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Effective
metro
system
investment
Getting on track



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EXECUTIVE SUMMARY

The case for public transportation in the cities of the Middle East is intensifying in response to population growth, ambitious economic growth goals, new expectations for commute times, and plans to improve quality of life. At the heart of urban public transportation is a metro system, a challenging project to undertake given the lengthy development time and cost, with lagging economic returns. However, not investing is also problematic, as a lack of public transit leads to road congestion, pollution, and traffic accidents.

In the Middle East, significant metro system projects are underway in the cities of the Gulf Cooperation Council (GCC).¹ Cities in the GCC have around 400 km combined of metro system track. We estimate that they will need around 1,500 km in total to cope with projected growth. Therefore, cities, or the local authority, must make sizable investments and do so through a clearly defined implementation framework. Using this framework, cities can make considerable gains, with a large-scale metro system generating three to four times the cost of investment in direct and indirect socioeconomic benefits, according to our calculations.

The implementation framework helps cities realize the anticipated returns and implement a metro system in a cost-efficient and effective manner. The framework consists of four pillars.

The pillars are:

1. Clear objectives
2. Integrated planning
3. High-quality service and customer-centric experience
4. Commercial mindset

The foundation on which these pillars rest is composed of four elements: effective governance; an ecosystem of policies and incentives to support transit adoption; funding throughout system development, launch, and early operations; and local capabilities that enable effective long-term management.

THE STATE OF METRO SYSTEMS IN THE MIDDLE EAST

Metro systems are spreading in the Middle East after over 20 years in which many cities deliberated whether to invest in them on a large scale. Many delayed taking the leap because of concerns about the long development time and the steep costs of building and operating these systems, issues that can lead to underwhelming economic returns. Another challenge for these cities is the car-centric nature of their societies and urban sprawl, which make it costlier and more difficult to establish urban transport connectivity. Adding to the difficulties is that each city has distinct requirements for the amount it should invest in metro systems and a different starting point in terms of available transit modes.

To date, within the GCC, Dubai, Doha, and Riyadh have begun implementing large-scale metro systems.² As of 2022, Dubai and Doha have 90 km and 76 km of operational metro system track, respectively. Riyadh is planning to launch a 176 km metro system by 2024 (see Exhibit 1). Meanwhile, Abu Dhabi began electric bus trials in 2019, and it has outlined plans for a 131 km metro system by 2030.³ Bahrain is in the implementation phase of its metro system project, which will connect commercial and residential areas.⁴ Kuwait City also has metro system plans.⁵

EXHIBIT 1 GCC cities have varied metro system needs and plans



Source: Strategy& analysis

The investment imperative

Cities in the Middle East are forging ahead with metro systems for compelling reasons. These cities cannot meet the demands of accelerated population and tourism growth without expanding and further developing metro systems. Roads will be overburdened with the anticipated surge in private transportation. For example, Riyadh's population is expected to roughly double by 2030 because of the development of several giga-projects that support the national development plan, Vision 2030.⁶ These projects, which include hotels and residential developments, are expected to attract a substantial influx of residents and tourists. In addition, the number of pilgrims visiting Makkah is anticipated to reach 50 million by 2030, with peaks of up to 10 million during Hajj week. The local authority in Makkah plans to expand the current 18 km metro system to 188 km by 2030, which will correspond to 84 km of track per 1 million inhabitants, which will be nine times the coverage today.⁷

Governments also are reimagining transportation systems given the return to normal commuting habits following the easing of the COVID-19 pandemic. Many riders have little patience for lengthy commute times and greater expectations about the quality of their journeys. Rising fuel prices are eroding the affordability of private car transportation.

