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Tech-enabled transport

Building smarter transportation networks in the GCC

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Executive summary

Gulf Cooperation Council (GCC)[1] countries face significant fiscal, safety, environmental, and accessibility challenges in their transportation systems. Innovative new technologies offer a means of managing these issues. These technologies include autonomous vehicles, electric cars, drones, traffic management systems, and other advances. To capitalize on such emerging technology, government authorities, ministries of transport, and other regional stakeholders in the GCC should use a four-part framework:

- ***Regulate:*** Revamp the operating model within organizations that oversee transportation, identify priorities, and develop an appropriate and up-to-date regulatory framework for emerging technologies. This framework should address data management, cybersecurity, privacy, and insurance and liability issues.
- ***Pilot:*** Test promising technologies, including assessing potential benefits and adoption rates, and suggesting improvements. These tests may require partnering with private-sector companies that have the requisite technical expertise.
- ***Build:*** Put the underlying infrastructure in place, including physical infrastructure (such as roads that can support autonomous vehicles, charging stations for electric cars, and facilities for greener maritime fuels) along with an IT backbone capable of handling the increased flow of information, and analytics tools to derive insights from the data.
- ***Incentivize:*** Offer incentives to customers and service providers to spur greater adoption of these technologies, including subsidies, gamification, public–private partnerships, and tax breaks.

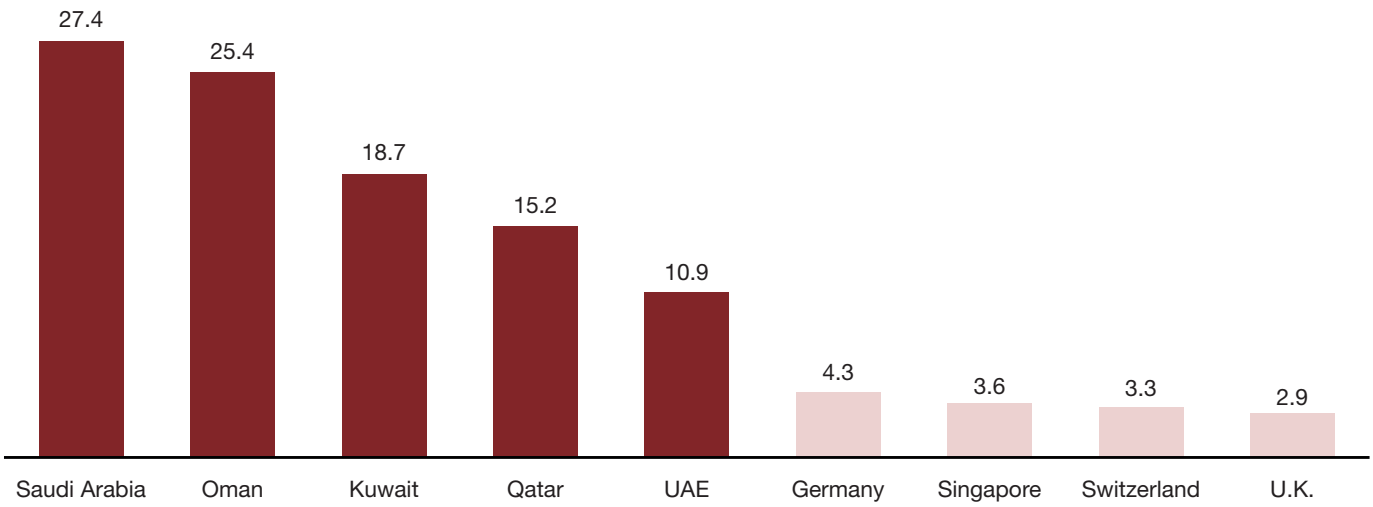
While introducing this framework, governments need to bear two factors in mind. First, GCC governments need not start from scratch. GCC nations can apply the lessons learned from other markets, that are further along in their adoption of transportation technologies, tailoring them to unique GCC needs. Second, technologies are developing quickly, making it difficult to project years ahead. For that reason, governments should avoid focusing on any one specific technology and spread their bets across multiple options, remain flexible, and adapt to changing conditions.

