

# Commentary

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## Understanding the Trajectory of Urban and Transport Development in Riyadh

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## The Riyadh metro project aims to be a reliable, affordable and sustainable transit system

### Introduction

Riyadh has been a car-oriented city since the 1950s, a trend that was compounded by the economic boom of the 1970s. Likewise, the first master plan of Riyadh, a highway-based plan prepared by Doxiadis Associates International in 1973, encouraged the continued use of private cars. Aldalbahi and Walker (2016) found that Riyadh's unique Islamic culture and conventions regarding privacy might have had a profound effect on the development of the city's transport system. Thus, cars became the main mode of transport, and car ownership continues to rise in the city. As a result, traffic congestion is a serious problem, and the introduction of a public transport system has become inevitable. To address this problem, the Arriyadh Development Authority (ADA) (now known as the Royal Commission for Riyadh City [RCRC]) initiated the Metropolitan Development Strategy for Arriyadh (MEDSTAR) project. This project includes the establishment of a brand-new public transport system in Riyadh.

The first public transport authority, the Saudi Public Transport Company (SAPTCO), was established in 1979 to build an advanced public transport system in the country through a government subsidy. Despite SAPTCO's transit services within and between Saudi cities, private operators continued to provide deregulated transit services across Riyadh, which they had done since the 1960s, creating competition for SAPTCO. AlGadhi (1994) argues that SAPTCO's poor service quality constitutes a greater obstacle to the development of a more efficient transport system than the fierce competition from unregulated bus services. For example, women account for less than 9% of SAPTCO's total ridership because of their desire to travel separately from men to whom they are not related and the availability of private cars and drivers (Aldalbahi 2017). Thus, public transport is unattractive for female users in Saudi society, and private cars have become convenient, and thus popular for them.

Riyadh, like other Gulf cities, experienced extreme wealth and economic growth as a result of the oil boom of the 1970s. Since then, Riyadh has become the economic center of Saudi Arabia's Central Region and the capital of the Kingdom, and also it is the largest metropolitan area among the Gulf states. This growth in economic activity increased personal mobility, which has generated high levels of car ownership and car use in the city. This led to the building of a series of highways and arterial roads across the city. In the past, these roads enabled easy mobility, but the situation has changed in recent years. For instance, the inner areas of the city are constrained and cannot accommodate further highway expansion. Meanwhile, significant increases in the population, coupled with rising personal mobility, have led to the continued expansion of car use and ownership, which has undoubtedly had significant effects on land use and transportation systems. Therefore, the increasing rate of automobile dependency has created a challenge for Riyadh in terms of maintaining reliable, safe and sustainable mobility, which has considerable implications both economically and environmentally. In 1997, the vehicle ownership rate in Riyadh was 224 per 1,000 people. This was low compared with other global cities, such as 604 per 1,000 people in United States (U.S.) cities, 491 in Australian cities, 524 in Canadian cities and 392 in European cities (Aldalbahi 2017). Data from the Saudi Ministry of Interior show there were only 22,805 cars in Riyadh in 1971. This figure increased to 2,052,934 in 1996 and was projected to reach 2,750,000 by 2019 (Aldalbahi

2017). This increase in car ownership largely compensates for the lack of effective public transport systems in the city (Al-Fouzan 2012). According to the Ministry of Transport's Department of Statistics, private car use is expected to rise by 8% a year. This means private car use in Riyadh will double by 2029 if no realistic alternative mode of transport is developed, or no future policies to reduce the growth in private car demand are introduced (Aldalbahi 2017). On June 24, 2018, Saudi Arabia ended its legal ban on women drivers, opening the way for millions of new drivers across the country (Krane and Majid 2018). By January 2019, 40,000 female driver's licenses had been issued in the country (Al-Ghamdi 2019), which might increase car ownership per household.

## Factors Increasing Car Ownership

The previous section described how Riyadh became a car-oriented city. This section discusses the factors behind this.

