Urban structures and daily mobility patterns in a city of long distances—the case of Muscat/Oman

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Population growth, urban sprawl and a high degree of car dependency as well as slowly rising petrol prices contribute towards increasing challenges for everyday urban mobility in Muscat, Oman. Until now, only a few empirical studies have dealt with urban mobility in Oman. Therefore, this article draws mainly on our own empirical findings to answer the following questions: What do daily and weekly mobility patterns look like in Muscat? How do these practices differ depending on the social position of the household, i.e. their nationality, income and education? Which interdependent effects can be discerned between everyday mobility practices and the fragmented and segregated urban structures? Since our research questions focus on the interrelations between urban structures and individual mobility, we chose a mixed-methods approach including methods derived both from social and spatial research. This article in particular draws on our quantitative survey covering 850 households and extensive mappings of three selected case study areas and secondary data analysis.

Keywords: Mobility, Urban, car dependency, Oman

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Introduction: The car dependent city of Muscat

In view of future challenges like climate change and oil depletion, there is a mounting consensus that the transport sector—which is currently responsible for 13 per cent of Greenhouse Gas emissions worldwide—has to adapt (Cervero, 2014: 175). In an urban context, which this paper is concerned with, the quest for more sustainable urban mobility is closely linked to debates about city structures and land-use planning (cf. e.g. Banister, 2012; Ewing & Hamidi, 2015).

In the large amount of literature on the interrelation of urban car-based mobility (usually measured as vehicle miles of travel per inhabitant) and urban structures, the factor density, diversity, design, destination accessibility and distance to transit have been taken into consideration (Ewing & Hamidi, 2015). While the relationship between population density and vehicle miles travelled is not a directly linear one (Vilhelmson, 2005), there is substantial evidence that low population densities (as a consequence of urban sprawl), job dispersion and a low priority given to public transport generate ‘cities of long distances’ and a high degree of car dependency (cf. e.g. Obeng-Odoom, 2015). Many urban planners are thus convinced that urban sprawl and car dependency have to be reduced if the current aim of achieving more sustainable, cleaner and more socially just cities of the future is to be realized (Cervero, 2014: 175).
This article looks more closely at the challenges that a transformation from carbon-based urban mobility to more sustainable forms of urban mobility poses for transport and urban planners, taking Muscat, the capital of the Sultanate of Oman, as an example. Muscat is one of the cities where the responsible governmental authorities have only very recently begun subscribing to a paradigm shift concerning urban mobility. Like other cities in the Gulf—whether Dubai in the UAE (Elsheshtawy, 2011; 2015) or Jeddah in Saudi-Arabia (Aljoufi, 2015)—Muscat has been shaped by the discovery and exploitation of oil in the 1970s and the subsequent quick modernization processes, population increase and urban growth. In these ‘oil-cities’, structural conditions as well as the general principles of urban planning have led to the emergence of ‘cities of long distances’ and a dominance of car-based mobility.

During the past 40 years, car-based traffic in Muscat has grown rapidly and has been accompanied by massive road infrastructure investments. The land consumption for roads, housing and commercial purposes has reached an alarming height and the responsible governmental bodies have begun to realize that there is a need for action: ‘The (mobility) problem of Muscat can’t be solved with roads. I think everybody will understand that we need to start having an integrated transport system’ (Representative of the Ministry of Transport and Communication, pers. comm., Muscat, March 2016).

The last five years have thus witnessed a number of crucial changes in Oman. On the one hand, it became apparent that for the last 40 years, the oil and gas reservoirs, which have laid the ground for the economic, social and infrastructural developments in Oman, will be depleted in the near future. On the other hand, lower prices on the world market led to a slump in state revenues, which resulted in a noticeable increase of petrol prices for residents. In times of rising fuel prices, the heavy reliance on individual motorized transport and the long distances to be covered by cars place an increasingly high financial burden on the less well-off households. It was only as recently as 2015 that a public transport system providing more equitable accessibility was introduced in the Capital Area of Muscat.

Our empirical research, conducted in 2016 and 2017, offers insights into a very decisive moment in terms of urban mobility in Muscat. Until now, aside from planning documents (see e.g. Jiménez et al., 2016; Ministry of Transport and Communication, 2016), very little research has been concerned with urban mobility in Muscat (noticeable exception: Al-Rawas, 1993). Therefore, our article is mainly based on our own empirical findings derived from a survey covering 850 households in Muscat, extensive mappings of three case study areas and secondary data analyses.

Here we focus on weekday mobility since the distances for work-related trips have been identified as a major source of significant growth in traffic in Muscat (Al-Rawas, 1993: 6). As our survey showed, work and education related trips make for the majority of trips on an average weekday. Weekend mobility (mostly leisure mobility) follows a different (and more differentiated) pattern and has therefore been mostly excluded from the analysis in this paper. We will draw on our survey data to answer the question: ‘To what extent can Muscat be regarded as a city of long distances?’ Furthermore, from a social sciences perspective we are interested in looking into the question of whether weekday mobility patterns differ depending on the social position in the household and/or depending on the respective built environment. In view of this aim, we have looked at both Omani and Indian family households since they are the two largest population groups in Muscat displaying independent mobility practices1. We will also compare three different neighbourhoods in Muscat (physically and socially differentiated
environments) to see whether and how differences in land-use and location may contribute to differing mobility patterns.

Our research is a first attempt to look at urban mobility in Muscat from a social sciences perspective. Our focus here is in particular, on the everyday mobility of individuals and households in a specific social context. Everyday mobility in this perspective is considered as all movements of people that do not entail the change of residence (Hanson, 2009: 467). This may include daily, weekly or monthly trips for work, education, shopping or leisure purposes, or trips made due to social obligations and to maintain social relationships. Everyday forms of mobility can be further differentiated into necessary (i.e. more or less unavoidable) forms of daily mobility, for example to a workplace or school, or more optional kinds of trips, e.g. for leisure activities or social contacts. Shopping trips can fall into both categories depending on whether their purpose is to purchase basic, daily goods or to ‘go shopping’ as a type of leisure activity. In contrast to mobility research that focuses on traffic and transport systems including movements of people and goods on an aggregated level (Gather et al., 2008: 24), our research is concerned with perceptions, preferences and experiences on an individual basis.

In the following section, we first describe Muscat’s urban growth and urban structure in more detail. Since we look at work related mobility, the second part of the section focuses on the distribution, expansion and clustering of work places within the city. The third section describes the methodological approach of the survey, while the fourth section presents some of the most significant findings related to the distances and times spent on the road for work related trips. The last two sections reveal how the respondents adapt to the latest increase in petrol prices and discuss the challenges towards more sustainable mobility in the specific case of Muscat.