Fiscal, safety, and environmental challenges affect transport

Transportation systems in GCC countries face fiscal, safety, environmental, and accessibility challenges. Fiscally, GCC governments still rely heavily on oil revenues to finance spending, and the large decline in oil prices has hurt state budgets. Unlike in years past, many governments can no longer justify spending freely on transportation infrastructure projects and need to scrutinize how and where they invest. Regarding safety, the region suffers from high rates of death from road accidents — significantly higher than international benchmarks (*see Exhibit 1*). Approximately 10,000 people died in GCC road accidents in 2014. Including non-fatalities, road accidents lead to economic losses equivalent to 2.5 percent to 4.5 percent of the GDP among GCC states.[2]

Exhibit 1
The GCC has high death rates from road accidents

Fatalities per 100,000 inhabitants, 2013

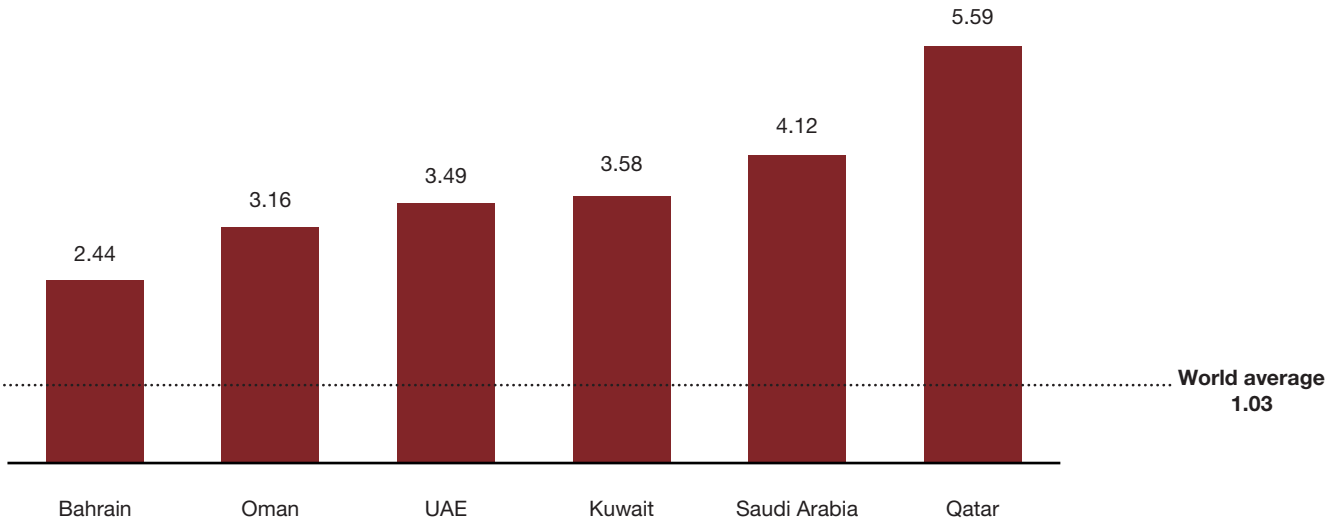


Source: World Health Organization, "Global status report on road safety 2015" (http://www.who.int/violence_injury_prevention/road_safety_status/2015/en/)

Transportation in the region also carries steep environmental costs. GCC citizens continue to prefer large SUVs and luxury cars, which generate more emissions than other vehicles. SUV sales in the GCC in 2015 totaled 9.3 for every 1,000 residents, compared to 3.0 for the rest of the world.[3] More broadly, state fuel subsidies, limited public transportation, and high temperatures all contribute to emissions levels that are far higher than in other regions (*see Exhibit 2*).

Exhibit 2
The GCC's emissions are well above the world average

Transport-generated emissions from fuel combustion, tons of carbon dioxde per capita, 2013



Source: Based on IEA data from 2015 CO2 Emissions from Fuel Combustion © OECD/IEA 2015, www.iea.org/statistics, Licence: www.iea.org/t&c; as modified by Strategy&, part of the PwC network; The World Bank, World Development Indicators.

