is similar to the case in Brunei. This observation is also supported by Johnson et al., (2011) and Currie and Senbergs (2007) who found that people on lower incomes have high car ownership. Giuliano and Dargay (2006) also indicated that a higher income does not correspond to high car ownership in the case of the USA. In the USA, the travel demand is increasing especially from lower- and middle-income earners, and cars are needed to meet the demand. This is because the USA does not have much public transport availability, or a great deal of choice concerning travel options. These findings support the ideas of Beirão and Cabral (2007) and Gardner and Abraham (2007), who suggest that the low cost of public transportation is important to members of lower and middle-class income society. However, the majority of middle-class income salary earners in Brunei do not use public transport.

A majority of the public transport users in Brunei (according to survey questionnaires, interviews and mini-exploratory activities) are students and low-income salary earners (Bruneian and non-Bruneian). Therefore, the cost of using public transport in Brunei is considered important. This finding further supports the conclusion of Charoentrakulpeeti et al., (2006) that public transport is considered inadequate to meet the demand of middle-class society. Furthermore, the use of bus services may portray the low self-image of the user (Buys and Miller, 2011). Students from high-income families in Beirut (Danaf et al., (2013), do not use buses because of the buses' low image. The bus user phenomena support the ideas

in newspaper articles (Bahrum, 2008; Buntar 2010; Shen 2011) that the bus services in Brunei are attracting the low-income immigrant workers. Shen (2011) further reported that 70 per cent of the bus users in Brunei are immigrant nationalities. The current domination of bus usage by non-Bruneians was shown to act as a deterrent to Bruneians' use of the bus.

There were similarities between the factors of adults especially having a car and employment expressed by Buys and Miller (2011), Cullinane (2003), Dargay and Hanly (2007), Delbosc and Currie (2012), Dupuy (1999) as quoted by Cullinane (2002), Giuliano and Dargay (2006), Kitamura (2009), Simmons et al., (2014), Matas et al. (2009), Nolan (2010), and Scott-Parker et al. (2011) in encouraging high car ownership.

The fuel subsidy, which makes both petrol and diesel in Brunei amongst the cheapest in the region, in addition to cheap car road tax and insurance, as well as the privilege of car loans and study allowances, helps to make car ownership easily affordable. Furthermore, the lump sum of road tax and car insurance (paid yearly) tends to mislead people about the true cost of having a car. The consistently cheap fuel makes it easier for people to estimate their travel costs. However, since the transportation environment in Brunei favours cars, especially due to urban planning and insufficient public transport causing the car to become essential, Bruneians tend to underestimate the cost of fuel use in their weekly/monthly budgets.

Surprisingly, one of the key factors promoting the use of buses is the issue of parking, which might limit car use in Brunei, particularly in town centres and the health centres: both hospitals and clinics. Although the parking issue does not greatly reduce the number of trips made or switch the mode of transportation from cars to buses, some Bruneians use the bus as a solution to the problems of parking. Therefore, the introduction of parking fees, the limited number of car parking spaces in town centres and health centres, and the new parking payment systems in town centres, have prompted some car users to turn to the bus. Furthermore, the worsening traffic congestion may have a strong positive influence on the transition to more sustainable transportation, such as the integration of land use plans and sustainable transportation policy. If the proposed rebranding of bus services, through the Bus New Tender and Brunei Land Transport Master Plan is implemented, so creating the concept

of mass transit, this initiative may meet the increasing demand for mobility amongst the Bruneians.

9.5.3 Public involvement in transport development

The majority of the literature emphasises the technological side of transportation and the need to increase public transport services and infrastructure. However, a limited amount of literature emphasises the role of the public in the development of transportation, particularly in democratic nations where most decisions are made by top-bottom governance.

Brunei is an automobile-dependent country with one of the highest rates of car ownership in the world. Moreover, according to a recent survey, with respect to the human population versus the car population in Brunei, it is suggested that every adult aged 19 and above has, on average, one car (Shen, 2011). Despite the inadequacies of public transportation, immigrant nationals still preferred the use of buses, especially at the weekends (mostly due to lack of options) (Buntar, 2010; Shen, 2011). Therefore, public participation in the transportation sector debate is urgently required in Brunei as, in the future, it will provide the following:

1. Information on the current transportation trend in Brunei, which will increase the awareness and knowledge of the community, especially the Bruneians, on the impact of transportation on their daily lives.

2. Awareness raising about the current and future environmental problems faced by the Bruneians through their dependence, and possible overdependence, on cars.

3. Review the current and potential transportation management performance and policy through open dialogue, discussion, and survey.

4. Respond to the current and future transportation landscape by emphasising the needs, demands and concern of the community through open dialogue, discussion, survey, letters and the Internet.

5. Assess the impact of the current and potential transportation changes on the social, economic and environmental spheres.

6. Assist the government and project proponents in the development of transportation in Brunei, especially in terms of potential solutions and transportation options.

One of the most important objectives of public participation is to increase the support of the community (Zhong et al., 2008). An example is the current public transportation situation in Brunei. The government and public transport operators have spent a certain amount of money on the improvement of services and infrastructure of the bus services in Brunei. However, the government and the public transport operators have not successfully attracted the locals to use the services. By involving themselves in public participation, the locals might voice their concerns about the services. The government should listen to the public's advice (Zhong et al., 2008) and consider their views, needs and demands (Wahl, 2013). The government and the public transport operators might increase the bus ridership by identifying the needs and demands of the bus users. This may lead to the improvement of efficiency and changes in travel behaviour (Huijts et al., 2012; Gatersleben and Uzzell, 2002). Furthermore, with the improvement in the services and infrastructure (favouring the public), the bus services would attract potential users in the future. This is relevant as Beirão and Cabral (2007) and Hiscock et al. (2002) identify that, in order to increase the number of potential public transport users, the services should:

1. Produce a design that fulfils the needs and the level of services required by the customer.

2. Offer similar benefits that will respond to different passengers' needs, such as the elderly and young generations.

The challenges for the public participation process in Brunei will be similar to those in other countries. Whitmarsh et al. (2011) studied public engagement with carbon and climate change in the UK. It was stated that the level of participation in carbon-reduction activities by active citizens in the UK is considered below the level required to achieve actual carbon reduction, based on the target of a 50 per cent reduction in greenhouse gas emissions by 2050. In the case of Brunei, the level of knowledge and awareness required for the public participation process is still unknown. If the process does not attract the public, it will probably be abandoned, as happened with the Regional Forest Programme in Northern

Finland (Saarikoski et al., 2010). Therefore, according to Whitmarsh et al. (2011), increasing the level of carbon-reduction capabilities is necessary, although it was considered insufficient to increase interest in a carbon-reduction lifestyle. Therefore, the Bruneian government and the project proponents must identify the issues to be discussed, as well as providing sufficient accessible information to the public and ensuring that the public are interested in participating in the process.

9.6 Conclusion

It has been widely acknowledged that the current transportation usage in Brunei is not sustainable. The population are highly dependent on the car, and the car is also known to be a less efficient way of travelling (compared to the mass transit such as trains and buses). In the wake of the Bruneian environmental awareness campaign, the shift towards sustainable development is becoming the main agenda. The transition from unsustainable transportation to sustainable transportation may help to achieve sustainable development.

Interest in preserving and maintaining the environmental quality in Brunei is increasing. There have been initiatives by the relevant authorities along with participation by the public, institutions (including educational ones), private sectors and NGOs to improve the quality of the environment in Brunei. Such initiatives include the current Heart of Borneo project, the cleaning campaign (including the rivers and beaches), tree plantation, and educational and awareness programmes. These initiatives have successfully increased the public's knowledge and awareness, particularly the Bruneians, of their environment. However, not much has been done in terms of the transportation sector. Despite the initiatives and projects conducted by the government and other research institutions, it has proved difficult to persuade people to give up their cars, or even modify their models or use.

Brunei is observing an increase in car use and ownership. Fortunately, the number of bus users in Brunei is also increasing, with more buses being provided to the populace, and more frequent buses on existing routes. However, the bus services are not keeping pace with the increasing development and travel demands for everyday activities. Since the 1970s, fuel in

Brunei has been sold at a fixed price, due to the subsidy. This has caused a slow increase in bus service use and a rapid increase in car usage. Despite the costs involved, such as maintenance, petrol, insurance and road tax, the car is still the preferred mode of transportation. With the bus services facing congestion problems caused by cars, in part due to the unavailability of dedicated bus lanes, as well as failing to attract more Bruneian users, bus services are facing challenges in attracting more potential users to switch from cars to buses.

This study has suggested that the transition from car use to bus use is challenging and complex. Plenty of work needs to be done, particularly in terms of education and awareness raising to motivate social change from a car culture to a bus culture. There is a need to study the current perceptions of cars and public transport in Brunei in order to increase the chances of motivating more potential users to switch to the bus services. Chapters 7 and 8 of this study examined the attitude and awareness of the study population regarding cars and buses, and their thoughts on sustainable transportation. It is hoped that this will shed light on the underlying causes of the low bus ridership. Studying the reasons for the low bus usage will help motivate potential passengers to use the bus and may gradually bring about a change in the choice of mode of transportation. The final chapter assesses the extent to which the MLP might be applied to assist the transition process in Brunei, in order to increase our understanding of what is happening or what may occur in the future. The chapter will also consider the potential adaptation of the theory to the cultural-economic-political situation in Brunei.

Chapter 10: MLP Transition Theory

10.0 Background

In this chapter the three levels of the MLP are used to identify the transportation scenarios in Brunei in order to support the development of low-carbon transportation. This chapter addresses the suitability of the sustainable transition theory, especially the MLP, to Brunei (research question 4) and outlines the study's contribution and suggestions for further studies associated with transition and transportation, particularly in Brunei.

10.1 Brunei and transition theory

The use of buses has been identified by the interviewees as one potential solution to Brunei's transportation problems. However, the previous Minister of Communications, noting that the Bruneians refused to utilise the existing public transport services, urged the community to use the services (Sadikin, 2010). Nevertheless, the Bruneians have complaints about the inadequate infrastructure and services of available public transportation (Oxford Business Group, 2008; Shahminan and Noor, 2010). Yet, according to the previous Minister of Energy, due to inadequate infrastructure and short sighted planning, the roads have been constructed only for motor vehicles and are unsuitable for pedestrians and bicycles (Oxford Business Group, 2008). In addition, the public transport infrastructure is considered poor with no dedicated traffic lanes for buses; hence, public transport is facing the same traffic problems as private vehicles (Oxford Business Group, 2008). Thus, there is a complex situation involving a range of stakeholders, formal regulations and informal practices informing any attempts to change the situation. This is the type of situation to which the

multi-level perspective has been applied elsewhere to understand and develop a sustainable transition.

The MLP provides a valuable tool for stakeholders in transport planning (Geels 2012; Whitmarsh, 2012). In addition, Spickermann et al. (2014) indicated that governmental authorities, strategic planners and multi-stakeholders play an important role in creating a sustainable Germany urban mobility system. Stakeholders may look into other factors, such as behaviour and culture that should be taken into consideration, thereby not solely focusing on investment and the improvement of transportation, particularly bus services, in transportation planning and policy to facilitate smooth shifts in mobility practices. The MLP will determine the effect of certain rules and regulations that might deter the shift towards low-carbon transportation. The role of subsidies and existing transport provisions, that favour the car's development, should be studied and necessary reforms should be introduced. The MLP might explain the reasons why people become locked into unsustainable transport systems, and identify the barriers to sustainability in Brunei, including and the current low bus usage, particularly amongst Bruneians. Thus, MLP identifies the role of actors from diverse fields and can bring them together in the field of transport planning.

The MLP might identify the actors and collaborations that should be in place to form the drivers to transition (Geels, 2012; Geels and Kemp, 2007; Köhler et al., 2009; Shove and Walker, 2010; Spickermann et al., 2014; Whitmarsh, 2012). The theory may also serve to identify the innovations and new technologies that are necessary for low-carbon transportation in Brunei. By applying the MLP to Brunei's transportation sector, it may be possible to identify the factors and pressures that influence the transition towards low-carbon transportation. Environmental concerns may not influence the transition, but the MLP may identify the hitherto unrecognised collective form of pressures, such as the National Housing Scheme leading to increased travel needs, and turn these pressures into actions to make people aware of the problems and influence the transition towards better transportation in Brunei.

10.2 Current mobility landscape in Brunei

The landscape in the mobility context is made up of the conditions, environment and pressure that influence the transition towards more sustainable transportation. Geels and Schot (2007, pg. 404) indicated that:

"The socio-technical landscape is a broad context that sustains action and actions easier than others. These external landscape developments do not mechanically impact niche and regimes, but need to be perceived and translated by actors to exert influence."

This study discovered several features of the mobility landscape that should be analysed and translated into influence or pressure towards low-carbon transportation but tend to be overlooked by the policy-makers, specifically in Brunei. The MLP has helped to define the context of transportation in Brunei. The thesis has identified the problems of transportation and highlighted the factors that would promote a transition. Transportation in Brunei is currently considered unsustainable[67]. Trends in unsustainable transportation in Brunei are expected to continue, typified by the increasing number of cars and excessive car use. There are several factors that lead to unsustainable mobility and transportation in Brunei, each of which is considered in turn here, starting with the issue of population increase. However, the most prominent landscape that always appears on the media in Brunei is climate change initiative (especially the government initiatives through legislation, act and international agreements)

An important development in the landscape is that Brunei is committed to cutting carbon emissions and reducing the impact of climate change in all sectors of economic activities, especially industry, transportation and energy. The importance of climate change and carbon emissions has put environmental issues, as well as energy security, at the top of the agenda in Brunei, even though there are currently no data published by the Government of Brunei on

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[67] The current transport arrangements are diminishing the petroleum reserves (non-renewable resources) and have a global atmospheric impact and a local air quality impact (Black and Nijkamp, 2002; Black, 2010; Wegener and Green, 2002).

carbon emissions. However, carbon emissions in Brunei are reported to be the highest per capita amongst the ASEAN countries in 2007 (No, 2010) and in the ASEAN region (Bandial, 2013). The transport sector is one of the major contributors to carbon emissions and other greenhouse gases in Brunei, according to the interviewees from the EDPMO and Ministry of Communications. Improving public transportation is another initiative; however, the car is still the preferred option for travelling, especially for employment and education purposes.
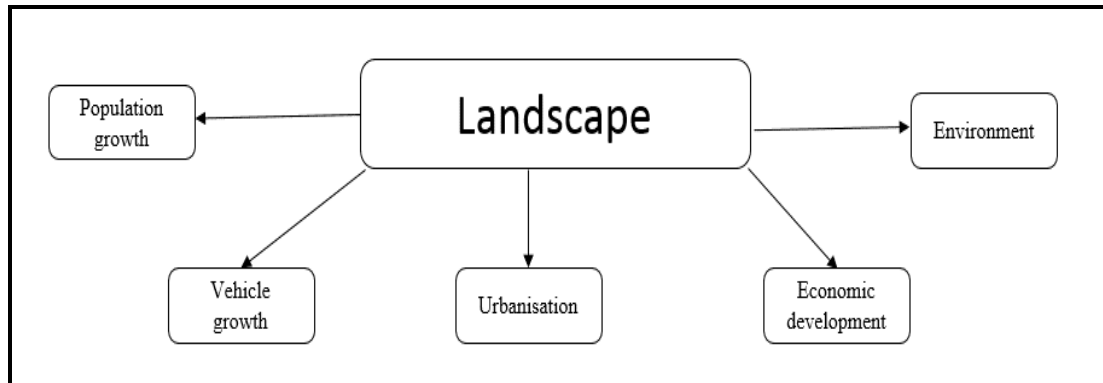
Figure 10.2 Current mobility landscape in Brunei.

The Local Forest Act, along with the signing of regional and international agreements, further highlighted the need for sustainable mobility. The Department of Forestry in Brunei, through Sustainable Forestry Management under the National Forestry Policy, has planned to maintain more than 55 per cent of forest reserves and permanent forest estates in Brunei (Thien, 2010b). The Department of Forestry is actively undertaking reforestation, such as tree planting activities to mark 30 years of diplomatic relations between Brunei and Thailand, on the 15th September 2014 (Kassim, 2014). The Forestry Department has seen an increase in the forested areas from 75 per cent in 2005 to 78 per cent in 2010[68] (Thien, 2010b). Furthermore, the annual rate of change through deforestation in 2010 was less than 0.5 per cent (Bandial, 2011). The Heart of Borneo project commits Brunei to preserving 58% of the forested area for this project (Piri, 2012). This brings pressure for more sustainable modes of transportation by reducing the amount of land cleared for development projects, especially

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[68] Replanting trees is one of the popular initiatives of the Department of Forestry, Brunei. The researcher was given the opportunity to participate in the replanting of trees, in conjunction with the Forestry Day, during his secondary school experience.

road infrastructure. Such pressure also forces the relevant authorities to undertake better rural and urban planning by improving the bus system's services and infrastructure in Brunei and creating awareness in order to increase ridership amongst Bruneians.

