



LEADING A CLEAN URBAN RECOVERY WITH ELECTRIC BUSES

Innovative business models show promise in Latin America

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**C4O
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Creating Markets, Creating Opportunities

INTRODUCTION

With the imposition of lockdowns in early 2020 due to the onset of COVID-19, bus, train, and metro lines experienced significant decreases in ridership. Between March and April, public transit ridership was down 70-90 percent in some places.¹ These recent challenges have come on top of a fall in public transport ridership over the past decade, all of which leads some to wonder if our ability to get around cities will ever be the same.

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Unsurprisingly, global transit agencies are in trouble. Although ridership is recovering from the early stages of lockdown, revenues are down and the costs of additional safety and sanitation measures is significant. In the U.S., the American Public Transit Association (APTA) estimates that public transit agencies will incur revenue losses of \$26 billion and \$24 billion in 2020 and 2021, respectively.² The *Union Internationale des Transports Publics* (UITP) estimates that EU-based urban transit operators will lose €40 billion in fares by the end of 2020.³

In emerging markets, where public resources are even more scarce, the numbers are daunting. For example, earlier this year, the Transformative Urban Mobility Initiative (TUMI) indicated that Brazilian urban transport systems were losing as much as \$1 billion Brazilian reais (roughly US\$190 million) on a daily basis just to keep the

system running.⁴ Globally, cities will need to be an engine for post-pandemic economic recovery, and this will require well-functioning urban transit.

At the same time, cities globally and their transit authorities are adjusting to these new realities, and stimulus packages are throwing a lifeline to municipalities. These packages create a unique opportunity for a green and more equitable recovery that creates jobs via investing in sustainable infrastructure. Zero-emission transit solutions such as electric buses (e-buses) offer municipalities a promising opportunity to decarbonize urban transportation, reduce air pollution, and create local green jobs. Unlike with personal cars, delivery vehicles, and taxis, the deployment of e-buses is mostly controlled by municipalities. Public authorities can take immediate action to reduce local emissions

1 <https://blogs.worldbank.org/transport/protecting-public-transport-coronavirus-and-financial-collapse>

2 <https://www.apta.com/wp-content/uploads/APTA-COVID-19-Funding-Impact-2020-05-05.pdf>

3 <https://www.intelligenttransport.com/transport-news/98876/city-ceos-call-for-public-transport-to-be-part-of-european-recovery-plan/>

4 <https://www.transformative-mobility.org/news/the-covid-19-outbreak-and-implications-to-public-transport-some-observations>

When reduced operations, energy, and maintenance costs over the lifetime of the vehicles are taken into consideration, e-buses emerge as a cost-effective alternative to fossil fuel-powered buses.



and catalyze the uptake of electric vehicles. Like most battery-powered vehicles however, e-buses tend to be significantly more capital-intensive than fossil fuel alternatives. For that reason, new business models and creative financial solutions have been at the heart of the conversation on e-buses, with public and private stakeholders working to develop alternative models to help municipalities overcome the high up-front cost premium associated with e-buses.

ZERO EMISSION BUSES POST-COVID-19?

Many municipalities are pushing ahead with plans to convert bus fleets to zero emission technologies, most notably battery electric buses. E-buses are fast-approaching so-called life cycle cost parity with internal combustion engines, adding commercial viability to benefits such as better air quality and reduced noise pollution. China has become the global leader in deploying e-buses driven by focused industrial policy and government support over the past decade. This has given the country a massive head start—nearly 98 percent of the current global e-bus fleet.⁵

In Latin America, municipalities in countries including Chile and Colombia have been making significant progress deploying e-bus fleets. Santiago is the leader with over 700 e-buses already on its streets. The Chilean capital plans to have as many as 770 e-buses operating under private contracts by the end of this year. Bogotá, the

Colombian capital, expects to have 480 e-buses operating as part of its *Transmilenio* program by the same time. Governments in each country, along with many others, have committed to supporting the electrification of urban transport using private sector-led business models.