**Muscat: Dynamic urbanization and fragmented urban structure**

The following section presents the spatial context of our case study and the first part is dedicated to tracing Muscat’s dynamic urbanization and population growth, while the second part introduces different economic and functional clusters as attraction points for individual mobility in the capital. In addition, we sketch the development and current state of the transportation infrastructure available in Muscat, i.e. road systems and public transportation. The physical conditions, spatial and functional fragmentation and infrastructure available in Muscat are described in some detail because we consider individual mobility as being embedded in and influenced by these urban features (Ewing & Cervero, 2010).

**Population growth and housing market**

1970 marked a political and economic turning point in the Sultanate of Oman. Sultan Qaboos took over power and the economic development of the country began resting on the exploitation of fossil fuels. During the ‘renaissance’ period—how this period is also known—modern social and technical facilities were established and developed at a quick pace (Peterson, 2004; Valeri, 2009). This is particularly true for the rapidly growing Capital Area of Muscat.

The National Development Strategy Plan from 1975 formed the guiding principles for settlement growth and the continuous expansion of the Capital Area of Muscat (Whelan, 1987). While during the 1970s, growth was mainly concentrated in the governorate of Muscat/Mutrah, during the 1980s, urbanization continued into the neighbouring governorate of Bawsher with the city quarters Qurum, Madinat Sultan
Qaboos, Al-Saruj, Al-Khuwair and Al-Ghubra. In the 1990s, the urbanization process moved further westwards and at the beginning of the 2000s it had reached the governorate of Al-Seeb, currently the main growth area (Scholz, 2014).

Due to the geo-physical setting, the growth of the Capital Area is confined by the Gulf of Oman in the north and by the Hajar Mountains in the south allowing the city only to expand in a linear way. Thus the Capital Area of Muscat today forms a linear urban corridor that stretches from Old Muscat in the east to Al-Maabela/Al-Seeb in the west, and extends about 80 km, covering a surface of 3500 km². The Capital Area of Muscat has been transformed into a highly fragmented urban space and forms a vast urban patchwork where mostly low-rise and low-density residential neighbourhoods alternate with areas dedicated to administrative, commercial, recreational, and cultural purposes.

The urban expansion corresponds to a continuous population growth (Table 1): in 1970, the Capital Area had approximately 50 000 inhabitants; in 1980, it had grown to approximately 226 000 inhabitants (Scholz, 1990: 162). In 1990, the count rose to 444 472 inhabitants, according to Al-Rawas (1993: 35), a population nine times as high as 20 years earlier. Beginning in 2007, the Statistical Yearbooks’ reports on population development and data showed a total population increase of 84 per cent from 2007 to 2016 for the Capital Area. While in 2007 the number of non-Omanis in the Capital Area was at 362 925 (Omanis: 422 590), by 2016 it had reached 929 583 (Omanis 512 039). Thus, in ten years the number of expatriates grew by 156 per cent, while the number of Omani nationals rose only by 21 per cent.

The latest census which also collected data on nationalities was conducted in 2010. At that time, the Capital Area of Muscat registered a total of 367 872 expatriates. Indian nationals comprised by far the largest group and at 238 383, accounted for 65 per cent of all expatriates there. The number of expatriates from other countries were much lower: 8 per cent Pakistani, 6 per cent Bangladeshis, 3 per cent Filipinos and 3 per cent Egyptian. The share of other Asian nationals combined reached 6 per cent, other Arab nationals totalled 5 per cent and other nationals, e.g. from European countries, made up 5 per cent of all expatriates in the Capital Area of Muscat.

Ever since the beginning of the labour recruitment in the 1970s, the majority of foreign labour in Oman has been from India. This is primarily a result of the long history of trade relations between Oman and India. The proximity of South-Asian countries


<table>
<thead>
<tr>
<th>Year</th>
<th>Omani</th>
<th>Expatriates</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>422 590 (53.8%)</td>
<td>362 925 (46.2%)</td>
<td>785 515</td>
</tr>
<tr>
<td>2008</td>
<td>434 403 (52.0%)</td>
<td>400 357 (48.0%)</td>
<td>834 760</td>
</tr>
<tr>
<td>2009</td>
<td>447 401 (47.1%)</td>
<td>502 293 (52.9%)</td>
<td>949 694</td>
</tr>
<tr>
<td>2010</td>
<td>407 006* (52.5%)</td>
<td>367 872* (47.5%)</td>
<td>774 878</td>
</tr>
<tr>
<td>2011</td>
<td>418 652 (41.7%)</td>
<td>585 090 (58.3%)</td>
<td>1 003 742</td>
</tr>
<tr>
<td>2012</td>
<td>435 149 (39.8%)</td>
<td>658 211 (60.2%)</td>
<td>1 093 360</td>
</tr>
<tr>
<td>2013</td>
<td>451 652 (39.1%)</td>
<td>704 209 (60.9%)</td>
<td>1 155 861</td>
</tr>
<tr>
<td>2014</td>
<td>470 085 (38.8%)</td>
<td>740 395 (61.2%)</td>
<td>1 210 480</td>
</tr>
<tr>
<td>2015</td>
<td>487 592 (38.2%)</td>
<td>793 640 (61.9%)</td>
<td>1 281 232</td>
</tr>
<tr>
<td>2016</td>
<td>512 039 (35.5%)</td>
<td>929 583 (64.5%)</td>
<td>1 441 622</td>
</tr>
</tbody>
</table>

*aActual Results of General Census of Population; all other data: Registered by the Directorate General of Civil Status; Source: National Centre for Statistics and Information 2008; 2010; 2012; 2014; 2016; 2017a.
plays a crucial role in the recruitment process as travel costs are low and even poorer families can afford to send relatives abroad and benefit from remittances. However, in the public sector, in the early stages of the recruitment, Egyptians were particularly preferred. Since the early 1990s there has been a shift away from hiring Egyptians into the public sector and instead hiring expatriates from Southeast- and South-Asian countries. This is owed, among other things, to their willingness to accept lower wages and poorer working conditions, albeit their being highly skilled. All these developments have resulted in Indian expatriates forming the largest foreign population group and providing the majority of expatriate workers in the private and public sector in the Capital Area of Muscat (Deffner & Pfaffenbach, 2015; Pfaffenbach, 2016).

The dynamic population growth is a big challenge to the responsible governmental bodies particularly in terms of providing enough and adequate housing. The Omani land allocation system established in the 1970s is based on the Land Law and is managed by the Ministry of Housing. The Ministry of Housing is responsible for housing policies and programs, structure plans and land use planning, land registration and all land management issues, including allocating land plots to citizens. Both the Royal Decree 5/80 and 125/2008 grant Omani nationals above the age of 23 years the right to claim a residential plot, a right that was extended to include female Omanis in 2008. Citizens apply for a plot and are registered on a waiting list. Whenever areas have been designated and prepared for development, the Ministry announces the distribution of plots by a lottery via internet and media. Those applicants that were drawn by lottery have to pay a registration fee within a given time span and are then registered as plot owners. Due to the ongoing and growing demand, residential plots today are primarily allocated in the newly developed areas, such as Al-Maabela West, and are merging with the eastwards expanding areas of the Batinah Governorate (Figure 1). Following the opening of new highways and access roads, new low density and low-rise settlements leapfrog into the areas designated by the Ministry of Housing. Rapidly sprawling urbanization is sped up by the fact that there is no enforcement to build up the plots after they have been allocated. The plot owner may wait for a couple of years until new roads, new schools and new hypermarkets have been opened before starting to build a house or sell the plot. Thus low density areas continue to grow, extending the urban ribbon along the coastline and thereby growing the distance between home and workplace, home and schools, home and shopping, as well as health and other facilities (Nebel, 2016).