Technology proliferation

New technologies are emerging to make transportation smarter, safer, less expensive, and more accessible — technologies that GCC countries can adopt to better manage their transport challenges. These technologies include electric and autonomous vehicles. For example, automobile manufacturers are making rapid advances in electric cars, which are projected to constitute 25 percent to 50 percent of the overall market by 2040, according to Bloomberg.[4] Throughout their entire life cycle — including manufacturing, operation, and end-of-life processing — electric cars generate about 50 percent less in carbon emissions than similar-sized cars that run on gasoline.[5]

Autonomous cars are likely to be introduced on roads in the foreseeable future. Dubai recently announced a plan to convert 25 percent of the emirate's total number of passenger trips to autonomous mode by 2030. In Singapore, people can already summon autonomous taxis through a smartphone app. During the initial rollout, the taxis are limited to a specific area of the city, with preset pick-up and drop-off sites.[6] In the U.S., Uber recently announced a similar program in Pittsburgh, where autonomous cabs will be supervised by humans in the driver's seat for the near term.[7]

Autonomous cars are likely to be introduced on roads in the foreseeable future.

Given that some 90 percent of accidents are due to human error, autonomous vehicles hold the potential to substantially reduce road accidents. In addition, accidents due to mechanical failures in brakes, tires, and other degradable components will drop, as autonomous vehicles are better able to monitor their conditions and anticipate technical problems. Driverless cars can also make transportation more accessible to restricted groups (such as women, the elderly, or disabled people), or to people in areas that are limited by space constraints. For example, a car that can park itself remotely and return when summoned will be far more convenient than the current system, in which cars need to be parked close to owners' residences.

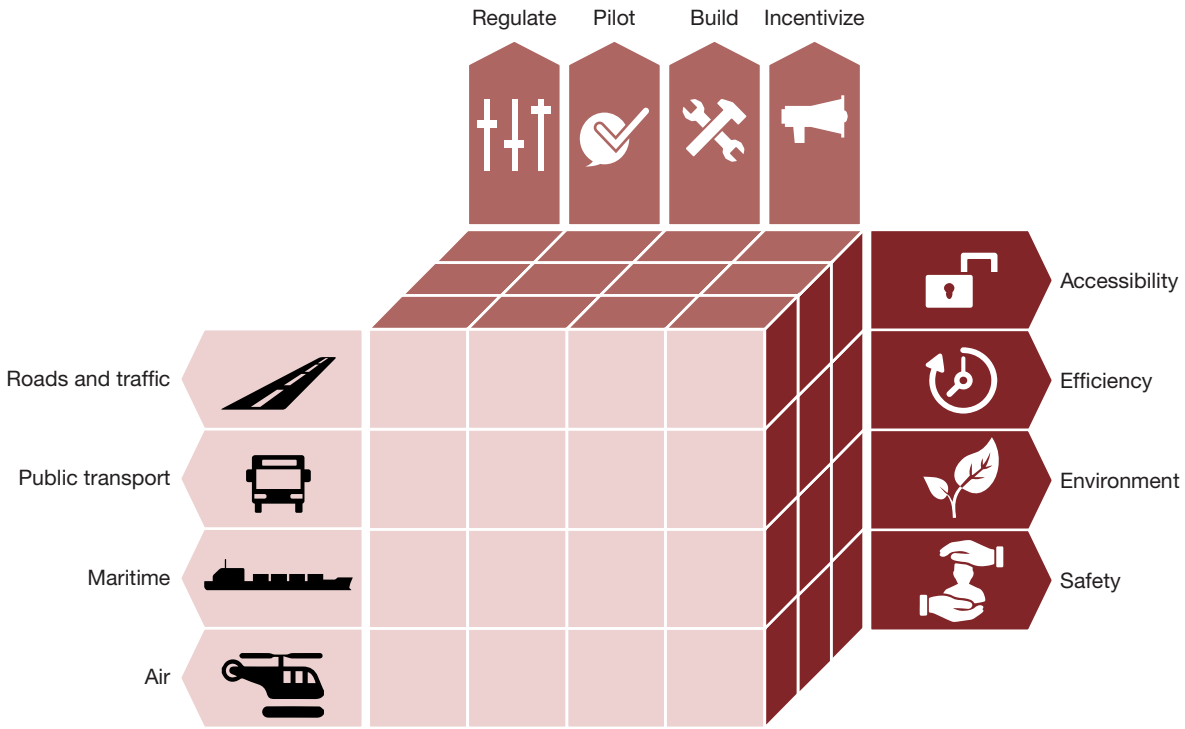
The opportunities in trucking are even greater. In May 2015, the first autonomous truck, Daimler's Freightliner Inspiration, was licensed to operate on a public highway in the U.S. state of Nevada.[8] In the realm of product delivery, DHL has been using autonomous drones in Europe to deliver urgently needed medicine to remote areas. Amazon is testing drones to deliver packages to customers within 30 minutes of an order being placed.