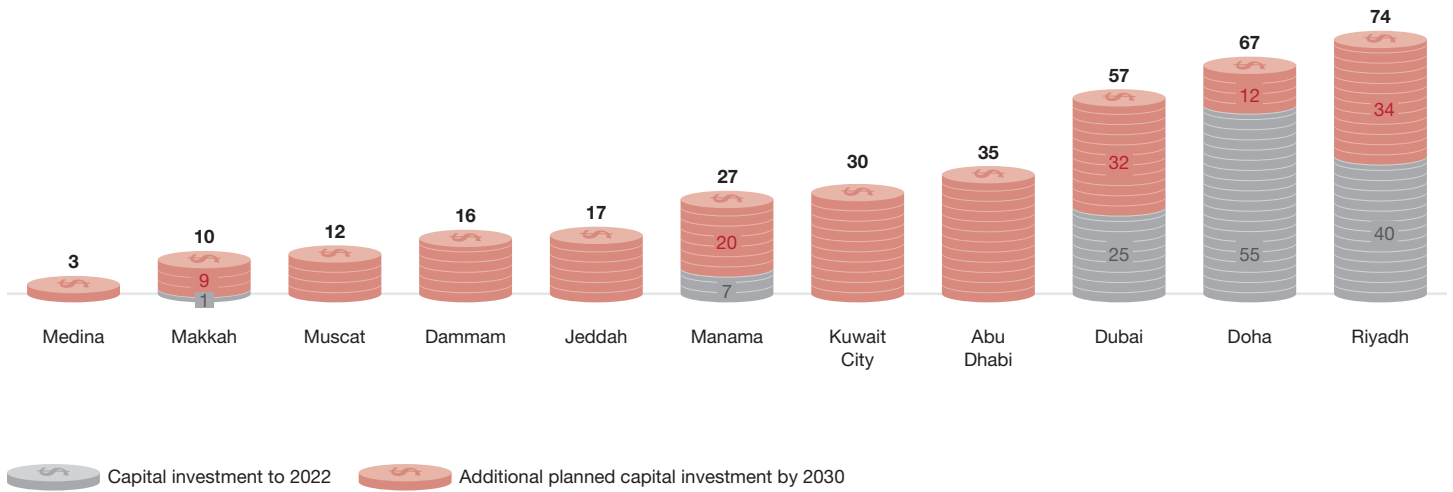
More generally, efficient mobility is important as it supports national goals to increase the standard of living. For instance, the UAE's 2071 Centennial Program seeks to make the country a world leader with a positive lifestyle and high quality of life, aims that a robust and flexible mobility ecosystem can support. Dubai, as part of its 2040 urban plan, intends to use smart and green mobility initiatives so that 55 percent of its residents reside "within 800 meters of a main public transport station."⁸

The scale of metro system investment and the returns

We estimate that based on current supply and expansion plans to meet population demand, GCC cities together require an additional 1,100 km of metro system by 2030. Such an expansion would increase the total network size to around 1,500 km (compared with some 400 km at present), leading to a ratio of 34 km of metro system track per million inhabitants (compared with 13 km per million inhabitants today). We calculate that these plans would involve US\$220 billion of additional investment by 2030. Riyadh, for example, would need an extra \$34 billion in capital investment by 2030 in addition to the \$40 billion it has already invested (see *Exhibit 2, page 4*).

EXHIBIT 2

GCC cities plan to invest significantly more in metro systems (US\$ billions)