As non-Omani nationals are excluded from state ruled land distribution, they depend on the rental housing market. The rental housing market reflects the diverse status of expatriates in Muscat and is mainly determined by the respective income situations. Migrants with low or intermediate incomes live in accommodations either provided for them by their employers or rented by them. The choices for higher paid expatriates are often also limited and typically depend on housing provided by employers and the proximity to international schools (Pfaffenbach, 2016).

Clustered workplaces
Workplaces in Muscat typically exhibit monofunctional structures and are clustered according to economic sectors. These land use patterns have their roots in the early years of development and were devised following the general guiding principles laid down in the Coastal Policy Study from 1977, the Capital Area Local Plan from 1977 and the Muscat Area Structure Plan from 1991. Muscat now has a number of distinct economic clusters—the Ministry district being the largest. It developed mainly as a result of Muscat’s function as the capital city and today about 18 ministries are located
in the neighbourhood of Al-Khuwair alongside the Sultan Qaboos Highway with more than 10,000 workplaces. The light industrial and commercial area is clustered in Ghala and commercial and office complexes in Al-Azaiba/Al-Ghubra. The Central Business District is located in Ruwi and is characterized by a high concentration of banks and company headquarters with thousands of employees and a large number of customers commuting in and out every day (Figure 2).

Another important monofunctional cluster is Muscat International Airport. It covers a surface of 21 km² and forms a distinct spatial-functional break in a central section of the urban corridor. In 2018, the airport was expected to have reached 16,000,000 passengers (Muscat Airport, 2019). More than 1000 staff members at the Omani Airport Management Company are responsible for airport assets, facilities, infrastructure projects and maintenance plans (Oman Airports, 2019).

Monofunctional zoning and clustering of workplaces has continuously been pursued. Currently, the area south of the International Airport is being transformed into
the next hub attracting citizens and foreigners from all parts of Muscat and beyond. In 2017, the Oman Convention and Exhibition Centre opened and hotels, shopping malls and high-end housing estates will be added (Oman Convention and Exhibition Centre, 2019).

Not only is there an increase in the number of economic regional clusters but also in the number of employees. Between 2012 and 2016, the number of workplaces in Muscat grew by 261 000 or 37 per cent (Table 2) and this in turn, led to an increase in commuting traffic.

**Monofunctional clusters as target locations for mobility**

Work places in Muscat are not the only ones being clustered. Other monofunctional clusters also represent important target locations for individual (and aggregated) mobility. These target locations generate large volumes of everyday mobility including trips to shopping and education facilities.

The big shopping malls, located strategically within the highway network, represent attractive destinations for all inhabitants of Muscat. The number of parking bays reflects the volumes of mobility generated by these structures: the City Centre Al-Hail offers 2250 parking bays whilst the two neighbouring malls, Avenue Mall and Muscat Grand Mall, offer 4200 parking bays in total. During peak hours, for example, on a Saturday evening, these car parks are fully occupied. In addition, the large super- and hypermarkets are typically frequented on a regular basis for grocery shopping. All of these large-scale structures occupy vast areas in Muscat. Since only few residential areas are close by, long distances need to be covered in order to get there. Reaching these monofunctional clusters by car is not a problem whereas going there by bus requires long walks to and from the bus stops and carrying the shopping goods on the return trip.

While shopping facilities are important for all Muscat residents, the educational clusters are only important for households with school children or university students. Despite this distinction, due to the demographic structure, this concerns a large number of Omani households. Omani governmental schools are more or less equally distributed throughout the whole city area. Different school forms are mostly pooled

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
<th>Employees in the public sector</th>
<th>Expatriates in the private sector</th>
<th>Omani nationals in the private sector</th>
<th>Workplaces in total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>785 515</td>
<td>30 587</td>
<td>335 796</td>
<td>n/s</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>834 760</td>
<td>31 390</td>
<td>409 099</td>
<td>n/s</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>949 694</td>
<td>33 284</td>
<td>439 336</td>
<td>n/s</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>775 878</td>
<td>34 513</td>
<td>488 131</td>
<td>n/s</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>1 003 742</td>
<td>38 179</td>
<td>530 360</td>
<td>n/s</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>1 093 360</td>
<td>39 878</td>
<td>594 255</td>
<td>63 313</td>
<td>697 446</td>
</tr>
<tr>
<td>2013</td>
<td>1 155 861</td>
<td>44 028</td>
<td>576 777</td>
<td>67 693</td>
<td>688 498</td>
</tr>
<tr>
<td>2014</td>
<td>1 210 480</td>
<td>47 477</td>
<td>668 357</td>
<td>71 861</td>
<td>787 695</td>
</tr>
<tr>
<td>2015</td>
<td>1 281 232</td>
<td>48 103</td>
<td>740 710</td>
<td>71 360</td>
<td>860 173</td>
</tr>
<tr>
<td>2016</td>
<td>1 441 622</td>
<td>92 688</td>
<td>787 619</td>
<td>78 140</td>
<td>958 447</td>
</tr>
</tbody>
</table>

together, thus forming clusters that attract 1000 to 2000 students daily. All in all, 50,000 students of different age groups commute to about 160 governmental schools in Muscat daily (National Centre for Statistics and Information, 2017b). The six large Indian schools in Muscat (Figure 2) each attract even larger numbers of students. The Indian school in Darsayt alone has 9400 students. In total 45,000 students were enrolled in Indian schools in Muscat in 2017 (Times of Oman, 2017).

The Sultan Qaboos University Campus forms a very important monofunctional cluster with 18,000 enrolled students in 2015/2016 (Muscat Daily, 2017). In 2017, the higher education campus in Halban with the German University of Technology and the Bayan College attracted around 2000 students and it is generally assumed that these numbers will continue to grow.

Transportation infrastructure

The continuously expanding residential areas and the dispersed location of services and facilities have led to longer and longer distances for necessary trips and the amount of traffic has increased considerably. Thus particular attention was given to upgrading and extending the road network—since 1974 the Sultan Qaboos Highway has been gradually upgraded from a 2-lane road to a 4 and then an 8-lane highway. To avoid daily congestions on this main intra-urban backbone, the 8-lane Express Highway running further inland was opened in 2012.

