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## **Abstract**

The Gulf Countries have undergone very rapid economic and population growth, which has been accompanied by major urban development and transportation system expansion. The dispersed urban fabric and largely highway-based transport system have resulted in car dependent travel behaviour, along with its various negative consequences. To encourage more sustainable travel behaviour, several cities in the region have planned or already implemented transit systems, supported by the concept of Transit Oriented Development (TOD).

This book chapter examines how Cities in the Gulf Co-operation Council (GCC) region became automobile dependent, and how recent distinctive initiatives taken by the government of Dubai have helped the city to re-orient its growth with the aim of becoming more sustainable, liveable and economically competitive, by integrating its land use and transit systems. As part of the study, the shifting attitudes and behaviour of developers in response to the planning and opening of the transit system are documented. The implications for TOD as a tool to encourage more sustainable travel behavior in GCC Countries are discussed.

**Keywords:** Gulf States, Dubai, automobile city, transit city, TOD, developer attitudes.

## Chapter 3: Development of TOD in Dubai City and the Gulf States

### <a> Introduction

Cities in the Gulf Cooperation Council (GCC) have undergone very rapid economic and population growth, which has been accompanied by major urban development and transportation system expansion. The dispersed urban fabrics and largely highway-based transport systems have resulted in high levels of car dependency, along with its various negative consequences. To encourage more sustainable travel behaviour, several cities in the region have planned or already implemented transit systems, supported by the concept of Transit Oriented Development (TOD).

Dubai is a pioneer in urban planning development approaches. It was the first city in the region to advocate a paradigm shift from automobile dependency to an integrated public transport system, supported with a metro network. Dubai was also the first city in the GCC to move from traditional 'problem oriented' or reactive urban and transport planning, to an 'objectives-led' or pro-active approach. Thus, the City of Dubai has interesting lessons to offer neighbouring countries that are seeking sustainable development growth.

This chapter gives an overview of the growth of Dubai and the evolution of its land use and transportation systems and associated policies. It explores how the city developed as an automobile-dependent city, then shifted towards developing an integrated public transport system, and has further shifted to become a city with a vision of being smart, sustainable, competent and happy. It explores how this shift has adopted TOD to achieve this vision and how different stakeholders' behaviour and attitudes changed over time to support the concept. The research underpinning this chapter has involved an analysis of historical documents and literature on the evolution of the city, and interviews with officials at the Dubai rail agency.

### <a> GCC Context

The GCC, which was formed in 1981, consists of six countries bordering the Arabian Gulf: Kingdom of Saudi Arabia, United Arab Emirates, Sultanate of Oman, State of Kuwait, Kingdom of Bahrain and State of Qatar. The member countries of the GCC evolved from an economy based on industries with limited financial returns, such as agricultural, grazing and animal raising, fishing and the pearl industry, and limited trade and commercial activities, to an economy based, mostly, on oil and gas revenues since the 1950s. The latter has been associated with high population growth and rapid urban development and expansion (Abu-Ayyash, 1980).

This growth led to a dispersed urban fabric and placed pressure on the transportation system, which developed largely as a highway-based system with no rail infrastructure and limited bus services. Coupled with an increase in car ownership, low density housing policies and severe hot and humid summer weather, a culture of car dependency developed. The negative consequences of this culture have now been realized. To reduce the externalities of car-dependency, while maintaining their economic competitiveness and enhancing their environmental sustainability, the GCC Countries are working to shift their land use-transport planning policies focus from catering for automobile ownership and use towards sustainable travel and cities of liveable places (Jones, 2014). Dubai now has significant operating Metro

and Tram systems. Other cities in the region have planned and are constructing transit systems (for example Abu Dhabi, Riyadh and Doha, among others) (Figure 3.1).

[INSERT Figure 3.1]

*Figure 3.1 Gulf Co-operation Council countries and planned transit and rail (UITP, 2017)*

<a> Dubai

The City of Dubai has undergone a transformation and period of growth over the last six decades, from a small fishing village to a major regional and global business centre. In 2016, seven sectors (wholesale and retail trade, manufacturing, transport and logistics, finance and insurance activities, construction, tourism sector activities and real estate) have contributed collectively to around 77.24 per cent of Gross Domestic Product (GDP) (Dubai Economy, 2017). The GDP in 2016 was around US\$ 107 766 million rising from US\$ 66 542 million in 2006 (Dubai Statistics Center, 2017b). The total number of employees reached 2 649 069 in 2016 rising from 1 561 762 in 2006 (Dubai Statistics Center, 2017a). Over the last six decades, population increased around sixteen-fold, from 55 000 in 1955 to just under three million in 2017 (Dubai Statistics Center, 2017c). Up to 1955, the total urban area covered only 3.2 square kilometres (sq. km). The urban area had expanded to cover 204 sq. km in 2000 (Sultan, 2002), and by 2009, the Dubai urban area covered 945 sq. km (DM, 2009).

According to Alshafiei (1997), this process has been stimulated by three main factors: economic affluence, use of modern technology in transportation and public utilities, and the government's land use policies. It is also linked to six distinct phases of spatial urban development. These phases can be defined by relating unique economic and demographic changes over time, with the evolution of urban planning policies for land use and transport.

<a> Dubai's Spatial Urban Development Phases

**Phase 1, 1900 - end of 1950s:** The city of Dubai was constrained by the location of its main economic assets, namely Khor Dubai (Dubai Creek) and the Arabian Gulf that the Creek stretches from. Population and economic activities were concentrated around the mouth of the Creek where the three existing districts of Deira, Dubai and Al Shindagha developed. Up to 1955, the total urban area covered only 3.2 sq. km with a population of 55 000 and by 1960 this had increased to just 5.3 sq. km. Given the high density and compact urban structure, the main modes of transport were walking and the Abra<sup>1</sup> for Creek crossings. Domestic animals were used for moving goods.