A technology adoption framework

GCC governments can use these technologies to develop more cost-effective, safer, accessible, and environmentally sustainable transportation systems. However, capitalizing on these technologies requires a structured technology adoption framework with four components: regulate, pilot, build, and incentivize (*see Exhibit 3*).

Exhibit 3
GCC countries need a four-part framework

Technology adoption framework



Source: Strategy&

Regulate

As a first step to take advantage of emerging transportation technology, governments will need to build the correct regulatory foundation. Transportation regulations in most countries were designed for an analog world and are limited in their ability to deal with new technologies. For example, automobile liability and insurance requirements currently fall on drivers, which is meaningless for autonomous vehicles. The authorities will need to determine how to allocate liability and insurance, potentially to manufacturers or operators (or even potentially to connectivity providers controlling the data flow to vehicles) for driverless vehicles. Similarly, governments will need to establish principles for how to program vehicle software. In the case of an unavoidable accident, how does the vehicle's algorithm weigh outcomes and determine how best to mitigate damage?

Governments in other markets are already taking steps to regulate new technologies. The U.K. — where the government is spending more than £100 million ($129 million) to support field trials for self-driving vehicles in populated areas throughout the country — will propose legislation regarding insurance for driverless vehicles. In the U.S., the Department of Transportation in September 2016 announced policies for driverless vehicles to be tested and introduced.[9]

Autonomous aircraft will also require new regulations. In the U.S., the Federal Aviation Administration (FAA) established new rules regarding drones. All recreational drones between 0.55 pounds and 55 pounds need to be registered so that they can be traced back to their owner if they are involved in an accident. The FAA also started authorizing commercial drone operations on a case-by-case basis, approving more than 5,000 companies thus far. Among other requirements, commercial drone operators need to be trained in operating unmanned aircraft, including an FAA designation.

In the GCC, building the right regulatory foundation will require that transportation authorities review their operating model — how the organization is structured, how responsibilities and accountabilities get allocated, and how different departments interact. Authorities will also need to set clear policy objectives and priorities. Should they focus on environmental factors such as reduced emissions, or reduced spending, or greater accessibility for certain groups of people? The right solution will vary by market, but regulators should identify the needs of their particular market at the outset. And GCC governments will need to implement regulations to address data, cybersecurity, and privacy issues — which are far more significant for new technologies.

Pilot

The second component of the framework is to conduct pilot programs to test new technologies, evaluate their potential benefits, and improve them over time. In many cases, this may require partnering with the private sector, particularly given that individual companies have the technical expertise required to launch such tests and most government agencies do not. For example, Dubai's Roads and Transport Authority recently partnered with Emaar Properties to conduct trial runs of a 10-seat autonomous shuttle on a 700-meter track along Mohammed bin Rashid Boulevard.[10]

One potential candidate for a pilot program is natural gas, which in liquid form is a cleaner fuel for the cargo shipping industry. The GCC is a major producer of natural gas. Compared with standard fuel oil, LNG can reduce the greenhouse-gas emissions of ships by 20 percent, along with reductions of certain other emissions by 85 percent to 100 percent. Singapore is currently planning a trial program for LNG-powered cargo ships. Starting in 2017, the country will test safety procedures and standards on six vessels, at a cost of up to S$2 million (US$1.5 million) per vessel.