Responding to the need for covering long distances in a short time and in keeping with the guidelines of the Supreme Committee for Planning issued in 1991, the road network has been developed continuously. As a result, Muscat features a high density road network, especially when compared to a relatively low population density (Nebel, 2016). This network shows a clear hierarchy of roads, categorized by the number of lanes and by the maximum speed allowed.

The first category of roads are highways and expressways that cross through the city, run parallel to the coastline and are linked to each other by a few by-pass highways and interchanges (Figure 2). The speed limit on these roads is 100 or 120 km/h. The second category are roads that access different parts of the city and link to local roads, their speed limit being 80 km/h. Streets of both categories reduce the time needed to cover long distances but they do not connect to destinations in residential areas. In order to reach Category 1 and 2 roads, it is necessary to cover additional distances due to missing exits on the highways. On the secondary roads, U-turns are the only way to turn left and enter residential areas, however, their numbers are limited. Thus many more kilometres must be driven and more traffic is generated.

Only in 2015 did the Omani government begin to establish public transport services in Muscat in a systematic way. Different from the Mwasalat buses that operate according to an official time schedule, the private minibuses operate on demand. Neither Mwasalat buses nor minibuses, however, service the residential quarters. Until lately, both bus types only ran on the Sultan Qaboos Highway. As an answer to the lack of alternative transportation within the city, some ten years ago, residents started to organize informal shared private taxi services. Both drivers and users are usually Indians (male and female). Pick-up routes are mostly pre-fixed according to demand or the drivers can be booked on a case-by-case basis. The cars are owned either by the Indian driver or by an Omani sponsor who participates in the business although it is not legally recognized by the Royal Omani Police.

All offered transport services so far are road based. Other types of public transport, e.g. a metro line like the one in Dubai or other rail based systems, are currently not
considered to be realistic options. In our interviews, the Assistant Director General of the Department of Studies in the Ministry of Transport explained, ‘Being practical, we started with road based bus traffic. We need to be practical, … one challenge is that the population is dispersed in a very big area …. Metro or water taxis might not be by themselves a solution. They can be a complementary solution’ (Assistant Director General, Department of Studies, Ministry of Transport, pers. comm., Muscat, March 2016).

Based on the given urban context, growth patterns as well as land use and transport infrastructure have been illustrated. Our expectation was for these structures to condition individual mobility patterns thereby resulting in a high degree of car-dependency. In order to test this expectation in 2016 and 2017 we carried out an empirical research project in Muscat. The methods used for this purpose will be presented in the next section.

**Methods: Survey and mapping**

Since our main question focuses on the interrelations between urban structures and individual mobility, we chose a mixed-methods approach that includes methods derived both from social and spatial research. In order to develop a thorough understanding of the case study area both at large and in sufficient depth, we included Muscat in general and selected three different neighbourhoods to be studied in more detail, namely Al-Ghubra, Al-Maabela and Al-Seeb (Figure 1). Their geographical locations within the metropolis, their age structure and the average housing prices differed significantly. We therefore expected that social positions and mobility patterns of the households in each neighbourhood would differ as well.

Al-Ghubra is located close to both the Ministry District and Ghala, the office and industry area. It is well connected to those neighbouring districts, home to several big shopping malls and has access to the Sultan Qaboos Highway. Originally planned as a suburban residential area, starting in the 1980s, it began to develop into a functional mixed area that today includes international hotels, private hospitals, offices and enterprises that generate substantial incoming traffic and require large parking spaces (Figures 3 and 4). Al-Ghubra was chosen here as an example of a more mature neighbourhood with high housing prices for households with predominantly medium to high income. Although housing prices are high in general, small apartments for households with low income are available there. The close proximity to working clusters was assumed to require only short commutes.

Al-Maabela, on the other hand, is a young and wide-stretching neighbourhood and is a typical example for recently developed suburban residential areas in Oman (Figures 5 and 6). Construction activities in Al-Maabela have stepped up since the opening of the Express Highway in 2012. Since the infrastructure development in the neighbourhood is still under way, rents and prices have stayed fairly reasonable. The Indian school in Al-Maabela is an important incentive for Indian families to move into this neighbourhood. The case study area Al-Maabela was chosen as an example for a newly developed neighbourhood with low housing prices for households of all income levels. Its location within the metropolitan area was expected to produce a high amount of long commutes.

Al-Seeb is a former fishermen’s village which includes a traditional Suq area (Figures 7 and 8) that offers a wide range of goods, e.g. local agricultural products, jewellery, furniture, fabrics and clothes (see Abdelghani, 2013). Due to the westbound growth of the Capital Area, the village and its extensions have been included into the urban fabric. The Suq area attracts customers from the adjacent, recently fast growing
Figure 3. Case study area Al-Ghubra.
*Source:* Photograph taken by author.

Figure 4. Case study area Al-Ghubra.
*Source:* Photograph taken by author.
Figure 5. *Case study area Al-Maabela.*  
*Source: Photograph taken by author.*

Figure 6. *Case study area Al-Maabela.*  
*Source: Photograph taken by author.*
neighbourhoods, including Al-Maabela as well as from the neighbouring governorate Batinah. The case study area Al-Seeb was chosen as an example of a neighbourhood with characteristics of a small town with medium housing prices. Due to the spatial structures of a small town with short distances, we expected to find fewer inhabitants who have to drive their cars in order to conduct daily activities.

For these three case study areas, we used a wide variety of methods to look into the spatial structures and residents’ mobility patterns.

Firstly, we retraced the spatial structures in Muscat by analysing official statistics and aerial pictures as well as own mappings. These spatial analyses served to develop thematic maps showing the potential destinations for everyday mobility in Muscat (second section and Figure 2).

Secondly, we conducted a quantitative household survey as well as individual qualitative interviews to collect data on mobility patterns. In order to reflect demographic structures in Muscat, we included Omani and Indian households into the sample. As mentioned before, according to the last census in 2010, 65 per cent of all foreigners are Indians. This means that Indian nationals are not only the largest non-Omani group but nearly as numerous as the Omani nationals in Muscat.

We focused on Indians living with their families (spouse and children) because their household structures are comparable to most Omani households and thus allowed for a better comparison of mobility patterns. Indian working migrants who want to be joined by their families need a minimum salary and the employer’s, i.e. sponsor’s, agreement (Zahra, 2015). Such an agreement can usually only be obtained by (highly) qualified migrants (Deffner & Pfaffenbach, 2015). Therefore, it can be estimated that the Indian families included in our research, for the most part, dispose of medium to high incomes and have sufficient means to buy and maintain a car. Their mobility

Figure 7. Case study area Al-Seeb.
Source: Photograph taken by author.
patterns therefore do not depend on the transportation services provided by their employers—as is the case for many low-income working migrants in Muscat.