**Phase 2, 1960 Master Plan:** The city's first master plan was prepared by the British architect John R. Harris in 1960; the plan promoted a culture of 'planned compact growth' (Alshafiei, 1997; Pacione, 2005). The development of additional housing, industrial uses and public services involved relatively limited expansion outside the original area of the city, with expansion of commercial activity within the central area. It suggested, for the first time, the provision of a network of roads, to meet the rising need for travel. The city had start reclaiming land for widening existing roads and constructing the suggested roads (Sultan, 2002). Thus, the 1960 plan led to the foundation of the urban road network:

*"Harris's 1960 document was principally a road map outlining the transportation armature to help structure the city's growth" (Ramos, 2010, p. 67)*

This facilitated the process of city expansion. By 1970 the land coverage had reached 18 sq. km and population density fell to 5556 persons per sq. km, down from 11 321 persons per sq. km in 1960 (Sultan, 2002).

**Phase 3, 1970 Master Plan:** With the production and export of oil beginning in 1969<sup>ii</sup>, a new and ambitious Master Plan was developed in 1970. This marked the start of a period some researchers refer to as the ‘transitional stage’ (up to 1980) (Sultan, 2002), or the ‘boom phase’ (up to 1985) (Gabriel, 1987). Other researchers refer to this phase as a ‘period of planned suburban growth’ (Alshafiei, 1997; Pacione, 2005). The plan made provision for ring roads around the city and a radial street network to outlying suburbs; major transportation infrastructure projects were developed to link districts on both sides of the Creek<sup>iii</sup>. There was a need for expertise and skilled labourers in the oil industry and for construction projects and this was largely met by an immigrant labour force: population tripled from 59 000 in 1968 to 183 187 in 1975, reaching 370 788 in 1985 (Dubai Statistics Center, 2017c).

Consequently, housing demand increased, leading to changes in the residential land development pattern. Expatriate housing needs were met by the private sector, with the municipal responsible for identifying suitable development areas. While housing for nationals was provided by the government based on National Housing policies initiated and implemented during this period. In 1980, an order was issued to provide Emirates’ citizens with plots of land of 10 000 sq. feet (ft) (929 sq. meter) in size, with financial assistance of around US\$54 500, in designated areas for construction of housing. In 1989, the area of land provided for housing grants was increased to 15 000 sq. ft (1393 sq. meters) and the ceiling for financial assistance was also raised to US\$68 000. In 1993, the financial assistance was replaced by interest-free loans, of up to US\$136 200, repayable over 25 years (Sultan, 2002).

Housing policy for nationals encouraged a process of suburb growth and the creation of low density communities on the fringes of the city, which have contributed substantially to the spatial expansion of the city (Alshafiei, 1997; Pacione, 2005). Limited diversity of housing types exist in these communities, with detached houses dominant. Alawadi (2018) found a clear difference in the pattern of neighborhood types before and after the implementation of the housing policy for nationals. Neighborhoods developed in the city before the 1980s are characterized by compactness, diversity and pedestrian friendliness. Neighborhoods developed after the 1980s tend to be low density, expansive, and oriented to accommodate automobiles. The total urban area increased to 109.7 sq. km in 1985 (Sultan, 2002). This expansion outstripped population growth, leading to a further fall in population density, to around 3400 persons per sq. km in 1985.

**Phase 4, The Comprehensive Development Plan 1985 and The Structural Plan for Dubai Urban Areas 1993-2012** (Figure 3.4). The plan focuses on the establishment of growth management tools to encourage more sustainable development patterns and to conserve the Emirate’s resources. The plan suggested that future development be located around areas served by existing car-based transport infrastructure. Although little emphasis was placed on public transport, the plan aimed to tackle traffic congestion, road safety, parking and pedestrian issues through better traffic management strategies (DM, 1995).

[INSERT Figure 3.2]

*Figure 3.2 Structural Plan for Dubai Urban Area, 1993-2012 (DM, 1995).*

*“Future development of the urban area shall be based on growth management principles to encourage cost effective use of Emirate resources in support of population growth and economic development” (DM, 1995, p. 3\_1).*

A standard for community facilities was introduced in the plan, based on population catchment sizes. Local facilities are provided in neighbourhood centres serving a maximum of 3000 residents. Community centres serve a maximum of 10 000 residents and district centres serve a maximum of 50 000 residents (DM, 1995). The standard was updated in the Dubai 2020 Urban Master Plan, when the population served by the different types of centre were increased. Additional levels were also added - with multi-district centres serving a maximum of 300 000 residents and town centres serving a maximum of 500 000 residents (DM, 2009) (Table 3.1).

[INSERT Table 3.1]

*Table 3.1 Community Facilities Hierarchy- Dubai 2020 Urban Master Plan (DM, 2009)*

**Phase 5, 1996- 2008:** Supported by continuing economic prosperity and spatial urban development, Dubai’s ambition was to be a global city (Ramos, 2010). Central to this vision was the construction of a series of ‘megaprojects’ or ‘cities within the city’<sup>iv</sup> (Elshehtawy, 2004; Pacione, 2005). Most of these projects are outside the framework of the master plan. As a result, a ‘leapfrogging’ of the urban development pattern occurred, adding pressure on the city’s transport system and undermining attempts to improve the sustainability of the city (United Nations, 2005). To speed up these projects, decentralization of responsibility for urban development occurred in the early 2000s, with the approval of some projects being given to governmental linked bodies<sup>v</sup>. This further impacted the traffic loads on roads, and in 2005, the Government of Dubai established an independent government authority responsible for all surface transport systems in the City, named the Road and Transport Authority (RTA).

