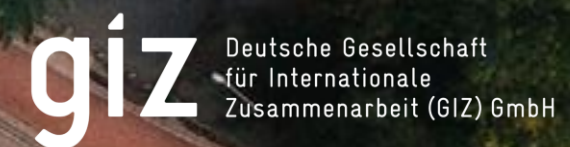


The Playbook for Zero Emissions Mobility LAC

Centering Climate Justice in Public
Transport by 2035 in the Global South.

RACE TO ZERO



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About this Playbook

The events of 2020 have tested our world's resilience and capability to adapt and overcome in ways few anticipated.

As a result of the pandemic, people are becoming more grounded in what's important to them as a community. This includes taking a closer look at what's really happening in our environment.

What's exciting about this moment in time is that there is an increased awareness and momentum to make a difference. This gives us more opportunities to collaborate with others to make an even bigger impact.

Under the slogan "Build Back Better," post-pandemic recovery plans provide an opportunity to rethink our usual systems as a whole. We aim for revolutionary change as part of a global coordinated effort centered on the 2030 Agenda for Sustainable Development and the Paris Agreement on Climate Change.

Prior to COP26, the electromobility agenda was, for the most part, focused on the northern global hemisphere. A few months

before COP26, the electromobility agenda expands its scope to the southern global hemisphere.

The elaboration of "The Playbook for Zero Emissions Mobility - LAC" is part of COP25's legacy to the southern hemisphere of the world.

Gonzalo Muñoz, the first High-Level Climate Champion from the region, proposed this project to create more ambition from the Global South towards a zero emissions future.

Its purpose is for Latin American and Caribbean cities to transform 100% of their public transport platform to zero emissions by 2035. This represents great commitment and effort on the part of the governments of the region. We recognize that its implementation will create a precedent for this initiative to be replicated in other southern continents.

The playbook partners - High-Level Climate Champions, GIZ, SLOCAT, UNEP, UITP, ICLEI, TumiVolt, UNFCCC, and EUROCLIMA+ - began working together in late May 2021.

The playbook model shines a light on how LAC countries are taking action. It identifies practical steps and resources for leaders to refer to in their transport transition journey. This model is based on previous intensive research and collective papers published by our partners.

The collaboration team started with a difficult task of creating a guide which could potentially work for any government type. As our meetings progress through May and June, the substance of the playbook began to emerge: we had a solid idea and strategy.

We decided to answer the important questions and list key tasks in this transition. We kept it simple making it easy to read and implement.

The best way to learn is from experience, or in this case, from example. We learn and grow from the examples set by others. Imitation can lead to innovation.

Yet, the playbook was missing stories, and the lived experiences of cities already making an impact.

To address this issue, we included case studies in our playbook about cities already making this change.

In 2021 we hope to work closely with change-drivers from different cities, to use this playbook as the foundation of a Transport Transition to Zero Emissions curriculum.

We present this version 1.0 of the playbook with the utmost humility, and with strong encouragement that you go forth in the same way we did, assuring every step is executed properly, working together as a team, and moving forward with new awareness and knowledge. The process is not easy, but through it we will take one step forward in the path towards Climate Justice. We look forward to learning from your efforts. Together, we will find a way.



*Quarantine Skies in the City of Bogota
Photo courtesy of the District Secretary of Environment in Bogota, Colombia*

Cities are beginning to understand that you do not build your city around a certain means of transport ... You should build your city around the people.

Rolf Kullen,
mobility director at research
consultancy firm Kantar



From Our Partners



"As we approach the last quarter of 2021, advancing sustainability and positive impact should be the core focus of our

operations. The High Level Climate Champions team for COP26 is tasked with making 2021 the most impactful year for climate action - driving and showcasing ambitious efforts taking place. To achieve greater sustainability in Latin America, governments need more resources aimed specifically to help them. Through this playbook, we hope to outline a simple, achievable process to create and implement a zero emissions transport action plan. We hope you use this playbook as a guide to boost your sustainability efforts. Let us continue to work together to build a more sustainable and resilient world."

Andrea Carolina Davila, from the High-Level Climate Champions



"The role of the transport sector in today's much-needed global climate action is not in doubt. Its decarbonisation is essential if we wish to contain the increase in

the global temperature and move towards a future in line with the Sustainable Development Goals (SDGs). In this sense, improving transport systems is a key strategy to provide sustainable, people-centred, resilient and climate-friendly mobility systems.

Therefore as GIZ we are happy to be part of this initiative led by the COP25 and COP26 High-Level Champions. We hope that this Playbook will help cities to achieve their climate ambition through transport transformation."

Vera Scholz, Director of Division Climate Change, Environment and Infrastructure



"While the parties of the Paris Agreement on Climate Change have the responsibility to determine their national level of climate mitigation ambition - all actors have a role to play in delivering reductions of transport greenhouse gas emissions, which was the second-highest emitting sector (along with industrial

emissions) in 2019. In our role as focal point for the engagement of the transport sector in the UNFCCC Marrakech Partnership on Global Climate Action (MPGCA), from the SLOCAT Partnership on Sustainable, Low Carbon Transport we work to engage actors from across the globe who are developing and delivering solutions that increase access to decarbonised transport and mobility. Low carbon transport and mobility solutions have a key role to play in making cities attractive places to live and work. Delivering efficient solutions for the complex systems that characterise urban environments in the Global South is essential to stabilise the climate and fulfill the promise of sustainable development for all. Sharing and showcasing successful action on the ground is also central to building confidence in solutions, encouraging others and hence increasing ambition in the next round of national climate commitments in 2025. This is why we are proud to support the Zero Emissions Mobility Commitment initiative focusing on urban electromobility in the Global South and are excited about its potential to further engage and support action leaders across different geographies. We look forward to further working with our peers towards increasing ambition and building momentum for truly global climate action from the transport sector in the run up to COP26 and COP27, and well beyond"

Maruxa Cardama, Secretary General, SLOCAT Partnership



“Latin America and the Caribbean have the opportunity, and the possibility, to drastically reduce transport emissions and improve air quality in cities through electric mobility coupled

with clean electricity. This transition has the potential to create an industry that favors an inclusive and sustainable economy, a critical element in the era of COVID-19 recovery.

The United Nations Environment Program (UNEP) has been supporting the advancement of electric mobility in the region through the facilitation of high-level political dialogues, technical assistance, and capacity building. The electrification of public transport —and especially buses— in the region is a catalyst for emissions reduction and the improvement of life quality in cities.

This playbook invites us to take a step in the right direction and to continue increasing climate ambition in the run-up to COP26 and onwards.”

Piedad Martin, Acting Regional Director and Representative for Latin America and the Caribbean, UNEP



*Electric Buses in Santiago de Chile
Photo courtesy of RCN Radio*



“To meet their transport emissions reduction targets, many cities are setting up transport strategies, considering electric mobility and more specifically

electric buses for their public transport networks. These political choices are part of cities' efforts to not only to take part in the global effort to combat climate change but also to improve air quality. This Playbook can play a critical role in supporting cities in the region to develop a step-by-step approach to become healthier places to live in. Electric buses can bring huge benefits to cities, but we shouldn't forget first to integrate land use and transport planning, strengthen mobility governance and give priority to public transport and active mobility over cars to encourage a modal shift.”

Philip Turner, Head of Sustainable Development, International Association of Public Transport (UITP)



‘The recently published Intergovernmental Panel on Climate (IPCC) report lays out the scientific basis of climate emergency and reinforces how

critical it is to achieve net-zero emissions. Many cities worldwide now consider electric mobility as a key part of their sustainable mobility agenda towards alignment with the Paris agreement. Now more than ever it is important for us to work together - ICLEI is pleased to collaborate with forward-thinking cities and regions and partners in implementing e-mobility solutions while prioritizing active mobility and the use of public transport for an accessible, equitable and inclusive transport system. The Playbook can help cities in the region to enhance their ambitions and actions in transport to a higher level and transition towards low-carbon urban mobility.’

Tu My Tran, Head of Sustainable Mobility, ICLEI – Local Governments for Sustainability



‘Fossil fuel vehicles are the main responsible for the poor air quality in most Latin American cities and for the emission of

greenhouse gases that cause climate change. Deployment of zero emission mobility transport systems is the most important way to save lives that otherwise would be taken by air pollution, to decarbonize cities and to better allocate resources. For that purpose, relevant technical, political, financial, and sometimes imaginary barriers need to be overcome to achieve transition to zero-emission mobility. C40 is pleased to be part of the group that developed this Playbook which, we aim, provides support to this worthwhile and viable endeavor, as we were able to offer the increased experience gathered through our Zero Emission Bus Rapid-deployment Accelerator (ZEBRA) in Latam..’

