

# Review of On-Street Parking Fees

Mahmoud I. Dibas, Asma A. Aljassmi, and Mohammad N. Ibrahim

Department of Transport, Abu Dhabi, UAE

Email: {mahmoud.dibas, asma. aljassmi, mohammad. ibrahim}@dot. abudhabi.ae

**Abstract**—Government policy on the price of paid parking requires careful consideration of a number of issues especially those relating to economic and social matters to ensure its policies benefit the city and its population. During recent consultation with most Abu Dhabi stakeholders, it was pointed out that the level of parking fees should be used as one of the parking demand management measure. However, what is the appropriateness of the current parking prices in Abu Dhabi and how much is the flexibility to change the fees is the content of this paper.

**Index Terms**—public paid parking management, parking price elasticity of demand, cost of living analysis, business & resident surveys

## I. INTRODUCTION

Cities around the world recognize that planning and management of parking systems is needed to achieve their objectives through policies and pricing structures. There is a clearly link between pricing and demand of parking, the level of parking fees should be used as one of the parking demand management measures similar to practices in most of the developed global cities. Compared to major European cities, Abu Dhabi's parking fees is significantly lower.

However, for Abu Dhabi city case the appropriateness of the current parking prices in is based on the demographics, income levels of most of the existing residents in the CBD and the availability of other mode of transportation choices.

With an increase in price the proportion which would switch to other travel modes significantly increases. This indicates a preference for individuals to switch to viable alternatives if they are provided.

A local survey result shows that even a small price increase results in a decrease in car travel but the parking space revenue would also decrease due to a drop in demand.

Public comments indicate residents are having troubles with the availability of parking during evenings near their residence and parking fees will not have any effect in reducing demand at their residential area.

In general using parking tariff as demand management tool in Abu Dhabi Island will not be as efficient as expected with the fact that around 75% to 80 % of land use is residential and with limited public transpiration availability.

## II. WHY DO WE HAVE PAID PARKING?

The literature review of world best parking practices show that there is a clearly established link between pricing and demand.

The basic concept of paid parking is to increases the turnover of the most convenient spaces with higher charge than normal area. These then become available for more users which facilitate economic activity and business operations.

Parking charges generally results in less parking demand. This means fewer parking spaces can be provided resulting in cost savings, more green space or optimization of land density.

It is also used to encourage users to use less convenient spaces such backside spaces or off-street car park. It can also play role in reducing traffic congestion, either by changes in travel mode or by reducing time spent searching for parking. This in turn reduces accidents, energy consumption and pollution.

## III. EXISTING FEES STRUCTURE

Since its inception, MAWAQIF which is the brand name of parking management in Abu Dhabi has operated a two tier pricing system with:

- Standard Spaces identified by turquoise and black colored kerb stones charged at 2 AED/hr. An all-day ticket costs 15 AED when parking between 8-24 hours. A maximum stay of 24 hours is permitted for Standard Spaces; and
- Premium Spaces identified by turquoise and white colored kerb stones charged at 3 AED/hr. with a maximum stay of 4 hours.



Figure 1. Parking meter (Mawaqif) in Abu Dhabi 2015

MAWAQIF payment can be made by using MAWAQIF Prepaid Card or coins at the parking meter Fig. 1, or by using Mobile Fees Payment service, that allows motorists to pay their parking fees through their mobile telephone numbers by sending an SMS in a predefined format. The applicable parking fee is directly debited from the motorists' mobile telephone number. MAWAQIF charges apply from 8am to midnight, Saturday to Thursday. Parking is free on Fridays and Public Holidays. It applies to all public surface parking spaces within Mawaqif zones. In addition to the Standard and Premium Spaces there are Disabled Spaces which are free of charge as well as spaces set aside for fire hydrants.

There are various systems for Residents within Mawaqif zones. In some areas Resident only bays operate between 9pm and 8am during which only those with

Resident permits may park in 'Resident Only' bays. In other areas Residents only bays operate 24 hours per day. These permits are available upon application. The first permit is provided at an annual fee of 800 AED and the second for 1200 AED. Inspectors routinely monitor Mawaqif parking throughout the day and issue fines for any violations. Where parking is deemed to be dangerous the vehicle can be removed and impounded.