With the growth management strategies suggested by the Structural Plan, the urban area was expected to increase to 309.1 sq. km by 2010 (Sultan, 2002). However, the Dubai urban area covered 945 sq. km in 2009. And with a total population of around 1 771 000, the density fell to 1874 persons per sq. km.

**Phase 6, Dubai 2020 Urban Master Plan:** In response to the fragmented development pattern, the Government of Dubai announced the need for a modified master plan. The ‘Dubai 2020 Urban Master Plan’ was developed, for the first time, by a steering committee consisting of governmental authorities’ representatives and other stakeholders. The plan focuses on managing the environmental, social and economic challenges of future growth, to address demographic and socio-economic dimensions, transportation, housing, utility network and environmental issues (DM, 2009). The plan calls for compact growth around the existing metro system, supported by integrated public transport (Figures 3.3). The hierarchy of community facilities, along with the distribution of employment activities have created a hierarchy of activity nodes within the city (Figure 3.4). The city is moving towards managing growth in a more sustainable manner.

[INSERT Figure 3.3]

*Figure 3.3 Dubai 2020 Urban Structure Plan (DM, 2009)*

[INSERT Figure 3.4]

*Figure 3.4 Existing and future Metro lines and hierarchy of activity centers 2020 (DM, 2009)*

Based on the new vision of the city, the latest Master Plan and the pro-active approach of its transport institutions, the TOD concept is one of the planning principles that has been advocated. Before discussing this, an outline is provided of the evolution of the transportation networks in Dubai.

#### <b> Transportation network

As previously noted, since the first master plan of 1960 a network of roads was suggested, based on extensive radial and ring roads, the development of two bridges and a tunnel across the Creek, along with a grid-based network serving Jebel Ali Port situated 35 km away from the initial urban area. Moreover, with the growing number of housing communities for nationals in the suburbs, the road network increased from 1049 lane km in 1980 to 7358 in 2002 (Sultan, 2002).

The use of the automobile rose during the 1970s. The expansion of the city, supported by a high capacity road network, alongside rapidly rising income (since the economic boom of the 1970s), has increased the attractiveness and affordability of car ownership. Around 73 000 were registered in 1985, which equates to approximately 197 vehicles per 1000 inhabitants (Gabriel, 1987). By the end of 1991 this rose to 117 800 vehicles; and this figure more than tripled to 387 350 by the end of 2002 (Sultan, 2002). In 2016, the figure reached 1.57 million cars, which equates to 583 cars per 1000 inhabitants (UITP, 2017).

A bus-based transit system was developed by the Dubai Municipality in the early 1960s. However, the city residents were heavily dependent on automobiles for travel and only 7 per cent of the person trips were made by buses and minibuses in 1991 (DM, 1995). The bus-based system grew as demand rose: in 1998, there were 83 buses serving 22 lines, and this increased to 1512 buses serving 137 lines in 2017 (Dubai Statistics Center, 2017d). Measures such as dedicated bus lanes and air-conditioned bus shelters were implemented to increase the attractiveness of the system. Bus-based transit ridership increased from 28 million passengers in 1998 to 155 million passengers in 2017 (Dubai Statistics Center, 2017d).

With the aim of further expanding and upgrading the public transport system, by 2010 the RTA had successfully started running the Red and Green Metro lines<sup>vi</sup> (Figure 3.5). The Red Line is 52 km long with 29 Stations and the Green Line is 22 km long with 20 stations. With reliable, frequent (every four minutes on average during peak hours and every seven minutes during off-peak hours) and relatively affordable fares (US\$0.82-US\$4.1), the Metro service succeeds in attracting significant numbers of passengers. The Al Soufoh Tram System began operating in 2014 to complement the Metro system. In order to integrate the public transport modes, multi-mode stations were developed for ease of transfer between metro, bus, taxi, and



water transport services. With the opening of the Metro and the new multi-mode stations, Dubai public transport ridership increased further: in 2017, 16 per cent of recorded person trips were made by public transport (UITP, 2017). A survey of 1265 Metro passengers in 2017 showed that 13 per cent were visitors, 81 per cent expatriates residing in Dubai, 4 per cent expatriates residing in other Emirates and only around 1 per cent United Arab Emirates (UAE) nationals. Further, 38 per cent were low income passengers (less than US\$1360 per month) and 90 per cent did not have access to a private motor vehicle (RTA, 2017).

[INSERT Figure 3.5]

*Figure 3.5 Alignment of Red and Green Metro Lines (RTA, 2008).*

Dubai could be said to have transformed over time from a walkable city to an automobile-city, and more recently is shifting towards being a transit city, as defined by Newman and Kenworthy (1996, 2006). Moreover, a further movement is occurring, moving the city towards a sustainable city model, a city of places, an integrated city and a smart city (Jones, 2018).

<a> Transit-Oriented Development

<b> The TOD Concept

TOD is essentially a pattern of land use development around transit stations or a transit network, which has been developed in such a way as to encourage public transport use. These urban developments are characterized by a number of planning principles which aim to encourage more environmentally, socially and economically sustainable urban development. These include the well cited '7Ds' of high density development, diverse land uses, pedestrian and bicycle friendly design, short distances to transit, good destination accessibility along with demographic and demand management (Cervero & Kockelman, 1997; Ewing & Cervero, 2001, 2010).