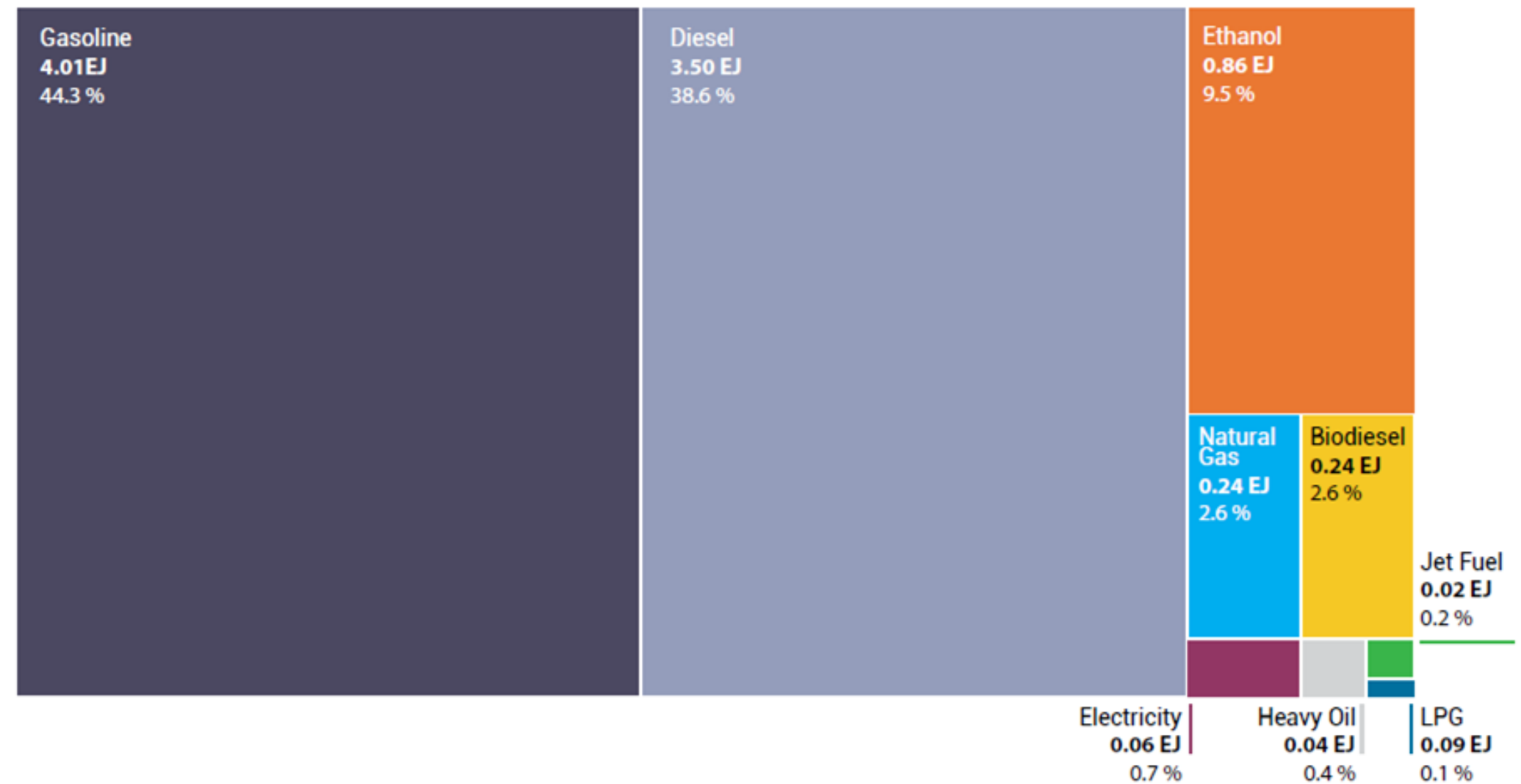
Manuel Olivera, C40 Regional Director for Latin America

Chapter One: Setting the Scene

Transport in LatAm - by the numbers

The transport sector is responsible for 15% of the greenhouse gas emissions in the LAC region, and it is the fastest-growing source of air pollution. Transport carbon dioxide (CO₂) emissions in the LAC region increased 3% from 2010 to 2019, and accounted for 8% of total global emissions in 2019. Transport remains the sector of energy use with the lowest share of renewables, with more than 95% of energy needs coming from oil and petroleum products and less than 4% from biofuels and renewable electricity in 2018. In the business as usual (BAU) scenario, emissions from both sectors are expected to double by 2050 as diesel fuel and gasoline continue to be the fuels most used in transport, accounting for 83% of the total in terms of energy use.

Figure 1: Fuels used in the transport sector, by product, 2018 (Total: 9 EJ)



By the end of 2020, 27 out of the 33 countries in the region have prioritized transport in their Nationally Determined Contributions (NDCs); however to date, no LAC country has set a mid-term goal to end sales of internal combustion vehicles and many still have deficient regulations for vehicle and fuel efficiency and emissions standards. Just 11% of countries included measures for renewables-based transport in their Nationally Determined Contributions (NDCs) towards reducing emissions under the Paris Agreement.

The role of e-mobility for the decarbonisation of transport

Decarbonising the transport sector will need to be linked to the decarbonisation of the power sector to take advantage of the synergies and linkages between these two. This will accelerate the decarbonization process, which not only aims to reach zero emissions by 2050, but it also has the potential to grow the region's economy while improving public health and energy security. The LAC region boasts the world's highest shares of renewable energy, including in electricity grids, allowing greater potential to decarbonise transport through electrification. Leapfrogging to electric mobility in Africa, Asia and Latin America can bring significant benefits to local environments and economies.

Between 2010 and 2020, the average price of electric vehicle batteries dropped 88%, from around USD 1,200 per kilowatt-hour

(kWh) to USD 137 per kWh, increasing the potential for more widespread uptake of electric vehicles. Electric vehicles contribute at least 22% fewer carbon dioxide (CO₂) emissions than internal combustion engines, even when the electricity used for charging is generated from fossil fuel sources. While electric vehicles are more energy efficient than conventional vehicles overall, they offer even greater potential for emission reductions if they are based on clean renewable energy.

Life-cycle emissions and the impact of electric vehicle batteries must be considered when comparing the environmental footprints of electric versus conventional vehicles. Major concerns include the extraction of raw materials and the recycling of batteries. A circular economy perspective, boosted by policies to extend the useful life of electric vehicle batteries can help governments and manufacturers offset the production costs, impacts and emissions. Studies by the International Council on Clean Transportation have shown that emissions

over the lifetime of average medium-size BEVs registered today are already lower than comparable gasoline cars by 66%–69% in Europe, 60%–68% in the United States, 37%–45% in China, and 19%–34% in India. The emissions will reduce even more as the power sector in those countries decarbonises.



*Quarantine Skies in the City of Santiago
Photo courtesy of BlocSUC Chile*

A number of governments have increased electric vehicle investments as part of their COVID-19 recovery packages. The increasing scope of policies to electrify road vehicles and other transport modes offers significant potential to increase the share of renewable energy in transport. More than 16 countries have electric mobility coordination bodies to lead the transport transformation. In 2020, the first-of-its-kind Zero Emission Vehicle Transition Council was established, comprising ministers and representatives from the world's largest and most progressive car markets.

The majority of passenger travel in the region occurs via public transport (averaging 68% of all trips). LAC has the world's highest per capita bus use and also leads in the implementation of bus rapid transit (BRT), with systems present in 57 cities as of 2021. The region has significantly fast urbanization rates – over 80% of its inhabitants live in cities.

Worldwide, more than 600,000 electric buses were in operation in 2020. In Latin America and the Caribbean, there are 2473 electric buses, and more than 700 will arrive in Bogotá and Santiago in 2021. As of 2019, 18% of the world's buses were powered through electricity, including battery electric (6.3%), hybrid-electric (7.9%) and direct overhead wires and similar (3%). However, in the region, the electric buses account for a minimum percentage of the total. Nonetheless, analysts forecast that by 2025, more than 5,000 electric buses will be delivered annually to Latin American cities.

Public transport can also benefit from its integration with active mobility modes, such as walking, cycling and using personal mobility devices (or micromobility). Electrifying micro mobility vehicles enhances the opportunities to a broader type of users, including people with reduced or limited mobility and ageing populations. These modes were

boosted during the pandemic as easy, affordable, clean and comfortable ways to mobilise. Many cities worked to provide a safe environment for their usage. Globally, the stock of electric two- and three-wheelers (excluding electric-assisted bikes) totalled 290 million in 2020 and around one-quarter of all motorised two-wheelers worldwide were electric.



*Electric Buses in Ecuador
Photo courtesy of Ecuador Times*

Use this playbook to move towards a zero emissions public transport system

Due to COVID-19 response, mobility reductions accelerated starting in mid-March 2020, and by the end of that month passenger travel demand in the region had dropped nearly 80% and stayed roughly the same through late 2020. Public transport systems in the region are financed through a mix of user fees and government subsidies, both of which have been greatly impacted by the pandemic, with decreases in ridership and economic downturns. Nonetheless, the pandemic provides countries and cities an undeniable situation to build back better and future-proof their transportation systems.