Furthermore, the discourse on climate change, sustainability and low carbon emissions taking place at meetings, seminars, conferences and activities in Brunei has led Bruneians, especially the younger generation, to take an interest in, and seek better knowledge of, the issues of transportation. Concern for the stability of Brunei's oil and gas related economic activities may imply that fuel subsidies may not last[69], and the finite oil and gas reserves, together with their revenues, will be used up. This development has led to investment and funding for low-carbon transportation and research into, and development of, innovations and new technologies in Brunei, such as electric cars (see chapters 5 and 6). The pressure from the media, in particular about carbon emissions, along with international agreements on the environment, has indirectly promoted sustainable transportation policies and planning in Brunei. This includes the National Housing Scheme, where building is moving towards high-rise apartments with high-density occupancy, thus promoting non-motorised transportation, and energy efficiency programmes that enhance and improve awareness of carbon emissions in Brunei.

Another development that impacts the landscape is the fact that the population of Brunei is gradually increasing. As shown in Table 1.3 (Chapter 1), the populations of Bruneians and non-Bruneians are increasing. The population density is also increasing (although still low[70]). The land area of Brunei Muara is limited, motivating the government to shift housing schemes and other development away from Brunei Muara district, or at least away from Bandar Seri Begawan. Because of the increase in population, the number of houses is

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[69] The Government of Malaysia abolished the subsidies of petrol and diesel on the 1st December 2014 (Ngui and Raghu, 2014).

[70] The population density in Brunei is 69 persons per square kilometre; however, the population density of Brunei Muara district is 500 persons per square kilometre. Brunei Muara district is the smallest district in Brunei. Brunei Muara is the administrative centre and about 71 per cent of Brunei's population live there. This excludes those people commuting to Bandar Seri Begawan every day for employment and education purposes.

increasing and thousands of new houses, flats and apartments are now under construction to accommodate the nation's growing population. The shift in the location of housing schemes may help to reduce the population density. The low population density may result in poor accessibility to activities such as employment, education and social activities and may increase the number of journeys made (Headicar, 2009; Pacione, 2001). This situation produces an increase in the demand for travel (Pacione, 2001; Pongthanaisawan and Sorapipatana, 2010), something which is occurring slowly in Brunei. The public transport services in the other districts are not fully developed; hence, with fewer services offered to the populace, people are turning to cars (Headicar, 2009; Pongthanaisawan and Sorapipatana, 2010). These researchers argue that limited affordable and efficient options in the provision of public transport contribute to car dependence, even in countries such as the UK and Thailand, where alternative modes of travel are available.

A further pressure is the increase in the number of cars in Brunei, a phenomenon which is due to several factors. Apart from the need to travel for specific activities, the role of government and other institutions, also directly and indirectly influences the increase in car ownership. A key incentive is the low cost of car insurance and road tax (Bahrum, 2008; Oxford Business Group, 2008). In 2011, the government of Brunei lowered the excise tax for energy-efficient cars (No, 2011). Moreover, the fuel price[71] is amongst the lowest in the ASEAN region (Bandial, 2010; Masli, 2010a; Oxford Business Group, 2008; Shen, 2012). Finally, government expenditure has produced good road infrastructure for cars but limited infrastructure for non-motorised transport (Stephen, 2011).

Ground-based public transportation is limited to the use of buses, with a decreasing number of taxis in Brunei and no public transportation in Temburong district. Bus services complement the car, as the majority of non-Bruneian immigrant population use buses for travelling; a single journey costs BND $1.00, regardless of journey length. The two public bus services in Brunei are the franchise buses, operating only in Brunei Muara and Belait

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[71] Since the 1970s, petrol in Brunei has been sold at fixed prices: Premium 97 costs BND $0.536 (£ 0.259) per litre, Super 92 costs BND $0.547 (£ 0.264) per litre and Diesel costs BND $0.325 (£ 0.157) per litre.

districts, and the inter-district buses. The latter run either from Belait district, via Tutong district, to Brunei Muara or from Tutong district to Brunei Muara. However, the Bruneians particularly in this study do not fully utilise the bus services. The survival of bus services is dependent on the immigrant population[72] even though they mainly use the buses at weekends, since they are taken to work by company vehicles during week days. The bus services are considered insufficient according to the interviewees, especially those from the Ministry of Communications and bus operators, as the services fail to meet the mobility demands of Bruneians. This is particularly true for employment and education travel. The possibilities offered by cars are more compelling, while the bus services are unappealing.

The combined factors of increasing population, housing pressure and increased travel needs, all of which trigger the use and ownership of cars, tend to be overlooked in land planning and transport policy. The implications of an increasing population have led to the outward development of housing,[73] instead of upwards development such as flats and apartments, which has resulted in an increased need for mobility. It was determined that, although several government departments have policies for sustainability, uncoordinated planning amongst these departments seems to be leading to less sustainable options. One of the major mismatches is the solution to traffic congestion. One of the departments indicated that its vision for sustainability is to create and open new routes by building more roads and bridges. A majority of the participants in the questionnaire survey in this study wish to see a greater choice of public transportation options. For example, mass transit is one option to be explored, although there are physical constraints, as there is a limited amount of land available for developing a financially sustainable system to reduce traffic congestion. Another department indicated that the shifting of housing and development, and sources of

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[72] Only a small number of elderly people and students use the buses.

[73] An interesting cultural fact is that Bruneians tend to prefer to live in individual houses (renting, buying or building their own houses) to living in apartments. For example, interviewee 14 is applying for a house through the National Housing Scheme and indicated that he will reject the scheme if he is offered an apartment or a flat and only wishes for a single house.

employment, may reduce the population density problems in Brunei Muara, thus reducing traffic congestion.

An important factor that distinguishes Brunei from other countries is the economic incentives offered to the public and made possible by the increasing economic development in Brunei. Brunei is an oil and gas-producing nation. Because of the increasing economic development (and the small population), the GDP per capita is amongst the highest in the world. Thus, Brunei can afford to subsidise several necessities such as rice and petrol, as well as providing free education and healthcare and no personal income tax. Furthermore, the increase in cars and mobility is associated with economic growth, as in Karachi and Beijing (Ahmed et al., 2008) and in Thailand (Pongthanaisawan and Sorapipatana, 2010). The main reason for this association is the fact that the increase in economic growth increases people's purchasing power and stimulates them to own private cars (Ahmed et al., 2008; Pongthanaisawan and Sorapipatana, 2010). This is especially true for Bruneians (and similar finding from Qatar Case study as mentioned in Chapter 2 where Qataris have higher purchasing power for cars and one of the reasons for this purchasing power is the non-existence of personal income tax). In the case of Brunei, low-salary earners tend to buy cars due to their affordability, convenience of travelling for both social and employment trips and for enhancing flexibility of travel, including not having to walk to the bus stop and use the bus. To some respondents the use of buses was perceived to be expensive if the passenger needed to make multiple journeys in a single day (Please refer to Figure 7.1.3 (a) and (b) for the participants response for using car and bus and the yearly cost of acquiring a car, including the cost of monthly payment, car insurance, fuel cost and road tax).

This corroborates the findings of Guiver (2007) who studied perceptions of bus travel by focus groups conducted in Leeds, Otley, Dundee in Scotland, Caton in Lancashire, and in Prenton. Guiver (2007) indicated that some car users thought the use of a car is worthwhile, because of its convenience and flexibility of travel, despite the high cost of a car compared to the use of buses. Furthermore, Guiver (2007) also indicated that the convenience of travelling by car outweighs the cost of individual trips by bus. These economic incentives tend to push Bruneians towards unsustainable behaviour, especially excessive use of petrol due to

unnecessary travel. This causes the Brunei government to spend more on subsidies. The problems may worsen as the income from oil and gas decreases due to the increasing local demands, causing a decrease in the export of petroleum (refer to figures 5.4 (b), (c) and (d)). Additionally, oil prices which tend to be unstable, and are currently decreasing, along with the decreasing oil and gas reserves, may slow down economic growth.

These landscape pressures might be translated into actions, especially by the government, to influence the transition towards more sustainable and environmentally-friendly attitudes and behaviour; particularly when it comes to sustainable transportation attitudes and behaviour. Landscape pressure might also be used to create more environmental awareness amongst the population, especially concerning transportation, through a series of education and awareness raising programmes. Furthermore, the government might use this pressure to influence the growth of bus services as one of the top agendas on sustainability and promote the use of technological and non-technological niches to reduce the pressure on revenues and the environment. In addition, this landscape and these niches might be scaled up in order to compete with the current mobility regime, especially to replace the existing bus regime and the attitudes and perceptions regime. The following sections explore the mobility regimes and niches in Brunei, in order to consider current barriers to change and how the government might use them to promote a transition to sustainability.

10.3 Current mobility regime in Brunei

The regime in the MLP refers to the dominant norms and beliefs, sets of rules, practices and routines, and the technology that provides the stability enclosed in society (Köhler et al., 2009). This study has shown the fundamental importance of the norms of behaviour and beliefs of individuals in the conservation of technology favoured by the existing mobility regime; in other words, the use of the motor car as the predominant method of transport. Based on the findings, some of the regimes that have influenced the unsustainable mobility of the populace are: 1) the belief that the bus is for lower-class people, including low-income foreign nationals 2) the cost of acquiring cars, which are perceived to be affordable and cheaper than the use of bus services 3) the increasing demand for mobility and travel needs

4) the inadequate non-motorised transport infrastructure, and 5) the policy that indirectly favours car development.

Part of the mobility regime is the bus service in Brunei. The public transport services in Brunei are dominated by bus services. However, the bus services are unattractive to the locals, despite being used by the immigrant population, due to their limited choices. The survival of bus services faces challenges, especially with the negative perception held by Bruneians that 'buses are for foreigners'. This negative view was also identified by Hine and Scott (2000) who noted that in Edinburgh, the 'public transport was for second-class citizens', which may complicate the initiative to attract more bus passengers in Brunei. The bus services will face a huge challenge if a major revamp is not implemented. Bus services currently attract the lower-income groups. The survival of buses in Brunei therefore depends on the low-income foreign workers and members of the student and elderly populations. The non-Bruneian low-income earners tended to be satisfied with the current bus services in Brunei, as they allowed them to participate in many social and leisure activities. However, the current bus services in Brunei did not meet the students' demand.
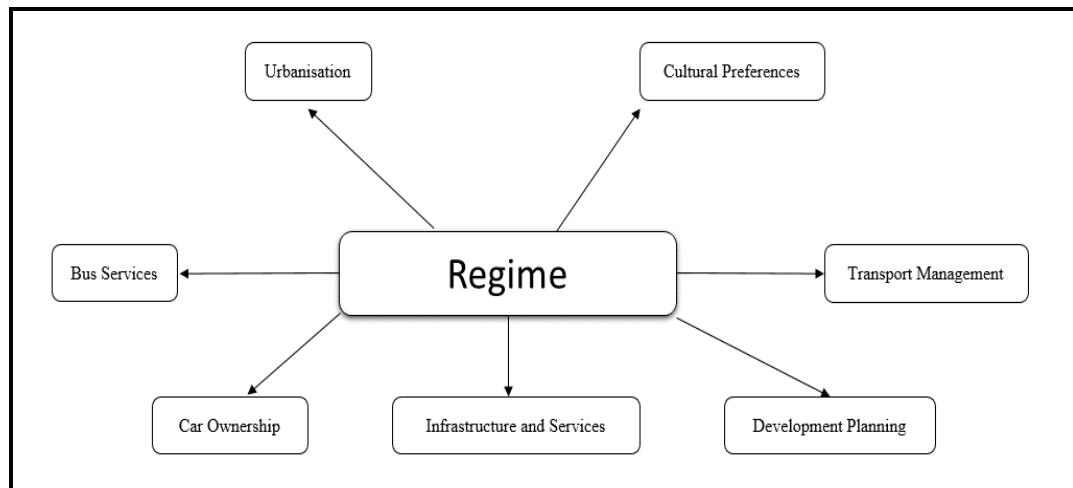
Figure 10.3 Current mobility regime in Brunei.

The preference for cars over buses is also due to the fact that the bus services in Brunei operate in only three districts of Brunei, namely Brunei Muara, Belait and Tutong. There are no bus or taxi services in Temburong district. However, some research participants from the Temburong district use the bus services. These participants mostly use multiple modes of

transportation, including ferries and buses. Temburong district is separated from the other districts by Brunei Bay but it is connected to Brunei Muara by ferry. Thus, it is possible that participants visiting Brunei Muara use the ferry from Temburong and continue their journeys by bus once arriving in Brunei Muara. The franchise buses in Brunei only operate widely in Brunei Muara district and on the return route between Seria and Kuala Belait in Belait District. There is no franchise bus in Tutong district. The inter-district buses operate in the three districts of Brunei, either on the return journey from Brunei Muara to Belait district (via Tutong district) or between Tutong district and Brunei Muara district.

The cultural preference for speed deters people from using buses in Brunei. The lack of satisfaction with the frequency, regularity and punctuality of buses in Brunei is similar to the attitudes to public transport found in Georgia (Grdzelishnili and Sathre, 2011), Penang, (Chee and Fernandez, 2013), Brisbane (Buys and Miller, 2011) and parts of the UK (Guiver 2007). In addition, lack of comfort while travelling (Belwal and Belwal, 2010; Beirão and Cabral, 2007; Buys and Miller, 2011; Chee and Fernandez 2013; dell'Olia et al., 2011), such as uncomfortable seats, unpleasant temperatures and overcrowding, puts off potential bus users in Brunei. Furthermore, the current franchise bus services do not fully meet the people's demand, in terms of speed. All the interviewees who use the bus services indicated that they need to use two bus services in order to reach their destinations. The occurrence of traffic jams, which are worsening, and the absence of bus lanes, mean that the bus is not an ideal way of travelling to work.

The use of cars is more attractive than using buses, especially given that car use enhances travel needs and provides door-to-door travel. Government policy favours the development of cars directly, such as car loans and cheap petrol, as well as indirectly via outlying housing schemes. This has led to many of the lower and middle-class salary earners having cars. This Bruneian situation was, however, considered different from other countries. Furthermore, younger generations in Brunei are exposed to the use of cars and parents tend to restrict their children from using the bus (and to some extend chauffeur their children to education institutions despite their children are studying undergraduate or postgraduate level in the local universities). Furthermore, low income earner in Brunei also choose to have a car

instead of two wheel vehicles such as motorcycles as experienced in Taiwan and Malaysia (the high-income earners tend to use cars and are unlikely to use buses, while low-income earners tend to use motorcycles). Furthermore, Danaf et al. (2014) indicated that high-income students are less likely to use buses in Beirut, while Verma (2014) also indicated that high car ownership in India amongst young people is due to the availability of car loans and finance schemes. However, Jeekel (2014) believed that poorer families (such as in the UK and the US) have cars in order to participate in the car-dependent society; cars for accessing work, health services and cheap shopping, although they pay a high cost for mobility.

Other surveys have also suggested that monetary value is an important factor in using public transport, particularly for senior people (Wall and McDonalds, 2007) and lower-income groups (Beirão and Cabral, 2007; Wall and McDonalds). Chee and Fernandez (2013) showed that a higher share of lower-income groups in Penang, Malaysia, use public transport, as they are unable to afford private transport. However, cheaper cost is not a central factor affecting the shift from car to public transport in Brunei. The rules, such as the subsidy regime, tend to make the car more attractive than using buses. Furthermore, second-hand cars in Brunei, according to the findings, are amongst the type of cars being bought by students (especially international students) or people with financial problems, such as limited funding. These costs are considered affordable, even for those with unstable incomes, such as students relying on monthly educational allowances. These factors in the regime either motivate or force Bruneians to own a car.