Potential benefits of TOD can be seen from different stakeholders' perspectives (Cervero et al., 2004). TOD benefits range from curbing urban sprawl and shaping more compact and sustainable urban patterns, increasing transit ridership, promoting walking and cycling, creating livable and attractive places, and accommodating the economic growth of a region. This can achieve financial gains for transit investments and businesses near transit stations; affords joint development opportunities; expands housing options; enhances neighborhood cohesion, social diversity, public safety and security; revitalizes declining neighborhoods; enhances the quality of life; promotes affordable housing; improves accessibility and reduces regional road traffic (Cervero et al., 2002; Cervero et al., 2004).

Building around transit stations with principles of smart growth is fairly well established in Europe and the United States, and in some cities in Australia and Asia. However, the concept is relatively new in the GCC Countries. Although TOD has proven to function in a variety of contexts, the concept needs to be carefully adapted to reflect the local urban context, social and cultural considerations, and market realities in order to achieve the potential benefits (Suzuki et al., 2013):

*“A one-size-fits-all approach to TOD planning and design is not recommended, particularly for rapidly growing cities in developing countries” (Suzuki et al., 2013, p. 36)*

Much of the planning focus of TOD has been on the local scale, concerning the micro-scale design of the built environment within walking distance of transit stations. While addressing the local scale is essential, thinking beyond the individual station is critical as well. Planning for the regional TOD scale requires a focus on the spatial structure of TODs, such as the location and distribution of land use activities across the region, the hierarchical distribution of TODs, and the links between them (Bossard, 2002; CTOD, 2009; Kamruzzaman et al., 2014). Effective development of TOD requires planning policies which successfully integrate the concept into the metropolitan fabric (Bossard, 2002), that is, the ‘transit metropolis’ suggested by Bernick and Cervero (1997). Therefore, long term planning of the land use and transport systems across the whole region - down to corridors, neighbourhoods and individual projects - is needed to successfully develop and integrate the concept of TOD into an existing city.

#### <b> TOD in Dubai

The Dubai 2020 Urban Master Plan acknowledges the metro network as a critical public asset that should be optimized as part of Dubai’s economic development strategy (DM, 2009). The Plan recommends the promotion of TOD along existing metro lines, supported by an integrated multi-modal transport system. The plan advocates focusing economic infrastructure and activity centres around Metro stations. There have been a number of studies conducted to promote the concept of TOD, such as an internal RTA study on Dubai TOD Guidelines in 2012. The RTA also developed the Dubai Transport Integration Manual in 2016, to encourage developers to integrate their developments with public transport and, more specifically, the Metro system. However, there are no regulations requiring developments to integrate with public transport. To support the development of the concept, a TOD team has recently been set up between the RTA and the Dubai Municipality (DM), in conjunction with the preparation of the 2040 masterplan.

#### <b> Developers’ attitudes and behavior in response to Dubai Metro Project

Developers’ attitudes and behaviour vary based on their perception of how much of the value of the TOD can be captured by their development. This will depend on the precise location of their development, and the numbers of residents, workers and visitors located within walking distance of the metro station. Factors such as transit frequency and quality, levels of access to facilities and the quality of the environment can all determine the location efficiency of TOD (Belzer & Autler, 2002).

Positive responses from developers in regard to integrating developments with Metro stations will add to the funding sources for the transit-based infrastructure, along with other strategies used for raising finance such as commercial space renting, general advertising in vehicle or at stations, and selling naming rights.

Since the initial planning stage of the Dubai Metro system, developers’ attitudes and behaviour have changed in line with the new approaches to planning outlined above. Based on interviews with two Rail Agency staff, developers can be classified into different groups, depending on their attitudes and behaviours pre- and post- development of the Dubai Metro.

Type 1: Developers who saw the benefits of integrating their developments with the metro system while the metro was in the planning stage. Many of these took the decision to cooperate with the rail agency and integrate their developments. For example:

- Emirates Airline decided to integrate their headquarters with the Metro system. The developer provided funding for the construction of the Emirates Station and the link that connects the development with the station.
- Property developer of the globally known developments Burj Khalifa and Dubai Mall decided to integrate the Metro system with their development. The developer provided funding for the Burj Khalifa/Dubai Mall station as well the link between the station and the development.
- Property developer of Nakheel Harbour and Towers and Ibn Battuta Mall provided funding for Nakheel Harbour and Towers Station, and for the Ibn Battuta Mall Station.
- Developer of the Mall of the Emirates took the decision to pay towards the Mall of the Emirates Station and the Metro-Mall Link.

Type 2: Developers who could not see the benefits of integration with the Metro system at the planning and construction phase, but who subsequently changed their view. After the Metro system began operation and the benefits of the system became apparent, these developers sought some form of physical integration with the Metro system.

- In the first instance, the developer of Deira City Centre (DCC) decided just to purchase the station naming rights for their development. However, after the line opened, the developer sought to develop a link between DCC and the Metro station, paying for the construction, maintenance and operation of the link, as well as access fees.
- The developer of Burjuman declined to finance the construction of the Burjuman Station. However, once the Metro had been built, the developer decided to buy the naming rights of the station. The developer also took a further step and reformed their development, reducing the number of parking spaces, which used to consume the ground floor of the mall, and utilizing this space for more retail facilities. The developer also requested a direct link into the Metro station; however, this was technically difficult and could not be delivered after the construction of the underground station.