This playbook is intended to provide information on how to achieve that, especially for the public transport systems through the use of electric buses. In this first version, the objective is to incentivize national and subnational governments to increase their ambition and decarbonize their public transport systems through the electrification of their fleets and services. As mentioned above, these actions will provide cross-cutting societal benefits through cleaner air, less noise, less greenhouse gas emissions, use of renewable electricity, therefore improving the quality of life of its people.



Chapter Two: Key Insights, Obstacles, and Questions

Category	Barrier	Recommendation
<p style="text-align: center;">LEGAL Institutional, legal, and normative</p>	<p>Absence of public transport electrification policies with clear strategic objectives and a defined goal</p>	<p>Develop electric mobility plans, including clear objectives, targets, responsibilities, deadlines, and indicators that promote the coordination of regulations and actions between the national and sub-national levels. Governments should provide clear market signals to automakers, dealers, and utilities.</p>
	<p>Complexity in the coordination of the different actors/institutions responsible for electric public transportation deployment</p> <p>Lack of alignment between national and sub-national policies and actions</p>	<p>Create technical or high-level instances for coordination, integrated by all relevant decision-makers at national and sub-national levels</p>
	<p>Inadequate duration of public transport concession contracts</p>	<p>Review and adapt the regulatory conditions of public transport systems to ease the integration of electric vehicles</p>
	<p>Lack or inadequate legislation and specific regulations for:</p> <ul style="list-style-type: none"> ● Charging infrastructure (standardization and responsibilities) ● Electricity tariffs ● Vehicle homologation ● Battery management 	<ul style="list-style-type: none"> ● Analyze and develop specialized electricity tariffs for electric vehicle charging. ● Design and application of standards to regulate electric vehicle retrofits. ● Develop and/or adopt minimum quality, efficiency, safety and maintenance standards and end-of-life of vehicles and their components

Category	Barrier	Recommendation
<p style="text-align: center;">LEGAL Institutional, legal, and normative</p>	Lack of plans to phase out current bus stock	<ul style="list-style-type: none"> ● Create and/or modify national and local government incentives and/or directives at the agency level to promote e-bus adoption and preparation of life-cycle approach for the transit systems. ● Develop and/or adopt minimum standards of quality, efficiency, safety, maintenance, and end-of-life of vehicles and their components, including the charging infrastructure. ● Create conditions that will ensure that buses will come off the streets when they reach their end-of-life.
	Weak coordination of maintenance duties	Develop robust contracts with clear responsibilities of the different asset maintenance, including a suitable maintenance verification mechanism
	Competition against other means of transport e.g. informal transit, private cars	Develop and enforce transit regulation that reduces the transit demand risk
	Weak standards for internal combustion vehicles	Develop and enforce emission standard regulation for new and used buses.
	Lack of space and land to install infrastructure	Foster and establish a comprehensive and inter-agency planning process & Define who is better positioned to make the investments
	Tender process inadequacy	Promote a new procurement process approach to consider the total cost of ownership, electric buses lower operational expenses and externalities of vehicle fleets.

Category	Barrier	Recommendation
<p>ECONOMIC & FINANCIAL Investment and financing needs</p>	<p>Lack of specialized financing options for electric passenger public transport vehicles</p>	<p>Develop and/or adapt financing options to address the characteristics of electric vehicle fleets (e.g. high CAPEX, low OPEX), including complex financing structures and products</p>
	<p>Difficulty borrowing in foreign currency (in certain countries)</p>	<p>Establish intermediate institutions that interact between local institutions and the private sector trying to access financing</p>
	<p>Higher purchase cost of electric vehicle fleets compared to internal combustion engine fleets</p>	<ul style="list-style-type: none"> ● Develop and enforce minimum efficiency norms for internal combustion engine vehicles. ● Develop a financing structuring mechanism and/or regulations which transforms the purchase cost (CAPEX) into operational cost (OPEX).
	<p>Significant capital expenses of grid infrastructure</p>	<p>Since an early stage of e-bus fleet design and deployment, engage with electric utilities and public service regulators to consider all associated grid and infrastructure costs and requirements.</p>
	<p>Lack of innovative financing options due to limited knowledge about electric mobility technology in the financial sector</p>	<p>Strengthen capacities of the financial sector and closer involvement with the electric mobility ecosystem to identify and develop new mechanisms adapted to electric vehicle deployment (purchase or lease).</p>
	<p>Limitations to scale up from demonstration projects to commercial fleets</p>	<p>Create a roadmap for scaling e-bus implementation to achieve mass adoption.</p>
	<p>Electric vehicle investment high-risk perception from the financing sector</p>	<ul style="list-style-type: none"> ● Develop derisking mechanisms, such as guarantee contracts and demand risk lowering contracts. ● Deliver specialized capacity building to local transit system managers to access complex financial products.

Category	Barrier	Recommendation
<p>TECHNOLOGY knowledge, diffusion, local materials, manufacturing capacities</p>	<p>Incipient regional market for electric buses and charging infrastructure</p>	<p>Strengthen the regional economic agreements to boost regional value chains for manufacturing and assembly of e-buses and charging infrastructure</p>
	<p>Range and power limitations of e-buses</p>	<p>Analyze and optimize e-bus specifications and fleet architecture based on each route's demands.</p>
	<p>Design flaws of e-buses</p>	<p>Incorporate pre-roll-out testing periods for the electric vehicles entering a transit system to test key elements of the bus.</p>
	<p>Lack of operational data of internal combustion and electric buses</p>	<ul style="list-style-type: none"> ● Create and implement data gathering and data analysis processes of the e-bus fleets ● Ensure data is accessible to relevant actors and institutions to strengthen decision-making
	<p>Lack of information, especially on where to start</p>	<ul style="list-style-type: none"> ● Convey all actors to develop and execute a joint plan for the electric mobility project – each sector will contribute with their expertise. ● Foster knowledge and experience exchange between cities, governments or public transit systems
	<p>Lack of information on the advantages and disadvantages of e-buses</p>	<p>Foster knowledge and experience exchange between cities, governments or public transit systems</p>
	<p>Lack of operational data of internal combustion and electric buses</p>	<ul style="list-style-type: none"> ● Create and implement data gathering and data analysis processes of the e-bus fleets ● Ensure data is accessible to relevant actors and institutions to strengthen decision-making

Category	Barrier	Recommendation
<p style="text-align: center;">SOCIAL Skills, training, labor, and gender perspective</p>	<p>Lack of specific programs to include a gender perspective in transportation</p>	<ul style="list-style-type: none"> ● Develop analysis and action plans to promote the integration of women in all electric mobility processes. ● Create specific policies, plans or initiatives to address gender issues in transport.
	<p>Lack of personnel with adequate skills, both for planning and technical activities</p>	<ul style="list-style-type: none"> ● Conduct training to strengthen the capacities of the current labor force. ● Review and update curricula of technical and professional education programs to incorporate the required skills and knowledge
	<p>Lack of specialized skills of first responders to attend road incidents with electric vehicles</p>	<p>Deliver specialized capacity building to first responders on vehicles and charging infrastructure in depots/en-route.</p>
	<p>Resistance to the adoption of more efficient technologies or zero emissions</p>	<ul style="list-style-type: none"> ● Develop awareness-raising campaigns on the several impacts of the new technology, including impacts on health and job creation. ● Adapt the communication strategy to educate the population about the non-economic benefits of technology to raise awareness and reduce uncertainties. ● Make sure public transit users are at the center of the modernization process so that electrification comes hand in hand with the improvement of the quality and sustainability of the service
	<p>Negative public perception</p>	<p>Assess the consumers' and incumbents' preferences and knowledge to develop communication campaigns and increase the levels of public awareness</p>

Category	Barrier	Recommendation
INFRASTRUCTURE E Physical barriers to recharging and energy infrastructure (from generation to charging)	In some cities, limited grid reliability	<ul style="list-style-type: none"> Plan medium- and long-term energy demand taking into consideration electric mobility plans Coordinate with relevant authorities and electric utilities to ensure grid reliability
	High dependence on fossil fuels for electricity generation	Comply with and expand commitments to generate electricity from renewable sources.
	Lack of understanding of the requirements to upgrade infrastructure	Since an early stage of e-bus fleet design and deployment, engage with electric utilities and public service regulators to consider all associated grid and infrastructure costs and requirements.
	Lack of standards and regulations for charging infrastructure	Develop regional regulations and standards for charging infrastructure, including interoperability aspects.
	Complex to determine grid infrastructure responsibilities	Assess infrastructure usage and develop specific contracts between all parties involved.
	Charging infrastructure low efficiency rate	Develop and execute strategies to optimize electric vehicle charging based on the e-bus fleet composition and operations (e.g. smart charging, specialized electricity tariffs).
COMMERCIAL Market availability of electric vehicles, charging infrastructure	Costly electric vehicles in the national markets	Provide temporary incentives to lower the taxes on vehicles and charging infrastructure, including elements of for the reduction for of the income taxes
	Disjointed or limited e-bus marketplace	<ul style="list-style-type: none"> Attract companies and manufacturers for local production, assembly and imports to improve supply.
	Low diversity of e-bus topologies in the national market	<ul style="list-style-type: none"> Enable imports, including facilitation of foreign exchange. Coordinate the import requirements (technology, efficiency, safety, etc) to foster a common market and ease the entry of electric vehicles

Chapter Three: Case Studies

“Big-bang” e-bus deployment in Santiago de Chile

Biggest fleet of e-buses in Latin America with 776 e-buses in Santiago (starting with more than 200 in 2018, rest was procured in 2020).



