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World
Sustainable
Development
Outlook 2012

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INVESTIGATION AND MODELLING OF TRAVEL BEHAVIOUR IN SAUDI ARABIA: A SUSTAINABLE BEHAVIOUR?

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Abstract: *Purpose* – The purpose of this study was to investigate and model travel behaviour and attitudes for households in Saudi Arabia.

Design/methodology/approach – A household survey was used to collect data on household travel patterns and socio-economic variables in the city of Tabuk in Saudi. The population of Tabuk city is just under 500,000 people, of which approximately 83 per cent are Saudi nationals and 17 per cent non-Saudi nationals. The average household size is about 6 persons.

Findings and originality – Although there have been a large number of research investigations into travel behaviour in Western countries, there is a huge lack of studies in this area in some countries, such as Saudi Arabia. The specific characteristics of socio-economic patterns as well as travel behaviour attitudes in this country make it a very interesting and unique area, which has its own characteristics and patterns, hence the need for the research.

Keywords: *Travel behaviour, Travel demand forecasting, Socio-economic variables, Travel behaviour in developing countries, Household surveys, Travel behaviour and sustainability*

Paper type Research paper



World Sustainable
Development Outlook
2012

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INTRODUCTION

Traveller behaviour research has been extensively investigated and analysed in Western countries and numerous papers have been published on the issue. However, there has been a distinct lack of research into this issue in developing countries. It is hoped that through this paper, a certain level of traveller behaviour shall be analysed, which will prove to be a starting point for further, more extensive analysis in the future. One of the main factors which affects the travel behaviour of individuals is the land uses adopted within the urban environment. In his 2010 paper, N.I. Mohareb carried out an analysis of the different factors affecting land use in Arab cities and the effect which these various land uses have on the methods of transportation used to access these areas. It put forward the argument that throughout history, Arab cities have developed in a completely different manner when compared to those of Western cities. Prior to the colonisation of these cities, they were allowed to develop whereby daily socio-cultural activities were located within walking distance of residential zones. However, due to the influx of Western ethos into these cities, there has been a change in the methods adopted in urban development and over time, this has led to a zoning of activities that depends heavily on vehicles for transportation (Mohareb, 2010). This change in general design of cities along with the rapid expansion of Gulf cities has led to an increased need for motorised transportation for residents to move between their required zones. An increase in population amongst Gulf countries can be clearly seen over the last 10 years, where the population of countries in the region such as Saudi Arabia, Qatar and United Arab Emirates have seen urban population growths at rates of 3.60 and 2.06 per cent, 6.81 and 15.48 per cent, 12.69 and 2.52 per cent respectively for the periods 2000-2005 and 2005-2010. When compared to rates of increase for Western countries such as the United Kingdom and the United States of America, with rates of 0.73 and 0.76 per cent, and 1.40 and 1.24 per cent respectively over the same time periods, this is a significant change in the population over a short period of time (United Nations, 2012).

CASE STUDY

The paper presents an investigation and modelling of travel behaviour and attitudes for households in Saudi Arabia. This is a very motivating and promising area of research. The specific characteristics of socio economic patterns as well as travel behaviour attitudes in this country make it a

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very interesting and unique area, which has its own characteristics and patterns, hence the need for the research. The city of Tabuk, in the upper north-western corner of Saudi Arabia, is selected as a case study. The concept of sustainability and attitudes to environmental issues has also been investigated in this research but not reported upon here.

Specific attention shall now be paid to the travel behaviour of individuals resident in the city of Riyadh, Saudi Arabia. It has been deemed prudent to analyse data collected in this city as it is located close to the town of Tabuk, whose residents shall be evaluated in the questionnaire section of this paper and as a result of their close proximity, both geographically and culturally, it is thought that their travel patterns should match closely. In the two papers under examination (Alhussein, 2011 and Al-Mosaind, 1998) there is an evaluation of different mode choices used by individuals in their journeys. However, as Alhussein's paper focuses on the modes used in arriving at the city's airport, there will be an inherent lack of authenticity for the study's results when examining daily travel patterns. Nonetheless, it is useful as a basis for the examination of the general mindset of the city's population. It is also deemed valuable as it is a much more recent document than that of Al-Mosaind.