Type 3: Recently, an active co-operation between developers and the RTA has been initiated to integrate development with new transit stations. Two different models can be recognized:

- An initiative led by the RTA to develop a TOD project on land adjacent to a Metro station, which is owned by the authority. Here the RTA is seeking to develop their land as a joint-development project based on Public Private Partnership (PPP).
- The second model is developer-led. Here the developer takes the initiative to develop private owned land based on the TOD concept by seeking active cooperation with the RTA to develop the project.

The 'Union Oasis' TOD and 'Mall of the Emirates' TOD proposals, respectively, represent these two models, and are discussed in more detail below.

## Case Study 1: Union Oasis Transit Oriented Development:

The Union Oasis project is the first TOD project suggested and promoted by the RTA. The project lies in the area of Union Square, a large open green space located in the CBD of Dubai. The line serves numerous adjacent land uses, including governmental services, major retail centres, tourist destinations and hotels, residential communities and commercial land uses. The governmental land includes the Dubai Municipality, the Dubai Economic Department, the Dubai Chamber of Commerce and Industry and the Dubai Land Department.

Union Station has been constructed beneath the square and is one of two interchange stations between the two Metro existing lines. It is the largest station on the network in terms of ridership, with around 11 million entry/exits during 2017 on the two lines, accounting for 5.47 per cent of total ridership. The site has good public transport provision; as well as the interchange metro station, it has the Abra and ferry stations, and bus stops nearby. The site is also efficiently located within a transport network of major roads that link the site to wider Dubai, giving it a significant strategic location.

With an aim to foster transit use and support other key goals related to people movement, such as increased walking and cycling, the RTA has set the objectives of the Union Oasis TOD project as providing:

- A landmark development: defined by its qualities relating to architecture, landscape and transport connectivity, while significantly improving the physical realm of Union Square and the Deira area.
- A TOD project: the RTA emphasises that the development should boost the use of the metro system, promote pedestrian and bicycle connectivity, emphasize street level activity to create a safe, secure and attractive community, as well as enhance the integration and connectivity between Deira and the whole of the city.
- A mixed-use development: a mix of land uses that are attractive to residents and visitors, and that will create opportunities to help retain and grow viable local small businesses and contribute to the overall economic sustainability of the Deira Community.
- High quality services to the residents and visitors by implementing an appropriate long term asset management, operation and maintenance programme, to incorporate whole lifecycle considerations and preserve the assets in good condition.
- Commercial viability: the RTA intends the project to be a financially feasible and sustainable project by utilizing a mixed-use development to achieve a better balance of residential and commercial uses as well as revitalizing economic drivers, including entertainment, a variety of boutique retail establishments and restaurants.
- A PPP model: by harnessing PPP model, innovation can be brought by private sector partners. In Dubai, a PPP law was introduced in 2015<sup>vii</sup>. The Union Oasis TOD project is planned to be delivered as PPP model, with the RTA offering the land on lease to potential developers for a period of 50 years from the date of signing the contract.

## Case Study 2: Mall of the Emirates (MoE) Expansion and TOD Development:

MoE is one of the most successful shopping malls in Dubai, featuring leisure, retail, food and beverage outlets along with an indoor skiing attraction. It is located on Sheikh Zayed Road, one of the major highways that links the site to the wider Dubai area, giving the shopping mall its strategic location within Dubai. The MoE station is located at an interchange on

Sheikh Zayed Road serving the shopping mall as well as surrounding residential and commercial communities. The station is attracting high pedestrian traffic from the mall and its associated facilities, using the covered mall-metro footbridge to directly access the mall. The Metro Station has seen seven million passengers in 2017, accounting for 5.5 per cent of total ridership along the Red Line (DSC, 2017).

To cater for the increase in ridership, the RTA is planning to undertake station capacity enhancement works at a number of stations, including MoE, where it is also planned to provide better integration with the regional bus station. The RTA has been in discussions with the MoE developer, about arrangements for sharing the cost. The developer has shown interest in reallocating land adjacent to the MoE, currently planned to be developed as a multi-storey car park, as a mixed-use development, accommodating an enhanced bus station and Metro station. The development is being planned as a PPP, with the private party given a concession to finance, develop, operate and maintain the facility in return for a fee.

#### <a> Conclusion

Dubai, like many other Gulf cities, has undergone major economic and population growth, which has been accompanied by extensive urban development and transportation system expansion. Tracing the evolution of Dubai's transport and land use from 1900 to the present shows that the city has developed using a growing range of modes for moving people: from walking, use of the traditional Abra ferry system and basic bus services, to automobiles and an extensive road system, and then again to the Metro and Tram systems that are being transformed into an integrated public transport system. The changing modes of transport and their effects on urban development are comparable to the three types of cities proposed by Newman and Kenworthy (1996, 2006): the 'walkable city', the 'transit-city' and the 'automobile-city'. However, historically the city developed differently, with a direct shift from the 'walking city' to the 'automobile city'.

Recognizing the negative externalities brought about by the automobile dependent phases of urban development in Dubai, a shift is underway to develop a transit and integrated public transport-based city, based on 'vision oriented' urban and transport policies, transport sector reform, and accessibility strategies, underpinned by a strong economy that has invested heavily in transport infrastructure.