#### IV. INTERNATIONAL CITIES PARKING PRICE COMPARISON

Table I presents parking price comparison for a total of 6 cities, with a range of characteristics including CBD parking price, population, land area, density, CBD public transport systems and car ownership, including Abu Dhabi.

TABLE I. PARKING PRICE COMPARISON WITH RELATED TRANSPORTATION VARIABLES<sup>1</sup>

City / Country	On- Street CBD Parking Price (AED/hr)	Population -year-	Land Area km2	Population Density people/km2	CBD PT Systems -Year-	Registered Passenger/ Private Cars -Year-	Registered Passenger/ Private Cars per 1000 people
Hong Kong	9.48	7,154,600 -Mid 2012-	1,104 -2013-	6,481	51% Bus/Tram <sup>2</sup> 30% Rail 6% Taxi 1% Ferry 12% Private Car -2011-	475,752 -2013-	66
London	22.04	8,308,369 -Mid 2012-	1,572	5,285	37% Public transport 37% Private transport 24% Walk 2% Cycle -2013-	2,549,275 -2013-	307
Singapore	7.1	5,312,000 -2012-	715.8 -2012-	7,421 -2012-	29% Bus 21% Rail 7% Taxi 43% Private Transport -2012-	540,063 -2013-	102
New York - State	3.67 - 14.69	19,607,140 -Mid 2012-	141,297 <sup>3</sup>	139	23% Public transport 33% Private transport 39% Walk 6% Other -2009-	9,185,181 -2013-	468
New South Wales - State	4.35 - 20.32	7,290,000 -Mid 2012-	809,444 <sup>4</sup>	9	5% Train 6% Bus 68% Car 18% Walk 2% Other -2011/12-	3,877,515 -2013-	532
Abu Dhabi - Emirate	2-3	2,334,600 -Mid 2012-	67,340 <sup>5</sup>	35	4% Bus -2013-	775,471 -2013-	332

<sup>1</sup> Reference from [1]-[16]

<sup>2</sup> Percentage of mechanised transport mode

<sup>3</sup> Total area (U.S. Census Bureau)

<sup>4</sup> Total area (Geoscience Australia)

<sup>5</sup> Excluding islands

As shown in the table, the cities with the highest population densities and extensive public transport systems have the highest parking rates. It is noted that Singapore and Hong Kong also have high population densities and extensive public transport systems but charge parking at cheaper fees than London or New York due to control of car ownership via alternative measures such as legislation and their urban nature.

Current Abu Dhabi parking fees are lower than the other cities included in the comparison due to:

- Low population densities; and
- Public transport networks are still in their early stages of development.

A clear attribute of the cities who charge the highest parking fees is the number of different public transport modes they offer and the extensive coverage of their networks. Public transport systems are an integral component of all major cities and extensive public transport networks are a necessity in providing transportation alternatives to individuals who cannot afford the price of parking.

V. ECONOMIC IMPACTS OF PARKING FEES

Literature review and best practices indicate that increasing the price of parking is expected to have various effects including a reduction in parking demand, traffic congestion and car ownership over the long-term. It is also likely to change travel behavior resulting in spaces being used for shorter durations.

However, recent surveys conducted in Abu Dhabi [17] recommended that increasing the current parking fee may have the following impacts:

- Portion of the resident population may choose alternative destinations for their leisure time or even result in residents relocating their homes or workplaces.
- Likely to result in an increase in the number of violations and hence the revenue generated.

- Any increase in price, without viable transportation alternatives, will impede the mobility of significant proportion of the population resulting in less movement to commercial areas and less spending. The economic strain on motorists and businesses will have adverse effects on the economy.

Any immediate simple increase in the price of Mawaqif would have expected negative economic impacts if not supported with an extensive public transport network. However, an increase in parking price will be needed in the future with the implementation of planned multi-modal public transport systems, sector improvements and changes in CBD land uses occur and new PT supportive parking policy measures are implemented.