Car ownership is another regime factor hindering the change towards sustainability. Many, if not all, of the students who currently use bus services are planning to buy a car in the near future. Since a majority of students use the bus because they have no other choice, and since the current bus services do not satisfy the young generation's needs, car ownership amongst the student population is a priority that is only likely to increase. The increase in socio-economic status in Brunei, such as no income taxes along with heavily subsidised goods like petrol, enables Bruneians, including college and university students, to buy their own cars. Furthermore, the study findings also indicated that the participants in both the interview and survey processes have multiple cars per household. This will eventually develop the cultural

perception that the car is a necessary item, especially amongst the young generations and will stimulate individual car ownership. This will work against the initiative for car sharing or initiatives to encourage the use of bus services rather than cars.

The process of making a decision on buying a car in Brunei tends to be straightforward. The majority of the participants have at least one car, and most of the research participants who do not have a car are planning to acquire one in the near future. About a third of the public transport users in Brunei also have at least one car. One of the reasons for this may be the access to cars or number of car drivers in the household. This has been illustrated by Chee and Fernandez (2013), who found that possession of a driving license and regular access to private vehicles influence the mode of choice. Moreover, the Bruneians were seen to have no choice in deciding on their mode of transportation, as in the studies by Hine and Scott (2000) and Hiscock et al. (2002). The current bus services and infrastructure in Brunei are considered inadequate, similar to findings in other empirical literature (Buys and Miller, 2011; Chee and Fernandez, 2013; Hine and Scott, 2000; Hiscock et al., 2002; Grdzelishvili and Sathre, 2011). It can be concluded that bus services are seen to be favouring the needs of foreign nationals. The perceptions of cars tend to be positive and that inadequate bus services strengthen people's positive views on cars.

Additionally, the majority of Bruneian students are helped out by their parents, who compensate them for the annual cost of the car by paying for the car insurance and road taxes. To some extent, students are given pocket money for petrol. Some parents buy cars for their children as a prize because their children have excelled in their public exams, especially 'A' levels. Hence, the parents do not have to drive their children to college/university. This corroborates the findings of Gardner and Abraham (2007) and Hine and Scott (2000) that car users tend to underestimate the expenses of the motor car, considering only the operating costs. Despite the cost factor noted by Beirão and Cabral (2007), Gardner and Abraham (2007), Hiscock et al. (2002) and Root et al. (1996) also mentioned the importance of cost in minimising the travel budget. However, it seemed that the cost had no effect on the preference for mode of transportation amongst the Bruneian participants.

Infrastructure and services are other parts of the transportation regime in Brunei. The public transport system is under pressure from the impact of the transport policies. In the US, Buehler (2011) indicated that one of the causes of the high percentage of trips made by car (90 per cent) is the various transport policies. Examples of these include low gasoline taxes and registration fees, highly subsidised road construction and maintenance, cheap parking, and poor public transport services in terms of frequency and access; all factors that favour the use of cars in the US. In Australia, Moodie and Barrett (2007) indicated that the public transport system is facing under-investment, with a focus on car-centric planning policy; this orientation in turn leads to poor service coverage and access, especially in many outer-suburban areas. Furthermore, the disproportionate investment in Thailand (Pongthanaisawan and Sorapipatana, 2010), in Beijing and Karachi (Ahmed et al., 2008) in support of traffic flow, a policy which often overlooks the necessary infrastructure for non-motorised transportation, further supports the use of motorised vehicles.

Major upgrades in services and infrastructure are required in order to attract more passengers in the future, whilst dissuading the current bus users from switching from the bus to the car; a proviso that applies particularly to the student population. Participants in Tbilisi (Grdzelishvili and Sathre, 2011) want improved public transportation in terms of services, information, safety and security, convenience, reliability and ventilation / air conditioning. The participants also wanted fares to be scaled down for students. This is similar to the conditions that motivate people in Porto (Portugal) to use the public transportation (Beirão and Cabral, 2007). All the bus operators in this present study indicated that the current bus services need more investment in order to attract more bus users in the future. The bus operators emphasised that the bus stops should be placed 100 – 200 metres apart and believed that the government is gearing much of its road investment towards cars.

Nonetheless, the public transport operators in Brunei are optimistic about delivering better services to the customers and are willing to improve the standards and quality of services. A majority of the public transport operators are willing to improve their services in order to improve accessibility for all groups, including students, business personnel and people with special needs. In addition, one of the public transport operators has devised a series of

initiatives to increase the attractiveness of the bus services. The bus transport operator has also been studying the feasibility of electric buses, as well[74] as hybrid technology buses. Bus operators also wished to help the government provide additional infrastructure, especially bus stops, at several locations where they consider them necessary. However, due to the tender restrictions, the bus operator has to wait for the result of the tenders. The bus operators will invest in bus stops provided they are awarded the bus tender.

Housing development planning tends to be influenced by the car. Furthermore, the uneven distribution of economic, industrial and housing scheme developments tends to make it difficult to use public transport, resulting in the need for a car. With the increasing economic growth in diversifying economic activities in Brunei, the demand for travel increases along with the transport of goods. The opportunities offered by cars include flexible travel times and destinations, comfort in travelling, diminution of problems associated with certain activities such as shopping and travelling with children. Furthermore having a car would have advantages on employment opportunities, as well as enhancing social interaction and connection with other people. The study's findings on travelling to work concur with the findings of several accounts in the literature that the bus is a significant factor in delays (Hine and Scott, 2000) and provides limited access to certain areas (Belwal and Belwal, 2010), while the car offers convenience, effortless travel and direct journeys (Anabel and Gatersleben, 2005; Buys and Miller, 2011; Ellaway et al., 2003). Furthermore, travel for social activities such as leisure, shopping and family gatherings is also dominated by cars. Hine and Scott (2000) indicated that people develop car resistance to shift from cars to public transport especially for performing social activities. This may be due to the absence of direct routes, especially to shopping complexes (Hine and Scott, 2000), and the difficulty of carrying items such as groceries (Buys and Miller, 2011).

Another regime is transport management, especially the key role of transportation governance, which promotes sustainable transportation. This includes the identification of problems such as conflicting visions and the government policy that indirectly causes the bus

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[74] The current franchise buses have been retendered for the second time. The new bus tender is still under evaluation.

services to be unattractive, which leads to car dependence. The thesis highlighted the limited roles of bus operators in assisting the government to provide better services and infrastructure. Their roles are limited to providing feedback and statistics on bus users to the Ministry of Communications. The government is hoping to move from top-down governance in transportation issues to a mixture of top-down and bottom-up governance. However, the platform for non-government actors, especially the public, is unclear. Additionally, the public do not know how to participate in transportation development.

For example, transport policy tends to address the smooth flow of traffic and attempts to reduce traffic congestion by building and widening roads. This, in turn, will address the problems of air pollution caused by traffic congestion. However, the environmental part of sustainability in transportation tends to be overlooked, despite the ministry being active in carbon reduction from electricity generation and climate change. The construction of roads tends to overlook the need to provide more non-transport facilities to the populace. The construction of better sidewalks and cycle paths is necessary, especially near workplaces and public and educational facilities. Providing employment and educational facilities and other social activities, such as leisure, shopping and family gathering activities within walking and cycling distance from their home will reduce the need to use the car. Thus, a clear shared vision is important in order to reduce conflicting visions of sustainable transportation.

User practice also serves as part of the transport regimes in Brunei. The user practice includes the perceptions, attitudes and behaviour towards buses and cars, as well as travel behaviour. Based on the findings in chapters 7 and 8, Bruneians have positive perceptions of cars and negative perceptions of buses. Furthermore, the culture of speed and the reluctance to allow family members and friends to use the bus service, contribute to the low utilisation of bus services by Bruneians and the promotion of cars. This indirectly influences car purchasing behaviour, as do the economic incentives such as low insurance, road tax and fuel prices, and travel behaviour that tends to be over dependent on car use.

Another important regime is fuel. This includes the price, the location of fuel stations and the reliability of fuel supplies (both petrol and diesel) throughout Brunei. As mentioned several times in this paper, the petrol price in Brunei is amongst the cheapest in the world (subsidised

by the government). Furthermore, the large number of filling stations in Brunei, the reliable fuel supplies (it is very rare to find a fuel station that has run out of petrol or diesel, except during the festive seasons) and the fixed price of fuel at every petrol station,[75] are all conditions favouring the excessive use of cars.
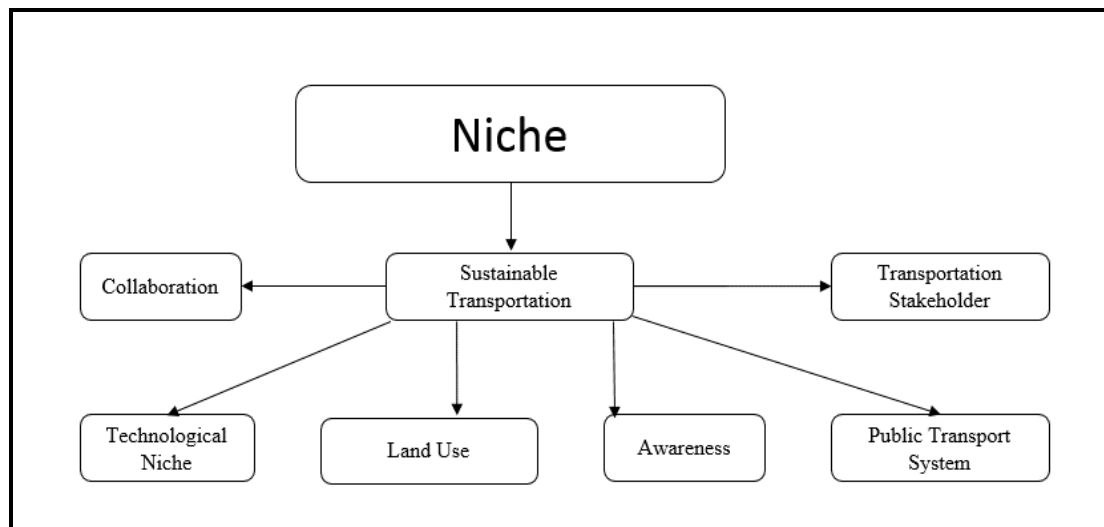
10.4 Current mobility niche in Brunei

A niche is the location where radical innovation and experimentation are taking place (Geels, 2002; Genus and Coles, 2008). Niches offer new practices and innovations that are protected from the influences of the market and regulations and are developed over time to challenge, or compete with, the dominant regime. Niche can be tackled sector by sector with emphasis on the energy sector. For example, in Turkey, the climate change strategy, towards low carbon urban development, emphasises two sectors: the settlement and carbon emission sector and the building and energy sector. These include decreasing energy consumption in public buildings, increasing the energy efficiency in commercial and public buildings and reducing carbon emissions from all new settlements by 10 per cent by 2023 (Kocabas, 2013). In Brunei, the sustainability strategy is also being tackled sector by sector, with the forestry and energy sectors being amongst the most active sectors in reducing carbon emissions and enhancing efficiency. Additionally, the building sectors and planning are also moving towards sustainability, thereby aiming to contribute to the reduction of carbon emissions in Brunei.

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[75] In several countries, such as the UK, the price of petrol varies from one station to another or from one area to another. Canocchi (2014) reported that drivers pay 10p a litre more on motorways compared to average prices and 16p more compared to supermarket prices. Collins (2014) also indicated that motorway filling stations charged up to 8p more per litre for petrol and 10p more per litre for diesel compared to the national average. This causes motorists to drive additional miles for cheaper prices (to non-motorway filling stations). Furthermore, Taylor and Massey (2014) found that motorists obtained cheaper petrol in the cheapest areas but paid more in the most expensive areas (in December 2014). For example, in Cardiff, Asda in Grangetown charged 114.7p per litre for petrol and 119.7p per litre for diesel, compared to Gulf in Llantrisant Road, which charged 133.9p for petrol and 140.9p per litre for diesel. In Brunei, the fuel prices are fixed.

The government and the public transport operators acknowledge the challenges involved in the transition to sustainability, especially to low-carbon-emission transportation. The government and the public transport operators thought that they had done much to achieve the sustainability vision. The government, through various ministries and departments, has implemented several strategies to reduce car-related problems.

Figure 10.4 Current mobility niche in Brunei.

The government is actively seeking a solution to the problem of unsustainable mobility in Brunei. The government also acknowledges the issues that Brunei will face if the trends in transportation and mobility are not changed. The government has tried various initiatives and introduced several innovations in the niche to change the regime. The main focus was on attempting to attract Bruneians to use the bus, through a series of campaigns, initiatives and projects. Accordingly, the government and the public transport operators have often organised meetings and discussions on ways to improve public transportation and increase bus ridership. The government has also circulated research feedback to car dealers selling hybrid cars, on the public's acceptance of hybrid vehicles.

The government, through the collaboration of different ministries, is trying to disrupt the established car culture and behaviour, by creating (environmental) awareness at the grass-roots levels. 'Green' societies have been set up in schools to create awareness and improve knowledge of environmental protection and preservation. Furthermore, environmental

projects and campaigns have been organised by the government to create opportunities for teachers and students to find out more about environmental conservation and preservation and the issues related to environmental destruction. One of the representatives from the EDPMO indicated that the projects and campaigns also indirectly motivate the students' and teachers' household members to take an interest in environmental issues. The aims such projects and campaigns (as mentioned by the representative from EDPMO) were to build a social network, enrol more actors, provide guidance on the current transportation problems, and attract the attention and interest of the younger generation in low-carbon transportation.

Another niche is the involvement of other stakeholders, who directly and indirectly influence the transportation sector in Brunei. Bose (2013), Karner and Niemeler (2013), Litman (2014), and Shi and Zhou (2012) believed that the role of stakeholders and their involvement, might reduce potential conflict(s) and improve the applicability of the solutions. Public transport operators in Brunei are taking the initiative to improve the services and bus passenger experience by specifying three main areas: frequency and punctuality, comfort, and safety. The operators also arranged a series of studies to improve their quality, services and customer care. Despite these efforts, satisfaction with their services is still considered low amongst both the Bruneians and the government. Furthermore, due to the limited scope and input from the government, their vision of improving the bus infrastructure through their corporate service to the customer, tends to be overlooked. This is because the main provider of the infrastructure is the government, in the form of various departments of various ministries.

The role of NGOs in Brunei has become increasingly visible and important in the field of environmental issues in recent years. Although there are no NGOs representing the transportation sector, the majority of the environmental NGOs are stressing their vision of sustainability and conservation, in terms of the environment and energy. However, NGOs in Brunei are still in their infancy and have limited resources. Furthermore, one of the retired interviewees indicated that the majority of the NGOs are represented by energetic youth and are eager to protect the environment. Their vision is vigorous and their views and campaigns may not generally represent the elderly generation, who are quite resistant to change.

Another positive development in the niche is the increasing demand, albeit still low, from the public to be involved in the relevant decision-making processes, as a result of the influence in the landscape level. The public expressed their dissatisfaction with the few opportunities to participate in decisions on transportation issues. A majority of the participants were not sure how to engage in public participation. Members of the public were also not sure how their input and ideas might influence the decision-making. Furthermore, one of the interviewees indicated that the lack of public participation was due to their limited knowledge on the technical part of the process, as well as the term. The participant called upon the relevant authorities to use simpler methods to explain the advantages and disadvantages of certain projects to the communities. However, the public is becoming more knowledgeable on the issues of transport sustainability. The public is urging the government and public transport operators to improve the quality of public transport systems. The public is also calling for Bruneians to use public transport more in the future.

Other niche developments were suggested by the participants towards low-carbon transportation. These include a new image for buses with comparable quality, services and infrastructure to the transportation conditions in neighbouring countries such as Singapore; or those available in Western nations such as the UK and Australia. Furthermore, participants were more willing to use other mass transport options, such as the Mass Rapid Transit (MRT) or Light Rail Transport (LRT), as compared to the use of buses, should such options ever become available in Brunei. However, the majority of the interviewees did not wish to use the public transport, instead urging other people to change their behaviour towards cars and buses.

A new public transport system in Brunei is another niche that it is hoped will reduce the car dependency. The Ministry of Communications is in the process of reviewing tenders for the new bus service system in Brunei, as well as creating the Brunei Land Transport Master Plan. Both the tender and the master plan are designed to disrupt car dependency by improving the public transport system, including bus and taxi franchises. This master plan and the tenders will transform the current bus services into a modern bus system through the use of ICT providing real-time information. Other hoped for benefits involve better route planning,

better services, access, and transfer hubs, addressing the needs of the elderly, the young and working citizens. The master plan and tenders will offer a smart choice of travel that aims to reduce car use, including travel to workplaces, educational institutions and other important amenities such as health centres and hospitals. Studies have indicated that postgraduate students in the National University of Malaysia would be attracted to use buses if there are reductions in time travel, travel costs and waiting time, as well as the improvement in bus stop conditions (Mohammed and Shakir, 2013).