The successful development of the Metro system has encouraged a culture of cooperation between public authorities and developers to promote a more accessible and sustainable city. The experience gained provides valuable lessons for other cities in the region that are inspired by the Dubai Metro to develop their own transit systems. In particular, strong control from government over urban and transport planning; giving transportation infrastructure investment priority; shifting from a 'problem oriented' to an 'objective-led' approach; integrating sustainable approaches to accommodate growth such as TOD; and working to develop a culture of co-operation between the transport authority and developers. Most of all, the opening of the Metro provides clear evidence for developers of the benefits provided for their developments. However, experiences in Dubai have not yet been that well documented. To better understand changing patterns in developers' attitudes and behaviour, an in-depth study of the factors (including market demand, profitability, socio-economic, physical and spatial planning) that affect their decision making is needed. This will help to develop models of developer behaviour that provide lessons for neighbouring countries.

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<sup>i</sup> Abra is a traditional boat made of wood. It is used to ferry people across the Creek and it represented the principal means of crossing Dubai Creek during this period.

<sup>ii</sup> Oil discovered in Dubai on 1966 and oil production and exporting began three years later in 1969. With oil revenues of US\$376 114 during the first year, to \$11 556 000 by the end of 1970 and to \$600 000 000 in 1975 (Ramos, 2009).

<sup>iii</sup> 'Al Shindagha Tunnel' beneath the Creek and two bridges across the Creek 'Al Maktoum Bridge' and 'Al Garhoud Bridge'.

<sup>iv</sup> Examples include the Jumeirah Palm, Dubai Internet City, Dubai Media City, Dubai Festival City, Dubai Marine, International City, Dubai International Financial Centre, Dubai Academic City, Dubai Health Care City, among others.

<sup>v</sup> Dubai Municipality was the planning authority since 1956.

<sup>vi</sup> The Red Line started operation on 2009 and the Green Line on 2010.

<sup>vii</sup> The PPP law (Law No. 22 of 2015) has been approved by H.H. Sheikh Mohammed Bin Rashid Al Maktoum on 10<sup>th</sup> August 2015. The Law governs the implementation of PPP projects within the Emirate of Dubai (It is a local law, not a federal law, and it does not apply in any of the UAE's six Emirates).

Hierarchal Subdivision of Dubai's Urban Area	Number of Residents	Facilities/ Services	Catchment Area
Neighborhood	< 5000 Residents	Local Park Local Plaza Post Shelters Local Mosque Playground Community Retail <2000m <sup>2</sup>	400m
Community	< 15 000 Residents	Jumaa Mosque Community Shopping Center Children Nursery Kindergarten Private General Clinic Private Specialty Clinic Private Polyclinic Playground Community Park Community Retail 5,000 – 15,000m <sup>2</sup>	800m
District	< 50 000 Residents	Intermediate School Secondary school Private Daycare Centre Post Office Health Care Centre Elderly Rest House District Park District Retail 15,000 – 35,000m <sup>2</sup>	1600m
Multi-District	200 000 – 300 000 Residents	Civil Defense Centre Eid Prayer Area Public Library Police Station Dubai Municipality Office Dubai Municipality Centre Private Hospital Government Hospital Multi-District Retail 35,000 – 50,000m <sup>2</sup>	-
Metropolitan Sector	500 000 Residents	Universities Regional Exhibition Centres Major Theaters Museums Metropolitan Sector Retail 50,000 – 300,000m <sup>2</sup>	-



<b>Saudi Arabia</b>	<b>UAE</b> (Abu Dhabi, Dubai, Sharjah, Ajman, Ras Al-Khaimah, Fujairah, Umm Al-Quwain)	<b>Bahrain</b>
<ul style="list-style-type: none"> <li>- 166.2 km Riyadh Metro</li> <li>- 35 km Jeddah Light Rail Transit</li> <li>- 161km Jeddah Metro</li> <li>- 444 km Makkah-Medina Railway</li> <li>- 182 km Makkah Metro</li> <li>-94 km Madina Monorail</li> </ul>	<ul style="list-style-type: none"> <li>- 45 km Abu Dhabi Metro Rail</li> <li>- 50 km Abu Dhabi Light Rail Transit</li> <li>- 74.25 km Dubai Metro</li> <li>- 10.6 km Al Sufouh Tram</li> <li>- 1,171 Km Etihad Rail</li> </ul>	<ul style="list-style-type: none"> <li>- 105 km Bahrain Urban Transit Network</li> </ul>
<b>Kuwait</b>	<b>Qatar</b>	<b>Oman</b>
<ul style="list-style-type: none"> <li>-161.65 km Kuwait Metropolitan Rapid Transit</li> <li>- 505 km Kuwait National Rail Network</li> </ul>	<ul style="list-style-type: none"> <li>- 206 km Doha Metro Project</li> <li>- 63 km Lusail Light Rail Transit</li> <li>- 350km Passenger and Freight Rail Network</li> </ul>	<ul style="list-style-type: none"> <li>- 2,244 km Oman National Rail Network</li> </ul>