The parking charges should also differentiate between surface and off street parking (i.e. in parking structures). Observations have shown that unless the parking fees within more accessible areas, such as the surface parking, are higher than those within off street (and less accessible) parking structures, people will not use the parking structures. Thus charging more for surface parking will result in better utilization of existing and planned parking structures within Abu Dhabi.

It should be noted that any increases in parking prices if and when justified will be introduced in stages with carefully planned price increments and monitoring of the various economic and social impacts.

VI. SURVEY RESULTS

DOT has conducted survey to get understanding on social and business impacts from MAWAQIF implementation, public perceptions and attitudes have been measured by means of a survey questionnaire to both Residents and Businesses. The Business survey collected 50 respondents and the Resident survey collected 747. The characteristics of the Businesses surveyed are depicted in the Fig. 2.

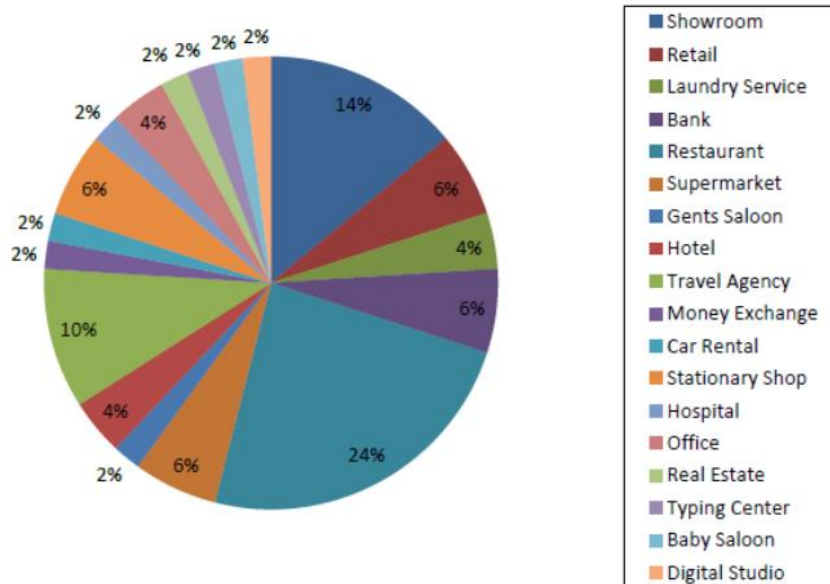


Figure 2. The characteristics of the business surveyed

A wide variety of Businesses were surveyed representing the spectrum of commercial land uses within the Abu Dhabi CBD. The highest proportion of Businesses surveyed were restaurants at 24% followed by showroom at 14%.

The Businesses were asked whether the introduction of Mawaqif had resulted in aspects of their Business becoming better or worse. Responses typically vary according to the Business nature. For Businesses that provide delivery, 63% stated that Mawaqif had no impact on delivery times and 67% stated that Mawaqif had no impact on number of delivery orders. 46% of Businesses said that customer numbers had decreased. For the amount of time for staff and customers to find available parking the responses were approximately split between become worse and no impact. It is likely that significant latent demand for parking in the CBD has replaced any vehicles which have been relocated because of costs. In addition the supply of parking spaces is less due to the removal of informal parking such as along the centreline.

Businesses were asked whether they prefer Mawaqif or free parking near their Business. The survey found that 60% of Businesses preferred being adjacent Mawaqif spaces. This is in contrast to many Businesses which stated that they had suffered from Mawaqif being implemented. However, discussions with those surveyed indicated that they recognized the visual improvements from more organized parking and the ease of maneuvering along street which before were choked with parking.