RESULTS AND ANALYSIS

Current travel patterns

Data collected from the surveys carried out (Fig. 1) showed that the majority of individuals drove their own vehicle to work with a total of 64.1% (25) indicating that they regularly drive to work. Another 25.6% (10) of the respondents indicated that they utilised an informal car share while a further 12.82% (5) took part in a formal car share programme. In total, 12.82% (5) of respondents also had some form of professional private driver who drove them to their place of employment. No respondent indicated that they would regularly walk to work with 18% (7) of people saying that they would sometimes or seldom walk to work, and 58% (23) indicating that they would never choose this option. Of the 7 individuals who did indicate that they would sometimes walk to work, it was found that 6 of these drove to work on the majority of occasions with one availing of an informal car share as their main mode of transport. Likewise only 5.1% (2) of respondents indicated that they would regularly cycle to work with 69.2% (27) saying that they

would never cycle to work. Both of these figures for the non-walking and non-cycling may be higher with these methods, as a number of people neglected to answer their preference for all options provided, which may result in even higher levels being achieved in these areas. Taxis represented the least used mode of transport, with only three respondents indicating that they would use these less than once per week.

Speed of access was deemed the most important factor when choosing the mode of travel, with a total of 80% of drivers choosing this as a determining factor in their decision making. The second most important factor affecting the car as the mode chosen was the frequency of this mode, with 60% of respondents signifying this as a determining factor. Privacy was another factor which influenced the decision making process, with 56% of respondents indicating it as a factor; however, only 8% indicated this as a major issue.

From data provided by the respondents, it was found that on average, citizens have a journey time of 17.89 minutes, while those partaking in informal car shares averaged 10 minutes. For those with private drivers, only 3 individuals responded to this question and provided an average journey time of 16.667 minutes. It has been found that there is a requirement within the study group to refuel their vehicles on average once every 3.92 days at an average expense of 34.107SR, with a maximum expenditure of 110SR being presented by one individual who refills their vehicle once every 3 days, which indicates a much greater above average car use. When we take a further look at this

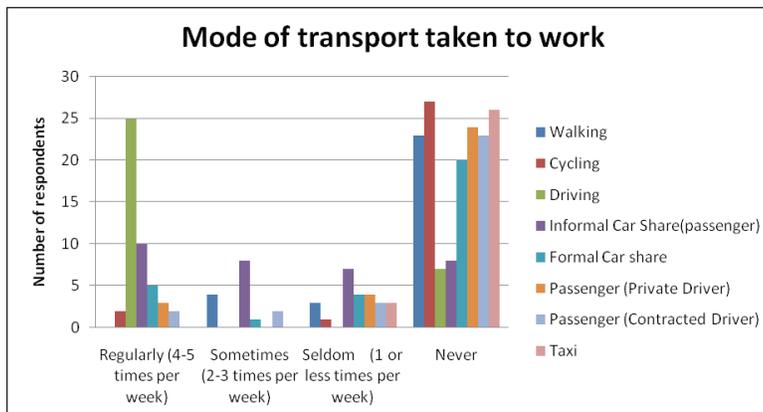


Figure 1:
Mode of transport
taken to work

individual's reason for choosing this mode, we see that they needed their car before or after work, which was one of the main influences on their modal choice.

When the respondents were asked about the importance of various characteristics of their current mode of travel, it was found that a major percentage of the drivers found safety to be the most important factor followed by comfort and reliability, with percentages of 82.7%, 75.8% and 72.4% of driver respondents identifying these factors as being very important to them. Environmental friendliness of this mode was once more at the bottom of the scale, with only 24% of drivers deeming it as very important and 13% deeming it not at all important. For those availing of car sharing programmes of one sort or another, it was found that safety, reliability and environmental friendliness accounted for the most important factor when choosing their mode. However, these only accounted for a total of 7.7%, 7.7% and 5.12% of the overall survey group. For those driven by private chauffeurs, comfort was the factor of utmost importance to them. Of the 25 drivers who partook in the survey, it was found that 8 of these had additional commitments on the way to or from work, with seven of these representing the transportation to or from school and one individual visiting the bank and Saudi monetary establishment.