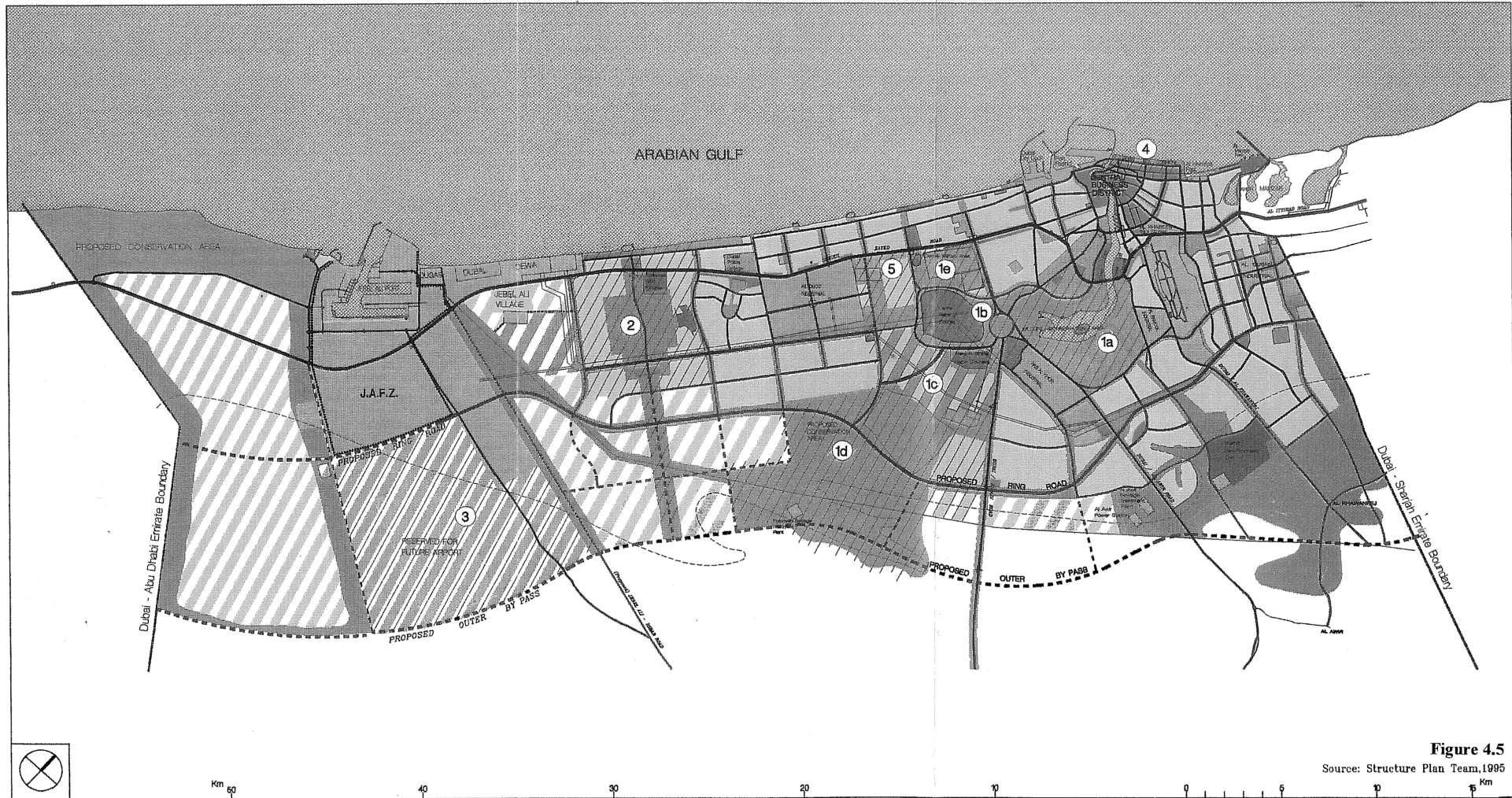


Figure 4.5

Source: Structure Plan Team, 1995

<p><b>LAND USES TO YEAR 2012</b></p> <ul style="list-style-type: none"> <li> Residential</li> <li> Special Residential</li> <li> Commercial</li> <li> Institutional</li> <li> Industrial</li> </ul>		<p><b>ROADS TO YEAR 2012</b></p> <ul style="list-style-type: none"> <li> Existing Freeways</li> <li> Existing Arterial Roads</li> <li> Proposed Freeways</li> <li> Proposed Arterial Roads</li> <li> Potential Arterial Roads requiring further Study</li> </ul>		<p><b>LAND USES BEYOND YEAR 2012</b></p> <ul style="list-style-type: none"> <li> Residential</li> <li> Industrial</li> </ul>		<p><b>ROADS BEYOND YEAR 2012</b></p> <ul style="list-style-type: none"> <li> Potential Roads requiring further Study</li> </ul>		<p><b>Special Study Areas</b></p> <ul style="list-style-type: none"> <li>1 Civic Spine</li> <li>1a Institutional Uses</li> <li>1b Recreation / Conservation Uses</li> <li>1c Residential uses compatible with adjacent Recreation / Conservation areas</li> <li>1d Conservation / Agricultural Uses</li> <li>2a Residential Uses on relocation of CMC to institutional site at Jebel Ali</li> <li>2b Mina Sheikh Tourism &amp; related uses - recreation, conference centers, offices.</li> <li>3 Jebel Ali Potential relocation of Airport, Airport related and general industrial uses.</li> <li>4 Deira Sea Corniche Proposed land reclamation and development of high density commercial, residential and recreational facilities.</li> <li>5 Al Quoz North Low income Housing and other land uses on relocation of National Cement Factory and extension of Ring Road</li> </ul>		<p><b>STRUCTURE PLAN AND ACTION AREA PLANS - DUBAI</b></p> <h1 style="text-align: center;">Dubai Urban Area Structure Plan</h1> <h2 style="text-align: center;">1993 - 2012</h2> <p style="text-align: center;">Parsons/Herland Bartholomew &amp; Associates</p>	
<p><b>LAND USES TO YEAR 2012</b></p> <ul style="list-style-type: none"> <li> Transport and Utilities</li> <li> Recreation</li> <li> Open Space Areas and Corridors</li> <li> Proposed Conservation/ Agriculture Areas</li> </ul>		<p><b>ROADS TO YEAR 2012</b></p> <ul style="list-style-type: none"> <li> Water</li> <li> Jebel Ali Free Trade Zone ( JAFZ )</li> <li> 30m contour</li> <li> Emirate Boundary</li> </ul>									

Notes: The final location of commercial centers is subject to further study.