Businesses were asked what changes they would make in response to a range of increases in parking price. A small increase to 3 AED/hr. for Standard spaces and 4 AED/hr. for Premium spaces would result in no changes to operations for 72% of Businesses. However, at a large price increase to 10 AED/hr. for Standard spaces and 15 AED/hr. for Premium spaces only 38% of Businesses would make no changes. A total of 34% of Businesses said they would either shutdown or relocate. 28% of Businesses said they manage the price increase by making changes to Business operations. The large number of Businesses who will either relocate, shutdown or change their Business operations would significantly impact the economy of Abu Dhabi.

The price of parking for these Businesses will directly influence the cost of Business operations. These increased costs must either be absorbed by the Business or passed on to the consumer which could lead to inflation and its associated economic impacts.

To provide some background for the Residents surveyed the socio-economic characteristics of each respondent was captured. The information requested included gender, nationality, number of years lived in the UAE, monthly salary, type of accommodation, number of bedrooms in accommodation, family status and car ownership.

The 797 Residents surveyed came from 55 different countries across the world and can be considered as representing the actual population mix of Abu Dhabi Island with majority of respondents were male (87%).

The length of time Residents have lived in the UAE was asked. Longer term Residents can be considered to have a perspective of “before and after” Mawaqif. The survey identified that 38% of respondents had lived in the UAE for more than 10 years, 24% for between 7-10 years and 25% for 4-6 years which means the vast majority of those surveyed were living in Abu Dhabi before Mawaqif was introduced. Monthly salary data was also captured during the surveys.

Car ownership is a large influence on parking demand and so Residents were asked about the number of cars they owned. From the different nationalities group a 1% owned 3 cars or more, 16% owned 2 cars, 72% owned 1 car and 11% have no car. Residents were asked a number of questions aimed at understanding their travel behavior. The majority of completed their home-work trip by Drive Alone Car with 71% and 2% Car drop-off, 3% Car Share, 4% by Taxi, 4% using Public Buses, 4% Staff Coach, 0% using Bicycle and 11% Walk.

The survey asked Residents why they did not use public transport to travel to work. 20% responded that they have to go to several places throughout the day as part of their job and therefore needed their car. A total of 46% stated that the bus services were inconvenient for a range of reasons.

Residents were asked to rate their level of agreement or disagreement of statements relating to Mawaqif. 71% responded positively when asked if Mawaqif was there for a good reason indicating that the public believes there is an overall need for a parking management system. It can be considered that like Resident like Businesses realize that there has been a visual improvement across the City where parking has been formalized. Furthermore, it is easier for Residents to drive through local streets. However, 60% also agreed with the statement that Mawaqif is mostly there to make money. Parking is an emotive subject and this is a natural reaction when asked to pay additional money.

When asked if Mawaqif has caused problems for the individual at their place of work or residence the responses were fairly balanced with a slight majority disagreeing with the statements. Theoretically, in areas where there is not enough supply to meet demand, respondents would be inclined to say that Mawaqif has caused them problems. In areas where there is adequate supply, Mawaqif would be of benefit to the users due to parking being organized and controlled instead of vehicles parked in an ad hoc manner. 51% of respondents agreed that Mawaqif has generally improved living in Abu Dhabi and 49% agreed that currently Mawaqif is affordable. When asked what they would do if Mawaqif became unaffordable 39% agreed that they would change residence and 14% agreed they would change workplace. Residents changing their home and work places would result in some areas suffering from falling rents. This may result in demographics of an area changing and becoming undesirable. If this happened other Residents would also leave the area causing rents to fall further.

The survey asked Residents whether or not they limit their car travel because of the existing cost of parking or because of the availability of parking. Approximately half of the respondents said they limit their car travel because of the existing cost of parking. However the availability

of parking spaces is a stronger deterrent and influences 66% of respondents to limit their car travel.

Respondents who own a car were asked how they would respond to three different increases in parking fees and the results are presented and summarized in Fig. 3.