Furthermore, several niche developments are planned for the future transition to low-carbon transportation. It is planned to implement technological initiatives, such as fuel improvement and fuel efficiency, in the future. This will enable cleaner car engines to be imported to Brunei. The introduction of low-carbon transport to Brunei is still under review. Furthermore, studies are being undertaken into the feasibility of using electric cars in Brunei; at present only a few companies are selling hybrid cars in Brunei. One of the interviewees, from the Ministry of Communications, indicated that a team has been set up to study the feasibility of using electric buses in Brunei. These learning processes involving technological initiatives are being studied to identify prominent technological issues and provide the facilities. For example, electric cars are suitable for Brunei due to its small land area, but there are issues in terms of facilities, such as recharging points. Also investigated will be feedback on the market demand in Brunei, as well as the use of policy instruments such as subsidies, and the key challenge of how to attract the attention of Bruneians to the new technology.

There are some possibilities of shifting public attitudes towards greener travel behaviour, especially by looking at the willingness of the Bruneians and the participants to consider environmentally friendly cars. However, even if it is possible to reduce carbon emissions and energy usage per trip, the problems of traffic congestion and car ownership will still exist. The introduction of environmentally friendly cars also depends on the performance and cost of the cars. The study findings indicated that participants are willing to buy hybrid cars if the performance and cost are comparable to conventional cars. The majority were unwilling to

buy hybrid cars if they are more expensive than conventional cars, despite the fact that car dealers indicated there is an increasing demand for hybrid cars in Brunei.

In support of the initiatives from the Ministry of Communications, the Ministry of Development is enhancing its planning strategies, especially in terms of land use. Dense neighbourhoods, according to Acker et al. (2014), tend to have lower car availability; thus mixed-use development could reduce the use of cars, promote non-motorised transport and might eventually reduce the necessity to own a car. However, such positive outcomes depend on Brunei having good public transport as envisaged in the Brunei Transport Master Plan and the New Public Transport Tender. Furthermore, Acker et al., (2014) indicated that travel attitudes are shaped after choosing the residential locations. One of the interviewees from the Ministry of Development indicated that the current housing areas in Brunei are equipped with amenities such as schools and multi-purpose halls. The future direction of housing in Brunei is towards upward development, with the introduction of apartments to create compact and high-density housing. Equally, there will be more systematic mixed-use development in the housing areas to promote non-motorised transport such as walking and cycling. This mixed-use development should also reduce journey times by making the desired amenities more accessible, and increase safety for children and elderly people.

In contrast to the cases of Brunei and Turkey, replication and up-scaling of the niche (such as the development of new public transport options that could compete with cars) are not a major issue in Brunei. The two major key issues faced by Turkey are public awareness and lack of financial incentives by the Turkish government: policy programmes and niche developments are substantially assisted by the EU, UNDP and other nations, such as the UK (Kocabas, 2013). In the case of Brunei, financial incentives to upscale the identified niche are not a major issue (see chapter 10.7 (a) reporting the Brunei government providing free installation of prepaid metres as an up-scaling niche initiative). Furthermore, Brunei is also receiving technical expertise from its membership of international organisations (such as ASEAN and APEC) by which the programmes in Brunei are also assisted by these organisations. The public awareness towards environment and energy is increasing, especially amongst the youth, and student generations, by which green attitudes are slowly

becoming a trend in Brunei. However, there are other factors that might slow down the replication and up-scaling of niches (see chapter 10.6 (c)).

10.5 Contribution of the study

Persuading people to use alternative forms of sustainable transportation is necessary in order to arrest climate change, reduce carbon emissions and create affordable transportation choices for the public; for example, buses or non-motorised transportation, such as cycling. This chapter indicates the study's empirical contribution that reduces the gap in the transportation literature.

In Brunei (and other parts of the world), people are too attached to, and dependent on, cars. Little change has occurred in Brunei to reduce car dependency. The understanding of the changes required, and how to accomplish them, appears inadequate. Studies elsewhere have tended to focus on the social acceptability and public transport infrastructure for change (Ahmed et al., 2008; Belwal and Belwal, 2010; Buehler and Pucher, 2011; Simmons et al., 2014). This thesis identifies some key drivers for understanding and promoting change in mobility.

One of the empirical contributions of this thesis has been to increase the understanding of the complex landscape and regime of the transportation sector in Brunei. As has occurred around the world, the increase in motoring, and particularly car ownership, has followed the increase in incomes and consumer choice. The issues of transportation have mainly been tackled with technical solutions, rather than social ones. The problems are seen as technical matters and the actors use technological solutions such as improvements to vehicles, vehicle inspections, and cleaner fuels for motor transport, to try to solve them. The government is also actively building and maintaining roads suitable for motor transport, but without fully accommodating the use of buses. The severity of problems such as traffic congestion and air pollution was attributed to the inability of government to better accommodate the increasing number of motor vehicles in Brunei. The evidence strongly suggests that promoting the use

of buses by running franchise buses and bus infrastructure fails to attract Bruneians to use those buses.

However, the problem of traffic congestion, due to the increase in mobility, can be seen as the main driver towards low-carbon transportation in Brunei. The issues of traffic congestion and public transportation have been widely researched. However, Brunei offers a different kind of research challenge in that 1) Brunei has a small land area 2) there is limited space for development[76] and 3) there is a high population density in Brunei Muara in contrast to a low population density in other districts. Furthermore, the limited amount of land available for the widening of roads, even as the government is hoping to build more roads to enhance connectivity, may force the government to look at technical solutions to improve the bus services, with initiatives being guided through the proposed study of the transport master plan and new public transport tender that aims to increase bus use and reduce car use. However, it should be noted that the inadequate number of studies on creating awareness in society is still a major hurdle

The climate change issue also provides a push towards green technology. Brunei has pledged to maintain about 55 per cent of its forest for the Heart of Borneo (HoB) project. Furthermore, Brunei has signed the UNFCCC agreement, even though the treaty does not set a mandatory limit on greenhouse gas emissions. This might be considered advantageous in several ways. First, with the limited amount of land available for development, and due to its small size, Brunei should be able to maximise its land development planning by reducing the need to travel. One example to do this is by using the Transit Oriented Development (TOD) in high-density areas in order to maximise the access to public transport. Secondly, energy used in housing and transportation sectors is responsible for 70 per cent of the nation's carbon emissions. Thus, with the UNFCCC, the government is looking to reduce the carbon emissions in these two areas. Currently, however, the government is implementing energy reforms in homes, but it is still encountering difficulties in initiating reforms in the transportation sectors.

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[76] According to one of the interviewees from the Ministry of Communications, some land is privately owned and, therefore, the government must buy the land to widen the roads.

Thus, this research believes that highlighting the social issues[77] of transportation in the analysis of low-carbon transport will provide important insights to achieve broader acceptance and success of transition to low carbon transportation. Therefore, the use of ABC, a conceptual framework, further elaborated in the suggestions section of this chapter, is necessary to help identify the current needs of the transportation demand in Brunei.

The power of a political system to influence transition is an idea that does not suit the conditions in Brunei. It is important to consider the wider governance by which the transition process takes place and redefine the transition's strategic aims, mission and vision. In Brunei, it was observed that a number of departments from different ministries have begun to respond to the energy issues, especially the need for energy efficiency, in their practices. The departments have their own missions and visions regarding sustainability. However, due to the unclear definition of 'sustainability', there have been variations in their missions and visions, leading to conflict in a number of ways[78]; thus, they do not have consistent visions of their role towards a more sustainable society.

Brunei has a top-down type of governance. The ability to study regime in Brunei is restricted. Literature reviews also tend to overlook the transition process of a single government) and concentrate their research on the Western nations[79]. Furthermore, unlike other transition

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[77] The MLP helps to analyse the behaviour and perceptions of Bruneians regarding the current car and bus system. The research also described and analysed the actions of several actors, especially the government, NGOs and bus operators in respect of transportation in Brunei.

[78] For example, the building and expansion of roads is a method of achieving sustainability for the Department of Roads, while the Department of Town and Country Planning is trying to shift development away from Brunei Muara (a major source of employment) to other districts, or to the outskirts of Brunei Muara. Due to the conflicting issues, one of the goals of the Ministry of Communications, i.e. encouraging the use of buses, is facing hurdles. This is because the other departments seem to favour the car or suggest that the bus services are unattractive (for example, because of the increased journey times involved in using the bus services).

[79] For example, Brunei has only one layer of government (Government of His Majesty) which some Western countries have layers of governments such as USA has three layers of government: Federal, State and Local government. Furthermore, there is no election in Brunei as other nations have voting system for every five years.

literature, where various actors such as the local and national government, private sectors, NGOs, and researchers were involved in transport sectors, the major actor in transportation in Brunei is the government. Brunei has no local and national governments, due to the monarchy and democratic system in Brunei, with limited participation by the bus operators, public and researchers. Thus, bottom-up governance is limited and Brunei offers a unique transition model that differs from most of the developed nations (combinations of top-bottom and bottom-up types of governance). Thus, this research contributes to the potential development of research into the role of a single government, such as governments in the Middle East, which are similar to the type of government in Brunei, when it comes to dealing with transportation issues.

Another contribution of this study is to identify the key players in the transportation sector in Brunei. The main responsibility for transportation lies with the Ministry of Communications, although the Ministry of Development also plays an important role in planning and building road infrastructure and land use plans, which are drivers towards sustainability. The participation of the Minister and senior officials from the Ministry of Communications, who spent time riding the buses, was seen as promoting the bus services in Brunei and attracting more Bruneians to use the bus. The role of the Energy Department of the Prime Minister's Office is seen as becoming more prominent, especially in educating the public on saving energy on the roads. Collaborative efforts are being made to improve transportation in Brunei. However, some of the public transport operators and members of the public thought that their roles are limited and insufficient to push the government, via the relevant department, to implement the plans already being drawn up for public transport improvement. The shift may occur with some noticeable outcomes, but it will be insufficient for the transition towards low-carbon transport, especially attempts to persuade people to use the bus.

Furthermore, this thesis also identified several stakeholders indirectly involved in the transportation scenarios, who are scarcely highlighted in the transition literature. The role of the Department of Housing and Town and Country Planning and that of the Ministry of

Education have shaped the transportation conditions in Brunei and these actors might be engaged in the future development of transportation.

Although some of the interviewees were reluctant to become involved in public participation processes for several reasons (such as lack of time, limited knowledge and doubts over whether their input would shape the decision-making), the majority of the participants in the survey questionnaires thought that they should be involved in the decision-making. This is an important contribution, as studies of public participation are more commonly based in countries with a parliamentary democratic style of governance in the identification of a debate[80] to which one might contribute is novel in Brunei (constitutional monarchy) and other similar countries.

10.6 Recommendations and further studies

This thesis has discovered several key findings and issues, an in-depth exploration of which is lacking both in the literature and in this study; the latter being somewhat hampered due to limited time, a small number of participants and budget constraints. These findings suggested several further studies to strengthen the transition literature that could not be explored in this thesis. The key findings are explored and categorised with reference to the three levels of the MLP in this section of the chapter. Primarily, however, this thesis makes one key policy suggestion.

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[80] The contribution of a debate might be initiated by the involvement of stakeholders and the community in the public participation process, before decision-making processes are concluded. An example is the involvement of youth. On the 26th March 2014, the Minister of Energy of Brunei participated in the first Youth Energy Dialogue with 300 young people from schools (including recent Bruneian graduates studying in Brunei and non-Brunei institutions) and non-governmental organisations. During the dialogue, the Minister of Energy received considerable feedback on energy efficiency and conservation and also agreed with several suggestions such as the use of energy-efficient vehicles for Ministers and other senior government officials (Thien, 2014).

10.6.1 A body for the transportation sector

The key suggestion is to have one government body, in which the departments associated with transportation and roads are consolidated, to enhance the development of the transportation sectors in Brunei. The new body should include the Land Transport Department and the Motor Transport Licensing Authority under the Ministry of Communications, and the Department of Roads under the Ministry of Development. The new body would be responsible for road design, public transport infrastructure, licensing, marketing of alternative transports, and green technology. This would consolidate and expand the social network of actors, gathering them into one department with a new vision that will bring guidance and direction towards low-carbon transportation and sustainability, by readdressing the disproportionate lack of investment and funding, especially in public transport. Furthermore, the research and development team should be placed under this body to reduce fragmentation in the transport system.

This proposition is informed by the fact that the departmental agencies involved in transportation sectors interact in complex ways. In the interviews, the phrases of "we are not sure", "we have different aims and goals" and "you should consult other departments" were often heard, reflecting the absence of an institutionalised and cohesive way of carrying out the planning of, and provision for, public transport services. Therefore, placing the departments under one body or department might reduce the fragmentation and create a more formal way of carrying out their planning activities involving regulations, funding and provision of roads and public transport, in order to deliver transport services effectively. Furthermore, public transport operators would be able to share their complaints and concerns with the new 'super' body[81].

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[81] Gilbert and Pearl (2010) also suggested the creation of a new redevelopment agency, called Transportation Revolution Administration to redesign the transportation in the US. Both author suggested the involvement of several stakeholders including government agencies, private organisations, industry associations and the armed forces. The mandate of the agency comes from the US President.

10.6.2 Landscape level

10.6.2 (a) Information on energy use and carbon emissions

Published figures on energy use and carbon emissions in Brunei's transport sectors are currently unavailable. These figures might provide a deeper understanding of how for example transportation in Brunei contributes to energy consumption and carbon emissions. The monitoring stations, with their greenhouse and air pollutant readings, would give indicators of the level of carbon dioxide and other gases in the atmosphere. For example, The US EPA developed the Greenhouse Gas Emission Data and has developed the US Greenhouse Gas Inventory report: 1990 – 2013[82]. According to the EPA Website, the body uses national energy data, data on national agricultural activities and other national statistics for this purpose. Furthermore, the EPA also uses the Greenhouse Gas Reporting Program to collect the greenhouse gas emissions data. For instance, the report helps the US Government in analysing the sectors that contribute to greenhouse gases; in 2013, 27 percent of the Greenhouse Gas emissions were contributed by the transport sectors and 31 percent from the generation and use electricity.

With available data, the transport sector could be targeted as one more sector where carbon dioxide emissions could be mitigated and the carbon emissions from road transport could be reduced, or could at least slow down the rate of emissions in the future. (See chapter 10.7.1 on how the Government of Brunei introduce new tariffs that led to reductions in the energy use in residential areas). Furthermore, the emissions data could be used to project, analyse and monitor the present transport activities, the energy used, including fuel consumption and pollutant emissions. Such information would be especially useful in order to project the future transport activities by corroborating with other variables such as income and age group.

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[82] The data could be retrieved and downloaded from the EPA Website

http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html

These could also be used to help identify the success or failure of such programmes to reduce carbon emissions. The official carbon dioxide emissions statistics published by the Bruneian authorities might be used as a tool to create more awareness of energy issues, especially in the transportation sectors, to produce a more sustainable transportation system that is accepted by the communities. Such data could provide more information and create substantial pressure in the effort to increase awareness of carbon-transportation issues amongst the Bruneians[83].

10.6.2 (b) Urban planning and the National Housing Scheme

This study has identified a gap in urban planning by assessing the role of urban planning in Brunei, where urban population densities, national housing schemes, and low population densities elsewhere, have caused a change in mobility patterns in Brunei. Because of these three factors, travel demand tends to increase, regardless of wealth and income class; thus increasing the probability of owning a car due to the limited bus services. In future, urban planning research might look into how low- and middle-class people living in the National Housing Scheme homes are affected by the increasing amount of travel required for work, education and social activities. Furthermore, studying the opinions of those who walk and cycle might add greater depth to the data analysis.

This thesis recommends further academic studies of how policies are framed and implemented in Brunei, especially in terms of transportation. Such studies might use the existing National Housing Scheme as a case-study for planning new high-density housing developments and determining how to achieve sustainability with regard to electricity usage, transportation and non-motorised transportation. The Government of Brunei has allocated

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[83] The US EPA also included the role of individuals that could reduce the effect of climate change and carbon emission (http://www.epa.gov/climatechange/). It includes the information on climate change, and what could be done in order to tackle the climate change issues). Brunei EDPMO http://energy.gov.bn/Pages/Download%20Page.aspx) also have similar information on their website and could do more (similar to the US EPA) in order to provide more information on the impact of daily activities to the climate change.

several areas for the National Housing Schemes. Within the housing areas, amenities such as schools, health clinics, mosque and community centres are provided. Thus, with existing National Housing Schemes, several pilot project could be conducted in order to reduce the over dependence of car use and to increase the use of non-motorised transportation.