Saudi cities more closely resemble American patterns of urban development, including transport systems, than those of Western Europe (Aldalbahi and Walker 2016). In many North American cities, homes and workplaces are planned in a decentralized manner so that workers must commute between the two. This has given rise to an increase in car ownership (Cervero 2005). Oil-producing cities in the Gulf region have experienced similar trends with remarkably inadequate public transport, and Riyadh is a classic example of such urban development. In contrast to Riyadh and most American cities, many European cities have been able to develop good public transport systems for commuters and city dwellers (Vuchic 2005). Thus, Aldalbahi (2017) states that most residents of European cities will turn to public transport first before using cars, whereas in Riyadh it is the opposite.

### Lack of adequate public transit infrastructure

As Riyadh continues to become more dispersed, building and operating public transit systems is becoming expensive. The dispersal of residential growth makes the city more car-oriented, making public transit systems a less popular means to support urban mobility. The awarding of free plots and uncoordinated land development in Riyadh has also led to a rapid expansion of the urban periphery. By selecting housing in fringe urban areas, residents restrict their potential access to public transit systems, thus increasing their car use.

### Easily affordable oil

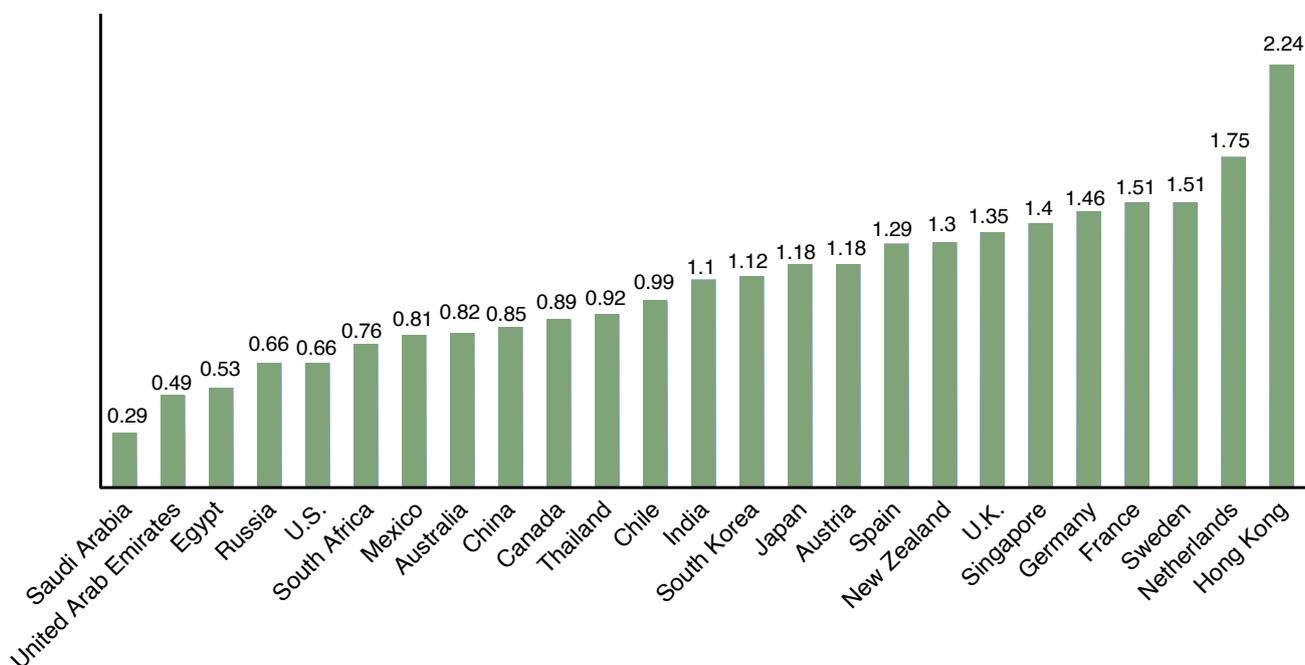
The oil boom made millions of dollars for the government, who then supplied low-cost oil to its citizens. This eventually triggered an increase in private vehicle ownership. According to Figure 1, the petrol price per liter in Saudi Arabia was US\$0.29 in the second quarter (Q2) of 2020 compared with US\$0.66 in the USA, US\$0.89 in Canada and US\$1.35 in the United Kingdom (U.K). This indicates that petrol prices in Saudi Arabia are still currently 56% cheaper than in the U.S., 67% cheaper than in Canada and 79% cheaper than in the U.K. Thus, the supply of affordable fuel remains high in Riyadh.