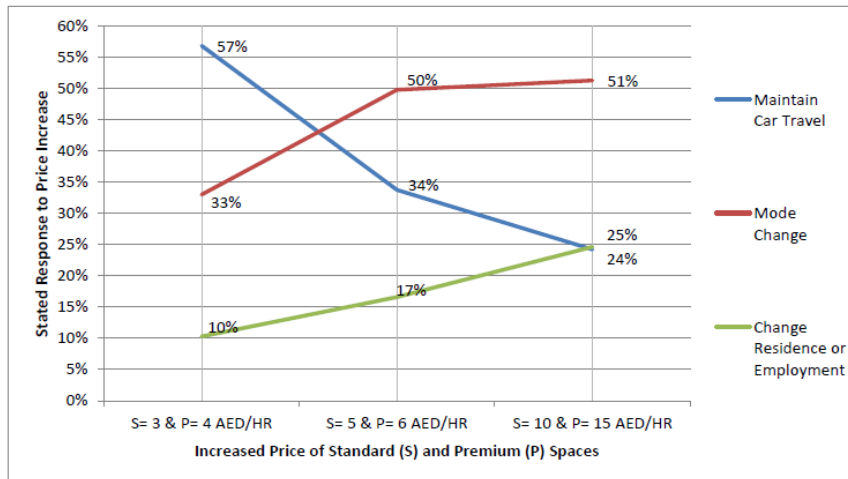


Figure 3. Stated public response to price changes

These results suggest that Residents are willing to switch to public transport if viable and convenient services are provided and would seek to do so before changing employment or residence.

#### VII. IDENTIFYING THE RIGHT FEES

The appropriateness of the current parking prices in Abu Dhabi is based on the demographics and income levels of most of the existing residents in the CBD, car dependency and availability of other mode of transport.

Assuming that parking is considered affordable up to a threshold of 3.5% of monthly salary, the existing cost of parking in Abu Dhabi is considered too expensive for 48% of residents [17].

Analysis shows that any increase in parking costs will result in the vast majority of population being unable to afford an annual residence permit plus the cost of parking at work.

Without extensive viable alternatives to meet the transportation needs of the population, increasing the cost of parking could have damaging effects on the economic health of both individuals and of the city.

Based on the Business surveys it is considered that a price increase will have significant impacts on Business including shutdowns, relocations and increased costs transferred to consumers. Customers may shift their activity to shopping malls to utilize free parking and the lack of economic activity within the sectors will cause Business owners to suffer financially.

Based on the Resident surveys it is considered that the current price of parking should be maintained as it already a significant expense to the majority of the population. If parking prices increased it would immobilize the population since there are not sufficient viable transportation alternatives. Parking costs would dominate the cost of living and Residents would be

forced to spend less on entertainment and outings. The increased costs of parking would have damaging effects on the economic health of both individuals and the city.

Further public transport systems are a necessity in order to provide transportation alternatives and facilitate the movement of Residents which in turn facilitates economy activity. An increase in the price of parking would be feasible only once further public transport systems are operational. It is recommended to consider increasing the cost of parking again in 2020 once the metro and LRT systems of Phase 1 of the Integrated Public Transport Network are operational and details of the following phases are available.

The continued use of parking charges will be an important element in both managing demand and in ensuring an optimal use of the available on and off street parking spaces. The use of alternative modes of travel will be significantly influenced by both the availability and cost of parking at and around trip end locations. These measures will need to be treated sensitively to reflect the impact of local climate conditions on suitable walk time parameters. However, the introduction of differential charging by location and parking purpose will need to be considered for future treatment to be successful in achieving a more optimal use of available parking spaces and in meeting strategy objectives.

#### VIII. RECOMMENDATIONS

Setting the right price for parking can be extremely useful in achieving a city's overall transport objectives. A detailed economic analysis for Abu Dhabi conditions has not yet been carried out in order to determine elasticity of parking demand in relation to cost. However, as the public transport alternatives to the private car are not yet fully developed it is unclear how increased costs will impact demand.



The following measures are recommended:

- Perform a detailed economic study to determine elasticity of parking demand in relation to cost. This will to determine future pricing for public parking, including use of differential parking fees in relation to demand levels and the appropriate horizons and triggers for the implementation of any price changes.
- This study will assess the impacts of both on-street and off- street parking fees on businesses and social life of residents and the general public.
- In addition, the potential impacts of parking fees on the use of alternative modes of travel and other Transportation Mobility Management measures will be studied further and considered.