While e-buses and associated charging infrastructure can still be as much as two- to three-times more capital-intensive, (up-front) as equivalent diesel bus options, battery costs and annual operating expenses are falling. The performance and reliability of e-buses are also improving fast. Manufacturers are producing lighter, more efficient buses with longer battery life and more reliable performance backed by better warranties. At the same time, transit agencies are taking note that the total cost of ownership (TCO)—which takes into account up-front capital investment as well as operation, maintenance, and other indirect costs over the life of the asset—for electric buses has already reached parity with diesel buses.

This critical issue of TCO is a fairly new consideration. Procurement of buses has previously focused on the up-front capital cost of the assets (the bus, battery and charging infrastructure). But when reduced operations, energy, and maintenance costs over the lifetime of the vehicles are taken into consideration, e-buses emerge as a cost-effective alternative to fossil fuel-powered buses. Taking things a step further, when the calculation includes air quality improvements and the reduction to greenhouse gas emissions, the scales tip further in favor of e-buses.

5 Source: [Bloomberg New Energy Finance](#), 2019

CURRENT COMMERCIAL MODELS FOR TRANSIT

To understand the backdrop for converting bus fleets to electricity, C4o, a network of the world's megacities committed to addressing climate change, has published a report reviewing business models currently

used for municipal transit buses in Latin America. The report, authored by C4o's Zero Emission Bus Rapid-deployment Accelerator (ZEBRA) and Dalberg Advisors, showed that there are diverse operating models with different roles assigned to the public and private sector.⁶ It also narrowed down the universe of transit models to five primary archetypes.

Table 1: Typical transit models for municipal buses in Latin America

Archetype	Market Share	Assets	Responsible Party			Funding	
		Fleet Size	Fleet Ownership and Provision	Operations and Maintenance	Oversight and Control	Financial Guarantees	Remuneration Scheme
A	Most common	Medium – Large	Private operator	Private operator	Govt assigns routes and sets fares via concessions or permits	Sometimes centralized farebox	By passenger
B	Very common	Large	Private operator	Private operator	Govt sets routes, fares, schedules, and fleet specifications via concessions	Farebox Trust backed by Govt	Service provided and by passengers
C	Very common	Small	Private operator	Private operator	Govt assigns routes and sets fares via permits	None	By passenger
D	Medium	Medium – Large	Govt	Govt	Govt controls and owns entire system	Govt budget	NA
E	Very rare	Medium – Large	Fleet Provider	Private operator	Govt sets routes, fares, schedules, and fleet specifications via concessions	Farebox Trust backed by Govt	Service provided and by passengers

Source: Adapted from Accelerating a Market Transition in Latin America. Dalberg Advisors for ZEBRA, Feb. 2020.

⁶ https://www.c4oknowledgehub.org/s/article/Accelerating-a-market-transition-in-Latin-America-New-business-models-for-electric-bus-deployment?language=en_US

Most current models are built on heavy risk allocation to owner-operators (public or private).



While Latin America is leading the way with innovative public-private partnership and concession-based models for integrating e-buses into their systems, the overwhelming majority of municipal buses on a global basis are owned either by a public authority or by a private operator holding a concession or permit with a municipality.