100 Sq. Km.  
Or  
10,000 Ha.  
Area Scale  
10 x 10 Km.

**Metropolitan Area  
(north of the Outer Ring Road)**

- Residential
- Nationals housing
- Metropolitan Centre
- Multi-District Centre
- District Centre
- District Centers (to be determined at detail planning )
- Institutional
- Tourism & Resorts
- Industrial
- Logistics
- Port / Airport
- Utility / Special Use
- Open Space
- Recreation
- Conservation Areas/ Environmental, Natural
- Agriculture & Farming settlements
- Limit of 12 Nautical Miles
- Infrastructure / ROW**
- Roads Network
- Metro / Rail
- Water, Electricity, and Gas Networks
- Marine route to Jabal Ali Port
- Marine major route
- Non-Urban Area 1**
- Desert Land/ Traditional Equestrian activities and related uses, non-urban settlement, resorts, utilities, & special uses.
- Non-urban uses, stables
- Non-Urban Area 2**
- Desert Land / Private and natural reserves, resorts, tourism, gas extraction areas, quarries, and other special uses
- Post 2020 Land Use**
- Possible Future Metropolitan Centre
- Land for future development subject to environmental investigations and detail studies.
- Future Metro Rail
- Union Rail
- Future Road where needed (subject to detail studies)



100 Sq. Km.  
Or  
10,000 Ha.  
Area Scale  
10 x 10 Km.

**Metropolitan Area  
(north of the Outer Ring Road)**

- Residential
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- Post 2020 Land Use**
- Possible Future Metropolitan Centre
- Land for future development subject to environmental investigations and detail studies.
- Future Metro Rail
- Union Rail
- Future Road where needed (subject to detail studies)





**Key**





- Metropolitan Zone
- Multi-district Centre
- District Centre
- ✱ Future Metropolitan Zone
- ✱ District Centre (to be determined by detailed planning)
- Metropolitan Zone Catchment Radius 10km
- Future Metropolitan Zone Catchment Radius 10km
- Multi-district Centre Catchment Radius 5km
- District Centre Catchment Radius 2km
- Major Retail Mall
  1. Ibn Buttuta Mall
  2. Mall of the Emirates
  3. Madinat Jumerah
  4. Dubai Mall
  5. Wafi Shopping Centre
  6. Burjuman Shopping Centre
  7. Al Ghurair Centre
  8. Al Mulla Plaza
  9. Deria Citycentre
  10. Dubai Festival City
  11. Murdifi Citycentre
- Metro Connections
- Future Metro Connections
- Etihad Rail

Q 
Q
N



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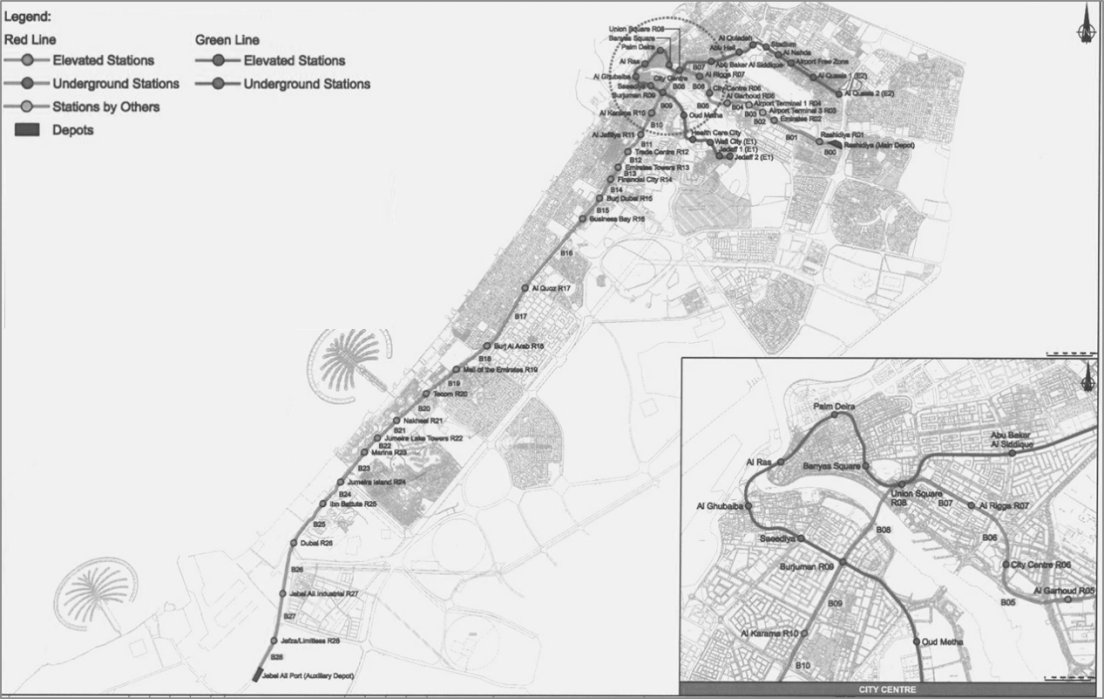
Legend:

Red Line

-  Elevated Stations
-  Underground Stations
-  Stations by Others
-  Depots

Green Line

-  Elevated Stations
-  Underground Stations



CITY CENTRE