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From left, Mauricio Almeida, Leandro Laia, Luis Carlos Affonso and Fernando Antonio Oliveira

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Movement Movement Movement

The race is on for cities to overhaul their transportation systems.

BY AMY WILKINSON
PORTRAITS BY LUIS CERDEIRA

Modern transportation is a crowded arena. As cutting-edge technologies move from the realm of sci-fi to mainstream and stakeholders increasingly clamor for more sustainable alternatives,

governments and private companies alike are rushing to develop solutions. Autonomous vehicles, drones, shared mobility and electric vehicles are all driving next-gen urban mobility projects, the scale of which hasn't been seen since the 1800s, according to a 2019 McKinsey report.

The stakes are high: Global revenues associated with autonomous vehicles in urban areas alone could top US\$1.6 trillion a year by 2030, according to McKinsey. And in the United States, public benefits—including less congestion, fewer accidents and freed-up real estate in urban areas—could hit US\$350 million as early as 2022. And with research indicating that 60 percent of the world's population will live in cities by 2030 (up from 50 percent in 2015), the stakes will only get higher.

In the race to develop and roll out new solutions ahead of the competition, project managers must balance speed with risk. For instance, after logging more than 10 million miles (16.1 million kilometers) during a scant 10-month pilot of its autonomous vehicle taxi on public roads, Google-originated Waymo announced in December that it would roll out the service commercially.

But the race is hardly limited to the private sector. Many local governments—often in concert with private and sometimes international organizations—are launching projects to overhaul or upgrade their public transportation, with an eye

toward more sustainable energy use and future-proofing their technology investments.

Late last year, Chile's capital city of Santiago rolled out 100 new electric buses as part of a public-private partnership (PPP) with European utility Enel (which provided the project's US\$33.4 million funding) and Chinese vehicle manufacturer BYD (which provided the buses). The project represents a jumping off point for the two companies, which plan to expand their reach into at least three other Latin American countries. Chile, meanwhile, intends to increase the number of electric vehicles on its streets tenfold by 2022, with plans for entirely electric public transit by 2050.

Meanwhile, the Canadian Urban Transit Research and Innovation Consortium last year launched a CA\$40 million PPP to create a low-speed smart-mobility ecosystem—including low-speed electric shuttles—across Canadian cities. And in the United Kingdom, Transport for London has invested US\$15 million to purchase 20 hydrogen-fueled buses, set to hit the streets in 2020 as part of the city's drive to reach zero-emissions status.

Global revenues associated with autonomous vehicles in urban areas could top **US\$1.6 trillion** a year by 2030.

Source: McKinsey



ISTOCKPHOTO



Far left, new electric buses in Santiago, Chile. At left, an autonomous vehicle from Waymo



“Transit in high-density megacities pays for itself from fares and property development.”

—Graham Currie, PhD, Monash University, Clayton, Australia

Project managers tasked with executing these new initiatives, though, are quick to underscore that integrating new technologies into old systems can be a complex undertaking. And for any transportation initiative to be a true success, those involved “need a very long-term view on benefits,” says Graham Currie, PhD, director of the Public Transport Research Group and chair of public transport at Monash University, Clayton, Australia.

BUREAUCRACY SPEED BUMPS

While the drive for modern, sustainable urban transportation models could help alleviate many cities’ mobility issues, it could simultaneously create a new problem: a shortfall in project funding for infrastructure and transportation initiatives. In fact, the global shortfall in road infrastructure funding could reach more than US\$7.5 trillion by 2040, according to the Global Investment Hub. These issues could have an especially outsized impact on project budgets in smaller to midsize cities.

“Transit in high-density megacities pays for itself from fares and property development,” says Dr. Currie. “Worldwide, about 20 percent of transit costs are

paid by government subsidy—much higher in some places like the United States and Australia.”

PPPs are quickly becoming a popular way for governments to fund and carry out their transportation projects. In June, for example, a PPP between National Highways Authority of India (NHAI) and Welspun Enterprises to upgrade the Delhi-Meerut Expressway reached its midpoint in project execution. The private-sector company is slated to oversee the expressway for 15 years before transferring it to the NHAI.

But with a crowded lot of stakeholders at the table, mobility projects can get mired in approvals and bureaucracies, says Mitch Ewan, hydrogen systems program manager, Hawaii Natural Energy Institute at the University of Hawaii, Oahu, Hawaii, USA. Mr. Ewan is managing a US\$5 million project to develop a hydrogen-fueled shuttle bus and hydrogen production and fueling infrastructure, with project funding from the U.S. Department of Energy, the State of Hawaii and the U.S. Office of Naval Research.

“We’re part of the state, and we have to follow procurement rules,” he says. “But there are just

inherent project delays built into the whole process. It’s not like days or weeks—it can take months or years to get things through the bureaucracy. It’s frustrating, but you have to accept that it’s part of the process.”

When it comes to clearing those schedule hurdles and setbacks, Mr. Ewan has found that stakeholder education works better than hounding team members to complete tasks. “If you go negative, then people will come back with negative,” he says. It’s more effective, he says, for project managers to lead with high-quality data on why a certain stage gate needs to be cleared or the impact a setback might have on the work breakdown structure.