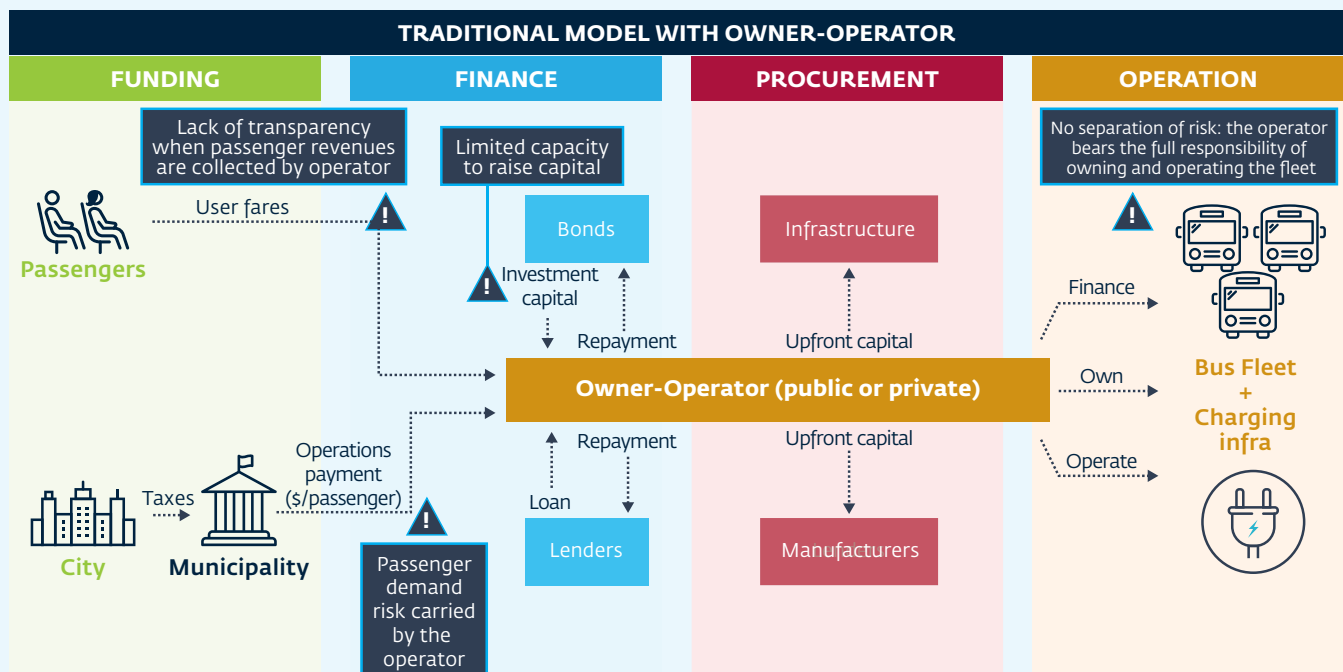
For different reasons, neither of these players is ideally positioned to lead a large-scale, investment-led transition to electrified fleets without changes to underlying business models. Public sector budgets, which were already constrained pre-COVID-19, are now even tighter. At the same time, existing private operators are often too small, have governance issues, and can suffer from a lack of financial transparency which makes them unlikely candidates for leading a broad transition to capital intensive electric buses.

The report also showed that most current

models are built on heavy risk allocation to owner-operators (public or private), including the risk of lower-than-expected ridership and new technology risk. This was seen as potentially sparking a wave of bankruptcies and service interruptions in a COVID-19 context of reduced passenger demand. While these owner-operators may have been able to survive while running fully-depreciated fleets at pre COVID-19 demand levels, it is hard to imagine these same firms leading the charge into e-buses under the post-pandemic ridership conditions.

The diagram below highlights some of the key “pain points” for bankability and the ability to invest in new technology. It highlights the concentration of risk on the owner-operator, the difficulty in accessing finance, and the lack of transparency on the revenue side. These factors are key barriers to the large-scale deployment of e-buses in cities.

Figure 1: Traditional model for municipal transit bus systems



Source: C40 Cities, October 2020

UNBUNDLING OWNERSHIP AND OPERATION

In an environment where traditional players are either unwilling or unable to lead the transition to e-buses, some municipalities are experimenting with new commercial models that offer a better risk allocation amongst stakeholders by involving third-party asset managers (fleet providers). Under these models, the fleet providers finance, procure, own and maintain the equipment, and provide e-bus fleets to operators or municipalities under stable long-term contracts, thus “unbundling” ownership and operation.

The concept of fleet leasing is not new and has been a key component of successful fleet operations in other industries such as freight, train cars, and aircraft. In the airline industry for example, the global leasing market for commercial aircraft is estimated at over \$330 billion⁷, with up to half of aircraft operated today being leased from third-party asset managers. In e-buses, leasing would eliminate the need for large up-front capital expenditure by municipalities or operators, while offering a more favorable risk allocation for the parties involved.