#### ACKNOWLEDGMENT

The authors wish to thank Mr. Ahmad N. Nasser from Project Management and Development Consultants (PMDC) for his support in collecting required statistics.

#### REFERENCES

- [1] Census and Statistics Department. (2014, November). Hong Kong Annual Digest of Statistics, Hong Kong. [Online]. Available: <http://www.statistics.gov.hk/pub/B10100032014AN14B0100.pdf>
- [2] Transport Department. (2014). Travel Characteristics Survey 2011 - Final Report. Hong Kong. [Online]. Available: [http://www.td.gov.hk/en/publications\\_and\\_press\\_releases/publications/free\\_publications/travel\\_characteristics\\_survey\\_2011\\_final\\_report/index.html](http://www.td.gov.hk/en/publications_and_press_releases/publications/free_publications/travel_characteristics_survey_2011_final_report/index.html)
- [3] Office for National Statistics. (2013). Mid-2012 Population Estimates: Population density in England and Wales; Estimated Resident Population, London. [Online]. Available: <http://www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-uk--england-and-wales--scotland-and-northern-ireland/mid-2011-and-mid-2012/index.html>
- [4] Department for Transport. (2014). Licensed Vehicles by Body Type, by Region, Great Britain, Annually from 2010. London. [Online]. Available: <https://www.gov.uk/government/statistical-data-sets/veh01-vehicles-registered-for-the-first-time>
- [5] Transport for London. (2014). Travel in London - Report 7. London. [Online]. Available: <https://www.tfl.gov.uk/corporate/publications-and-reports/travel-in-london-reports>
- [6] Land Transport Authority. (2014). Singapore Land Transport Statistics in Brief 2014. Singapore. [Online]. Available: <https://www.lta.gov.sg/content/dam/ltaweb/corp/PublicationsResearch/files/FactsandFigures/Statistics%20in%20Brief%202014.pdf>
- [7] G. Sun, E. Gwee, L. S. Chin, and A. Low. (2014). Journeys-Sharing Urban Transport Solutions. Singapore: LTA Academy, Land Transport Authority. [Online]. Available: [www.lta.gov.sg/ltacademy](http://www.lta.gov.sg/ltacademy)
- [8] F. Southworth, T. Reuscher, and H. L. Hwang, New York State 2009 - NHTS Comparison Report, Oak Ridge National Laboratory, U.S. Department of Energy, 2012.
- [9] U.S. Census Bureau. (2014). Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico, April 1, 2010 to July 1, 2014 NST-EST2014-01, Population Division. [Online]. Available: <http://www.census.gov/popest/data/state/totals/2014/index.html>
- [10] Department of Motor Vehicles. (2014). Vehicle Registrations in Force 2013, New York. [Online]. Available: <http://dmv.ny.gov/org/about-dmv/statistical-summaries>
- [11] U.S. Census Bureau. State Area Measurements and Internal Point Coordinates. [Online]. Available: <https://www.census.gov/geo/reference/state-area.html>
- [12] Australian Bureau of Statistics. (2013). Regional Population Growth, Australia, 2011-12. [Online]. Available:

- <http://www.abs.gov.au/ausstats/abs@.nsf/Products/3218.0~2011-12~Main+Features-New+South+Wales?OpenDocumentT>
- [13] Australian Bureau of Statistics. (2014). Motor Vehicles Census. [Online]. Available: <http://www.abs.gov.au/AUSSTATS/abs@.nsf/ViewContent?readform&view=ProductsbyTopic&Action=Expand&Num=3.17.11>
- [14] Bureau of Transport Statistics. (2013). 2011/12 Household Travel Survey, Summary Report 2013 Release. [Online]. Available: <http://www.bts.nsw.gov.au/Publications/Reports/default.aspx>
- [15] Geoscience Australia. Area of Australia - States and Territories. [Online]. Available: <http://www.ga.gov.au/scientific-topics/geographic-information/dimensions/area-of-australia-states-and-territories>
- [16] Statistics Centre - Abu Dhabi. (2014). Statistical Yearbook of Abu Dhabi 2014, Abu Dhabi. [Online]. Available: <http://www.scad.ae/en/statistics/Pages/Statistics.aspx?ThemeID=7&TopicID=48&SubTopicID=15&PublicationID=539>
- [17] Department of Transport in Abu Dhabi, Assessment and Review of Increasing Paid Parking Fees in Abu Dhabi, 2013.