Views on modes of travel

The next section of the questionnaire dealt with individuals' overall travel behaviour and their views about modes of transport in general. Initially the questionnaire asked about modes of travel used for any purpose over the last year. For these data we have found that the amount of people who walk has increased significantly, with 10% of respondents walking more than once again, which has increased from 0 for work journeys. Those who said they never walk dropped from 58% to 38%, with increases even taking place throughout all of the other options.

The option of a public bus was also introduced into this scenario, and it was found that only three individuals used the bus at all and only one person used it on a weekly basis. The use of the car/van is still the most popular mode of transport at 38%; however the amount of people who indicated that they never use this mode rose to 48%. This seems erroneous, as it is extremely unlikely that the amount of people not using cars for any possible journey can rise when compared to those using them for work journeys only. This may be due to some confusion in the

wording and is further emphasised by the fact that the level of people cycling also fell.

It was also seen, however, that the number of people availing of a private driver on a regular basis increased by 2.56% to 15.4% of respondents. The number of people availing of taxis also increased, with a total of only 56% now indicating that they never take a taxi, which is down ten per cent from 66% for work journeys. When asked about the adoption of an alternated mode of transport should the current available mode become unavailable to them, it was found that 48.7% of respondents would avail of a private driver, while a further 41% would choose to take a taxi. The lowest mode represented here was that of the private bus, with only 5% of respondents indicating that it would be a choice they would partake in.

When asked about journey prices and durations we can see that overall there was a perception that these alterations in mode choice would often result in increases in both regards. Where individuals indicated walking trip durations, we can see that these would most likely be unfeasibly long with the average journey time being 59 minutes. Consideration should also be made of the fact that these also represent two of the individuals who specified having other commitments on the way two and from work in the form of transporting children to school. These individuals would be most likely to be safer in cars than walking.

When asked to rank the modes of travel available from one to five (one being good and five bad) for various criteria, it was found that the private car consistently scored best in all areas examined. A car sharing option is seen to rank worse with respect to cost than that of a private driver and equal to that of a driver for the work trip only. The taxi was deemed most expensive. Cost, reliability and safety are the only scenarios where the car share option was rated better than that of the taxi. A private driver was viewed as the second best available option in all the scenarios, with a private driver for work trips only being consistently third. Surprisingly, these views held up for environmentally friendliness, which viewed car sharing as the least popular surpassed by all other modes of transport.

Changes to travel time

We can see that the majority of the travellers surveyed begin their working between the hours of 07:00hrs and 08:00hrs with a total of

56% of individual starting at this time, and a further 29% starting before 07:00hrs. The highest representative finishing times are between 02:00hrs and 02:30hrs and 14:30hrs pm and 15:00hrs pm and account for 35.9 and 30.8% respectively. Due to these start and finish times, it is clear that these individuals will be using the road network during the peak early morning traffic times. Should these individuals be capable of changing their start and finish times, then they may be capable of reducing their overall journey times, as there would be significantly lower traffic volumes, which would result in a less obstructed commute.

When asked about the possibility of changing their start and finish times the majority (59%) of individuals indicated that they would be capable of changing their working hours should they so wish. On average, those who would be capable of changing the start time of their job would be able to do so 30 minutes earlier and 70 minutes later. The main reason presented by those who would not be able to change their start time (23.07%) was due to the restrictions of specific timetables within their workplace, along with the need to transport children to school. With reference to finishing times, it was seen that similar numbers would be able to finish later: (61%). From the data supplied by these individuals, on average, their working hours could be extended by up to 90 minutes, which would represent a significant change in the relative percentage of these individuals travelling during the evening peak. Once more, the main factors preventing any alterations in the finishing time of certain individuals are family commitments and lack of flexibility within the workplace.

Attitudes to travel impacts

Initially in this section the respondents were asked about their perceptions of how they and in turn the general public are effected by specific traffic situations. From this it has been found that a large percentage feel that pollution is an issue that affects them in some way (86%) along with its effect on the general public, with 68% of respondents thinking this is a valid issue. These levels of concern about environmental issues are quite surprising given that such a small percentage of respondents viewed it as something to consider when a mode of transport to take to work. Traffic congestion during off-peak and peak time is seen to be a major issue which affects both the individual and the general public. This can be seen as 79% of people believed that off-peak and 87% believed that peak times were a serious problem, with no respondent indicating that traffic

congestion was not an issue that affected them. Also it was perceived as a serious issue for the general public by 56% and 69% of respondents for the two time periods.