The questionnaire for the quantitative survey was provided in Arabic for the Omani households and in English for the Indian households. The questions focused on mobility resources and mobility routines, statistical information about the household members as well as on their satisfaction with different aspects of the neighbourhoods. In addition, we asked the head of households, spouses and the two oldest children to fill in a table with all trips undertaken on the previous Monday, a regular weekday, including the means of transportation used for the trips.

The survey was conducted in the three case study areas from October 2016 to January 2017 by two research assistants, one Omani national, and one Indian national, both living in Muscat. Within the three case study areas, we selected several residential areas to conduct face-to-face surveys addressing all the households in the area. However, the response rates from these door-to-door surveys were very low since most residents were not at home or did not open the door. Therefore, we decided to recruit additional respondents via three Omani and four Indian schools. In each school, we reached out to all parents with children in forms 10 or 11. Using both approaches (door-to-door and school based), 850 questionnaires were filled in, of which 551 households live in our three case study areas. In the following, we drew on the overall response rates when answering general questions. Analyses with regard to mobility within the neighbourhoods was based on the lower number of respondents.

Firstly, due to the way in which our survey was designed, our results only allowed us to draw conclusions from Omani and Indian nationals. Such conclusions could not be transferred to other nationalities living in Muscat. Secondly, when discussing the
extent of discrepancies shown between our sample and the population, we were able to refer to the household size and employment sector of Omani households and employees because census data are available for these indicators on the level of governorates (Al-Raisi, 2011). This allowed us to assess our sample quality. One indicator is the average household size (of Omani households)—in our sample, the household average is 7.7 persons, whereas in the census data, the household average is 7.0 persons. Another indicator is the share of Omanis working in the public sector—in our sample, 58 per cent of employed Omani household members work in the public sector, whereas in the census data, that share only reaches 43 per cent. When comparing those values, we concluded that big households were slightly overrepresented in our sample and that employees in the public sector were clearly overrepresented. This may be caused by two reasons: one being that they may feel more obligated to participate in a survey and another may be that they have more time to do so in comparison to employees in the private sector, who have to work more daily hours.

Thirdly, we made comparison on income structures of Indian and Omani households (Figure 11). Although we expected the Indian households approached in our survey to have predominantly medium to high income levels, 43 per cent of the Indian households have less than 1000 OMR at their monthly disposal in comparison to 53 per cent of the Omani households. However, 25 per cent of the Indian households earn more than 2000 OMR per month, compared to 24 per cent of the Omani households. These data show that neither Omani nor Indian households who took part in our survey can be considered as privileged or under-privileged in comparison to each other. To the contrary, the socioeconomic position of households of both nationalities show rather comparable income variations.

In addition to the survey, we conducted 39 qualitative interviews with Omani and Indian residents who live in the three study neighbourhoods. The interviews were concerned with reasons, constraints and wishes with regards to mobility and queried the respondents’ experiences being on the road.

Finally, our empirical approaches were rounded off by four expert interviews. In order to learn more about the official perspectives on mobility and challenges related to urban and transport planning, we interviewed the Director of the Department of Technical Studies of Muscat Municipality, the Director General of Townplanning in the Ministry of Housing, the Assistant Director General of the Department of Studies in the Ministry of Transport and the General Manager for Corporate Support at the transportation company Mwasalat.

This article is based mainly on the analysis of the quantitative survey, using some additional supporting information from the qualitative and expert interviews. The analysis of the quantitative survey focused mainly on differences between the three case study areas as well as on differences between the two national groups. The following sections are dedicated to the presentation and discussion of our findings on work and education related mobility and to current and future changes in household mobility patterns.

**Working day trips**

In the following analysis we focused on work and education related mobility for two reasons. Firstly, from a conceptual viewpoint, these types of trips are those that cannot be easily avoided and thus represent necessary trips which urban planners have to provide for. Secondly, from an empirical perspective, we asked our respondents for their mobility patterns on an average weekday. The analysis revealed that the majority of
respondents provided data only for work and education mobility on this day. Information on other types of mobility is derived mainly from our qualitative interviews which is why these types of mobility are excluded from the quantitative analysis in the following section.

**Distances and durations**

As shown earlier, economic sectors and therefore workplaces in Muscat are spatially clustered. Thus, we expected to see employees having to cover long distances between their homes and their workplaces. Since we could not assume respondents would know the distance (km) between their homes and workplaces, we asked them how long those trips took on average and where they worked. Figure 9 shows the destinations mentioned most often and the approximate distances between the neighbourhoods where the respondents lived and worked. The following analysis includes all household members for which working or educational trips were documented in the survey. Working trips were mostly reported for the head of households and in fewer cases, also for their spouses, while educational trips were mainly reported for children with only a few cases for spouses or heads of households. Only very few respondents reported two or more work related trips; in these few cases we only included the longest (main) trip in our analysis.

On average, work trips take 30 minutes ($n=457$, including respondents from all areas in Muscat). The median is calculated at 25 minutes ($25^{\text{th}}$ percentile: 15 minutes; $75^{\text{th}}$ percentile: 45 minutes). The shortest trips were reported to be less than five minutes ($n=29$), the longest, two hours and more ($n=7$).

We expected to find differences between Omani and Indian respondents due to the fact that these two groups face different restrictions in their access to the housing market. Omani families predominantly own their residential properties (70.5 per cent of our respondents). Indian families, on the other hand, live in rented properties, since, in general, they are not allowed to buy property in Oman (except in Integrated Tourism Complexes, see Margraff & Scharfenort, 2017: 12). Among our respondents, 78 per cent of the Indian families pay rent for a residence of their choice, while 20 per cent live in an apartment or house provided to them by their employer.

We expected tenants to move more easily and therefore, probably live closer to their work places compared to house owners—especially given that Omani nationals are allocated construction lots via lottery and cannot choose where the property they build on lies. The only possibility they are left with is selling or exchanging their property on the secondary housing market. Therefore, we assumed that Omani nationals, a majority of whom are house owners, would spend more time on average, on work related trips, when compared to the Indian respondents. But surprisingly, we found that the average trips to work barely vary between the two nationalities. On average Omanis need 31.5 minutes to reach their work place, while Indians need a little less than 30 minutes. The median duration taken to reach work via all means of transportation is 30 minutes for Omanis ($n=125$; $25^{\text{th}}$ percentile: 15 minutes; $75^{\text{th}}$ percentile: 45 minutes) whereas it is 20 minutes for Indians ($n=332$; $25^{\text{th}}$ percentile: 15 minutes; $75^{\text{th}}$ percentile: 40 minutes).

This unexpected outcome can be explained by information given in the qualitative interviews. In our discussions, the Indian families told us they very often had to choose a current place of residence based on the location of the Indian school their children would attend and not primarily according to their place of work. Therefore the work trips of Indian employees—while still in a reasonable range, equalling that of Omani
respondents—are often longer than would have been the case, had they chosen a home closer to their working place.