**Mahmoud I. Dibas** holds a master's degree in civil engineering (transportation) and B.Sc. degree from University of Texas at Arlington in USA in 1989 and 1986 respectively.

He has 27 years of experience in transportation/traffic engineering. He has joined Abu Dhabi Department of Transport in 2008 as Traffic Engineering Specialist. He was Chief Engineer and Manager of Traffic Signage Section at Roads and Transport Authority in Dubai, UAE. He served in several professional organizations related to the transportation and traffic field in City of San Diego in USA for 16 years. Develop and publish Transportation Impact Study Guideline and procedure for Emirates of Abu Dhabi. He developed Parking Strategy for the Emirates of Abu Dhabi in 2012 as well as prepared DOT Strategic Plan Budget and published Capital Improvements Program (CIP) for Emirates of Abu Dhabi. He has planned and developed a major roadway infrastructure improvement inside Abu Dhabi Island to serve several developments. Mr. Dibas is Registered Professional Engineer in State of California as Traffic Engineer and is recognized at the City of San Diego for outstanding service. He is a member of several Transportation Committees for Department of Transport and other agencies.



**Asma A. Aljassmi** obtained her master's degree in urban planning – transportation planning and B.Sc. degree in civil engineering from the American University of Sharjah, UAE, in 2008 and 2005 respectively.

At present, she is the Traffic Studies Section Head of the Abu Dhabi Department of Transport, responsible to review and approve transportation impact studies and transportation masters plans in the emirate of Abu Dhabi. She is also responsible to conduct feasibility studies and business case studies for various transportation projects such as parking strategy and planning, road projects and safety initiatives, as well as public transportation projects. In addition, she works on transportation policy and regulation initiatives in support of the emirate strategic sustainability objectives such as road user charging, transportation impact fees and other mobility management schemes. She is also in charge of the Abu Dhabi transportation capital improvement program and is responsible to develop and maintain it. Before joining the Department of Transport in 2009 and after obtaining her Bachelor degree, she worked as a Senior Transportation Modeler with an engineering consultancy firm, Africon Engineering International (now known as Aurecon). Mrs. Aljassmi has recently received the exceptional employee award by Chairman of DOT in Abu Dhabi. She also received the prestigious Deans Award for Academic Excellence on her master's thesis from the American University of Sharjah in 2008.



**Mohammad N. Ibrahim** obtained his master's degree in engineering management from University of Wollongong, Sydney/Dubai in 2012 and B.Sc. degree in highway and bridge engineering - civil engineering from Al-Balqa' Applied University, Jordan in 2004.

At present, he is a Lead Transportation Engineer at Department of Transport in Abu Dhabi, UAE with 10 years of experience carrying out range of professional transportation assignments related to traffic safety, parking management

and traffic congestions management. He had worked as Traffic Safety Engineer for Road and Transport Authority RTA, Dubai in UAE between 2007 and 2010. He has played many key roles in providing technical support for several tasks such as: Abu Dhabi Parking Strategy Update, Assessment and Review of Paid Parking in Abu Dhabi, Traffic Safety Strategy for Dubai and Road Safety Auditing for Dubai Roads. Mr. Ibrahim has a membership in Engineers Australia and Jordan Engineer Association. He participated recently in Gulf Traffic Conference in 2014 as a speaker entitled "Solving Parking Issues - practical view of Abu Dhabi experience" and received the parking award on behalf of DOT.