1 Strong Political Commitment

- Santiago's government has pushed the e-bus deployments through policy action and incentives to operators (for example capital guarantees).
- The city has committed to procure only zero emission buses after 2025.
- The national government aims to electrify public transport by 2040: - regulatory framework - National Electric Mobility Strategy.

2 Electric roadmap 2018-22

Risk reduction through new business models and diversification:

- New actors – the utility firms Enel X and Engie have invested in e-buses and charging stations
- Credit guarantees from national banks
- Fleet size of operators is limited
- Passenger Transport Authority guarantees leasing payments between operator and utility.

Read more about it,
Going Electric A Pathway to Zero Emission Buses (2021)
https://cms.uitp.org/wp/wp-content/uploads/2021/06/EBRD_UITP_GIZ_Going-Electric-A-Pathway-to-Zero-Emission-Buses_June2021.pdf



Travel with e-bikes grows 33% in Rio de Janeiro in the first half of 2021

Bike Rio was the first third generation system for Bike sharing in Brazil – released and opened in 2011 - and now becomes the first system in Latin America offering electric bicycles at their stations.



A study carried out in partnership between Tembici, Laboratório de Mobilidade Sustentável, Aliança Bike and GIZ shows that e-bikes are already the new darlings of cariocas (citizens of Rio de Janeiro, Brazil). Proof of this is that the number of trips grew 33% in the first half of this year, comparing January with June, and only in the second quarter of 2021, the total number of users increased 26%, according to data from Tembici.

The study sought to evaluate the system since its launch, in September 2020, and shows an increase in the percentage related to trips made on e-bikes.

The e-bikes expands the possibility of daily use, as it facilitates longer displacements and with different reliefs, requiring less effort from those who pedal. It allows many people, who previously combined different modes in their journeys, now use only the bike to get around, also resulting in financial savings. For 12% of respondents, the innovation made it possible to carry out routes that were not previously made with

conventional bicycles, including a route that runs between two stations where there is a large slope.

Regarding the main motivations and positive impacts perceived by Bike Rio users, who have already tried electric bicycles, the agility and comfort during trips as well as the efficiency of e-bikes as a means of transport in cities can be highlighted. The reduction in travel time and physical fatigue or sweating, increased agility on the path and ease of pedaling on climbs were the main advantages of using e-bikes.

The study also noticed an increase in commuting to and from work with e-bikes, reinforcing the change in habits in relation to the mode of transport, which is now increasingly seen and used. The percentage of use of electric bikes among men for daily commuting to work is 60% higher than the use of regular bikes, while among women, the use of the e-bike is twice as high as the conventional one.

[Read more about it, Monitoramento Piloto Bicicletas Elétricas no Bike Rio - PNME](#)

Uruguay - Subsidy redistribution

On Monday, June 17, 2019, through Decree No. 165/019, article No. 349, a subsidy was established to support the replacement of diesel-powered buses with new zero-emissions buses with electric motorization in the regular service of public transport. For the implementation of the subsidy, the law creates a Technical Commission made up of representatives of the Executive Power to determine the technical requirements to access the subsidy, among other functions.

The MOVÉS project, executed by the Ministry of Industry, Energy and Mining (MIEM) and the Ministry of the Environment (MA), provided an incentive to transport operators, which fostered the purchase of the first 30 units for the City of Montevideo. Of the total incorporated so far, 20 units are BYD K-9 buses, and 10 are Yutong E-12. The original objective of Decree No. 165/019 is to support the replacement of up to 4% (about 120/150 units) of the total

diesel engine bus fleet assigned to the regular public passenger transport service within the national territory.

In Uruguay, diesel-powered public buses get a subsidy on their diesel expenses. This subsidy covers the difference in price between a bus with a diesel engine and one with an electric motor of similar dimensions. From a financial point of view, the subsidy for the purchase of an electric bus is equivalent to the total subsidy that a diesel bus receives during its lifetime. In this way, resources are redirected for their best use without generating incremental expenses to the government.

In December 2020, after the first six months of service, the Technical Commission conducted a performance assessment. Over this period, the electric buses travelled more than 700,000 km in Montevideo and replaced 300,000 liters of fossil fuel. The electric buses were tested in specific routes with different demanding conditions to measure their capabilities. The initial results point that the units have responded fully to the operational requirements.

Results also evidence that these new units provide benefits in terms of service quality and working conditions.

[Read more about it,](#)

PNUMA (2021). Movilidad eléctrica: Avances en América Latina y el Caribe 2020. Programa de las Naciones Unidas para el Medio Ambiente, Oficina para América Latina y el Caribe, Panamá

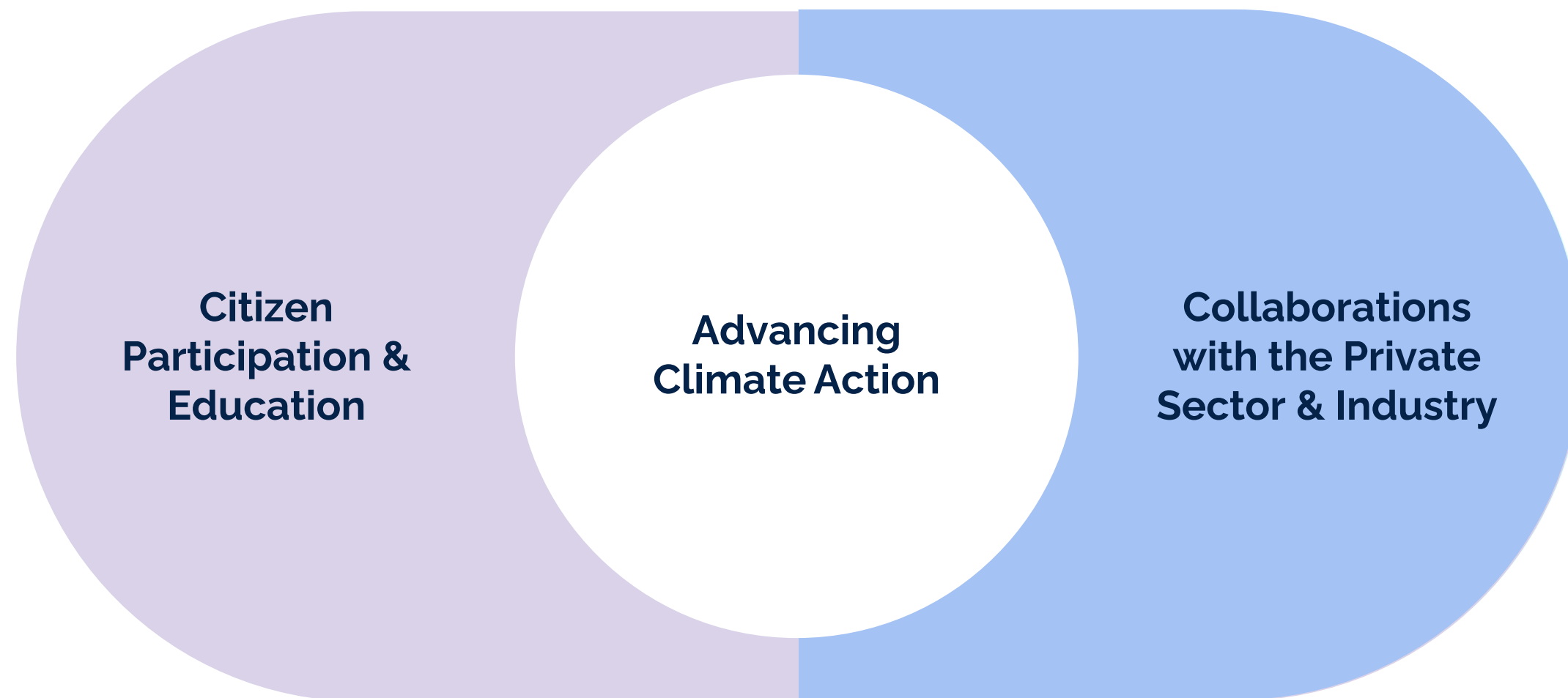


Photo by Autoblog Uruguay

Chapter Four: Collaboration in Action

The transition to clean mobility cannot be a step only led by governments. Although policies and mechanisms for promotion and financing provided by States have a crucial weight in the development of electric mobility, there are other factors and actors with great influence and potential to accelerate this transition.