The first project could be using the parking spaces in the mosques and community centre areas for park and ride facilities. Car sharing used to be practiced in the past (according to several interviewed participants). However, it is a practice facing a downward trend due to several factors. One of the public transport operators is also suggesting (still under process of reviewing) to use 15-seater vans during the peak hours in an attempt to reduce journey times. Therefore, this thesis suggests a pilot study for establishing park and ride facilities with mosques and community centres as the point of waiting. Car users would park their cars at the community centres or at the mosque to be picked up by the bus.

The rationale of this recommendation is that the majority of the government offices are located in Berakas, with very few in the capital city. Furthermore, there are several financial institutions, semi-government offices and private companies located in the capital city. Additionally, the RIPAS hospital is also located in the capital city. Therefore, as a start, three routes are suggested for this pilot study: non-stop route to Berakas stopping at every ministry; a non-stop route to the capital city with several stops upon reaching the city, such as the ministry or near the workplace; and a route to clinics and RIPAS hospital, stopping only at the clinics and RIPAS hospital. This pilot study would hope to reduce the severity of traffic congestions leading to the workplace, reduce the carbon emissions as well as reduce the likelihood of accidents by employing skilled drivers. Furthermore, the 15-passenger vans would travel at faster speeds as compared to buses. This research also takes into account the culture of Brunei, as mentioned in the interview (refer to Chapter 7.2.4). Thus, two types of vans are suggested with one van designed for women passengers only[84]. The vans or

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[84] In Malaysia, KTM has provided a coach reserve for lady passengers (located in the middle of each train, distinguished by its pink colour as well as a pink "women-only" sticker on the window) as an option for travelling. The ladies coach was introduced in 2010 to provide comfortable and safe journey for female passengers and to avoid the risk of sexual harassment in a congested environment (KTM, 2014). It was

minibuses could be provided by the government, or the public transport operators, according to the zones in which they are designated[85].

This thesis would encourage the mixture of motorised and non-motorised transportation to the waiting points. However, since the pedestrian path is provided for walking, this thesis recommended a clean and well maintained walking path and suggested regular and proper maintenance work. Clean, well maintained and safe walking paths would not only contribute to a pleasant walking experience but also improve the street scenery that would attract more people to walk. Flowers and benches are recommended to further encourage elderly people to walk, as well as to rest when they need to. The weather in Brunei is hot and wet and therefore, shadings (such as with trees) would cool the foot path and reduce the heat from direct sunlight. Safe crossing areas should be provided, as well as traffic calming initiatives to reduce the speed of cars and thus enhance the safety of pedestrians.

Cycling is another non-motorised transport that would help people to travel to the park and ride facilities. The park and ride facilities should be equipped with safe bicycle storage facilities, as can be found in Amsterdam and London. Furthermore, cycling path should be made available. The existing foot paths could be widened and clearly-marked lanes for cycling and walking lanes should be made visible.

With the improvement of the walking and cycling paths, it is recommended that schools in the housing schemes provide safe and secure bike storage for cycling students, as well as to increase the number of showers in the existing gyms for the students to get changed into their school uniforms. Walking and cycling programmes and talks (about the importance of walking and cycling in reducing car dependencies in Brunei and the benefit of walking and cycling to the environment and health) should be given in schools and thus, the training programme for walking and cycling in schools would further increase student participation in

indicated that the majority of the KTM Komuter passengers (60 percent) were women (The Star Online, 2010). More information at: http://www.ktmb.com.my/index.php/component/fsf?view=faq&catid=2.

[85] As mentioned earlier, the bus operators in Brunei are given permits to operate on certain routes: northern, eastern, southern, western, central and business routes.

cycling to school. Subsidies for bikes, especially for students, are also recommended. The participation of financial institutions would help to further increase cycling activities and interest by issuing bicycle loans, similar to computer loan).

The safety concern regarding crime in the neighbourhood would not be much of an issue, if students chose to cycle in groups to schools, such as with friends and neighbours. Furthermore, the neighbourhood watch programme in Brunei and police patrols would make cycling and walking safer pursuits, not only for students but everyone. Furthermore, the improvement in non-motorised transport infrastructure and the increased use of buses, as well as reduced car use, would reduce the possibility of accidents as bus accidents are rare occurrences (Hiscock et al., 2002).

A UK example illustrating the above suggestions is the bike facilities Hull UTravel Active,[86] in the University of Hull. The Hull UTravel Active not only promotes bike rides but also offers a bike maintenance programme, bike clinics[87], cycling training and learning to bike, cycle safety and security as well as bike rental facilities.

The result of the pilot study would be beneficial to the new National Housing Scheme[88], which are now offering a mixed-use development planning, by which the housing schemes are developed vertically instead of building individual detached houses. With the increase in population densities, other method of planning, such as Transit Oriented Development (TOD) could be recommended to be implemented in the new National Housing Scheme, as well as the result of the pilot study of park and ride facilities and the expansion of non-

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[86] https://hullutravelactive.wordpress.com/

[87] The researcher has experience the bike clinics service. During the sessions, the researcher's bike was examined and repaired free of charge. The bike clinics also assessed the condition of the researcher's bike (for safety) and offered consultation on the topic of safe bike riding.

[88] Gilbert and Pearl (2010) uses several areas such as Beacon Hill in Boston as an example where urban communities are design around pedestrian. Both authors also indicted that these locations have been the most desirable city locations in America. Both authors also indicated that areas in California where the suburb are developed around commuter rail are more appealing are more valued compared to suburbs designed for cars.

motorised transportation. The new National Housing Scheme should be pedestrian and cycling friendly. Apart from the park and ride facilities, the Bus Rapid Transit, along with the existing franchise and inter-district buses, could be used to support the TOD, especially with the development of interchanges.

10.6.2 (c) Role of taxis

This study has not investigated taxi activities in Brunei, since none of the participants answered the section on taxi use. Furthermore, none of the interviewees had ever used a taxi in Brunei. Initially, several taxi drivers agreed to be interviewed for this study; however, only two participants successfully completed the interview. The role of the taxi industry is another important landscape component in transport transition. The mixture of public transport, such as buses and taxis is linked into the transportation system in other countries. Hiscock et al. (2002) indicated that the anti-drink-driving laws in Scotland have turned the car into a potential liability, rather than an asset; hence, people tend to turn to the bus or taxi after drinking. Other activities, such as going to the cinema and dining out may also trigger the use of taxis at night (Cooper et al., 2010). Drink-driving is not an issue in Brunei, as the sale of alcoholic drinks is banned. Due to the high amount of car use in Brunei, the use of taxis is limited and taxi drivers rely on tourists in order to survive in the taxi business.

10.6.2 (d) Existing bus services

This study integrates the findings on both franchise and inter-district buses. For future research, this study recommends separating the franchise and inter-district buses. This would illustrate the travel behaviour for shorter and longer trips. The interview process has indicated that the elderly generation for the Bruneians are the main users of the inter-district service. However, a qualitative survey to identify the current services and infrastructure of both franchise and inter-district buses would make a huge contribution to the current regime, especially in defining the quality required by people for long-distance travel and, in particular, young people.

The questions that could be asked would be their experience of using buses (in Brunei and outside Brunei) and their impression of their recent bus journey in Brunei. The majority of the non-public transport users have used buses abroad. Because of the higher standard of services and satisfaction, Bruneians tend to compare the bus services in Brunei and abroad; this almost always results in negative perceptions and attitude towards the bus services in Brunei. However, the negative perceptions and attitudes could be used to identify the service quality that is demanded by the Bruneians, especially the young and elderly. This would help the government to implement the Brunei Land Transport Master Plan. The government could study the behaviour of Bruneians towards buses, and invest in the major improvement in bus services. The government could also risk 'reinventing' the bus use in order to encourage new transport behaviour towards bus services (Gilbert and Perl, 2010). Furthermore, it is recommended that after the demanded quality standards are reached, the bus services should have a bargain value fare promotion, such as a one month free ticket or two tickets for the price of one to try to disrupt the car use and promote a change of habit towards more bus usage[89].

10.6.3 Regime level

This thesis emphasised the attitude and behaviour of the Bruneians concerning cars and public transport. However, there are several limitations on ways of determining how they acquire these attitudes and behaviour. Therefore, some study recommendations listed below

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[89] Fujii and Kitamura (2003) studied the habit change amongst the students in Kyoto University, and the one-month free bus tickets changed the habits of the student car users and increased the bus use. In Copenhagen Thøgersen (2009) indicated that a month long free travel card (given to random car users), led to an increase in public transport users by 10 percent, in the short time (previously 5 percent) and 7 percent six months later. Furthermore, a study in Malaysia indicated that Postgraduate students studying in the Universiti Kebangsaan Malaysia (UKM or in English, National University of Malaysia) indicated that, they would consider switching mode of transport from cars to buses if there are reduction in time travel, travel cost, waiting time and improvement in bus stops (Mohammed and Shakir, 2013).

not only strengthen the data analysis but also fill in the gap in the transition literature, which tends to overlook the role of society in MLP.

10.6.3 (a) Demographic patterns in transportation

One of the tasks is to understand the demographic changes that impact urban transport. For example, several studies have identified the increasing size of the elderly generation, which may influence the mobility patterns. However, the increase in the size of the younger generation, which may shape new patterns and demands for mobility, has not been widely researched. Headicar (2009) indicated that the amount of car ownership increases with the presence of children, while Root et al. (2002) pointed out that women's travel behaviour was complicated by the presence of small children. Zhu et al. (2012) indicated that Chinese college students have strong intentions to own cars. Thus, the majority of the literature concentrates either on young children or on tertiary-level students (college and university). This thesis found that parents tend to drive their children, especially to school, college and university, and do not wish their children to use the bus (similar to the case of Qatar as mentioned in Chapter 2).

This research also found that the young generation are experiencing travel difficulties in that non-motorised transportation as walking and cycling is considered dangerous. Parents are concerned for their children's safety when using the buses, as often there are no direct routes to take their children to college. One of the participants indicated that, after having children, they have to use their own car (previously a shared car) for educational trips for their children; having children up to university level age shapes travel patterns in Brunei. There is a need for additional research into this issue in Brunei, and other countries where people are dependent on cars.

The research might be used to engage people, especially the young generation including young students and non-students in sustainability, particularly sustainable transport, as well as to study the effectiveness of environmental awareness campaigns by exploring the views of school children[90].

Thus, future research might also examine 1) how frequently parents drive their children for various purposes, in order to explore and explain the differences in modes of transport use; 2) what are the underlying reasons that restrict parents from allowing their children to use the school bus/public bus to school?; 3) to what extent are parents willing to pay for transport costs (college and university students) in order for them to use the car to get to their educational institutions, therefore avoiding using the bus?

10.6.3 (b) Redevelopment of non-motorised transport

Another suggestion for future study is to examine the importance and potential for non-motorised transportation such as walking and cycling, which seems to be overlooked in efforts to develop potentially sustainable transportation.

Therefore, research on walking and cycling activities might be undertaken. This includes the attitude of Bruneians to these activities, as well as the type of activities they would consider in relation to cycling and walking. Thus, there is a need to promote the academic methodology on strategies to promote non-motorised transport to students. Future studies might provide methodologies for reducing the number of journeys and incorporating non-motorised transport features into the current road system and the National Housing Scheme in Brunei. Questions such as' in what circumstances children are allowed to walk or cycle in the National Housing Scheme?' and 'why are cycling and walking to school considered dangerous in Brunei?' could and should be looked into.

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[90] Banister et al., (2013) in Moving towards low carbon mobility book indicated that young generation should be trained to use the low carbon transportation, in order to develop the culture and behaviour towards the use of low carbon transportation in the future.

Marketing modes of non-motorised transport is considered necessary and therefore a new approach to marketing these activities is needed. For example, emphasise the levels of Brunei carbon emissions (research on carbon emissions should be done first as mentioned earlier in 10.6.2 (a)), subsidies and the cost of travel in congested periods, as part of the marketing of non-motorised transportation to create awareness on the over dependence on car use.

Several studies indicated that traffic congestion is associated with the increase in fuel consumptions and carbon emissions, especially carbon monoxide (Barth and Boriboonsomsin, 2010; Dallmeyer et al., 2012. Dallmeyer et al., (2012) indicated that carbon dioxide emissions are directly proportional to fuel consumption and these studies indicated that energy consumption and carbon and other emissions increase as vehicles are in acceleration and deceleration, such as stop and go conditions and at idling or standstill. Therefore low traffic density, and free flowing traffic will lead to low fuel consumption and carbon emission. Hence, there would be certain marketing strategies that should be emphasised:

- First, the relationship between fuel consumption and pollution emissions

- Secondly, the relationship between traffic congestions and health problems associated with carbon emissions.

- Third, the increasing travel cost due to unwanted fuel consumption during traffic congestion and jams.

- Fourth, to emphasise the health and environmental benefits of non-motorised transports

Secondly, put emphasis on the fuel subsidies. The current oil and gas price, as well as maintenance work in the oil and gas sectors in Brunei, could be used to improve the awareness on subsidies. The burden of the fuel subsidy incurred by the government of Brunei is increasing (Figure 5.4 (d)) due to the growth in domestic fuel consumption (Figure 5.4 (b)). The burden of paying the subsidy is now increasing due to the oil price crisis, as a result of which the profits from petroleum sales are decreasing. Furthermore, the reduction in the production and export of oil and gas (Figure 5.4 (c)) further impacts the sales and profits of

the oil and gas industry. Thus, these conditions could be used as a simulation of what would happen if the subsidies continue to grow, the oil price remains low and the production of petroleum is decreasing. Additionally, the scenario of what would happen if the government withdraws the subsidy and people are paying the petrol price at full cost could be used as pull and push factors for the increased use of buses in Brunei. This would also encourage the use of non-motorised transport, such as walking[91] and cycling in Brunei.

The use of websites and series of talks and seminars targeting the educational institutions as well as the government officials would maximise the effort to create awareness and understanding on the issues of transportation as well as marketing the use of buses and non-motorised transport. As mentioned previously (recommendation in chapter 10.6.2 (a)), the EPA website[92] has provided good tools for the community to learn more about climate change, including transportation issues. The site also stresses the role of stakeholders, such as the role of EPA in climate change, what the community could do at home, office, road and school to reduce the problems of climate change. This information includes the household carbon footprint calculator that would help to identify the annual emissions and therefore presents the opportunity to reduce the emissions. Thus, developing a similar website page and/or provide a link to the EPA website could raise the level of information knowledge to the Bruneian community. Eventually this would create a well-informed community, particularly regarding transportation and climate change and would initiate steps towards pro-environment behaviour, especially at the grass-roots level. This would eventually increase the participation amongst Bruneian in environment-related issues and projects and

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[91] One of the interviewed participants indicated that despite one government office to another government office is in close proximity, some government staff use their car. Furthermore, according to one of the interviewed participants, some youths use their car to the football field rather than walking or cycling, despite the football field being only a few minutes walk from their home.

[92] http://www.epa.gov/climatechange/

would eventually create the mixture of top-down and bottom up governance rather than concentrating on the top-down approach)[93].

10.6.3 (c) Role of ABC and social practice theory

Thus, the role of ABC is relevant in deciding the most suitable choice of transportation in Brunei. This is because Bruneians have different attitudes and behaviour regarding the current transportation sector in Brunei. The Attitude to public transport tends to be negative. This Attitude leads to the Behaviour of car overdependence: Shove (2009) indicated that Attitude is one of the drivers of Behaviour. The Behaviour is based on the individual Choices themselves. However, from the current attitude and behaviour of the Bruneians, particularly those in this study, it was seen that the Choices made by the Bruneians do not tend to embrace environmentally friendly attitudes; for example, there is a tendency to waste energy. Thus, information, combined with persuasion, is needed to change attitudes, in order that favourable attitudes to more environmentally friendly behaviour might lead to more environmental friendly actions. The role of transportation actors, particularly the government, is important to encourage individuals to make different choices by providing them with more choices. The ABC framework would encourage Bruneians to identify their preferred mode of public transportation, such as the mixture of public transport options[94] available in Kuala Lumpur, Malaysia; one of the major destinations of Bruneians for holidays or flight transit. The behavioural model of ABC might be influenced by the concern over climate change, or other factors that are similar to the landscape level. In ABC, according to Shove (2010), individual behavioural choices are responsible for responding to climate change. To this end, individuals might voice their preferred transportation options

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[93] According to Heiskanen et al., (2009) and Shove and Walker (2010), the mixture of top-down and bottom-up approaches could facilitate transition process.