HUB AND SPOKE

Public transportation can’t be built in a vacuum. It’s a lesson Angela Rivada, project manager, Remourban, Agency of Innovation and Economic Development, City of Valladolid, Valladolid, Spain, learned when managing a project to transform the city’s traditional bus routes into an electrified line.

The ambitious initiative, which concluded last year, was never intended to stop at the city’s

boundaries: Project sponsor Remourban (short for Regeneration Model for Accelerating the Smart Urban Transformation) tasked the project team with establishing and tracking metrics for two years after the electrified line had been rolled out, in order to also establish a template that could be easily replicated across other urban areas.

The fleet of five buses and two pantographs (chargers) were purchased for US\$1.4 million, with the public bus company Auvasa taking charge of all technical tasks, including the charging infrastructure. One of the biggest challenges of the project, says Ms. Rivada, was adapting this ready-made solution to the city’s unique needs.

“Although the buses could drive 100 percent of the route in full electric mode, we explored a better balance, taking into account variables such as battery life and economical parameters,” she says.

The city tested three modes—hybrid, partially electric mode and full electric mode—before the technical team recommended having the buses run fully electric as soon as they cross into the city’s center. “That covers about 70 percent of the line in this mode,” says Ms. Rivada, which maximizes



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—Angela Rivada, Remourban, Agency of Innovation and Economic Development, City of Valladolid, Valladolid, Spain



the energy savings in the denser urban center while preserving the bus's battery when it's farther afield.

Accommodating the chargers required the project team to amend the existing bus routes, moving certain several stops slightly in order to allow ample room for vehicle maneuverability. While that infrastructure tweak didn't carry a hefty price tag, it did require a level of communication so residents' regular commutes weren't disrupted, she says.

During the project's pilot phase, each bus was also monitored through an onboard device that records and transmits metrics, including energy consumption, heating, regenerated energy under braking and battery level, as well as external sensors to gauge temperature, humidity and nitrogen oxide.

Those weren't the only metrics the project team kept its eye on: In tandem with the technical rollout, the project team developed a robust communication strategy to get residents excited about their

new rides. That spanned an official presentation by the city's mayor, local television programming and a consistent drumbeat in all messaging that the Office for Electric Vehicles would appreciate feedback.

That orchestrated approach paid off, with more than 2.1 million people using the new electric line in 2018. Overall, the project has helped the city slash emissions by 80 percent while achieving 50 percent energy savings, says Ms. Rivada. And in January the city council agreed to purchase and integrate six more electric buses.

But not all projects go according to plan. When the 2014 eruption of the Kilauea volcano threatened the fueling station that Mr. Ewan's project team was working on, relocation was a no-brainer. But figuring out where to go proved far more challenging: The team spent months assessing different project sites before seeking to secure an area across from a school. But when school parents protested over safety concerns over a possible explosion, the project team was forced to move on, says Mr. Ewan, though he maintains that hydrogen fueling stations are safer than gasoline fueling stations.

The team could have saved time by engaging with local stakeholders earlier before investing resources into a lengthy design phase, he says. But that lesson learned will have to inform future projects. On the current initiative, the team opted to relocate to a third site rather than wage a lengthy public battle. The nine-year project is slated to end this year, when the team will hand over two hydrogen-fueled 19-passenger shuttles and one 29-passenger bus to the county of Hawaii to be operated by Hele-On Bus services. **PH**

Around the World in Five Urban Mobility Projects

Efforts to ease transportation headaches with sustainable fleets are spreading across the globe.



Air Taxis in New Zealand

In late 2018, aviation company Kitty Hawk (backed by Google co-founder Larry Page) launched a project with Air New Zealand to build the world's first autonomous air taxi service. The New Zealand-based initiative comes on the heels of a 2017 pilot to test its new autonomous air taxi, named Cora, which can fly up to 110 miles per hour (177 kilometers per hour) with a range of about 62 miles (100 kilometers).

Drones in the Netherlands

At this year's Amsterdam Drone Week in Amsterdam, the Netherlands, the city announced it would launch a project to investigate the feasibility of creating a drone corridor—a dedicated lane where unmanned air vehicles could fly without interfering with other aircraft. Beyond typical consumer

goods drop-offs, city officials are curious if the drones could be used for more critical transportation needs, such as blood or organ deliveries.



Electric Vehicles in India

As part of its bid to make Delhi the

"electric vehicle capital of India," the local government revealed in June that it is piloting a project in which up to 1,000 electric vehicles will be deployed to deliver online orders over the next 12 months. A host of industry players are taking part, including Amazon, Blue Dart Express, Delta Group and Tata Power.



Hydrogen Fuel in Canada

In March, the Development of Low-Cost, High-Performing and Durable Polymer Electrolyte Membrane Fuel Cells Project moved into its first phase. The US\$1.4 million initiative is a partnership among the Canadian Urban Transit Research and Innovation Consortium, the University of Waterloo, the University of Western Ontario, and private and government groups to develop hydrogen fuel cell technology for automobile and transit use.

Autonomous Shuttles in the United States

To help ease first- and last-mile issues in its public transit system, the Utah Department of Transportation is testing an autonomous shuttle system with a US\$800,000 project. The self-driving vehicle, which holds up to 12 passengers and reaches speeds of just 15 miles per hour (24 kilometers per hour), began touring the state in April, offering free rides to garner feedback from the public. A "shuttle host" is always on board to ensure passenger safety and to take action in case of an emergency.



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