Key approaches to advance Climate Action through collaboration



1 Citizen Participation and Education

To advance Climate Justice, start by engaging citizens. Such partnerships help diversify the voices that contribute to your climate action strategy while also contributing to resilience and increased opportunities for change.

The collaboration with citizens makes best sense when it is directed within local communities with task forces. Those task forces should include subnational governments (be they regional or municipal) considering that much of the task should be done on a much more local scale.

For example:

This type of organization can be found in numerous Latin American and Caribbean countries, committed to promotion, education, information exchange, and policy development, among other things.

These collaborations highlight the need of achieving a social consensus that accelerates the region's adoption of electric mobility. The growth of local and national events such as mobility fairs, transition and electric mobility discussion forums, user-to-buyer seminars, and so on, demonstrates the region's desire to learn, discuss, and apply this type of technology.

Brazil, Chile, Costa Rica, Ecuador, etc., for example, already offer educational and training programs ranging from seminars to technical, undergraduate, and graduate degrees. This is obvious proof of the employment opportunities that will arise as a result of the adoption of electric mobility technologies.



*Educational Program in Chile - Educa Sostenible
Photo courtesy of Educa Sostenible*

2 Public-Private Partnership (PPP)

Effective supply of charging infrastructure is a necessary support for the development of electric vehicle and also an important strategic measure to promote energy consumption revolution and green development. The construction and operation of charging infrastructure is unfortunately not smooth, lagging behind the actual demand. Public-Private Partnerships (PPPs) may offer a promising way forward and accelerate the development of charging infrastructure by tapping the private sectors' financial resources and professional skills

Public-Private Partnership (PPP) is a long-term contract between a public party and a private party, for the development and management of a public asset or service, in which the private party bears significant risk and management responsibility through the life of the contract. PPP may offer a promising way forward and accelerate the development of charging infrastructure by tapping the private sectors' financial resources and professional skills.

For example:

Tangible examples of the effectiveness of Public Private Partnerships (PPP) are the national electric mobility projects funded by the Global Environment Facility (GEF) and supported by UNEP and the International Energy Agency (IEA) through the Global Electric Mobility Program. The PPPs will benefit with support in the development of their strategies and national regulations in electric mobility, the implementation on the ground of demonstration projects and pilots of electric mobility, the development of business models and long-term sustainability plans of low-carbon electric mobility.



We hold ourselves to account to meet ambitious sustainability goals. In order to achieve these goals, partnerships are key. We can achieve more together.

Christopher Hillman, Head of Sustainability & Social Innovation, Danone UK & Ireland

Chapter Five: The Journey to Achieve Zero Emissions in Public Transport

The introduction of electric buses presents decision-makers and (public) bus operators in cities with a multitude of new challenges. **TUMI provides a list of questions preparing cities in transforming their public transport for the electric future.** The following steps can be useful for both pilot projects as well as a fleet scale e-bus rollout.



Key steps for the introduction of electric buses



1. Electrification strategy

What are the fundamental goals for bus electrification for your city?

Set specific and time bound strategic bus electrification goals for your city and involve stakeholders in every stage. Example: Santiago de Chile decided to electrify the bus system by 2040.

2. Political and legal framework

Which political/legal requirements must be considered?

Define political commitments, understand and amend regulatory frameworks and introduce necessary demand incentive programs on national and local level.

3. Zero emission bus technology

Which vehicle technology is best suited to local conditions?

Define vehicle requirements according to local conditions, such as route length and topography, passenger capacity, heating and AC requirements.

4. Charging Infrastructure

Which charging infrastructure is required?

Determine the charging infrastructure according to operation and vehicle requirements and fleet size. Choose between depot charging or opportunity charging (en-route).

5. Tendering

What are the key elements of the bus tender?

Identify key actors (agencies / operators) and define business model to tender necessary assets or operation services (such as e-buses, charging infra, management).



*Santiago de Chile
Photo courtesy of RCN Radio*

6. Financing and funding

What is the estimated investment volume, which funding programmes are available?

Prepare investment/ financial planning and identify available funding programs and financing models (self-funding, bank loans, leasing etc.). Politicians need to create national and local funding programmes.

7. Energy supply

How to provide sufficient amounts of renewable electric energy?

Plan for increased power requirements, strengthen grid and ensure supply from renewable sources. Coordination with electric utilities is key to ensure this step.

8. Staff training

How to prepare all operating staff and first line workers to work with electric buses?

Train all operating staff to work with e-buses and infrastructure throughout the whole value chain (including driver/ safety and operation & maintenance, planning personnel, first responders trainings).

9. Operations & Maintenance

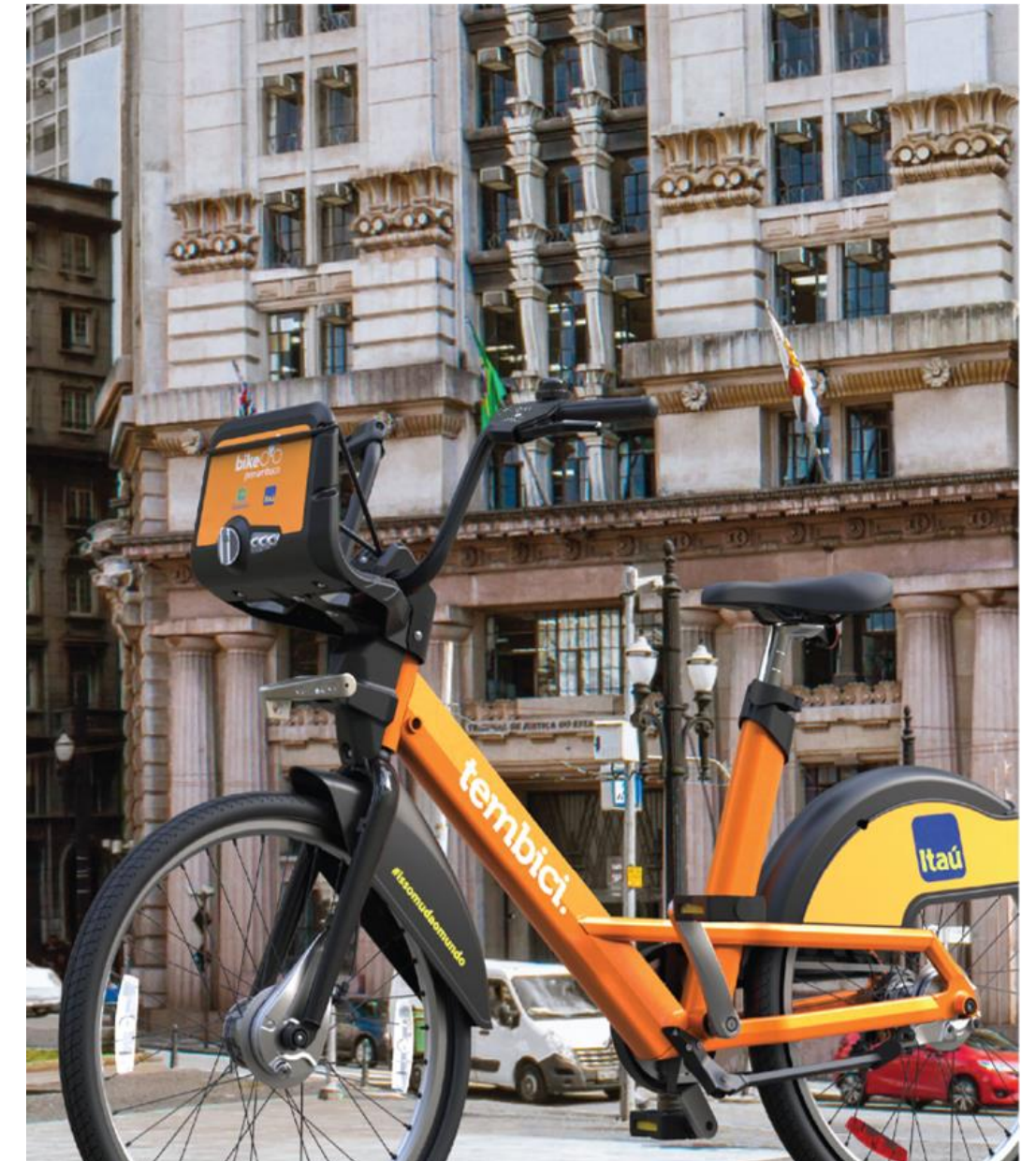
How to ensure a solid O&M scheme?