A further 74% of individuals believed that delays due to congestion were a serious issue for them, and once more, no individual said it was not an issue in any way. The respondents also believed that this was an issue for the population as a whole, with 59% of respondents agreeing that it is a severe issue, along with 23% believing it to be a moderate problem for the general public.

With respect to noise issues, we see a change in perception when the issue concerning impacts on the general public are assessed. In this situation, the respondents were once more asked to assess the impact of traffic noise on themselves and the general public. In this case, 69% of respondents viewed it as an issue that affected them, whereas only 20.5% viewed it as an issue affecting the general public. This is seen further whereby the implications of the perception of the effect of traffic fumes on pedestrians for the individual was rated by 59% of respondents as being a serious issue and 30.7% as a moderate problem. However, once they were asked to apply these same criteria to the general public, only 28.2% viewed it as a serious problem, with 41% viewing it as a moderate problem. Furthermore, 69% and 61% of respondents felt that pedestrian and cyclist safety were serious issues when they were applying the situation to themselves. A further 25% and 12% respectively felt that these were moderate issues. When these situations were to be applied to the general public, it was found that the levels of concern fell to 41% and 30%, with a further 30% and 28% respectively seeing as a moderate problem.

A large percentage of the individuals surveyed (51.2%) believed that charging would result in a reduction in the level of congestion. As was pointed out earlier, this is viewed as a major problem within the city and any steps to alleviate it will be surely welcomed. The respondents were also asked for their view on the ways in which the revenue generated by these charges could be used, and it was seen that the majority wished for it to be reinvested in initiatives aimed at further reducing congestion. For example, 56% and 59% of respondents agreed that the revenue generated should be used to improve public transport and that parking fines should be put in place to further reduce congestion. In addition, 46% of respondents believed that the revenues should be used to tackle

the environmental pollution created by transport. Along with this support for charging facilities, we can see a significant backing for public transport and various public transport initiatives. For example, 51.23% of respondents stated that if a public transport system was put in place, they would use it to commute to work.

It was found that the average age of respondents was 30 years of age with the majority of respondents occupying the 25-30 age profile. The majority, representing 41.3% of respondents, were the head of the family, with the wife representing 23.08% and oldest sons, daughters and sons representing 12.8%, 12.8% and 7.2% respectively. Married individuals represented 64.7%, with 35.3% indicating that they were single. University graduates represented 44% of the sample group, followed by those possessing a diploma at 26.5% and those who had gone on to postgraduate level accounting for 20%. The remainder had achieved high school level with only one respondent having ceased education at middle school. The most common income level was represented by those earning between SR 4,000-8,000 per month accounting for 30.7% of respondents, with a further 20.5% occupying both the under SR 4,000 and the SR12,001-18,000 ranges.

The average number of cars per household was found to be 2.4 cars. However when this level of car ownership was compared with the car ownership per wage bracket, the average number of cars per household for those in the under SR 4,000 /month was found to be 2.375 cars, which is in line with the overall average. For the SR 4,001-8000 wage range, the average car per household was found to be 2.83. However, the main reason for this group being above average can be put down to the fact that one household within this range possesses a total of nine cars, which is far above the general survey group average. When this respondent was questioned about driving licence prevalence within the household, it was indicated that all individuals within the household did in fact hold a driving licence. Unfortunately, this individual neglected to answer the question pertaining to the household size, therefore we cannot use this information to determine how many cars per person are present within this household. Overall, the number of cars owned per household was generally on a par or lower than the number of individuals who were capable of driving within the household as a whole.

When asked about the ownership of a valid driving licence, only nineteen of the possible thirty-nine respondents indicated that they were

in possession of one. This is quite startling when the fact that twenty-five of the respondents indicated that they drove to work on a regular basis taken into account. This indicates that there is a lack of concern for the possible implications of being found driving without holding a valid driving licence. This also leads us to question how good the driving of these individuals might be if they have not achieved the standard of driving capability necessary to possess a licence.

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