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## Work policy

Due to its continuing economic growth, Riyadh has attracted national and international migration for work. One third of the city's population consists of expatriates, and most are blue collar workers who are unable to drive because of their work conditions (Aldalbahi and Walker 2016). Due to the nature of their employment contracts and conditions, these workers are required to travel by private buses or trucks. The Kingdom has begun a national movement, Saudization, the newest policy implemented by the Ministry of Labor and Social Development. Under this policy, Saudi companies and enterprises are required to fill their workforce with Saudi nationals up to certain quotas to reduce the number of unemployed Saudi nationals. This means that foreign workers who cannot afford to drive would be replaced by Saudi nationals who are most likely to own cars. This could eventually increase daily car trips in the city.

**Figure 1.** Comparison of petrol prices US\$/liter worldwide.



Source: Bloomberg (2020).

## Effects of the weather

Riyadh summers are extremely hot, characterized by low humidity, which largely contributes to car dependency. Summer temperatures in Riyadh reach over 45 degrees Celsius (°C), which hinders residents' ability to make trips by foot, bike or even by bus or van. Owing to the high temperatures during the summer, the elderly, children and those with special mobility needs cannot walk easily. Moreover, pedestrian pathways are not well developed. There is also almost no provision for sidewalks along major roads, and, even where they exist, many are being removed (Aldalbahi 2017).

## Cultural factors

Culture is one aspect that consistently dominates urban morphology. The unique cultural characteristics of Riyadh have played a central role in the historical development of its transport system. In Saudi culture, women and men are segregated on urban buses and are usually transported separately via group transportation services or by family members or taxis. Due to this tradition, women expect door-to-door service (Al-Fouzan 2012), and private cars can meet this expectation.

## Riyadh Development in the Context of Transport

Previously, Saudi Arabian citizens received free plots of land to construct their own homes (Sidawi and Meeran 2011; Mubarak 1999), which unfortunately provoked urban sprawl. These plots were often located on the periphery of the city. The Real Estate Development Fund (REDF) of the Saudi Government, established in 1971, also contributed significantly to the sprawl in Riyadh. This is because Saudi citizens who bought or received free land are eligible for interest-free loans from the REDF. Since citizens must have land to apply for an REDF loan, low-income individuals seek cheaper land, which is often located further from the city center. The REDF is not authorized to control the location of development; instead, it controls the amount of development. Consequently, this tendency to acquire land in the outer suburbs has resulted in low-density development. Furthermore, operating cars is considerably more affordable than in other nations because of cheaper fuel, and car purchases are not taxed. This situation has also supported urban sprawl because commuters can drive from the periphery to the city center at a low cost. Furthermore, desert cities often expand horizontally because of their wide, open spaces.

Following the establishment of the REDF, the Ministry of Interior entered into an agreement with Doxiadis Associates (consultants for the development and ekistics of Athens, Greece) to formulate a master plan to guide the development of Riyadh to the year 2000. Doxiadis submitted its master plan in 1971. The plan included the expansion of the urban form and shape, community and administrative buildings, open spaces, housing, transportation, public utilities, industry, among other elements. Its plan proposed a kind of supergrid approach with north-south and east-west connections. The master plan was designed in a manner that promoted automobiles as the only mode of transport (Al-Hathloul 2017). It appears that the consultant failed to adequately predict the extent of urban growth. However, it could be argued that it was beyond the capability of the consultant to foresee the economic growth that would be caused by the oil boom in the 1970s, which led to such rapid urban growth.

Riyadh's growth in the 1970s exceeded the city boundaries, as defined by the Doxiadis master plan. By the mid-1970s, the plan's predictions as well as its planning proposal had become obsolete, necessitating further adjustments to accommodate the city's rapid growth. In 1976, SCET International of Paris came on board to update the Doxiadis master plan. The SCET plan proposed a ring road and retained the supergrid concept of Doxiadis. The SCET plan offered an expanded version of Doxiadis's plan to deal with the city's unforeseen growth.