Adapt and upgrade the level of operation and maintenance scheme to new necessities posed by electric buses.

10. From Planning to Implementation

Get Started! Don't wait to start electrifying your public bus fleet!

The full TUMI E-Bus Checklist is available at:
<https://www.transformative-mobility.org/campaigns/e-bus-checklist>



Sao Paulo Electric Bicycles
Photo courtesy of PBSC Urban Solutions

Tools

When cities want to electrify their bus fleet, usually several questions arise. What needs to be considered for the technical design of routes and charging infrastructure? How do the busses perform in financial and economic terms in comparison to other technologies? Which additional capacities need to be trained for the planning, operation and maintenance of e-buses? How can the impacts be monitored and verified?

To help cities in this assessment, the following tools for technical design, financial and economic cost analysis, capacity building and monitoring and impact assessment can be useful:

Technical Design



Technical requirements for tender documents and operators of electric bus fleets for public transport of Santiago de Chile
<https://theicct.org/sites/default/files/publications/ZEBRA-requisitos-tecnicos-ebus-stgo-nov2020.pdf>

Bus Fleet Renewal Toolkit (includes also other technologies)
<https://www.changing-transport.org/toolkits/bus-fleet-renewal>

Good practices across key technical topics and geographies.
<https://cms.uitp.org/Going-Electric-A-Pathway-to-Zero-Emission-Buses>

Financial & Economic Cost Assessment



Global Excel-Tool for economic and financial evaluations of e-buses
<https://www.changing-transport.org/publication/e-bus-global-tool/>

eMob calculator for buses, motorcycles and light duty vehicles
<https://www.unep.org/resources/toolkits-manuals-and-guides/emob-calculator>

Capacity Development



UITP Training E-Mobility in Public Transport
<https://www.uitp.org/trainings/la-electromovilidad-en-el-transporte-publico/>

SOLUTIONSplus global e-learning "Course 1 - Electric mobility: More than just electrifying cars" and the Latin America Regional Training Program 2021
<https://www.mobility-academy.eu/mod/page/view.php?id=1443>
<http://www.solutionsplus.eu/regional-trainings-2122.html>

E-Mobility Know-How incl. FAQs, Tools, Webinars and Publications
<https://www.transformative-mobility.org/campaigns/knowhow>

LAC E-Mobility Community of Practice
<https://movelatam.org/>

Monitoring and Impact Assessment



Monitoring, Reporting, and Verification Systems for Electric Bus Projects in Colombia
<https://www.changing-transport.org/publication/mrv-scheme-ebuses/>

MobiliseYourCity Emissions Calculator for SUMP and NUMP
<https://www.mobiliseyourcity.net/mobiliseyourcity-emissions-calculator>

UITP E-Bus 'Standardised On-Road Test cycles' to measure energy consumption and optimal daily range
<https://www.uitp.org/e-sort>

Chapter Six: Financing Electric Buses

Challenges

The biggest challenge for electric buses deployment in Latin American cities is their high upfront cost compared to diesel buses. Nevertheless, their lower maintenance, energy and operation costs can potentially result in lower or comparable Total Costs of Ownership (TCO) along the vehicles' lifetime, revealing that e-buses can be a cost-effective alternative to fossil fuel powered buses (1).

The COVID-19 pandemic has exacerbated this already major challenge, due to the decrease in ridership and therefore, revenues, in public transport systems around the world. Thus, there is an urgent need for the development of new business models and innovative financial solutions to help cities overcome high upfront costs and successfully deploy zero-emission bus fleets (2).

The current bus operation models in Latin America vary depending on the role of public and private actors in the ownership, operations and maintenance of the system. The most common or traditional model rely on private owner-operators holding a concession or permit with a municipality, allowing them to own, operate and maintain the bus fleets. This model is not optimal for e-bus deployment due to various challenges detailed below. Figure 1 presents the traditional model and some of its main "pain points" for bankability and ability to invest in electrification (3). It highlights that key barriers to large-scale deployment of e-buses are related to concentration of risk on the private owner-operator, their difficulty in accessing finance, and the lack of transparency on the revenue side.



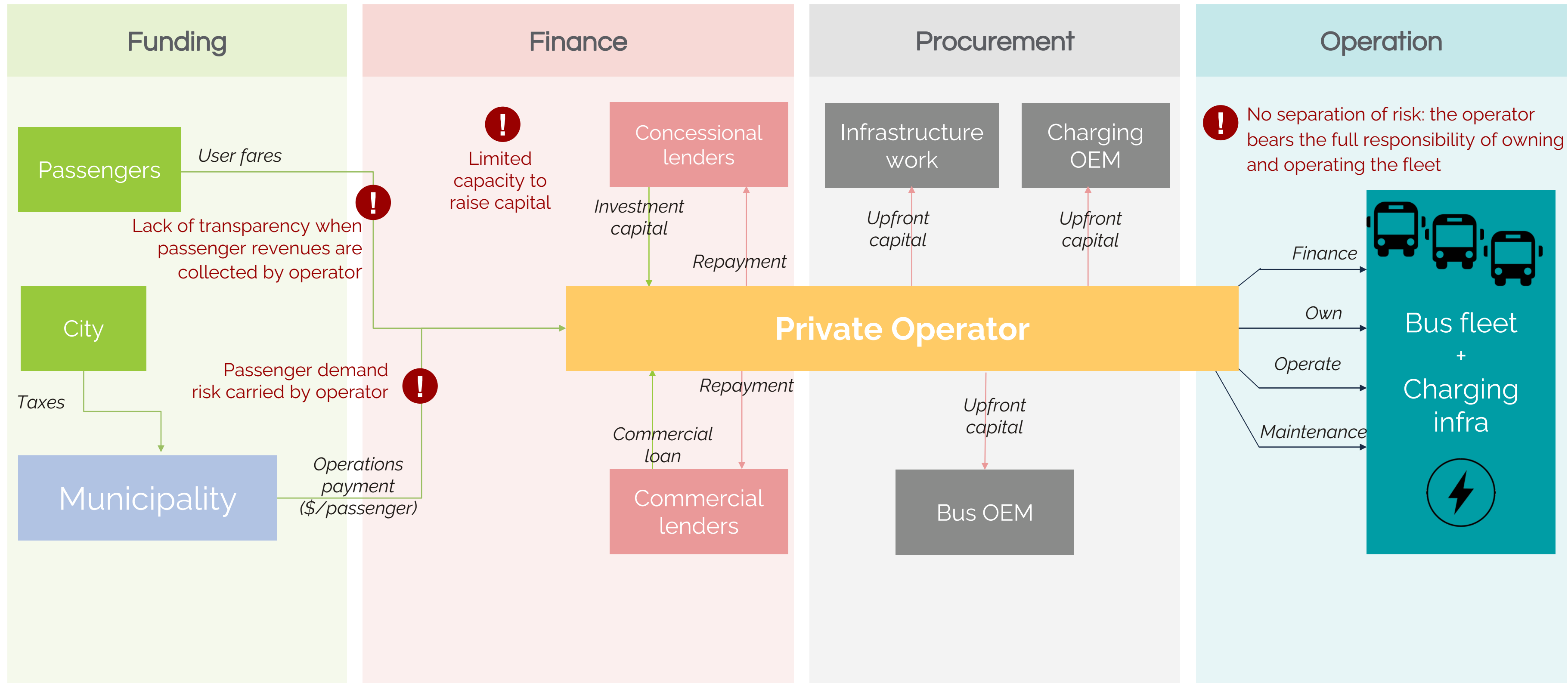
Medellin, Colombia
Photo courtesy of La Republica

1) <https://assets.bonhub.io/professional/sites/24/2018/05/Electric-Buses-in-Cities-Report-BNEF-C40-Citi.pdf>

2) https://www.c40knowledgehub.org/s/article/Accelerating-a-market-transition-in-Latin-America-New-business-models-for-electric-bus-deployment?language-en_US

3) https://www.c40knowledgehub.org/s/article/Leading-a-clean-urban-recovery-with-electric-buses-Innovative-business-models-show-promise-in-Latin-America?language-en_US

Figure 1: Traditional transit model for municipal buses in Latin America



Where to start in order to reach bankable e-bus projects?

To overcome those challenges, cities can implement critical changes to prepare the public transport system and create the conditions for financially sound and bankable projects that can attract investors.

1. **Manage demand risk:**

In a post-COVID-19 environment with reduced and unpredictable ridership, allocating the demand risk to operators with already fragile finances after the pandemic induces tremendous financial risk and a high likelihood of bankruptcy. Therefore, cities must transition to payment schemes based on indicators that affect costs, such as kilometers driven, punctuality, and service indicators

irrespective of farebox revenue (which is then retained by the transit authority).