[94] Some of the public transport options serving Kuala Lumpur are KTM Commuter (connecting Kuala Lumpur and the suburbs), Express Rail Link (ERL) connecting Kuala Lumpur Central with Kuala Lumpur International Airport, Light Rail Transit (LRT), People Mover Rapid Transit serving the major offices and commercial developments within the City Centre, and bus and taxi systems (SPAD, 2014).

and services, such as commuting mode of choice, in order to replace their cars with public transport. With the mixture of information and persuasion, as well as the public transport options combined with affordable and attractive fare systems, the attitudes towards public transport may eventually change and may create behaviour towards more sustainable transportation conditions in Brunei.

However, using the ABC framework alone is not enough to initiate behaviour change towards low-carbon transportation as the evidence from this thesis indicated that the Bruneians do not wish to use buses as they are comfortable using cars. Furthermore, a majority of the interviewees indicated that Bruneians have a lack of interest in transport planning. Additionally, the role of NGOs in Brunei is still limited (there are no NGOs focusing on transportation), and they are unable to provide much help with sustainable transportation. Furthermore, despite the government's efforts and initiatives to promote sustainable transportation, less than 20 per cent knew about these initiatives. Information and persuasion are needed; however, it was seen that the information is not having much impact despite the use of media and the Internet; efforts to encourage the use of bus services are considered insufficient. Therefore, this study believes that continuous awareness campaigns and programmes towards sustainable transportation are necessary and should be emphasised before and during the implementation of the mega bus service project; or at least before the new bus tender and Brunei Land Transport Master Plan are implemented.

For this, the role of Practice Theory would be beneficial. The theory would be used to identify the behaviour of the Bruneians towards different modes of transportation, starting from studying the history of buses and cars in Brunei and how the behaviour of using cars is replacing the behaviour of using the bus. In addition, the theory of planned behaviour could be used to reinvent cycling behaviour, especially targeting school children and how to market cycling activities (as explored in recommendation 10.6.2 (b).

Thus, the government might put in place the necessary information, tools and measures to solve the transportation problems. Academic researchers might form a bridge between the public, bus operators and government on how to engage these three actors to work together. A decision would also need to be made as to the best platform and role for the cooperation to

work and to provide suitable tools and resources that might be used for transportation development.

10.6.4 Niche level

Reflecting upon his interest in undertaking this research (chapter 1), the researcher realised that the provision of more bus services and improved service quality and infrastructure, as the main niche, would be insufficient to promote low-carbon transportation in Brunei. To recap, Brunei's transport system is dominated by cars, with generally poor provision for pedestrians and cyclists and a lack of quality in public transport services. Initially, the researcher believed that providing more bus services would reduce social inequality. After carrying out the data collection and analysis, it was found that there is almost one primary school in each village and one secondary school and healthcare facility in each mukim: a collection of several villages. However, there was social inequality when employment became more difficult and costly, due to long-distance journeys and in terms of fuel consumption per kilometre of travel. Public transport is inadequate in several areas, and walking and cycling are dangerous, thus forcing people to rely on cars. The researcher believes that the improvement of bus services not only provides a social balance but also has several other benefits, such as reducing pollution associated with carbon emissions from cars, reducing energy use and reducing government expenditure on fuel subsidies. Therefore, to provide a high-quality bus system, several aspects of transportation need to be addressed.

10.6.4 (a) Investment in research and development

Brunei is not lacking in niche development. Brunei is not only concentrating on the technological niche but is also emphasising the non-technological niches, which tend to be overlooked in the niche literature. Current research and development is focusing on the electric car. Two of the interviewees indicated that Brunei is suitable for developing electric cars due to the country's small size. However, some of the feedback suggested that,

currently, the electric car is unsuitable due to the weather; unexpected rain triggers the need for power to the lights, wipers, and air-conditioning to reduce condensation on the windscreen, so there is a need for charging points to recharge the battery to be located in every filling station and perhaps every new home. The franchise buses and building of infrastructure for buses are examples of niches that have been implemented. An important question is as follows: 'Why has Brunei been unable to successfully implement these niches? The Bandar Seri Begawan Master Plan, the Brunei Land Transport Master Plan and New Public Transport tender are viewed as correct approaches, but there are likely to be problems with the implementation, a lack of political will, uninformed decisions and institutional disintegration that will cause the transition to fail to meet its aims. Thus, there will be opportunities for academic researchers to examine, identify and hopefully explain the issues and problems. Economic diversification and the introduction of an Energy White Paper are seen as being capable of pushing renewable energy in this group, which would include new low-carbon transportation technology. Brunei is a rich nation and is no doubt capable of establishing a fund to undertake research and development, stage by stage. There are several research-based bodies in Brunei; however, due to the limited overall budget for research and development, transportation research tends to be limited.

10.6.4 (b) Transit Oriented Development (TOD)

Unbalanced development (as majority of the development are concentrated in the Brunei Muara District) encourages high private vehicle mobility and ownership in Brunei. The development of the National Housing Scheme located away from the capital city, and away from employment areas; combined with the limited services of public transport, further increase the need to have a car. With the increasing trend in car ownership, increase in population and high population density in the capital, the traffic congestion in Brunei is becoming worse. The data from interviewed participants indicated interest in mixed-use housing areas in the future, including the high rise National Housing Scheme that would increase the population density, as well improving the transportation sector by reducing

traffic congestion and promoting the use of public transport. The Transit Oriented Development is one of the options to be implemented in the future.

The concept could be implemented in Brunei, especially with the current and future housing areas. The future National Housing Scheme[95] is more oriented towards vertical developments such as flats and apartments; a higher population density would support the development of TOD. Furthermore, the current National Housing Scheme developments are located outside the capital city. Thus, TOD would reduce the severity of traffic congestion, especially towards the city centre, as it promotes the use of public transport (Bishop, 2015; Cohen-Blankshtain and Feitelson, 2011). In addition to the development of TOD with the future National Housing Scheme, the current National Housing Scheme areas could be redesigned or redeveloped to facilitate TOD. Furthermore, such an initiative would improve access, thus Bruneians do not have to live near to the capital city and thus have a wider range of options for housing choices. TOD, less emission of greenhouse gas from the transportation sectors, and the promotion of walking and cycling activities would further enhance the target of having a healthy lifestyle (Bishop, 2015, Cohen-Blankshtain and Feitelson, 2011).

The road capacity in Brunei is considered insufficient to accommodate the increasing number of cars on the roads. According to one of the interviewed participants, the roads have been expanded to the maximum in the congested areas. In order to widen the roads, private lands have to be acquired and the compensation capital is not considered to be cost effective. Furthermore, the interviewed participants acknowledged that some of the National Housing Scheme projects have limited or no access to public transport. The existing bus services also failed to deliver a good services during the peak hours, so contributing to the traffic congestion. Buses failed to satisfy the requirement for mobility in the peak traffic hours and their infrastructure and services not comparable with services outside Brunei, making bus services unsuitable for travelling to work and education. Hence, TOD would allow the redevelopment and redesign of the congested areas, and the areas near to the congested areas, that would support the reduction in car use, allow walking and cycling activities, especially

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[95] Brunei has a small land area and about 55 percent of the land area are for forest reserves. Thus, developing individual houses for the National Housing Scheme (with low density) is not favourable.

for students travelling to schools. Such action would maximize access to public transport in Brunei, thus allowing more passengers to use the services. The locations for park and ride facilities should be free for parking and bike storage in order to maximise the use of public transport.

10.4.6 (c) Bus rapid transit

It is recommended that the Government continue the franchise buses in Brunei; but to expand the operation to all four districts of Brunei. The inter-district buses are also recommended to continue their operations by increasing service frequencies to cover the all districts of Brunei, including the Temburong district after the completion of the bridge that will connect Temburong and Brunei Muara districts. However, this thesis recommended that the bus franchise should not enter the capital city zones and bus interchanges should be built at the outskirts of the capital city. This would give the opportunity for the implementation of Bus Rapid Transit (BRT) system in Bandar Seri Begawan;[96] leading to the workplace, major shopping centres and the capital city.

According to a study for the BRT in Beijing, China (Deng and Nelson, 2013), the advantages of BRT is that it offers higher operating speed, due to its dedicated lanes for BRT, thus reducing travel time up to 38.3 percent. The speed of traffic was improved, partly due to the cancellation of some bus line systems and the increased ridership from car users; both these outcomes contributed to a reduction in traffic congestion. Furthermore, the BRT in China is reported to have high satisfaction from its users, especially BRT are frequent thus waiting and travel time is reduced. A study in Thailand (Satiennam et al., 2013) indicated that BRT would attract older motorcycle users, passenger vehicles without driving licenses and private vehicle users living within 400 metres from the station. Thus, based on the current traffic congestion in Brunei, and the growing frustration towards travelling to work during the peak

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[96] Prior to the submission of this thesis (for viva purpose), Brunei Land Transport Department has published the Land Transport Master plan that includes the BRT system. The system also includes 4 park and ride locations, and BRT Feeder Bus Services (Mohamad, 2015). However, the researcher is yet to read the Land Transport Master Plan.

hours, together with inadequate services and infrastructure, as well as the below standard quality of the buses in Brunei, BRT would offer convenience to car passengers, especially for travelling to work. Special lanes for the BRT system, despite the two-lane type of roads in Brunei, would be a push factor for Bruneians to use the service, thus reducing the number of vehicles on the roads during the peak hours and thus reducing the severity of traffic congestion in the peak hours.

10.6.4 (d) Collaboration and the development of public private partnership

Sustainability campaigns in collaboration with various ministries, private companies such as banks and NGOs are used to promote the sustainable way of life. The campaigns have used social media (Facebook and Instagram), the Internet, newspapers and advertisements on radio and television. The target audience comprises youths, teenagers; as well as primary, secondary and tertiary students). The effort has been seen to have improved the awareness of sustainability. There are also some signs of change in attitudes to travel, with students tending to share cars with friends instead of using their own cars in the classical 'one car one person' mode, and declaring a willingness to use public transportation in the future should the services and infrastructure be improved. Additional research might explore in more depth the success of environmental awareness campaigns and how academic research might help to improve collaborative work and increase environmental awareness among Bruneians.

Several public transport operators have undertaken research on ways to increase bus ridership. After undertaking such research, public transport interviewees indicated that they are willing to provide more information on bus schedules by publishing their bus route timetable online and at the bus stops. One of the bus operators has taken the initiative to print out the bus timetables and post them on the bus route zones. Another initiative was to build new bus stops in their zones. Based from these initiatives, it was seen that several bus operators are willing to reduce the government burden in constructing bus stops in Brunei. The costs incurred by implementing these initiatives are covered by these bus operators. However, approval still needed to be sought from the Ministry of Communications. Thus, this thesis recommends that the new body (as suggested in 10.6.1) would facilitate the

development of Public Private Partnership[97] in order to develop the transportation sectors in Brunei,[98] especially the infrastructure for bus services. With the involvement of public and private sectors, bus operators would gather more financial resources, reduce the burden from the government, as well as develop new techniques and technologies in order to find and operate novel approaches for better bus services in Brunei. The advantages to the government is that the bus operators, who have been running the franchise bus in the same zone for more than 17 years, have expertise on the hot spot areas for bus services, the facilities needed for building bus stops and bus stations, and would be able use their bus stops and buses as advertisement platform for other companies (for marketing strategies) in order to make extra income. Thus, this would improve the success of the project helping Brunei in the Niche stage for the development of low carbon transportation in Brunei.

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[97] Gilbert and Perl (2010)) explored the Public Private Partnership strategies used in France for the development of high-speed railways in the year 1960 – 1985. The French railway management, government officials and the rail equipment manufacturers turned to redeveloping the relationship between the government, public enterprise and the private industry to develop new approaches to delivering new transport options. With the involvement of Public Private Partnership, the combination of new technology, techniques, expertise and financial and political resources, SNP was able to develop a high speed train that currently serves Paris and most corners of France. This revolution of Public Private Partnership has reintroduce the role of railway as mobility providers, whereas the US and UK believed that the railway was reaching the end of its industrial development. Presently, the development of high speed trains has spread in Europe with the increasing role of Public Private Partnership. Furthermore Tsamboulas et al., (2013) reviewed a Public Private Partnership Scheme against Conventional Procurement, in terms of transport infrastructure provision and operations in India (Pilot Bus Rapid Transit corridor infrastructure project in Indore City, India). The study revealed that Public Private Partnership Scheme is a more preferable option and in addition, the Public Private Partnership Scheme demonstrated more transparency, which was considered necessary, especially to promote social acceptance of the project. This approach was a good marketing strategy for the community to use the bus.

[98] The first Public-Private Partnership project between the private sector and the Government of Brunei is the Ulu-Ulu Resort established in November 2008. Under the Authority of Forestry Department, the company was responsible for managing the only National Park in Brunei. Thus, since it is not a new approach in Brunei, therefore it is possible to build up more public-private partnership projects, which include the transportation sectors. Ulu-Ulu National Park Resort could be accessed at https://www.uluuluresort.com/about-us/.

10.6.4 (e) Improvement in internet connections and coverage

The idea of improvement in internet connections and coverage in Brunei for this thesis comes from the study of Coroma et al. (2012), who experimented with a two-site conference format using tele-conferencing[99]. The study indicated that the carbon dioxide emissions caused by the attendees travelling for the conference were significantly reduced, mainly due to reducing the number of flights to the conference site, when compared to the single-site format.

This researcher discovered the increasing interest in the use of internet for online commerce, although he believes that online services would not replace the traditional services, such as banking and shopping. However, this researcher believes that online commerce would affect the number of vehicles on the road. With the improvement in the internet connections, online shopping and banking would be made more efficiently, thus fewer shopping trips or trips to the financial institutions would be needed, so their numbers would be reduced. It is also suggested that the online services would also provide information about certain products, compare the prices and view the availability of the produce in the shops. So, this would reduce the unwanted travel, especially if the wished-for products are in stock[100]. Although the online buyers do not travel to the store, the products have to be delivered. However, by referring to the researcher's experience, such as groceries shopping in the UK, the store has provided their own transport and would deliver the product at the researcher's preferred time.

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[99] The conference was organized by EcoTopia Science Institute at Nagoya University between 14th – 16 September at Davos (Switzerland) and Nagoya (Japan).

[100] In the UK, RetailWeek indicated that the online shopping was growing 14 percent in 2014) (Bowden, 2015). The report also indicated that Christmas shopping periods showed an increase of 13 percent, as compared to the 2013 Christmas shopping period. The convenience of shopping via smartphones and tablet also influenced the increase in online sales (55 percent increase as compared to the Christmas shopping period of 2013). PR Newswire (2015) also indicated that the increase in online shopping was due to three factors: greater convenience, better prices and ease of use.

The use of company vans to deliver the products would reduce the buyer's commute activity; thus would not contribute to traffic congestion, so leading to fewer pollutant emissions[101].

In addition to e-shopping, the government of Brunei is introducing the e-Darussalam portal. For example, renewal of driving license and vehicle licence for the Land Transport Department in the Ministry of Communications can now be done by computer or I-phone, as can applying for job vacancies in the government sector. In response to one of the interviewee job seekers who was wishing to apply a post in the government sector, will need to apply through e-recruitment via the e-Darussalam services site. Job seekers no longer have to travel to the Public Service Commissioner building to apply for the advertised job. Vacancies in the government sectors are usually posted in the *Pelita Brunei Newspaper.* Usually, the vacancies are advertised three times a week. Previously, applicants had to fill in the recruitment form (known as SPA 2) and the form had to be submitted to the Public Service Commissioner counter by hand. With the e-Darussalam, as well as better internet connections and coverage, job seekers do not have to make a weekly journey to the PSC counter in Berakas, to apply for the post.

Another benefit of improvement in the internet services and connectivity is the role of tele-conferences, especially for attending meetings. For example, two of the interviewed participants indicated that there would be several occasions in a month for them to travel outside the district to attend meetings and talks, especially for teachers working outside Brunei Muara district. Thus, tele-conferencing would be of benefit. First: the attendees do not have to travel far from their offices, thus reduce the possibilities of traffic accidents due to tiredness. Carbon emissions are reduced as no major journey is required, so allowing more attendees to participate in the talks, while at the same time lowering the overall carbon emissions.

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[101] Based on the researcher's experience, researchers could buy products from Boots Pharmacy that are not available in shops located in the city or at other stores. The researcher could purchase online and collect the products at the nearest Boots Pharmacy shop.