Online-electric vehicle (OLEV) technology is another promising area currently undergoing pilot tests. OLEV systems transfer power wirelessly from tracks embedded in roads directly to electric vehicles (using magnetic transmitters). A city in South Korea first deployed two OLEV buses in 2013. The U.K. government has committed £500 million ($648 million) over the next five years to pilot and develop OLEV technology, including an 18-month test of charging lanes on highways. The technology holds promise for GCC drivers to reduce the local consumption of gas and lower emissions, because OLEV vehicles do not require gasoline.

Build

The third component of the adoption framework entails building the required infrastructure to support new technologies. That includes both physical and IT infrastructure.

Physical elements include charging stations, road sensors, LNG bunkering facilities, automated port terminals, and traffic management control centers. For example, Japan has built more than 40,000 electric-vehicle charging stations — including fast-chargers and those in homes — more than the country's 34,000 gas stations. In Paris, an electric-car-sharing service called Autolib' has operated for the past five years. The system currently has more than 2,000 cars and nearly 1,000 locations around the city and surrounding suburbs. The Parisian government contributed €35 million ($39 million) to the system by building rental stations, and local authorities in nearby suburbs each contributed €50,000 ($56,000) for each station. The system's 4,500 charging stations are also available to charge privately owned cars and motorcycles.

For the GCC, connected and/or self-driving cars will become a reality only if the government builds the right infrastructure to support them. That includes signaling and data-capture systems that can coordinate among a proliferation of autonomous vehicles on roads at the same time. A system like Autolib' holds the potential to reduce car ownership in GCC cities, leading to lower emissions and less traffic.

In addition to physical infrastructure, governments will also need to build the IT backbone required to capture increased flows of data, analyze it, and use it to improve processes. Cities can improve public transport systems by using data-driven analytics, allowing them to synchronize the flow of buses and trains, leading to better utilization, lower costs, and an improved experience for customers. For example, the U.S. city of San Diego built a system that uses variable dynamic pricing to reduce traffic congestion. The system increases tolls in the express lanes along a 20-mile section of highway during periods of heavy traffic, with signs that alert drivers to the current toll. Similar approaches should be used in the GCC. Rapid population growth and urbanization in the GCC means that governments need to get ahead of traffic problems before they become acute.

Data analytics, gathered by IT infrastructure, can reduce accident rates. In Canada, the city of Edmonton's Office of Traffic Safety studied geographic information system (GIS) and geospatial data to analyze traffic safety data and determine which sites should be the highest priorities for improvement. That allowed the city government to focus its limited resources, while still making improvements that reduced collisions by nearly 40 percent, saving the city nearly $600 million. Given the high rates of traffic accidents in the GCC, analytics can allow government authorities to identify the worst sites for such accidents and use their capital effectively on the highest-priority fixes.

In the realm of commercial logistics, GCC countries are investing to become major logistic hubs. Yet to become globally competitive, they need to become more efficient and cost-effective for traders. To that end, trade and transportation authorities can build Web-based, single-window platforms that give both parties in a commercial trade a streamlined means of handling all import, export, and transit-related regulatory requirements — including the required clearances and permits.

Incentivize

The fourth and final aspect of the framework is to use incentives to encourage both customers and service providers to adopt new technologies. Governments have a variety of mechanisms they can use to create such incentives.

On the customer side, for example, companies can encourage drivers to use emerging technologies by giving them access to richer information, such as real-time traffic-flow data, which can help drivers avoid congestion (or choose to take mass transit instead of driving). Social apps connect drivers en masse and allow them to exchange information regarding traffic, accidents, gas prices, parking availability, or road conditions themselves, through crowd-sourcing. These apps can be enhanced through gamification, encouraging people to participate and generate useful data at little cost to authorities.

Economic instruments such as tax breaks or subsidies can help persuade consumers to purchase low-emission vehicles or those that have better fuel economy. Infrastructure elements such as dedicated lanes or parking spaces make electric cars or car-sharing systems more convenient to consumers. The same holds true for commercial customers. In Sweden, the port of Gothenburg provides LNG refueling, and the port offers an incentive for shipping companies to switch to LNG. Vessels that run on the fuel receive a discount of up to 30 percent on the port charge.

To incentivize the second group — service providers — governments can set up public–private partnerships (PPPs) to tap into the capital and expertise of the private sector, including local companies and multinational firms. Governments can also offer innovative funding instruments for PPPs, such as special-purpose bonds and revenue incentives. For example, in Riga, Latvia, the local public transport operator set up a PPP with Xerox to install and operate a digital ticketing system for all bus and tram lines.