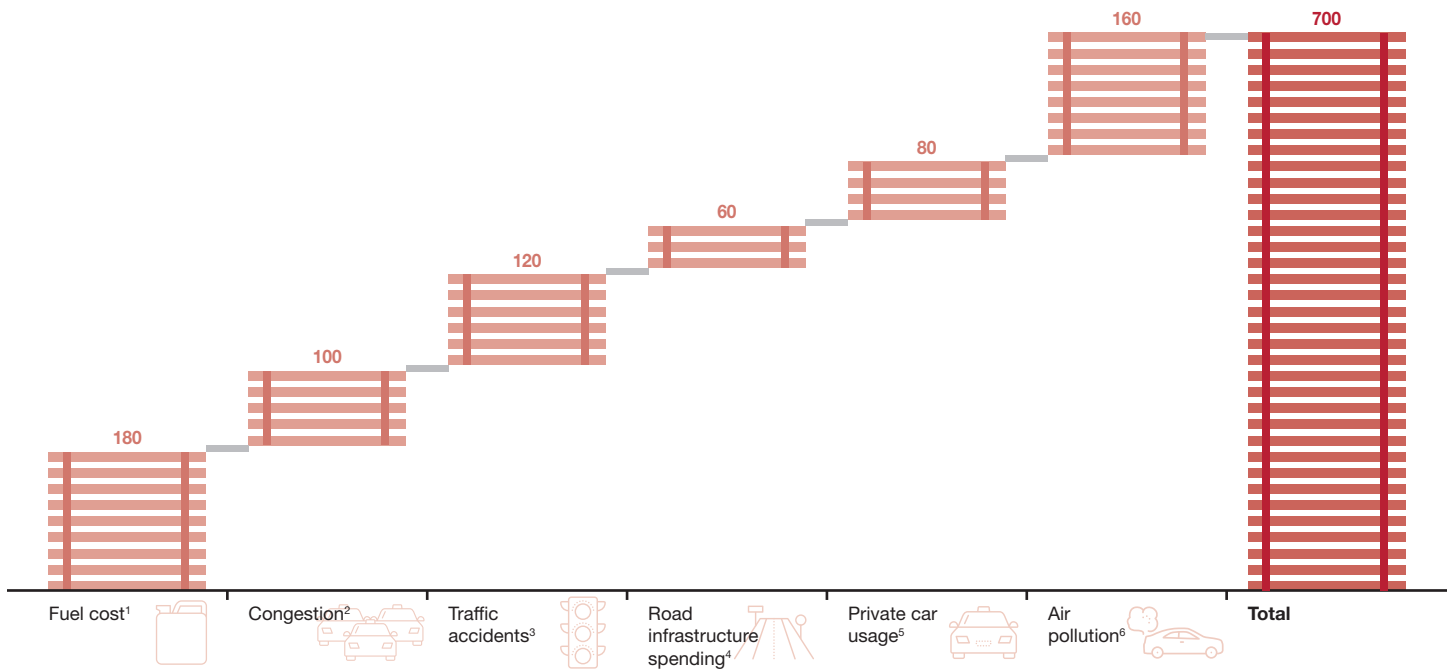


Source: Strategy& analysis

Although the cost is significant, a properly implemented and funded metro system can generate three to four times in direct and indirect socioeconomic benefits. If GCC cities were to build the additional roughly 1,100 km of metro rail required by 2030, they could realize direct and indirect socioeconomic benefits worth around \$700 billion from 2031 to 2050. Less road traffic would mean fewer road accidents, a cut in healthcare and social costs, and less need to spend on road infrastructure (see *Exhibit 3, page 5*). Additional indirect, qualitative benefits would include more predictable travel times, and improved air quality.

EXHIBIT 3

More metro system capacity would lead to identifiable direct and indirect socioeconomic benefits (US\$ billions 2031–50)