In other words, the “unbundled” model—under which asset owners own, and operators operate—allows all parties to do what they do best. On the one hand, asset managers acting as fleet providers are paid to raise capital, procure e-buses at scale, and keep a reliable and well-charged fleet in service. On the other, operators simply operate, providing bus services and running bus fleets.

From a risk management perspective, the traditional model allocates too much risk to owner-operators that simply do not have the financial or technical capacity to absorb existing risks—let alone act as the catalysts for an investment-led transition to zero-

emission technology. The unbundled model not only allows risk to be distributed, but also provides for a better segmentation of the business model and has a chance of generating commercial interest from private capital to support the transition.

Our view is that structure matters, and the unbundled model represents a more sensible allocation of risk and reward between the public and private sector based on what each does best. However, critical issues need to be addressed before these models can become truly bankable and reach their full potential in developing markets.

“X-FACTORS” FOR THE UNBUNDLED MODEL

The following issues need to be addressed before the unbundled model can gain traction and lay the foundations for a faster transition to e-buses:

Managing demand risk—In a difficult global context of reduced transit ridership, the reality of a fluctuating passenger demand, leading to a loss of revenues for operators and asset owners, creates tremendous financial risk for investors. Operators with already fragile finances are not equipped to manage passenger demand risk in a post-pandemic world, and financiers are likely to shun operators in this scenario. Cities must work to reduce or remove demand risk and transition to a payment scheme based on kilometers driven, punctuality, and service indicators irrespective of farebox revenue (which is then retained by the transit authority).

Structuring municipal payment risk—Municipalities should aim to structure payments and contracts with the aim of isolating investors from the financial risk associated with operating the transit

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7 Why Are Airlines Leasing More Aircraft?, ICF, 2018

The municipality must be prepared to use its balance sheet to stand behind any shortfalls, using clearly drafted legal undertakings backed by the necessary political approvals.



system. By segregating revenues and payments, a municipality can shield fleet providers and their investors from uncertainty regarding the financial health of the transit system itself. To achieve this, we propose three structural changes to improve the unbundled model.

First, and most urgently, adopt a centralized fare collection system, which is an essential part of any municipal transit system that aims to attract private investors. If municipalities can take control of the revenue stream, this in turn will help ensure that fares are collected through a thorough and transparent process. Doing so will reduce the risk of questionable practices by operators, maximizes revenue collection, and allows segregation of leasing (provision) payments to fleet providers from operation payments to operators.

Second, create separate contracts for asset provision directly with municipal authorities, with performance indicators independent from operating performance and payments earmarked specifically for fleet provision. This arrangement is regarded as the most investable scenario by banks and investors, where payments to the fleet provider are isolated from the operating performance and financial health of the transit system.

Third, establish a bankruptcy-remote trust fund, either managed by the municipality or by a private entity. This is designed to guarantee payments and shield the various transit stakeholders from threats to consistent cash flow to the transit system, including political risk. In some jurisdictions, private operators have actually been given seniority in the cash “waterfall” of these trusts to provide greater payment certainty.

Finally, while trusts and liquidity instruments go a long way towards creating investor comfort, the municipality must be prepared to use its balance sheet to stand behind any shortfalls, using clearly drafted legal undertakings backed by the necessary political approvals. This is likely to be a serious matter for all those municipalities

whose credit ratings have suffered and funding has become challenged amid COVID-19.

Better allocation of technology risk—While the technology of e-buses is rapidly improving, there is still a lack of data and modeling of the long-term performance of these buses over time—particularly in relation to battery performance. Manufacturers have been offering warranties that still leave some of the technology risk with the owner of the fleet and investors. This uncertainty forces the financiers of fleet providers to use highly conservative commercial and financial benchmarks to ensure that their banking cases to not suffer from optimism bias.