Governments can also launch contests to incentivize potential service providers to develop new technologies. Some governments stage "hackathons," in which they present a range of civic challenges (including transportation problems) and give software programming teams 24 hours to solve them. The winning teams often receive contracts with the government to implement their solutions more broadly.

However, because the range of potential solutions is so broad — and because technology changes so rapidly — it is impossible for governments to predict how well specific technologies will do. Some may not work out at all, while others will vastly exceed expectations. As a result, governments need to be flexible and adopt an "all of the above" approach. They should stay on top of developments in other markets, take the best of what works elsewhere, and apply it to the unique needs of their market. They should also encourage experimentation. For example, Dubai recently announced a contest to link Dubai to Fujairah via a hyperloop — a super-fast transportation system that would reduce travel time between the two cities (a distance of more than 150 kilometers) to 10 minutes. The contest will take place over 48 hours, with international teams representing various scientific organizations.[11]

Conclusion

As the GCC population grows and urbanization continues, governments have little choice but to upgrade their transportation systems. The wealth of new technologies can significantly help, provided governments use a systematic framework to assess and implement them. Specifically, transportation authorities should apply a four-part framework that encompasses regulating, pilot testing, building, and incentivizing:

- *regulate* — review policy objectives and identify priorities within the key themes of mobility, safety, sustainability, and other factors; develop the right operating model; and develop new regulations as needed.
- *pilot* — evaluate the potential benefits of new transportation technologies through testing, potentially in conjunction with private-sector partners.
- *build* — develop both the physical and IT infrastructure needed to support new technologies.
- *incentivize* — spur their adoption among both customers and service providers.

Technology offers GCC governments a means to not only address some of the most pressing fiscal, safety, environmental, and accessibility challenges they face, but also build the regional and global hubs for transportation and logistics that can propel regional economies into the future.

Endnotes

[1] The GCC countries are Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.

[2] Jamal Al-Matawah, "Appraisal of Road Safety in GCC Countries," 2015 (http://www.traffic.psd.gov.jo/images/jti/images/04.pdf).

[3] IHS Global Insight, Strategy& analysis.

[4] Tom Randall, "Here's How Electric Cars Will Cause the Next Oil Crisis," *Bloomberg,* February 25, 2016 (http://www.bloomberg.com/features/2016-ev-oil-crisis).

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[6] Annabelle Liang and Dee-Ann Durbin, "World's First Self-Driving Taxis Debut in Singapore," Associated Press, August 24, 2016 (http://www.bloomberg.com/news/articles/2016-08-25/world-s-first-self-driving-taxis-debut-in-singapore).

[7] Max Chafkin, "Uber's First Self-Driving Fleet Arrives in Pittsburgh This Month," *BloombergBusinessweek,* August 18, 2016 (http://www.bloomberg.com/news/features/2016-08-18/uber-s-first-self-driving-fleet-arrives-in-pittsburgh-this-month-is06r7on).

[8] Dr. Ulrich Kögler, Fadi Majdalani, and Dr. Richard Viereckl, "Trucking to the future: How GCC governments can open the road for autonomous trucks," Strategy&, December 2015 (http://www.strategyand.pwc.com/reports/trucking-to-the-future).

[9] U.S. Department of Transportation, "DOT Issues Federal Policy for Safe Testing and Deployment of Automated Vehicles: Four-Part Policy Lays the Foundation for the Next Revolution in Roadway Safety," September 20, 2016 (https://www.transportation.gov/briefing-room/us-dot-issues-federal-policy-safe-testing-and-deployment-automated-vehicles).

[10] Dubai Roads and Transportation Authority, press release, "Joining hands with Emaar in operating a smart vehicle at Mohammed bin Rashid Boulevard," August 31, 2016 (http://tinyurl.com/glpm6hx).

[11] Agencies/Dubai, "Travel from Dubai to Fujairah in 10 minutes," *Khaleej Times*, August 9, 2016 (http://www.khaleejtimes.com/nation/transport/travel-from-dubai-to-fujairah-in-10-minutes).

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