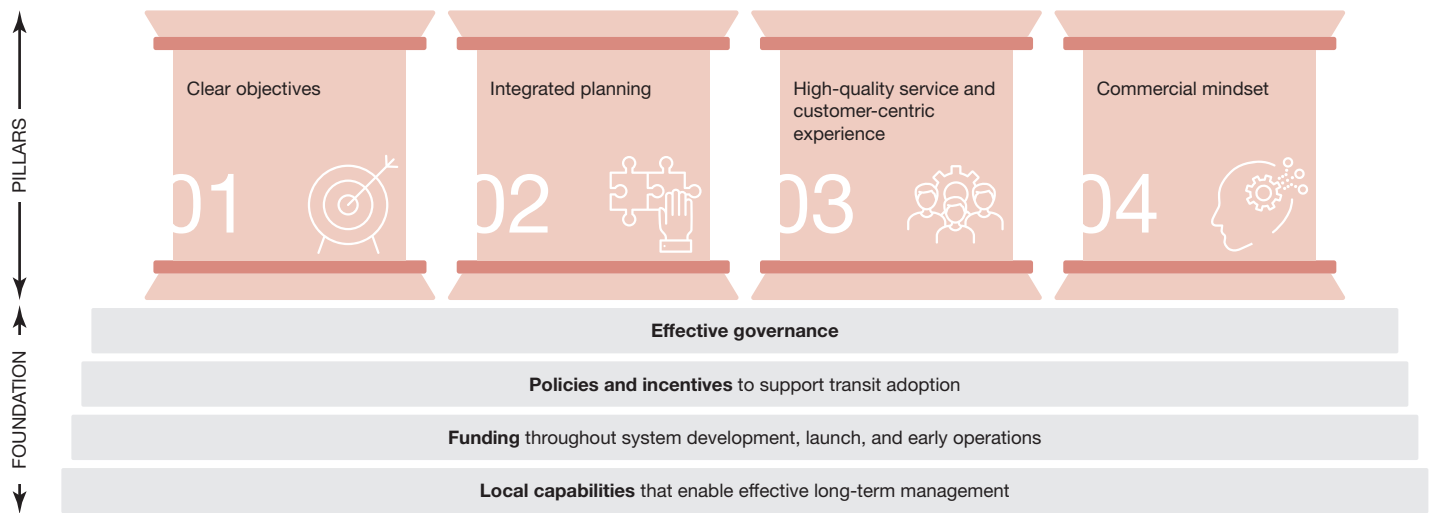


1. Fuel cost represents the fuel cost saved when people ride metro-rail rather than use private vehicles. 2. Congestion represents the labor productivity gain hours not wasted in peak and nonpeak traffic congestion. 3. Traffic accidents represents the savings from having fewer accidents in terms of healthcare and associated costs (repairs, insurance premium increases, etc.). Calculated in terms of vehicle kilometers driven and accident cost estimates from Royal HaskoningDHV. 4. Road infrastructure spending is based on estimates from GCC governments. 5. Private car usage cost represents the cost ownership savings in terms of a city's population resulting from increased public transportation use. 6. Air pollution cost represents savings from the reduction in total emissions from private vehicle use, calculated using US\$ amount per CO₂ emissions based on long-term data. Source: Royal HaskoningDHV, "Make roads become safer and healthier for its citizens" (<https://global.royalhaskoningdhv.com/projects/roads-safer-and-healthier-for-its-citizens>); Strategy& analysis.

A METRO SYSTEM IMPLEMENTATION FRAMEWORK

Cities can use an implementation framework to build metro systems in a cost-effective manner that maximizes socioeconomic returns. The framework has four pillars, which are supported by a foundation of four elements. Each city will lean on different pillars to varying degrees based upon its metro system starting point (see *Exhibit 4*).

EXHIBIT 4
The metro system implementation framework has four pillars



Source: Strategy&

The four pillars of the metro system implementation framework are discrete yet complementary.

Pillar one: Clear objectives

Cities must define clear objectives at the outset to prevent conflicts among different goals during metro system implementation. Each metro system has numerous goals that vary widely and that can be potentially inconsistent; for example maximizing ridership, meeting financial targets, and pursuing environmental sustainability.

Pillar two: Integrated planning

Integrated planning is vital if cities are to provide riders with a convenient and smooth experience. For example, it is important to consider first-mile and last-mile challenges—that is, how riders get to the public transportation system, and how close that system puts them to their final destination. The metro system is at the heart of integrated planning, as it carries the largest number of passengers.

Cities can plan for their metro system to be flexible and provide maximum connectivity for riders by considering how transport modes work together, whether they are such existing modes as buses, taxis, and ride-hailing, or emerging modes such as micro-mobility, autonomous shuttles, and pods (fully autonomous, electric vehicles that seat up to four people). Integration spares cities from overinvesting in capacity that could take too long to build or that may not receive adequate long-term use, such as isolated metro stations or dedicated bus networks that run through low-density residential areas.

Pillar three: High-quality service and customer-centric experience

A metro system should provide its users with a high-quality experience that is convenient, safe, and smooth. People have high expectations for their quality of life and their transport service. If these are not met, they may avoid using the metro system.

One way to provide a high-quality experience is to make the interaction between the digital and physical aspects of the service seamless. Mobility-as-a-service apps, for instance, can help riders plan their entire journey and offer electronic ticketing, fare payment, and service updates. Such apps can collect journey data and user feedback to inform service improvements. These apps can include loyalty programs.

Some GCC metro systems are already building the high-quality experience pillar. Doha, for example, increased the number of transit cars and how often they ran for the 2022 FIFA World Cup. The city also offered a transit card that riders could use on the metro, buses, and trams.⁹ Similarly, Dubai allows riders to pay for tickets on their mobile phones.¹⁰

Pillar four: Commercial mindset

A metro system should aim to realize its full commercial potential through arrangements that capture long-term revenue generation opportunities beyond ticketing. Such a commercial mindset yields options in the short to medium term such as advertising, sponsorships, and retail spaces at metro stations. In the long term, there are possibilities for the metro system to work with developers to build new commercial and residential areas attached to the metro system.