When taking a closer look at the respondents living in the three case study areas (n=243), the time spent on trips to work varies. The average trip duration in Al-Ghubra is 21.5 minutes (n=108), in Al-Seeb it is 35.5 minutes (n=59) whilst in

Figure 9. Main work places in the case study areas Al-Seeb, Al-Ghubra and Al-Maabela
Source: Composed by author based on survey data.

5 %  10 %  15 %  20 %
of all trips to the workplace mentioned by respondents
Al-Maabela it is 39.5 minutes (n=76). The median of the trip duration in Al-Ghubra is 15 minutes (25th percentile: 10 minutes; 75th percentile: 30 minutes), whereas it is 30 minutes in both Al-Seeb (25th percentile: 15 minutes; 75th percentile: 45 minutes) and Al-Maabela (25th percentile: 20 minutes; 75th percentile: 45 minutes). Average trips to work from the more recently developed suburban neighbourhood of Al-Maabela take twice as long as trips from the older neighbourhood Al-Ghubra, situated close to many of the major work place clusters8.

A more detailed analysis of the location of work places revealed that in Al-Ghubra, most work related trips stay in the neighbourhood (16 per cent) or only go to the neighbouring districts (Al-Azaiba (15 per cent), Al-Khuwair und Ghala). Residents in Al-Seeb also stay in the neighbourhood (17 per cent) or drive to more distant destinations such as Al-Ghubra (21 per cent), Al-Khuwair and Ruwi. Most Al-Maabela residents stay in the neighbourhood (13 per cent) or commute to destinations like Ghala (11 per cent), Al-Rusail and the airport. Figure 9 shows the main places of work for all three case study areas, including all destinations cited by more than 5 per cent of the respondents. The lengths of the arrows reflect the approximate distances in km while the widths of the arrows are proportional to the respective share of overall work trip destinations from the area.

These results clearly show that Muscat as a whole, is not ‘a city of long distances’—but rather—that this description more accurately fits individual neighbourhoods. Al-Ghubra is the neighbourhood with the shortest commutes measured both in minutes and in kilometres. Distances covered from Al-Seeb or Al-Maabela are significantly longer, however, due to the good road infrastructure (highways), these distances can still be covered in a reasonable amount of time. The qualitative interviews confirmed covering long distances was acceptable as long as drivers were able to commute on highways.

Daily trips include not only work related trips, but also trajectories for educational purposes (schools and institutions for higher education). A closer look at these education related trips confirms the statements made by parents that they aim to reduce their children’s commute to school as much as possible. Education related trips on average take 23 minutes (n=415 including respondents from all areas in Muscat). The median is calculated at 15 minutes (25th percentile: 10 minutes; 75th percentile: 30 minutes).

Again, the results vary only slightly according to nationality with Omanis taking 22 minutes (n=88) and Indians taking 23 minutes (n=327) on average. The median values, at 25th percentile as well as 75th percentile are the same for both groups. This can be explained by the fact that Omani national schools are located in most Muscat neighbourhoods, even in newer ones like Al-Maabela (Figure 2) while the Indian families, wherever possible, move close to one of the six large Indians schools in Muscat. However, just as is the case for work related trips, the average duration of trips for educational purposes varies substantially between the three neighbourhoods (n=221). On average, these trips take 16 minutes in Al-Maabela (n=74), 18 minutes in Al-Ghubra (n=89) and 27 minutes in Al-Seeb (n=58). The median of the trip duration is 15 minutes in Al-Maabela (25th percentile: 5 minutes; 75th percentile: 25 minutes), whereas it is 10 minutes in Al-Ghubra (25th percentile: 5 minutes; 75th percentile: 30 minutes) and 20 minutes in Al-Seeb (25th percentile: 10 minutes; 75th percentile: 45 minutes).
of transportation chosen for these trips. 87 per cent of our respondents regularly get to their work places in private cars (n=456), be it as the driver (62 per cent) or as the passenger (25 per cent, Table 3). In Al-Ghubra (n=107) 92 per cent of the respondents commute in private cars (driver or passenger), in Al-Maabel (n=79) the share is 90 per cent and in Al-Seeb (n=63) it is 83 per cent. These numbers also do not differ significantly when looking at nationality: 90 per cent of Omani (n=140) and 86 per cent of Indian respondents (n=316) commute to work places in private cars. These findings confirm that Muscat’s society, like many other cities in the countries of the Gulf Cooperation Council, can be considered a car-dependent society.

A mere 2 per cent of the polled households (n=836) do not own a car. Likewise only 2 per cent of the surveyed households are without at least one member holding a driving permit. 46 per cent of households own one car, 28 per cent have two cars and 7 per cent own five or more cars. In this respect, the difference between Omani and Indian households is significant. While Omani households on average have 2.7 cars (n=383), the Indian households on average own 1.4 cars (n=453). One reason for this divergence is the difference in the average household size. With an average of 7.7 persons per household, the Omani households (n=374) are considerably larger than the Indian households (n=448) included in our survey, which on average comprise of 4.1 household members.

The situation is different when turning to education related trips (Table 3). For one third of the sample comprising the two eldest children in families surveyed, (n=424) the school bus is the most frequently used means of transportation for getting to school or to other educational institutions. A fourth of them are taken to school by an adult, while a fifth of them either drive themselves or are taken by a driver (the answer option ‘driver’ was unfortunately prone to misunderstandings in this case). The 15.6 per cent of all children that walk to their place of education is relatively high when compared to the adults’ work place mobility. 70 per cent of children walking to school or university take less than 10 minutes, while another 23 per cent take between 11 and 20 minutes.

Since the bus is the most common means of transportation to get to school or university, bus trips do merit a closer look. 24 per cent of school bus trips take less than 10 minutes, 21 per cent take between 11 and 20 minutes, 27 per cent take between 21 and 30 minutes and 28 per cent take longer than 30 minutes. This means that the duration of education related trips varies significantly and is dependent not only on the

<table>
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<tr>
<th>Means of transportation to place of work</th>
<th>Means of transportation to place of education</th>
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<tbody>
<tr>
<td>Car – driver</td>
<td>62.1%</td>
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<tr>
<td>Car – passenger</td>
<td>25.2%</td>
</tr>
<tr>
<td>Taxi</td>
<td>2.0%</td>
</tr>
<tr>
<td>School bus / company vehicle</td>
<td>5.5%</td>
</tr>
<tr>
<td>Public bus / Minibus</td>
<td>1.8%</td>
</tr>
<tr>
<td>Bike / Motorbike</td>
<td>0.2%</td>
</tr>
<tr>
<td>Walk</td>
<td>3.3%</td>
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<tr>
<td>Total</td>
<td>100% (n=456)</td>
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Source: Composed by author based on survey data.
distance between the place of residence and the school but also on routes taken by school buses. While Omani children (36 per cent) are more frequently driven to school as compared to their Indian counterparts (23 per cent), Indian children walk to school much more frequently (19 per cent) as compared to Omani children (6 per cent).