Thus, this thesis argues that improvements in internet services would reduce the repetitive travel of shopping, bill payments and banking transactions, as well as job applications. Furthermore, with the development of ICT[102] along with the improvement of internet services and coverage, it would help the future of bus users in Brunei, for especially planning their journey[103].

10.7 Additional information: new electrical tariff and 'No subsidy day' campaign

Transition towards low-carbon transportation requires not only technological innovations but also a change in aspects of institutions, including rules and regulations, both social and cultural. The transportation sector in Brunei is highly complex because it calls for multiple players including the different ministries in various transport roles, and multiple factors combination of rules and societal and behavioural modifications. The multi-level perspective aids an understanding of the transition, such as why the transition occurs by identifying all aspects of transition in the current mobility system; including the environmental, social and cultural aspects of mobility.

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[102] Banister et al., (2013) in his book "Moving towards low carbon mobility" calls for the integration of technology into social media such as Facebook as well as mobile phone app that would offer more information on the services in real time thus offered reduction in travel needs and so to allow more utilization of low carbon transportation.

[103] Based on experience, the researcher used the translink website (http://translink.com.au/) to travel around Brisbane. By going to the website, and entering the starting point to the desired destination, the website gave several options of travel and indicates the total travel in terms of time and distance to the bus stops and the price. Thus, it was hoped that the use of ICT would be utilised into the bus services in Brunei, and the role of the new body would facilitate the diffusion of ICT into the bus services.

10.7.1 New electrical tariff

During the period of the research, the Brunei government made changes in response to the increasing usage of electricity, which correlates with the increase in carbon emissions. The retail prices of fuel are highly subsidised and have not been changed since the 1970s; the energy prices for electricity have remained unchanged since the 1960s. Brunei is one of the highest electricity users per capita in the ASEAN region and in the world (*The Borneo Bulletin*, 2007). The electricity issue is an example of pressure on the landscape that is transformed into issues that are to be translated into action.

The former Minister of Energy indicated that power (electricity) was sold to the public at sub-benchmark prices. The Government of Brunei has recognised the unsustainable behaviour of Bruneians in terms of electricity use - an example of the electrical regime: unsustainable behaviour in electricity use. The Government of Brunei has also realised that the electricity tariff encourages Bruneians to use more electricity since, according to the tariff, the more electricity that is used, the cheaper the cost (another regime: electrical tariff).

The Government of Brunei announced two niches that it hoped would reduce the consumption of electricity by the public. First, His Majesty announced on the 15 July 2011, that all private households in Brunei would be equipped with prepaid meters thus replacing the post-paid electricity meters. The cost of installation of the new meters would be covered by the Government of Brunei (Masli, 2011). The second niche is the new electricity tariff, enforced on 1st January 2012. The new tariff gives the public the power to control their electrical consumption, thus reducing the unnecessary use of electricity. Unlike the old tariffs, the new tariff clearly charged people more for using electricity.

Although the changes are considered new, some positive behaviours have been seen. Several interviewees indicated that they were reluctant to use buses but stated that they have reduced their electricity consumption and are reusing and recycling more, demonstrating a favourable attitude to sustainability.

Old Tariff (kWh)	Price	New Tariff (kWh)	Price
0001 – 0010	BND $0.25	0001 – 0600	BND $0.01
0011 – 0060	BND $0.15	06001 – 2000	BND $0.08
0061 – 0160	BND $0.10	2001 – 4000	BND $0.10
Above	BND $0.05	4001 and Above	BND $0.12

Table 10.7 The old and new electricity tariffs in Brunei: Source: Department of Electrical Services (2012).

The role of the government is important in the new tariffs. The free installation of prepaid meters is another way of enhancing public acceptance of the new electricity tariffs. The government created awareness of the excessive use of electricity before implementing the new tariffs. The public are also advised on the efficient use of electricity via the media. The government is in the process of importing into Brunei energy-saving electrical appliances to help Bruneians turn to energy-efficient electrical devices in the future. Therefore, these niches are applied in a way that reduces techno-fixes but also creates social learning (a non-technological niche) towards the efficient use of electricity in Brunei. Furthermore, the government is using the increase in population growth, leading to increased energy use, together with carbon emissions, as urgent issues and translating them into problems of sustainability. Furthermore, the governance of energy is placed under one roof. The Department of Electrical Services is transferred to the Energy Department of the Prime Minister's Office, thus producing a shared vision of sustainability in the electricity sector. It is not known whether the public are involved in the decision-making, but the Brunei based NGOs are also relevant in informing the public about the problems of overuse of electricity.

10.7.2 'No Subsidy' Day

The Energy Division of the Prime Minister's Office (now The Energy Department of the Prime Minister's Office) took the initiative to suspend the petrol subsidy to commemorate Energy Day on the 24th May 2010. The aims of this action were a) to raise awareness of the importance of conserving energy, and b) to appreciate and avoid wastage. The petrol price

was temporarily increased to the commercial market price (Masli, 2010a; Masli, 2010b; Masli, 2010c; Othman, 2010; Shahminan et al., 2010).

The community had different responses to the initiatives. A day before the Energy Day, the number of motorists filling up their petrol tanks increased drastically, and only a few filled their tanks during the Energy Day (Masli, 2010a, Masli, 2010c). This initiative was seen to create awareness among the community that petrol may not always be sold at the lower price and that prices would increase if resources became depleted. It can also be seen that the government wishes to create a transition to more sustainable energy and transportation. The department only suspended the subsidy for a day; limited time and lack of education and awareness meant that the community's attitudes to cars could not be changed in a day. In addition, the community opposed the initiative for several reasons: 1) the initiative was announced at short notice; 2) the infrastructure and services provided by public transport are inefficient and poor. The community voiced their concerns, especially on public transport, as the services are poor and there are no alternatives.

This is relevant to the Brunei transportation system. A change in regime, especially on subsidies, will be possible in the future. Furthermore, the cost of electricity and fuel are also subsidised by the government. Thus, the reform of bus services, in the new tender together with the Brunei Land Transport Master Plan, may reduce unsustainable mobility in Brunei. The possibility of reform of petrol subsidies and the vision of providing more bus services on new routes and with improved frequency and service coverage, may enable the bus services to improve and attract more passengers in the future.

10.8 Conclusions

This chapter has identified the three levels of the MLP in Brunei. Brunei has been developing several programmes and initiatives to promote sustainable transportation. However, the effort has had little effect so far. Thus, the employment of the MLP may aid an understanding of the state of sustainable transportation in Brunei, in terms of identifying the reasons why transition occurs, the suitable technological and non-technological niches for sustainable

transportation and the barriers and potential of sustainable transportation. The chapter also addresses the gaps in the literature identified in chapter 3 and explains how the thesis might strengthen the MLP by using the transportation case of Brunei. This thesis further motivate the potential of new research to enhance the use of MLP in a country where there are particular circumstances (in this case cheap fuel limiting the attractiveness of public transport) challenge the transition to sustainable transportation to occur.

It is clear that Brunei needs a transition towards sustainable transportation, more specifically low-carbon transportation. The nature of the car, which dominates the transport system and shapes the attitudes and behaviour of the people in Brunei, makes the transition challenging. It is concluded than public transportation has not supported social and economic activities in Brunei in a sustainable way. Brunei is thus facing an unsustainable transportation scenario.

Transition towards low-carbon emissions in Brunei is progressing but progress in the transportation sectors is slow. Thus, the government should introduce more vigorous measures for transition purposes. The transition in the transportation sectors is seen to be undergoing soft policy measures. Radical measures are needed but the government should have good options available before radical measures are implemented. These include the involvement of other actors in the regime, such as the views of the people regarding suitable public transport options.

This research offers an example of transition towards low-carbon transportation. The importance of this study lies in the insights it provides into efforts by the regime in Brunei to achieve transition in transportation, especially involving the use of cars. This research has provided a good example to enhance our understanding of the transition process, especially in a country with a different system of governance compared to that found in the West. Brunei has a top-down governance model, dominated by the oil and gas industries. This model represents a good place in which to undertake transportation-transition research and offers a challenge to academics and researchers to contribute to the development of low-carbon transportation in Brunei and globally in countries with the same system of governance.

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Appendix

Appendix 1: Ethical Clearance

APPENDIX C

A PROFORMA FOR

STAFF AND POSTGRADUATE RESEARCH STUDENTS BEGINNING A RESEARCH PROJECT

Department of Geography

Research Proposer(s): MUHAMMAD AMIRRUDDIN BIN HAJI ABDULLAH

Programme of Study (postgraduate students): PHD in HUMAN GEOGRAPHY

Research Title: Analysis of the suitability of the SOCIO-TECHNICAL TRANSITION to the development of low carbon transportation in Brunei Darussalam

Research (brief):
- people's perceptions and attitude towards cars and public transport
- improve transport sustainability in Brunei
- analyse the Brunei policy and governance
- consider the appropriateness of socio-technical concept for the sustainable transportation in Brunei

Source of Research Funding (where appropriate) BRUNEI GOVERNMENT SCHOLARSHIP

Proforma Completion Date: 01/2014

This proforma should be read in conjunction with the ethical principles. It should be completed by the researcher. It should be sent on completion, together with a brief (maximum one page) summary of ethical issues raised by the proposed research, for approval to the Geography Ethics Officer prior to the beginning of any research.

Part A

1. Will your research involve animal experimentation?   Y (N)

   If the answer is 'YES' then the research/teaching proposal should be sent direct to the University Ethics Committee to be assessed.

2. Will your research involve human participants?   (Y) N

   If the answer to both questions is 'NO', there is no need to proceed further with this proforma, and research may proceed (however, please send a copy of the form to the Ethics Officer). If the answer is 'YES' please answer all further relevant questions in part B.

Part B

3. Will the research involve people under 18 years of age?   Y (N)
   If yes, have you taken the following or similar measures to deal with this issue?
       (i) Informed the participants of the nature of the research?   Y / N
       (ii) Ensured their understanding?   Y / N
       (iii) Gained the non-coerced consent of their parents/guardians?   Y / N

4. Will you obtain written informed consent from the participants?   (Y)/ N
    If yes, please include a copy of the information letter requesting consent
    If no, what measures will you take to deal with obtaining consent?

    ███

5.   Issues for participants. *Please answer the following and where you respond YES in any case, state how you will manage perceived risks:*

    a)   Do any aspects of the study pose a possible risk to
    participants' physical well-being?   YES   (NO)

    b) Will any important information about the research be deliberately   YES   (NO)
    withheld from the participants?

    c)   Are there any aspects of the study that participants might find
    humiliating, embarrassing, ego-threatening, in conflict with their   YES   (NO)
    values, or be otherwise emotionally upsetting?*

    d)   Are there any aspects of the study that might threaten   YES   (NO)
    participants' privacy (e.g. questions of a very personal nature;
    observation of individuals in situations which are not obviously
    'public')?*

    e)   Does the study require access to confidential sources of
    information (e.g. medical records)?   YES   (NO)

    f)   Could the intended participants for the study be expected to
    be more than usually emotionally vulnerable (e.g. medical patients,   YES   (NO)
    bereaved individuals)?

    *Note: if the intended participants are of a different social, racial, cultural, age or sex
    group to the researcher(s) and there is **any** doubt about the possible impact of the
    planned procedures, then opinion should be sought from members of the relevant
    group.

6. Might conducting the study expose the researcher to any risks   Y (N)
    (e.g. collecting data in potentially dangerous environments)?

7. Is the research being conducted on a group culturally different from the
    researcher?   Y (N)
    If yes, are sensitivities and problems likely to arise?   Y / N
    If yes, please describe how you have addressed/will address them.

8. Does the research conflict with any of the Department's research principles?
    (please see attached list, page 7).   Y (N)
    If yes, describe what action you will take to address any conflicts?

9.   Will the research require the consent of any outside organisation?   (Y) N

If yes, describe how you will obtain consent.

Written letter to the Ministry of Education, Brunei

Name of Researcher ..MUHAMMAD AMIERUDDIN HAJI ABDULLAH

Signature ......Amir... Date ...22/08/2011...........

This research proposed in this proforma must gain recommendation for approval from the Geography Ethics Officer. Once this is gained, formal approval will be given by the Geography Ethics Committee.

It is recommended that the research referred to in this proforma is given approval by the   (Y) / N
Geography Ethics Committee.

Name of Ethics Officer ....

Signature .... Date...26.8.11.................

Appendix 2: Letter to Brunei Student Unit

Cikgu Hjh Azizan D.P. Haji Othman

Acting Director of Studies

Brunei Student Unit

35-45 Norfolk Square,

London W2 1RX

4th March 2012

Dear Madam,

Request for permission to conduct a PhD research study entitle "Analysis of the suitability of the socio-technical transition to the development of low carbon transportation in Brunei Darussalam"

I am a Doctoral candidate at the Department of Geography, University of Hull, United Kingdom. I am conducting a research study entitle "Analysis of the suitability of the socio-technical transition to the development of low carbon transportation in Brunei Darussalam". The aim of this research study is to analyse the potentials for the development of low carbon transportation in Brunei Darussalam.

For your information, my research study is guided and supervised by Dr Pauline Deutz, Professor Andrew Jonas and Professor David Gibbs, from the Department of Geography, University of Hull, United Kingdom.

I would like to request permission and a letter of authorization to recruit 400 participants for survey questionnaires and between 25 - 30 participants for in-depth interviews (from the government officials, the private sectors, research institutions and NGOs). The data collection will take place in the four districts of Brunei Darussalam between April till September 2012

The data collection will be minimal disruptive to the participants working hours. All data will be stored under secure conditions. The participation is voluntary and details of participants will remain anonymous. The participant can withdraw from the study without consequences and prejudice. The data from the participant who withdraw from the study will not be used.

This study has been cleared in accordance to the ethical procedures from the Department of Geography, University of Hull. You are free to discuss this study with the principal supervisor (Dr Pauline Deutz) or speak to the Ethic Officers on + (44) (0) 1482 465320

1 | P a g e

Yours faithfully,

....

Muhammad Amirruddin Haji Abdullah

PhD student,

Department of Geography,

University of Hull,

Cottingham Road,

Hull, HU6 7RX,

United Kingdom

E-Mail: M.A.Haji-Abdullah@2010.hull.ac.uk

BSU no: 30366

Tel: +673 8973565 (Brunei Darussalam)

Tel: +447749107124 (UK)

Dr Pauline Deutz

Principal Supervisor

E-mail: p.deutz@hull.ac.uk

Contact No: +44 (0) 1482 465948

Professor Andrew Jonas

Email: a.e.jonas@hull.ac.uk

Contact No: +44 (0) 1482 465368

Professor David Gibbs

Email: d.c.gibbs@hull.ac.uk

Contact No: +44 (0) 1482 465330

Cc:

Cikgu Khalid Hj Sulaiman

Academic Coordinator,

Brunei Student Unit

Appendix 3: Letter (supervisor) to Brunei Student Unit

UNIVERSITY OF Hull

Acting Director of Studies
Hjh Azizan D.P. Haji Othman
Brunei Student Unit
35-43 Norfolk Square
London W2 1RX

Geography
T 01482 465948
F 01482 466340
E p.deutz@hull.ac.uk

8 March 2012

Dear Hjh Azizan D.P. Haji Othman,

RE: Muhammad Amirruddin Haji Abdullah

I, Dr Pauline Deutz, principal supervisor for Muhammad Amirruddin Haji Abdullah, hereby give permission for him to conduct his research study in Brunei Darussalam from April 2012 to September 2012. I understand that his research study entitled "Analysis of the suitability of the socio-technical transition to the development of low carbon transportation in Brunei Darussalam" aims to analyse the potentials for the development of low carbon transportation in Brunei Darussalam.

His research study will involve up to 400 participants for survey questionnaires and 25 – 30 participants for in-depth interviews, throughout the four districts in Brunei Darussalam. His research study has been cleared in accordance to the ethical procedure from the Department of Geography, University of Hull. The cost of his study (which includes flight) in Brunei Darussalam will be paid by the Department of Geography, through his bench fees.

I understand that
1.   The aims, methods, and anticipated benefits, and possible risks/hazards of the research study have been explained to me
2.   The aggregate result will be used for research purposes and may be reported in scientific and academic journals
3.   The research study will be minimal disruptive to the participants' working hours
4.   The research study is voluntary and participant can withdraw from the study without consequences and prejudice
5.   All data will be stored under secure conditions.

Yours sincerely,

Dr Pauline Deutz,
Lecturer.