2. **Adopt a centralized fare collection system:**

This is a critical component for any municipal transit systems' ability to attract investors. By collecting fares directly and centrally instead of relying on operators, municipalities can ensure accuracy and transparency in the process, maximize revenues, and reduce the risk of questionable practices or mismanagement by operators.

2. **Establish a bankruptcy-remote trust fund:**

Either managed by the municipality or by a private entity, a trust fund provides investors with confidence that revenues will be managed transparently and independently, and that payments will be backed by a

well-capitalized entity, as opposed to being channeled through operators that may have sub-optimal financial management practices. In some jurisdictions, private investors have actually been given seniority in the cash "waterfall" of these trusts to provide greater payment certainty.

4. **Better allocate technology risk:**

As a relatively new technology, there is limited data on the life expectancy and reliability of electric buses and batteries. This uncertainty forces the fleet providers' financiers to use highly conservative commercial and financial benchmarks to mitigate the risk. To address this, reliable long-term performance data and robust warranty frameworks for these technologies should be required from original equipment manufacturers (OEMs) in order to attract financiers.

5. **Mitigate foreign exchange risk:**

In Latin America, e-buses tend to be imported and procured in hard currency, while revenues are generated in local currency and diesel buses are commonly manufactured locally. This implies a foreign exchange risk barrier to early adoption of e-buses, at least until the long-term goal to manufacture e-buses in the country is achieved. National and municipal governments can address this by helping to create foreign exchange mitigation options, and by using inflation-indexed contracts. 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.

Furthermore, besides the five actions suggested above, cities may change their transit business model to address some challenges and allow for e-bus deployment. In this sense, the traditional model can be improved to provide better access to finance through concessional financing or variations of ownership responsibilities.

Concessional finance for asset owners:

Corresponds to an adaptation of standard fleet renewal financing by engaging different capital providers such as Multilateral Development Banks (MDBs) or other Development Finance Institutions (DFIs) to tailor financing and reduce financing costs, enabling operators to purchase e-buses and other components such as batteries and charging stations. For

that, concessional financing provided by MDBs or DFIs via financial intermediaries (such as local banks) would have longer duration (e.g. 15 years), grace periods and lower interest rates than commercial loans. Furthermore, risk mitigation guarantees can be provided through city-level trusts, credits from MDBs or DFIs and/or revenue guarantee from a Public Transport Authority.

Another promising arrangement to increase the bankability of e-buses is the **unbundling of ownership and operation** responsibilities between different actors, thus enabling a better risk distribution than the traditional transit model (see following section).

The Unbundled Model

The unbundled transit model is a commercial structure that transfers ownership of e-bus assets (charging infrastructure, batteries and/or buses) to third-party players who have capital available to make the high upfront investments. These players finance, procure, own, maintain and lease the assets to the operators, allowing for a better risk allocation amongst stakeholders and mitigating upfront costs for operators.

The unbundled model may be implemented through direct contractual and financial leasing ties between the bus operator and the bus owner. However, this solution exposes investors to the operator's financial health and bankruptcy risk. To avoid this, the benefits of the unbundled model can be maximized by creating separate contracts and separate payments for asset provision and for operation directly with municipal authorities (Figure

2). This is particularly critical where private operators have a history of bankruptcy.

The traditional model allocates too much risk to operators who do not have the financial and technical capacity to absorb alone the challenges associated with e-bus deployment. On the other hand, the unbundled model not only better distributes risk between players, but also provides for a better segmentation of responsibilities (allows parties to do what they do best) and can generate commercial interest from private capital to support the transition.

These innovative models have fostered electric buses deployment in public transport systems across Latin America. The city of Santiago, for example, has reached a total of 776 e-buses operating on its streets in August 2021, which makes it the largest electric bus fleet outside China, and with hundreds more to be soon

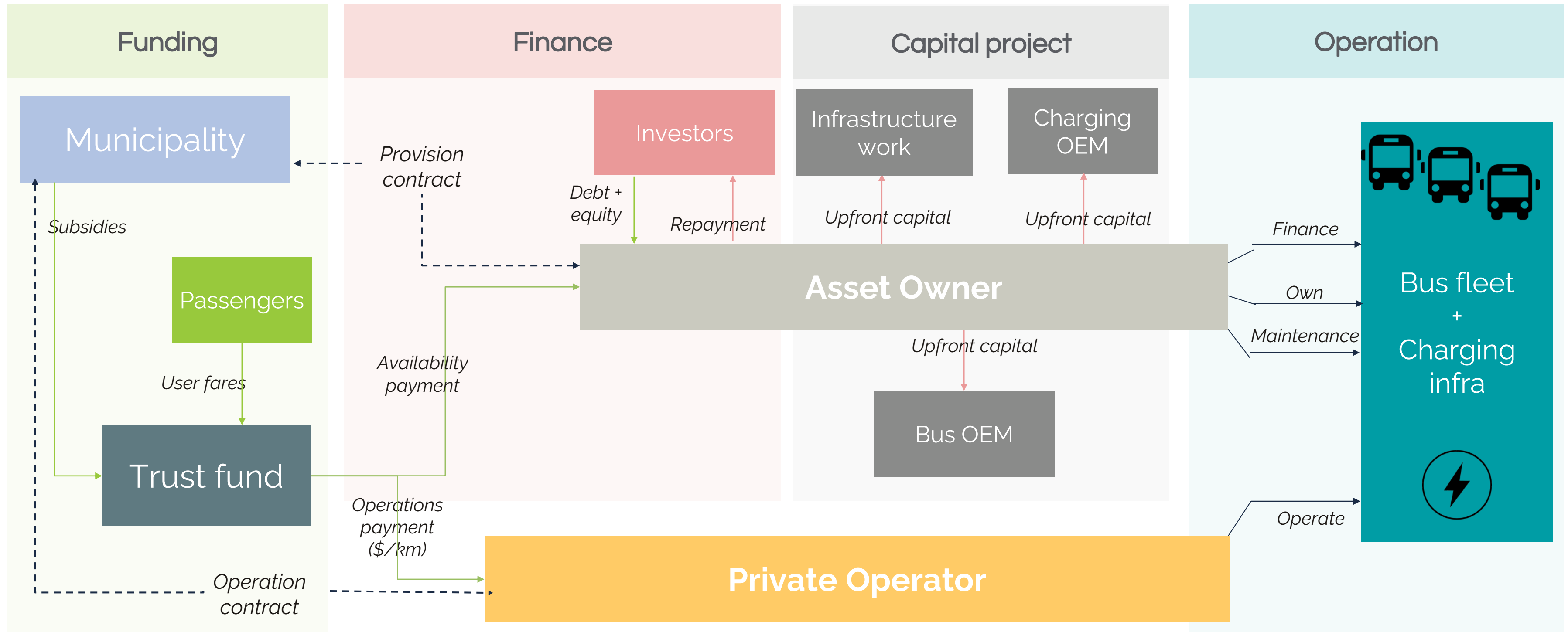
deployed through a series of public tenders. The majority of deployed and planned e-buses in Santiago use the strategy of separating ownership and operation in their transit models, showing the viability and bankability of this solution, as well as its strong business case (see Metbus case study for reference (1)). A similar framework has also allowed for over 1480 e-buses to be procured in Bogotá, and several cities are following suit.

Moreover, the growing demand and market potential for e-buses in Latin America has attracted a number of investors and manufacturers. In December 2020, the Zero Emission Bus Rapid-deployment Accelerator (ZEBRA) partnership, which supports the transition to zero emission buses in Latin American cities, launched a commitment (2) signed by several institutions pledging to finance e-bus deployment in the cities of Medellín, São Paulo, Mexico City and Santiago.

1) https://www.c40knowledgehub.org/s/article/Metbus-pioneering-e-bus-deployments-in-Santiago?language=en_US<clid=783c9a17-3d76-4ed6-950e-d6fe45e86854

2) <https://theicct.org/events/zebra-pact-ebus-dec2020>

Figure 2: Improved Unbundled Model



In conclusion, it is possible to state that the transition to electric buses in Latin American cities can be financially viable, since the key challenges can be overcome by changes in existing transit models, such as separation of ownership and operation. However, to make this possible, cities have a very important role to play in preparing and structuring their transit systems to enable bankability and attract investors interested in the Latin American market.



Chapter Seven: Bringing it All Together

Centering Climate Action

As you've learned in the pages above, a conscious effort must be made in order to implement climate action in your government's decision-making.

The road ahead

This Playbook for Zero Emissions Mobility for LAC is the first step by step guide for LAC governments that includes all aspects of zero emissions mobility. Use this as a blueprint for your zero emissions transition journey. We present this work with great humility, and very much consider it Version 1.0, with additions and amendments to come.