Access to means of transportation also differs considerably by gender. The Muscat society seems to be a very mobile one. However, this is only true with regards to men. Gender differences become obvious when considering the percentage of driving license holders. Whereas almost all (adult) men (n=771; 95 per cent) of the polled households hold driving licenses, only 46 per cent of the women do (n=698). Interestingly, the low share of women who hold a driving licence corresponds with more traditional gender roles: Two thirds of the working women (n=179) in our survey hold a driving licence but only one third of the homemakers do (n=364). Given that they live in a car-dependent society, homemakers are extremely restricted in their mobility. Adding to the limitations is the fact that in one-car households, it is the bread-winner who typically uses the car. We found that while 63 per cent of Omani women (n=312) hold a driving licence, only 32 per cent of Indian women do (n=386), leaving them at greater risk of being socially excluded than their Omani counterparts. Even more restricted in their daily mobility are Indian homemakers (n=232), with only around one fifth of them holding a licence. Through the qualitative interviews, we learned that women ask their husband, brothers or family friends to drive them in urgent cases. Many women (have to) stay at home. Only few women walk to nearby destinations or take a taxi. Public transportation is not considered an option. Omani women have to avoid contact with men who do not belong to the family for religious and cultural reasons. This is also true for Indian women from more traditionally oriented families.

Changes in mobility

In 2015/2016, when the oil prices dropped on the international market, Oman, similar to many other oil-exporting countries, was confronted with sharp drop in revenues. As a consequence, the government introduced a number of spending cuts, one of which reduced fuel subsidies. This caused the price for car fuel to rise from 137 Baiza (February 2016) to 186 Baiza (May 2017) during the survey time. Although 186 Baiza (USD 0.48/litre) is still cheap compared to petrol prices in other countries, an increase of 37 per cent in only 15 months can be considered as potentially meaningful. Since nearly all traffic is car-dependent and due to the lack of viable alternatives up to date, a price increase directly impacts almost all residents.

We incorporated these changes into our survey by asking our respondents if and how their families have adapted everyday mobility according to changes in car fuel prices. This question included all kinds of mobility, i.e. not only necessary trips to work or school but also leisure mobility. 37 per cent of our respondents (n=806; including respondents from all areas in Muscat) answered that they had adapted their mobility practices in the last year. The rate of adaption, however, varied considerably in the three case study areas. In Al-Ghubra (n=176), which is more central, only one third of the respondents had changed their mobility, while in Al-Seeb (n=167) 43 per cent reported changes and in Al-Maabela it was (n=178) 52 per cent. This outcome gives reason to believe that neighbourhood structures and infrastructure settings play a role for individual mobility practices. In addition, the qualitative interviews made clear that the average distances covered for regular trips are equally important since the price increase is felt much more by those covering longer distances.
The extent to which changes in mobility were made depend on the respondent’s nationality. While 45 per cent of Omani households (n=371) reported mobility adaptations, only 31 per cent of the Indian households (n=435) reported the same. This discrepancy between the two groups can be explained with differences in the social networks and leisure time activities as well as disparities with regard to household income. Since many Omani residents in Muscat originally come from other areas in Oman, they regularly drive to their hometowns by car to visit their families. Some Omani respondents reported that they had reduced the frequency of these visits as one measure to counterbalance the increase in petrol prices.

Family income is another factor affecting changes in mobility due to the price increase for fuel. The lowest-income households (less than 500 OMR) reported the most changes (48 per cent), while only 20 per cent of the highest income households (more than 3000 OMR) did so (Figure 10; n=693, Cramers-V=0.193, correlation is statistically significant).

A closer look at the distribution of income between the two national groups reveals considerable disparities (Figure 11). Among the Omani respondents, (n=339) around 25 per cent earn up to 500 OMR (nearly USD 1300), around 28 per cent earn between 500 and 1000 OMR, 23 per cent earn between 1000 and 2000 OMR and around 25 per cent earn more than 2000 OMR. Among the Indian respondents (n=379), the number of low-income families disposing of less than 500 OMR is far lower than that among Omani respondents (13 per cent). Roughly one third of the Indian respondents earn up to 1000 OMR and one third between 1000 and 2000 OMR. This income distribution is explained by our choice of Indian families who—as stated before—depend on a higher income generated by the highly skilled head of household whereas our Omani respondents cover all income groups.

Of the 238 respondents that described changes in their mobility behaviour, 56 per cent reported that they avoided certain kinds of trips and 42 per cent drove shorter distances. 27 per cent started sharing car rides (more often) with other people, e.g. family

![Figure 10. Changed mobility of participants according to income (n=693). Source: Composed by author based on survey data.](image-url)
members or colleagues going to work. Only 16 per cent of our respondents started using public transportation—either minibuses or the newly established Mwasalat buses.

Given that petrol prices are likely to continue to rise, we asked our respondents which adaption strategies they deemed probable and feasible in the future. The majority (78 per cent; n=769) responded that they would likely or very likely forgo all avoidable trips. Nearly as many (75 per cent; n=728) thought that they would likely or very likely opt to drive shorter distances whenever possible. A little more than half of the respondents (56 per cent; n=733) answered that they would share car rides more often. The likelihood of taking a public bus is much lower. 48 per cent of the respondents (n=707) found it likely for the men in their households to take a public bus in the future, while only 34 per cent of the respondents (n=681) expected women in their households to do so.

Probable changes in mobility behaviour also vary by nationality. Omani men and women are more likely to plan on reducing the length and number of trips (86 per cent, n=355; resp. 83 per cent, n=344). Fewer Indian respondents, both male and female, see options in reducing lengths and numbers of trips (72 per cent, n=414; resp. 69 per cent, n=384). Depending on nationality and gender, differences in the likelihood of using public transportation are also significant (Table 4).

These differences between Omani and Indian households can be explained by several factors. First, our results showed that a significant number of Omani men and women do not have any working trips on an average working day. Thus, a considerable part of an Omani household’s mobility is shaped by their leisure mobility and their mobility preferences while a large part of an Indian household’s mobility is dominated by unavoidable, necessary trips to their working places. This means that Omani families can react to the rising fuel prices by reducing their ‘optional’ leisure trips and therefore seem to have more adaptation options and leeway when it comes to adjusting their mobility behaviour.

**Conclusion and discussion**

This paper has shown that in Muscat, the stage for a car-dependent society was set by a number of factors—namely a linear urban corridor, fast growth in inhabitants and low density land development as well as a road-based transport infrastructure, the low price of fuel and a focus on monofunctional clusters for work, education and shopping. Our survey has confirmed that only 2 per cent of the surveyed Omani and Indian
family households do not own a car. Access to car-based mobility, however, does vary with economic position and gender: the households without a car are found mostly in the lowest income classes included in the survey. The percentage of women holding a driving license is significantly lower, which is particularly true for Indian households. Even in the context of families owning ‘only’ one car, women without a licence, elderly people, children and teenagers under the driving age are faced with noticeable daily mobility restrictions.