The foundation

The four pillars of the implementation framework rest on a foundation of four elements.

Effective governance

Cities need an overarching governance structure that clearly defines roles and responsibilities. Such integrated control over all transport modes is vital for the success of a metro system. The governance structure allows cities to manage vital decisions across the planning, delivery, and operations of the metro, thereby avoiding the danger of having transport modes operating in silos and investments failing to deliver the anticipated benefits.

Policies and incentives to support transit adoption

Cities need an ecosystem of policies and incentives that encourage people to swap private car journeys for public transportation. They can encourage more people to use metro systems by providing attractive and sustainable first-mile and last-mile options such as placing bikes and e-scooters near stations. Cities can also provide fare incentives, including discounts for users such as university students and frequent commuters.

Simultaneously, cities can nudge people away from private car use. They can limit private car access in specific areas and offer last-mile taxis or ride-hailing. Cities also can use parking charges, tolls, and vehicle registration fees, and a vehicle fuel efficiency tax. Such approaches raise funds for investment in public transport. Similar initiatives in Dubai have encouraged residents to move away from private car use.¹¹

Funding throughout system development, launch, and early operations

It is vital that funding for any new metro system endure through the development, launch, and early operation phases. Such a guarantee of support prevents gaps in investment, prevents significant delays, and ensures that operational funding is accessible to provide the quality and availability that attracts riders. The continuity of funding prevents cities from cutting corners and enables public transportation to reach its full potential.

Cities can supplement direct funding by commercializing public transport entities. That means creating subsidiaries that focus on activities such as retail and advertising, entities that are part of the system's commercial mindset. Cities can obtain additional funding through long-term loans, bonds with assets as collateral, and the sale and lease-back of movable assets.

Local capabilities that enable effective long-term management

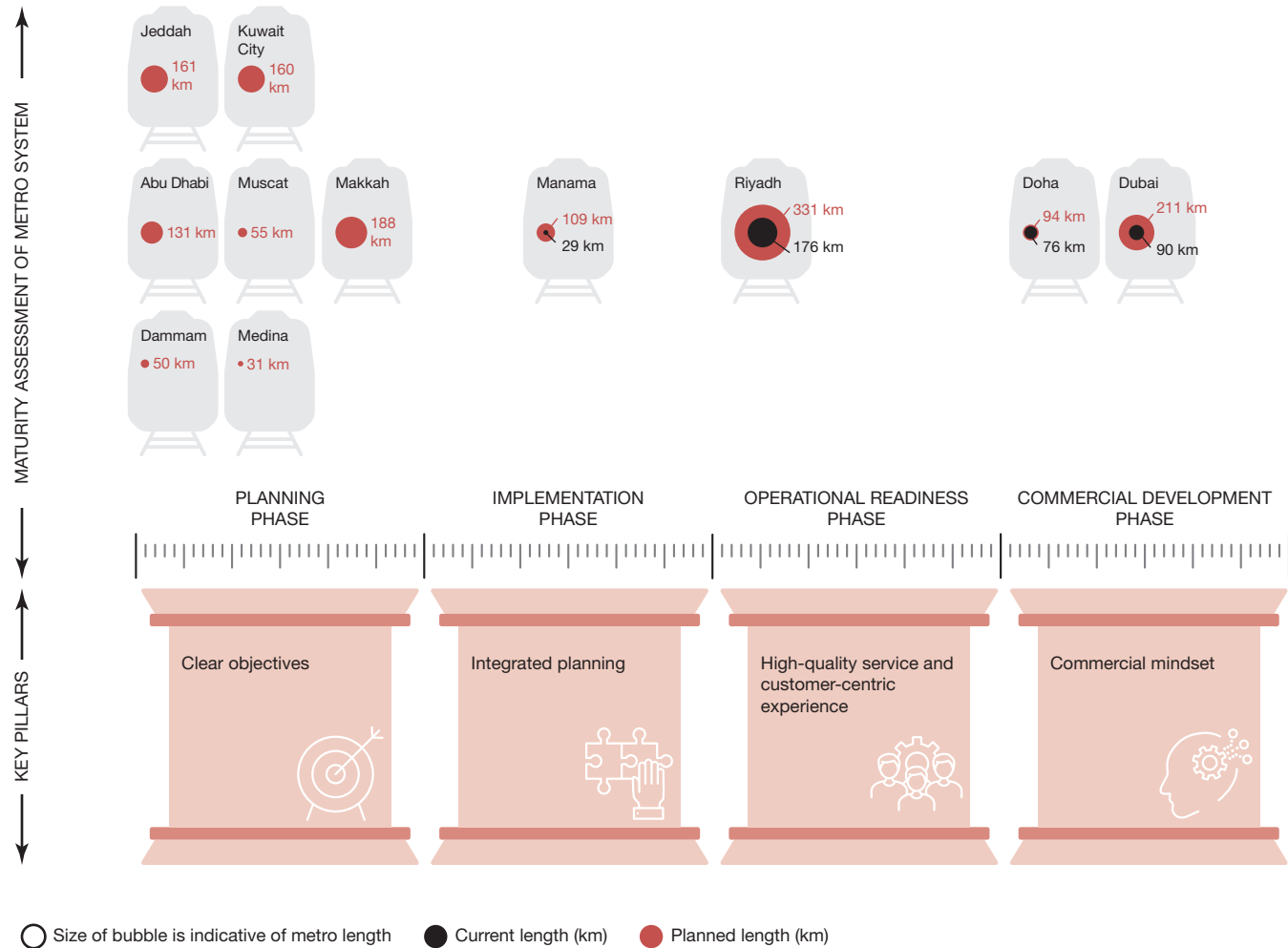
Cities need to develop local capabilities such as design, planning, and maintenance to ensure the metro system is managed well and operates effectively over the long term. That is particularly important for those cities with little experience in metro systems.