In the end, reliable performance data and solid warranties for these technologies will be required to attract financiers. To address this, manufacturers must take responsibility for the long-term performance of their products through more robust warranty frameworks that create the “back-to-back” protection of performance parameters required by transit agencies. As the entity with preferred access to long-term performance data and projections, a manufacturer is best-positioned to manage the risk associated with e-bus technology.

Mitigating foreign exchange (FX) risk—In emerging markets, e-buses tend to be imported and procured in hard currency. While the long-term objective should be to manufacture in-country to create local green jobs, the present situation creates a tricky FX risk given that transit revenues are generated in local currency. In addition, affordable long-term local currency financing options are unavailable in many emerging markets, while relatively cheaper US dollar or euro-denominated financing requires expensive hedging instruments for currency matching. Moreover, few municipalities have the financial wherewithal, or the legal and regulatory authorization, to underwrite long-term, multi-year budgetary commitments in hard currency.

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National governments could play a role in creating foreign currency protection and other backstops for municipal obligations if zero-emission transit is high on their policy agenda. Well-drafted, inflation-indexed contracts are also helpful when trying to deal with foreign exchange fluctuation. Development banks and local and international capital markets may also be able to work together and create affordable local currency financing options and guarantees to attract international investors interested in financing greener transit.

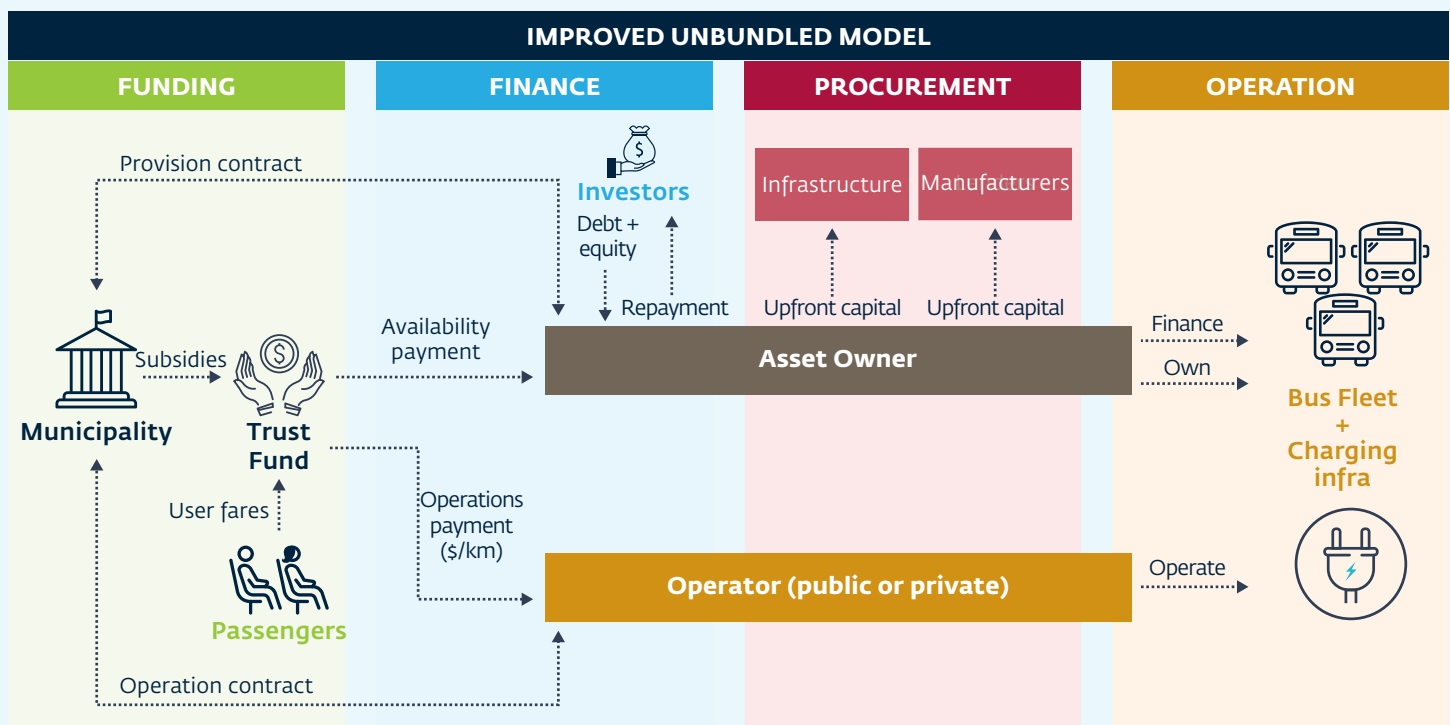
GETTING TO SCALE

There is a great deal of interest in expanding the use of e-buses in emerging markets,

with proposals from governments, development finance institutions and the private sector. They are mostly focused on creating procurement at scale and finding financial resources that are not subject to the weight of processing individual transactions, which can be cumbersome and expensive.

Investors require returns, banks require well-structured risk, and equipment manufacturers want to move product as quickly and efficiently as possible. Operators must also be brought into the discussion as they will need to be persuaded that their businesses can be run better in the long term using e-buses than with diesel ones. Crucially, governments need all the help they can get to accelerate the implementation of clean transit solutions. From a municipality's

Figure 2: Unbundled model for municipal transit buses



Source: C40 Cities, October 2020

The trick is to align this complex web of stakeholders in a way that creates competition, transparency and reasonable returns for the parties involved.



perspective, partnering with the private sector brings a layer of complexity that must be carefully managed to ensure that the partnership creates long-term value for all stakeholders.