Our survey has added evidence to previous studies (cf. Ewing & Cervero, 2010 and Wang & Lin, 2013 for overviews) by revealing that neighbourhood and city structures do influence individual mobilities. Commuting times show that although Muscat is a city of long distances, due to the good road network and the low density settlement structures, these distances are usually covered in quite a reasonable time span. This confirms findings from similar cities in the USA (cf. Ewing & Hamidi, 2015). Contrary to many cities in the Global South (see e.g. Obeng-Odoom 2015), road construction in Muscat has up until now been able to keep up with the growing demand. In our qualitative interviews particularly, our respondents highlighted the fluidity of traffic as a huge advantage.

However, commutes from the denser and more diversified neighbourhood of Al-Ghubra are significantly shorter on average than from the lower density and more suburban neighbourhoods of Al-Seeb and Al-Maabela. These findings support the hypothesis that in the long run, significant changes in the urban planning priorities in Muscat will be needed in order to achieve the recent governmental goals of more sustainable and equal mobility structures.

While neighbourhood structures can only be changed in the long term, mobility structures and practices can and should be addressed within the given urban structures, aiming at decreasing vehicle kilometres of travel. Although our expert interviews have shown an acknowledgement by responsible bodies of this paradigm shift, the challenges currently faced by governmental authorities to implement an effective and sustainable public transportation system in an urban space characterized by urban sprawl and low population density are enormous.

Our qualitative interviews have revealed that on the supply side, further expansion of the public transportation system is needed. This would require extending and improving the bus system, e.g. by setting up air-conditioned bus stops, transit stations, feeder buses within the residential neighbourhoods and a (rapid) bus lane (Ministry of Transport and Communication, 2015; Jiménez et al., 2016). Further, plans for a multi-

| Table 4. If the price for petrol doubles in the future what would household members most likely do (cumulated answers ‘likely’ and ‘very likely’)? |
|---------------------------------|----------------|----------------|----------------|
| Drive the car less often (avoid trips) | Indian households | Omani households | All households |
| Drive less further (choose other destinations) | 72% | 85% | 78% |
| Share a car with colleagues going to work | 69% | 83% | 75% |
| Use the public bus (Mwasalat) male household members | 52% | 43% | 48% |
| Use the public bus (Mwasalat) female household members | 39% | 28% | 34% |

Source: Composed by author based on survey data.
modal transportation system that would include, for example, water taxis, trains or a Rapid Bus System are also being discussed. However, according to our interview partners in the Ministry of Transport and Muscat Municipality, they are currently still far from being decided upon. Despite the fact that our interviews have indicated the Omani and Indian respondents’ preference for a rail-based transportation (modelled for example on the Dubai metro system), the responsible governmental agencies give priority to road-based public transportation. In view of high investment costs and low degrees of flexibility associated with rail-based transit systems (cf. e.g. Cervero, 2014) this might be a quite reasonable decision. The reluctance to invest heavily in the public transport sector can also be explained by the (even up till now) very selective demand for this service, ‘We see that the public transport sector is mainly dependent on expats. And most of these people don’t have cars, and they even don’t have driving licenses. They rely 100 per cent on the public transport’ (Representative of the Ministry of Transport and Communication, pers. comm., Muscat, March 2016).

While for many of the foreign blue collar workers, a well-established public transportation system would provide the only chance for independent mobility, which in turn could support social integration and participation in diverse activities, our survey has raised questions as to whether a further improved public transportation system would attract more users among the highly educated/high and medium income Omani and Indian families. The reasons for reluctance to move away from the current car-based mode of transportation can be summed up in the four C’s: Convenience, Climate, Culture and Costs.

Omanis have a long-standing habit of using the car as a comfortable and flexible means of transportation. While this is the case, in many cities around the world (see e.g. Miralles-Guasch et al., 2014 for the case of Barcelona), the hot climate in Muscat (up to 50 degrees Celsius in summer) makes public transportation, which is generally viewed as being uncomfortable, even less appealing. Currently, bus stops are not only extremely difficult to access but they lack air-conditioning and are only sometimes sheltered. Due to the local climate, walking and bicycling can only be considered as alternatives for very short distances and/or during the winter.

Cultural misgivings also play a role. Using public transportation is not compatible with middle or upper class identities. There are also religious and cultural reasons that deter the use of public transportation: Omani and Indian women from families who adhere to traditional social values are expected to avoid contact with male persons that do not belong in their own families. Efforts such as special family sections for women and children provided by the new Mwasalat buses have not yet been able to counter these misgivings.

The comparably low cost for purchasing and maintaining a car have up till now prevented any forebodings of an environmental and economic crisis that would affect Omani (and Indian) habitual mobility patterns in a substantial way. We did, however, find (in line with previous studies, e.g. Ewing & Hamidi, 2015) that costs and economic considerations have an impact on mobility choices. When asked for their reactions to the petrol price increase of 37 per cent in the months prior to our survey, a significant percentage of our respondents reported only smaller changes in their carbon-based mobility behaviour. These changes included avoiding trips, choosing less far-off destinations if possible or sharing a car with friends and relatives more often. Again, the likeliness to adapt one’s everyday mobility varies according to income and neighbourhood structure—those with lower income and those living on the urban fringe with longer commuting trips/higher costs per trips have been found to be more likely to adapt their mobility behaviour. In view of future price increases, between
28 per cent (Omani females) and 54 per cent (Indian males) could imagine using the newly installed Mwasalat buses in addition to or in place of their private cars.

Our expert interviews revealed that the responsible administrative entities are slowly beginning to realize that transport planning and management in Muscat is in dire need of substantial rethinking. In addition to current efforts and future plans to enhance the public transport network (supply side, pull factors), the authorities have realized that in order to enforce changes on the demand side as well, cost related push factors will be needed. Measures such as road tolling and the installation of parking meters are currently being discussed. Whether Muscat will make a rapid or slower transition towards more sustainable urban mobility patterns will, among other things, depend on the willingness of governmental agencies to enforce these and other unpopular measures that factor into the ecological costs of car-based mobility.

Acknowledgements

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Endnotes

1 Third section: ‘Methods’.
2 This distinction is a gradual one. Of course face-to-face social contacts can be perceived as an obligation both on an individual basis (especially in neo-traditional societies such as the Omani one) and from a perspective of social sciences (see Urry, 2004). However, while work and school usually have to be attended on a daily basis on weekdays, intervals between social visits may be more variable.
3 Special calculations of census data 2010 by the Ministry of National Economy; own calculations.
4 In order to enhance readability, in the following the whole Capital Area of Muscat will be referred to as ‘Muscat’, unless indicated otherwise.
5 Second section, first part: ‘Population growth and housing market’.
6 cf. Introduction section.
7 Second section: ‘Muscat: dynamic urbanisation and fragmented urban structure’.
8 Second section, second part: ‘Clustered workplaces’.

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