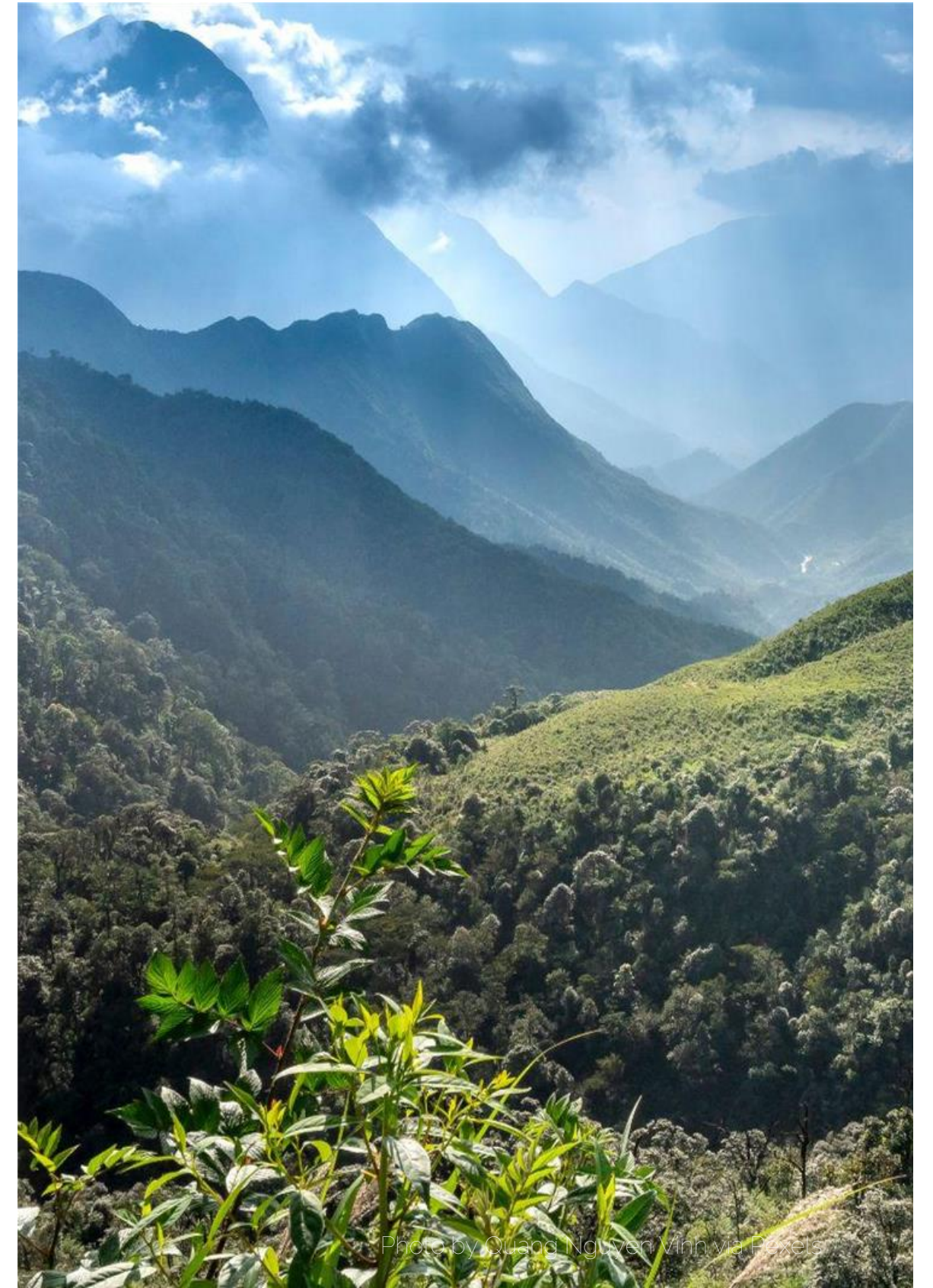
The Climate Justice Playbook for Business, Version 2.0.

Based on our learnings to date and the shortcomings of this first process, we're excited to begin work on Version 2.0 of this playbook in 2022. Version 2.0 will focus on other areas of the Global South, including new and suitable insights, strategies, and case studies.

COP26, Glasgow

This November 2021, the 2021 United Nations Climate Change Conference will bring together leaders from around the world. Transport Day will focus on knowledge sharing, mobility projects, and advances in the private and public sector. As part of the mobility projects for the Global South, The Playbook for Zero Emissions Mobility LAC will play an essential role in the content of this gathering, and the Conference will also be used as an incubator for taking the playbook to the next level.

Thank you for making it this far. We hope you join us in this path towards sustainable mobility in the Global South.



Chapter Seven: Bringing it All Together

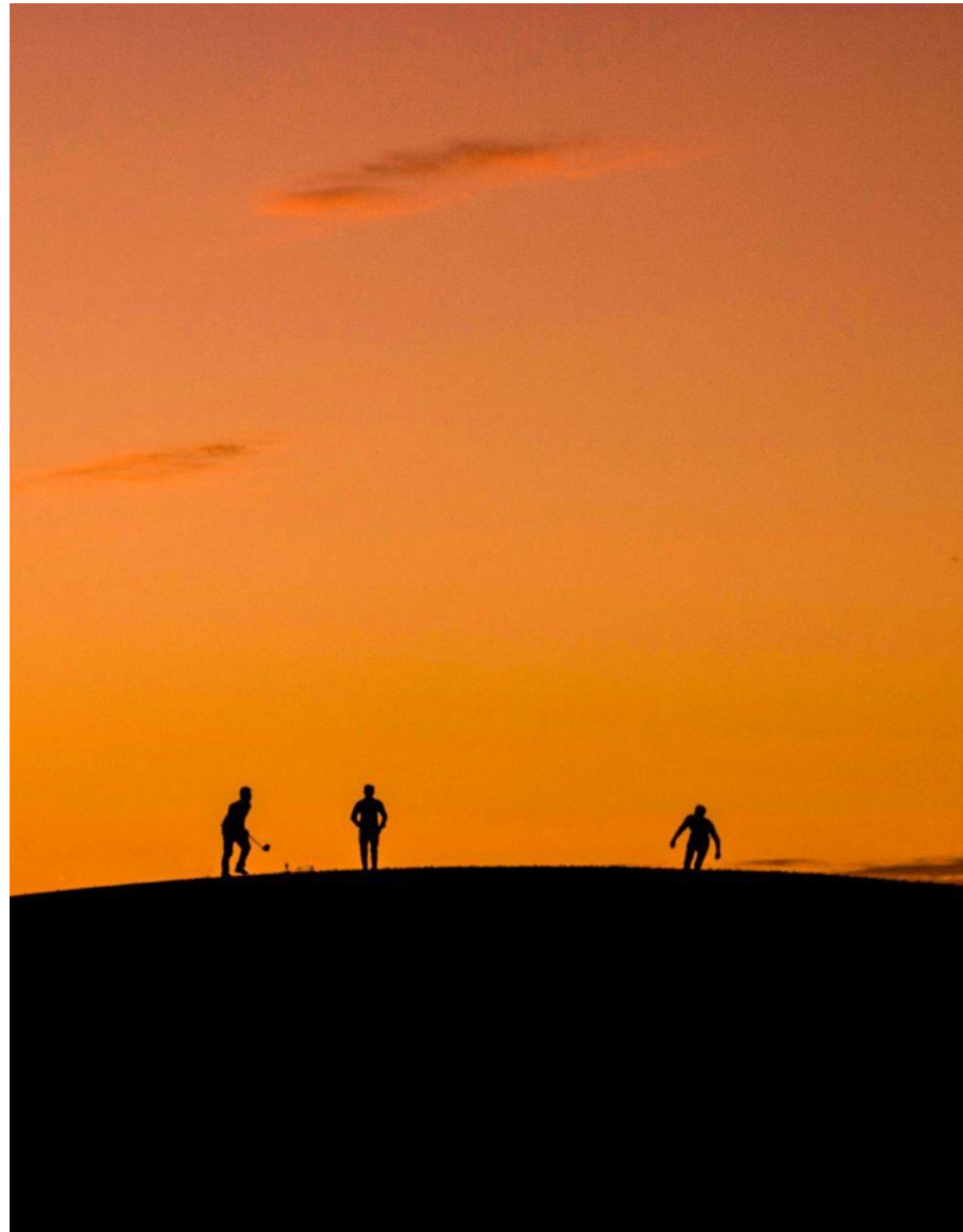


Photo by Haris Irshad via Pexels

With Gratitude

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- Bianca Macêdo, from C40
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- Yiqian Zhang, from ICLEI

Chapter Seven: Bringing it All Together

Our Partners





“It’s surely our responsibility to do everything within our power to create a planet that provides a home not just for us, but for all life on Earth.”

Sir David Attenborough