In particular, cities need to expand the skill sets of their workers and deploy technology. Dubai plans to train recent graduates so they can work in operations and maintenance. The city also is using an artificial intelligence system called "City Brain" to improve efficiency and service in the city's bus system.¹²

Leaning on the pillars

Although the implementation framework applies to all cities, individual cities will focus their attention and investments based on where they stand in terms of their metro system (see Exhibit 5).

EXHIBIT 5
Metro systems will lean on different pillars



Source: Strategy& analysis

For example, as all metro systems strive to define clear objectives, the first pillar, some cities are already advanced in their design plans for integrated metro systems. Therefore it makes sense for them to focus on integrated planning, the second pillar, while attending to the four elements of the foundation. Some other cities, meanwhile, aim to expand further their soon-to-be-launched metro system. Such cities could then focus on a high-quality service, the third pillar, and a commercial mindset, the fourth pillar.





CONCLUSION

Cities in the Middle East have the opportunity to transform their public transport systems. Irrespective of where they are on that journey now, they require an implementation framework to ensure that their large-scale investment meets future demographic and economic demands. Properly implemented and managed, metro systems can create long-term socioeconomic returns, promote sustainability, and improve the quality of life for residents.

ENDNOTES

1. The GCC countries are Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.
2. Afrah Bari, "Everything you need to know about the Riyadh Metro," *Time Out Riyadh*, June 1, 2022 (<https://tinyurl.com/45xhtv4r>).
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6. "Saudi Vision 2030" (<https://tinyurl.com/4276jjxa>).
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8. Dubai 2040 Urban Master Plan (<https://tinyurl.com/yc7cmdmd>); Dubai 2040, "Key Outcomes" (<http://dubai2040.ae/en/>); Sultan Al Ghurair, "The 15-minute city: Blueprint for post-Covid recovery; Dubai a prime candidate," *Arabian Business*, November 8, 2021 (<https://tinyurl.com/2p9ababw>).
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10. "Dubai public transport payments to be made with mobile phones," *The National*, October 7, 2019 (<https://tinyurl.com/5ez4z9xx>).
11. Sarah Forster, "More than 304 million journeys on Dubai public transport in first half of 2022," *The National*, August 14, 2022 (<https://tinyurl.com/bddy2ubk>).
12. Anup Oommen, "How Dubai is using AI to get people on public buses, reduce waiting time, and speed up journeys," *Arabian Business*, June 13, 2022 (<https://tinyurl.com/2vkw587x>).

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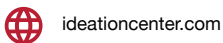
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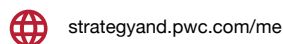
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