Similar challenges have been successfully overcome in other sectors. A decade ago, the same frustrations bedeviled credit and investment committees confronted with the risks and returns associated with solar and wind projects. With the brute force of technology, track record and scale of production, the same will happen with the e-bus market, driven by governments wanting to clean their transit systems and a host of private sector stakeholders (including investors, banks, manufacturers and insurers) wanting to invest in the sustainable infrastructure space. The trick is to align this complex web of stakeholders in a way that creates competition, transparency and reasonable returns for the parties involved.

The task now for the financial and development bank community is to find ways to accelerate the transition to e-buses. The introduction of new business models (such as the unbundled approach above) and financial products designed to replicate the fleet company experience from other industries gives electrified transit a considerable edge.

The challenge is to create the right foundations for e-bus adoption that will create a virtuous cycle of technology investment, scale, cost reductions, transparency and, ultimately, greener transit that could very quickly begin to resemble the successes of the wind and solar energy markets. In an industry as complex as transit, structure matters. Institutions like C4o and IFC stand behind this effort with investment, advisory, and advocacy to create new business models that will lead to healthier and greener streets for global cities.

For more, please check out:

- **The Electric Vehicles 101 Notes by IFC:**
 - [*Bumps in the Road: Challenges to E-bus Implementation*](#)
 - [*Electric Buses: Why Now?*](#)
 - [*Twists and Turns: New Business Models*](#)
 - [*An EV Playbook for Electric Buses*](#)
 - [*E-Bus Economics: Fuzzy Math?*](#)
- **C4o Knowledge Hub's resources for cities on Zero Emission Buses**

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ABOUT C40

Around the world, C40 Cities connects 97 of the world's greatest cities to take bold climate action, leading the way towards a healthier and more sustainable future. Representing 700+ million citizens and one quarter of the global economy, mayors of the C40 cities are committed to delivering on the most ambitious goals of the Paris Agreement at the local level, as well as to cleaning the air we breathe. For more information, visit www.c40.org

ABOUT IFC

IFC—a member of the World Bank Group—is the largest global development institution focused on the private sector in emerging markets. We work in more than 100 countries, using our capital, expertise, and influence to create markets and opportunities in developing countries. In fiscal year 2020, we invested \$22 billion in private companies and financial institutions in developing countries, leveraging the power of the private sector to end extreme poverty and boost shared prosperity. For more information, visit www.ifc.org or www.ifc.org/infrastructure