University of Hull
Hull Campus
Cottingham Road
Hull, HU6 7RX

www.hull.ac.uk

Appendix 4: Letter from Scholarship Division to Head of Department

Fax : 673-2380701
Telephone : 673-2381133

كنترين قنديديقئن

KEMENTERIAN PENDIDIKAN
MINISTRY OF EDUCATION
BANDAR SERI BEGAWAN BB3510
NEGARA BRUNEI DARUSSALAM

Rujukan Kami :
Our Reference JPLL/S/6715

25 Jamadilawal 1433
17 April 2012

KEPADA SESIAPA YANG BERKENAAN,

Tuan / Puan,

MEMOHON MEMBUAT KAJIAN PENYELIDIKAN
AWANG MUHAMMAD AMIRRUDDIN BIN HJ ABDULLAH
TAHUN 2 PhD IN HUMAN GEOGRAPHY
UNIVERSITY OF HULL, UNITED KINGDOM

Dengan ini adalah disahkan bahawa pelajar tersebut di atas adalah penerima biasiswa kerajaan pada sesi 2010 / 2011 dan pada masa ini sedang berada di Brunei Darussalam.

Untuk makluman Tuan / Puan, pelajar berkenaan berhasrat untuk membuat kajian bagi mendapatkan data-data yang diperlukan untuk pengajiannya. Tajuk kajian ialah **"Analysis of the suitability of the Socio-Technical Transition Concept to the development of low carbon transportation in Brunei Darussalam"**. Kajian akan dibuat dalam bulan April 2012 hingga 1 September 2012.

Sehubungan dengan ini, sukacita dipohonkan jasa baik dan kerjasama Tuan / Puan untuk membantu pelajar di atas bagi mendapatkan maklumat-maklumat yang diperlukan yang mana maklumat-maklumat tersebut adalah sebahagian daripada kandungan isi kursus bagi menyumbangkan markah PhD pada tahun akhir (tahun 2013) pelajar berkenaan.

Pelajar boleh dihubungi melalui alamat: No.9, Simpang 192, Kampong Kilanas, Jalan Bebatik Kilanas, BF2320, Negara Brunei Darussalam, atau melalui talian telefon 8729129 / 2680565 atau emel: ardiel982@hotmail.com.

Di atas kerjasama yang diberikan, saya bagi pihak Kementerian Pendidikan telebih dahulu mengucapkan ribuan terima kasih.

"Taat Beragama Hidup Sejahtera"

Sekian dan Wassalam.

[AWANG ABDULLAH BIN HAJI AHAD]
Pmk.Pegawai Tugas-Tugas Khas Kanan / Ketua Bahagian Dermasiswa
Kementerian Pendidikan
Negara Brunei Darussalam

hbhh2012

Appendix 5: Survey questionnaire

UNIVERSITY OF Hull

Transportation Questionnaires Survey

This questionnaires survey is part of a research study.

The aim of this questionnaires survey is to identify the travel attitude, behaviour and the choices of mode of transportations amongst people living in Brunei Darussalam.

This questionnaires survey is completely confidential and the data collected in this study will only be used for academic research purposes.

The questionnaires survey is divided into 7 sections. You are free to withdraw at any time and without adverse consequences.

Please spend about 10 to 15 minutes to answer this questionnaires survey. Your time and cooperation is very much appreciated.

This is an anonymous questionnaire. Please ensure that you do not write your name, or other comments that will make you identifiable, on the attached questionnaire. By completing this questionnaire you are consenting to take part in this research. If you have any concern about the ethics, please contact the Ethics Officers, Department of Geography, University of Hull, Cottingham Rd, Hull, HU6 7RX;
Tel No (+44) (0)14824 65320

Muhammad Amirruddin Haji Abdullah
PhD student,
Department of Geography,
University of Hull,
United Kingdom
E-Mail: M.A.Haji-Abdullah@2010.hull.ac.uk

Please tick (√) where appropriate

Section 1: About yourself

1.1 Are you:
Male   [ ]
Female   [ ]

1.2 District:
Belait   [ ]
Brunei Muara   [ ]
Temburong   [ ]
Tutong   [ ]

1.3 Nationality:

_____

1.4 Age:
18 – 25   [ ]
26 – 35   [ ]
36 – 45   [ ]
46 – 55   [ ]
56 – 65   [ ]
66 and over   [ ]

1.5 Occupation:
Student   [ ]
Working (Government sector)   [ ]
Working (Private sector)   [ ]
Self-employed   [ ]
Retired   [ ]
Not working   [ ]
Looking for a job   [ ]
Housewife/househusband   [ ]

1.6 Salary range/allowance range per month:
Below $1 000   [ ]
$1 000 - $2 000   [ ]
$2 001 - $3 000   [ ]
$3 001 - $4 000   [ ]
Above $4 000   [ ]

1.7 Number of people in your household:
1   [ ]
2   [ ]
3   [ ]
4   [ ]
5 and above   [ ]

Section 2: Car Ownership

2.1 How many car drivers are there in your household?
        0   [ ]
        1   [ ]
        2   [ ]
        3   [ ]
        More than 3   [ ]

2.2 How many cars in your household?
        0   [ ]
        1   [ ]
        2   [ ]
        3   [ ]
        More than 3   [ ]

2.3 How many cars do you own at present?
        0   [ ]
        1   [ ]
        2   [ ]
        3   [ ]
        More than 3   [ ]

2.4 Are you planning to buy a car in the near future (within 2-3 year time)?
        Yes   [ ]
        No   [ ]
        Maybe   [ ]
        Not sure   [ ]

2.5 What are the main motivations for you to buy a car? [you can tick more than one]
        Necessity for work related reasons   [ ]
        Necessity for family reasons   [ ]
        Safer travelling with car than bus   [ ]
        Personal Security   [ ]
        Safety on the road   [ ]
        Easy to travel   [ ]
        Inadequate public transport services   [ ]
        Pressure from family and friends   [ ]
        Existing car needs replacing   [ ]
        To have a car is affordable   [ ]
        Afford to buy a newer model than you have   [ ]
        Afford to buy more expensive model that you have   [ ]
        Others (please specify) _____

2.6 What is your main criterion for choosing a car?
        Cost   [ ]
        Comfort   [ ]
        Good for the environment   [ ]
        Life style   [ ]
        Engine Power   [ ]
        Physical appearance of the car (example shape)   [ ]
        Others (please specify) _____

Section 3: Public transport use

3.1 Do you use public transport (bus or taxi) in Brunei?
        Yes   [ ]
        No   [ ] (please proceed to section 4)

3.2 How often do you use public transport in Brunei?
        Everyday   [ ]
        Weekdays   [ ]
        Weekends   [ ]
        Once a week   [ ]
        Once a month   [ ]
        More than once a month   [ ]

3.3 How do you get to the public transport area?
        Walk   [ ]
        Cycle   [ ]
        Drive and park near the stop   [ ]
        Driven to the nearest stop   [ ]
        Other (please specify) _____

3.4 What is your main motivation to use the bus (for bus user)?
        I prefer the bus over my car   [ ]
        I choose to ride the bus   [ ]
        The bus is my only option   [ ]
        To save money   [ ]
        For the environment   [ ]
        Personal Safety   [ ]
        Safety on the road   [ ]
        Convenience   [ ]
        Other (please specify) _____

3.5 What is your main motivation to use the taxi (for taxi user)?
        I prefer the taxi over my car   [ ]
        I choose to ride taxi   [ ]
        The taxi is my only option   [ ]
        To save money   [ ]
        For the environment   [ ]
        Personal Safety   [ ]
        Safety on the road   [ ]
        Convenience   [ ]
        Other (please specify) _____

3.6 How do you rate the bus and/or taxi services:
    1 = very satisfactory   2= satisfactory   3= not sure   4= unsatisfactory   5 = very unsatisfactory
        Cleanliness   Bus [ ]   Taxi [ ]
        Frequency   Bus [ ]   Taxi [ ]
        Reliability   Bus [ ]   Taxi [ ]
        Personal Safety   Bus [ ]   Taxi [ ]
        Safety on the road   Bus [ ]   Taxi [ ]
        Comfort   Bus [ ]   Taxi [ ]
        Information   Bus [ ]   Taxi [ ]
        Cost   Bus [ ]   Taxi [ ]
        Travel coverage   Bus [ ]   Taxi [ ]

Section 4: Travel behaviour

4.1 Which mode of transports do you use most frequently for:

Travel to work/school	Car [ ] Bus [ ] Taxi [ ] Other _____
Leisure	Car [ ] Bus [ ] Taxi [ ] Other _____
Shopping	Car [ ] Bus [ ] Taxi [ ] Other _____
Family Gathering	Car [ ] Bus [ ] Taxi [ ] Other _____

4.2 Rate how important the following factors are for using cars:

1 = very important, 2 = important, 3= not sure, 4= not important, 5 = least important

Travel time	[ ]
Frequency	[ ]
Reliability	[ ]
Personal Security	[ ]
Safety on the road	[ ]
Comfort	[ ]
Cost	[ ]
Weather	[ ]
Self-satisfaction	[ ]

4.3 Rate how important the following factors are for using bus:

1 = very important, 2 = important, 3= not sure, 4= not important, 5 = least important

Travel time	[ ]
Frequency	[ ]
Reliability	[ ]
Personal Security	[ ]
Safety on the road	[ ]
Comfort	[ ]
Cost	[ ]
Weather	[ ]
Distance from bus stops/taxi stand	[ ]
Self-satisfaction	[ ]
Information	[ ]

4.4 How much do you spend on fuel for your car per week?

Below $10	[ ]
$11 - $20	[ ]
$21 - $30	[ ]
$31 - $40	[ ]
Above $40	[ ]

4.5 How much do you spend on using the bus per week? [For those using public transport]

Below $5	[ ]
$5 - $10	[ ]
$11 - $15	[ ]
$16 - $20	[ ]
Above $20	[ ]

4.6 How much time do you spend on the road on a typical day [Example journey from house to university 40 min, university to gym 20 min, gym to house 30 min. Time spends on the road = 90 min]

Below 60 min   [ ]
60 – 90 min   [ ]
90 – 120 min   [ ]
More than 120 min   [ ]

4.7 Why, in your opinion, people do not use buses?

1 = strongly agree, 2 = agree, 3= not sure, 4= disagree, 5 = strongly disagree

The bus services are infrequent   [ ]

Concern with personal safety when using buses   [ ]

Concern with road safety when using buses   [ ]

The buses are not clean   [ ]

The bus is not comfortable   [ ]

The buses are not reliable   [ ]

They are embarrassed to use the bus   [ ]

Using the bus in Brunei would affect my social status   [ ]

It is cheaper to use the car   [ ]

Could save time when using car   [ ]

The destination covered by the buses are inadequate   [ ]

Bus infrastructure is inadequate   [ ]

Bus stops are far from home   [ ]

Inadequate information about bus and their services   [ ]

My spouse/parents/family/friends do not wish me to use the bus   [ ]
       [if you answered 1 or 2, please state the reason(s)]

_____

4.8 Your opinion on the following statements on car ownership?

1 = strongly agree, 2 = agree, 3= not sure, 4= disagree, 5 = strongly disagree

I am happier if I have a car   [ ]

Car offers prestige, symbol of status and success   [ ]

Having a car is affordable in Brunei   [ ]

Cheap petrol price motivates me to own a car   [ ]

Easy to go shopping, socialising and attend family activities with cars [ ]

Public transport restricts my mobility [ ]

Car protects me from undesirable weather [ ]

More job opportunities and options if I have a car [ ]

Easy to send child/children to school [ ]

Pressure from family/friend to own a car [ ]

4.9 Your opinion on the effectiveness of the following initiatives for sustainable transport use

1 = very effective, 2 = effective, 3= not sure, 4= not effective, 5 =very not effective

More bus routes [ ]

Cheaper fares [ ]

Few parking space [ ]

Higher parking fees [ ]

Introduction of bus lanes [ ]

Introduction of cycling lanes [ ]

Introduction of Mass Rapid Transit (MRT)/ Light Rail Transit System (LRT)/ Monorail [ ]

More environmental friendly public transportations [ ]

More environmental friendly private transportations [ ]

More frequent public transport services [ ]

Improve safety for walkers by providing pavement/sidewalk and crossing area [ ]

4.10 Your opinion on the effectiveness of the following policies for sustainable transport use?

1 = very effective, 2 = effective, 3= not sure, 4= not effective, 5 =very not effective

Increase the cost of fuel [ ]

Increase car tax [ ]

Increase car insurance [ ]

Reduce fuel subsidy for private cars in favour of investment in public transport [ ]

Subsidise ticket for public transport (such as Employee travel scheme) [ ]

Change the transport allowance for students to public transport tickets [ ]

More regular car inspection (both on the road and at the vehicle inspection centre) [ ]

Penalties for vehicles which emit pollution above the standard limit [ ]

Subsidies on environmental friendly private transportation [ ]

Subsidies on environmental friendly public transportation [ ]

Education and awareness on environmental issues [ ]

Education and awareness on sustainable transportation [ ]

Program for increasing bus attractiveness [ ]

Better integration and coordination of public transport services [ ]

The use of ICT for bus timetables and services [ ]

Section 5: Awareness on sustainable transportation and carbon emission

1: Agreed   2: Disagreed   3: Not Sure

In your opinion, do ground transportations (such as car and bus) have environmental impact on the environment?
[ ]

Brunei is one of the highest carbon dioxide emitter per capita in the world. In your opinion, do you think cars and other ground transportations contribute to this emission?
[ ]

Are you willing to use public transport more often to reduce carbon emission?
[ ]

In your opinion, are the traffic congestions in Brunei due to the high rate of car ownership?
[ ]
In your opinion, are the traffic congestions in Brunei due to the lack of public transport services?
[ ]

Would you be willing to purchase environmental friendly car (such as the hybrid car) in the future if the cost were similar to the conventional car?
[ ]

Would you be willing to purchase environmental friendly car (such as the hybrid car) in the future if the performance were similar to the conventional car?
[ ]

Would you be willing to purchase environmental friendly car (such as the hybrid car) in the future if the cost were more expensive compare to the conventional car?
[ ]

Would you consider car sharing to reduce traffic congestion?
[ ]

In your view, should the community (for example, yourself) participate more in the sustainable transport initiative?   [ ]

In your view, should the community (for example, yourself) participate more in the planning process of sustainable transportation policy?

[ ]

In your view, should the government and the public transport operators invite the community (for example, yourself) to participate in developing public transport infrastructure and services?

[ ]

In your opinion, do the abundance of forest in Brunei is enough to reduce the level of carbon in Brunei?   [ ]

In your opinion, could urban planning reduce the carbon emission from transportation?

[ ]

Section 6: Management

6.1 Are you aware of any government's initiatives to reduce carbon emission?

Yes	[ ]
No	[ ]
Not sure	[ ]

6.2 Are you aware of any private sectors' initiative to reduce carbon emission?

Yes	[ ]
No	[ ]
Not sure	[ ]

6.3 Are you aware of any government's initiatives to promote sustainable transportation?

Yes	[ ]
No	[ ]
Not sure	[ ]

6.4 Are you aware of any private sectors' initiative to promote sustainable transportation?

Yes	[ ]
No	[ ]
Not sure	[ ]

6.5 Please rate the following statements

1 = very satisfied, 2 = satisfied, 3= not sure, 4= unsatisfied, 5 = very unsatisfied

Are you satisfied with the government sectors' initiative to reduce carbon emission?

[ ]

Are you satisfied with the private sectors' initiative to reduce carbon emission?

[ ]

Are you satisfied with the government sectors' initiative to improve the sustainable transportation?

[ ]

Are you satisfied with the private sectors' initiative to improve the sustainable transportation?

[ ]

Are you satisfied with the current public transport facilities?

[ ]

Are you satisfied with the current road infrastructures?

[ ]

Are you satisfied with current services offered by the public transport operators?

[ ]

Section 7: Suggestions and comments

7.1 Do you have any suggestions on how to increase public transport user in Brunei Darussalam?

_____
_____
_____
_____

7.2 Do you have any suggestions on how to reduce car dependency in Brunei Darussalam?

_____
_____
_____
_____

7.3 Do you have any comments on low carbon transportation options in Brunei Darussalam?

_____
_____
_____
_____

7.4 Do you have any comments on ground transportation and carbon emissions in Brunei Darussalam?

_____
_____
_____
_____

7.5 Any other additional comments and recommendations?

_____
_____
_____
_____

Thank you for your time and cooperation.