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However, as neither of these master plans was successful, in 2003 the Arriyadh Development Authority (ADA) established a comprehensive strategic plan, the Metropolitan Development Strategy Arriyadh (MEDSTAR) project. The goal of the project was to plan, manage and control the city's growth by establishing an urban growth boundary (Alkhayyal 2017). By the 1990s, Riyadh was a fast-growing city, with a population of over 4 million and an annual growth rate of 8%. The total population was projected to reach 10 million by 2020 (Al-Hathloul 2017), which underscored the importance of developing a comprehensive strategic plan to accommodate this growth and ensure the city functioned efficiently. The MEDSTAR project is still being updated to adapt to the changes in the city. A major component of the project is the development of a public transportation system, including specified sub-centers across the city. Under the MEDSTAR project, the Riyadh Public Transport Network (RPTN) has been proposed to achieve a reliable, efficient, and affordable public transport system for residents. This network is composed of metro lines with Bus Rapid Transit (BRT), community bus lines, feeder buses and park-and-ride facilities. The project is underway and is expected to become operational soon. To implement the RPTN, the Royal Commission for Riyadh City (RCRC) is currently undertaking a preliminary study of Transit Oriented Development (TOD) within the city. This study symbolizes the TOD strategy for the future of Riyadh, which includes intensifying mixed-use activities and increasing the density around metro stations.

**Under the MEDSTAR project, the Riyadh Public Transport Network (RPTN), which is composed of metro lines with bus rapid transit (BRT), community bus lines, feeder buses and park-and-ride facilities, expects to deliver a reliable, efficient, and affordable public transport system for residents**

### **Discussion and Concluding Remarks**

Riyadh's initial Doxiadis master plan and Saudi cultural norms continue to have an impact on the city's continuing urban development. The emphasis on the use of private cars as a mode of transport in the Doxiadis plan caused Riyadh to become a car-oriented city rather than public-transport friendly. Therefore, the current form of Riyadh is still highly dominated by car transport infrastructure, and environmentally sustainable transport modes, such as walking and cycling, do not exist. As a part of the MEDSTAR study, the new Riyadh Public Transport Project is the first travel alternative for commuters, and it should reshape the city's form in the coming years. Measures related to metro stations, TOD sites, bus stops, park-and-ride schemes and land use changes will increase the number of connections to and between public transport services (UN-Habitat 2013). This should bring about significant positive changes to Riyadh's current form. Sustainable and efficient public transport in Riyadh would decrease urban sprawl and increase density. Cervero and Murakami (2008) argued that TOD embodies the physical features of high density and mixed-use land, accommodating enough people within an acceptable distance to encourage walking, cycling and the use of public transport. This could also contribute to improving social cohesion.

Introducing public transport, including metro and bus services, in Riyadh will have large direct and indirect economic benefits. Large investments in the transport sector stimulate the economy. Furthermore, public transport could increase property prices by mixing land uses. Weisbrod, Cutler, and Duncan (2014) indicated that public transport investment could offer significant economic growth in the short and long term, and have a cumulative impact on economic productivity. From the customers' perspective, using public

transport would reduce household expenses as they switch from using cars to traveling by metro or bus. Public transport should improve accessibility between areas of the city and save overall travel costs and time. Concurrently, it should contribute to reducing congestion, which would eventually improve car mobility, reducing the travel time and costs for peak hour car travelers. A recent study indicated that the Riyadh public transport system might reduce motorized travel by 10% to 15% (Alotaibi and Potoglou 2018). This reduction would help to minimize environmental pollution. Moreover, as the Riyadh public transport system has been designed to use solar energy and other environmentally friendly power sources, such as electric metros and ultra-low emission bus technologies, it will increase city-wide emission reductions. Transport based on an integrated TOD network will also discourage people from using private cars.

In Saudi Arabia, Islamic cultural norms and characteristics are frequently stated as a barrier to public transport uptake, unless the system is designed accordingly. This is an important consideration when formulating public transport policies. For instance, women's privacy must be addressed in public transport planning. Therefore, persuasive as well as 'soft' measures need to be considered at the household and individual levels to target the shift from private cars to public transport. 'Hard' measures, such as improving public transport through building infrastructure and pricing policies, are insufficient to change travelers' perceptions regarding private car and public transport use (Zhang et al. 2015). However, soft measures such as security, comfort, reliability and convenience could play significant roles in changing travelers' mode-choice behavior, even if the trip takes longer than driving (Alotaibi and Potoglou 2018). Public campaigns, social awareness and lessons in schools on respecting social norms and the local culture could be effective in promoting public transport services. Aldalbahi and Walker (2015) noted that changing the attitude of Saudi citizens and their mode-choice behavior is a gradual process that is difficult to achieve in the short term. However, the opportunity to have a diversity of transport modes could lead to a shift from traditional modes of transport toward the use of more sustainable, public transport.

SCET and MEDSTAR maintained the main ideas of the Doxiadis plan, while enlarging it and making it more flexible. However, MEDSTAR offers three new proposals: i) introducing subcenters, ii) developing suburbs in the north and east, and iii) implementing RPTN, which seemingly departs from the original Doxiadis plan. The future and potential shift toward TOD around metro stations will weaken the original proposal of the Doxiadis plan. Therefore, the impact of the new MEDSTAR project proposal, particularly the subcenters, the RPTN and TOD strategies, will bring a considerable change to the urban morphology of Riyadh in the coming years.

In addition to the MEDSTAR project, Saudi Arabia recently announced its National Transport and Logistics Strategy (NTLS) to enhance its transport management system. The main idea of the NTLS is to see Saudi Arabia become a global logistics hub connecting Asia, Europe and Africa. The strategy also aims to improve all transport services, including air, land, sea and rail transport, in support of Saudi Vision 2030 to unlock new prospects for economic development.

The NTLS proposes an integrated road map for the next era of the Kingdom's transport and logistics sectors' development. It aims to build modern urban



**Changing the attitude of travelers and their mode-choice behavior is a gradual process that is difficult to achieve in the short term**



transport infrastructure to improve and facilitate mobility within Saudi Arabia and beyond. For instance, the strategy indicates that the total length of all railways in the country should be increased to 8,080 kilometers (km) from about 4,975 km currently. It also proposes a 'land bridge' project, spanning more than 1,300 km (Saudi Gazette 2021; SAR 2021). This expansion is expected to cover a capacity of about 3 million passengers and transport more than 50 million tonnes of freight annually. Furthermore, the strategy specifies the goal of advancing the Kingdom to fifth globally in the number of transit passengers. It also plans to increase direct flights to over 250 international destinations by introducing a new national airline. The strategy also seeks a two-fold increase in the capacity of the country's air cargo sector to at least 4.5 million tonnes. The strategy also expects Saudi Arabia's maritime sector to reach a capacity of more than 40 million twenty-foot equivalent units (TEU) annually. To achieve this capacity, it stipulates the necessary investments to enhance port infrastructure, promote the integration of logistics hubs in the Kingdom and support connectivity with international shipping lines. Integrating rail and road networks will contribute to improving the efficiency of the transport ecosystem and its economics. The contribution of the transport and logistics sector to national gross domestic product is also set to increase to 10% from its current 6%.

The NTLS is a key pillar in achieving the transport goals set out in Vision 2030. It will strengthen Saudi Arabia's position as an international logistics hub, given its advantageous location.

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## About the Project

This paper is part of the ongoing project, KAPSARC Spatial Urban Energy System. The project has two main components: (i) the Urban Energy Model (UEM) and (ii) the Spatial Economic Model (SEM). The project has three objectives: (i) to gain energy efficiency through transit-oriented development (TOD) in the transportation and electricity sectors, (ii) to gain additional efficiency by realizing the potential opportunities of the innovative and smart technologies offered by TOD, and (iii) to investigate the energy and economic impact (including real estate development) of Riyadh's transportation, land use and urban planning interventions. The project also includes a literature review, or 'scoping study,' to develop baseline information. The energy efficiency gains that TOD enables are directly related to land use changes and a modal shift to public transport. Understanding the history and current status of the Riyadh transport system is an important step in implementing this project.

## About KAPSARC

KAPSARC is an advisory think tank within global energy economics and sustainability providing advisory services to entities and authorities in the Saudi energy sector to advance Saudi Arabia's energy sector and inform global policies through evidence-based advice and applied research.

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