SOLVING THE COOPERATION PARADOX IN URBAN MOBILITY

By Joël Hazan, Martin Reeves, and Pierre-François Marteau

I F YOU BUILD IT, the saying goes, they will come. But they have to be able to get there. In cities around the world, getting there is a challenge, fraught by growing traffic congestion and deteriorating public transit systems. All of this piles on travel time and impedes access to urban locations. But it's more than a source of frustration—the mobility problems that cities face threaten their economic viability, the environment, and society overall.

Traditional approaches to solving mobility problems—adding roads and transit lines—are not sustainable, primarily because of concerns related to climate change, public health, and funding. Hence the interest in new technology-powered forms of mobility: ride sharing, free-floating bikes, autonomous electric vehicles, digital mobility platforms, and more.

These technologies could be "congestion busters," prompting people to give up grueling commutes in single-occupancy private vehicles in favor of modes of transport that will offer swifter, easier, cleaner travel while decreasing the number of drivers and vehicles on the road. But when it comes to these new modes, most cities and transport authorities have effectively relinquished control by either allowing private actors to compete unfettered with traditional modes of transportation or letting mobility languish as they restrict innovation.

Waiting for the technology to sort itself out is not the way to proceed. It is incumbent on cities to be part of the mobility revolution and ensure that technologies are deployed in ways that are best for cities and the people who live and work in them. City governments need to, in a word, mobilize. They need to regain control of urban mobility by orchestrating the entire landscape of mobility providers and users.

Mobility Can Drive—or Derail—Wealth

The relationship of transportation and economic growth is well grounded in economic theory and empirical evidence.

As Adam Smith explained in *The Wealth of Nations,* improvements in transportation systems increase the extent of a market, allowing the division of labor and unlocking economies of scale. The development of the world's major cities illustrates this relationship. In New York City, for instance, the construction of the underground subway (financed by the city because no private players were willing to take on the risk) united the five boroughs and created what is now the world's second biggest city, as ranked by GDP. And in the Paris metropolitan area, the construction of the regional metro and the urban highway network in the 1960s and 1970s changed the shape of a territory, increasing the number of inhabitants from 5 million in 1900 to 12.2 million today.

As many economists (among them Jean Poulit and David Levinson) have demonstrated, in urban areas mobility drives wealth by fostering access. We define access as the number of valued destinations that inhabitants can easily reach within their daily travel time budget. Access is the effective size of the city. Given that daily travel time budgets everywhere have reached a steady state, increasing access relies on transportation speed—how quickly individuals can reach their workplaces and commercial destinations such as shops and restaurants—and the density of those pop-
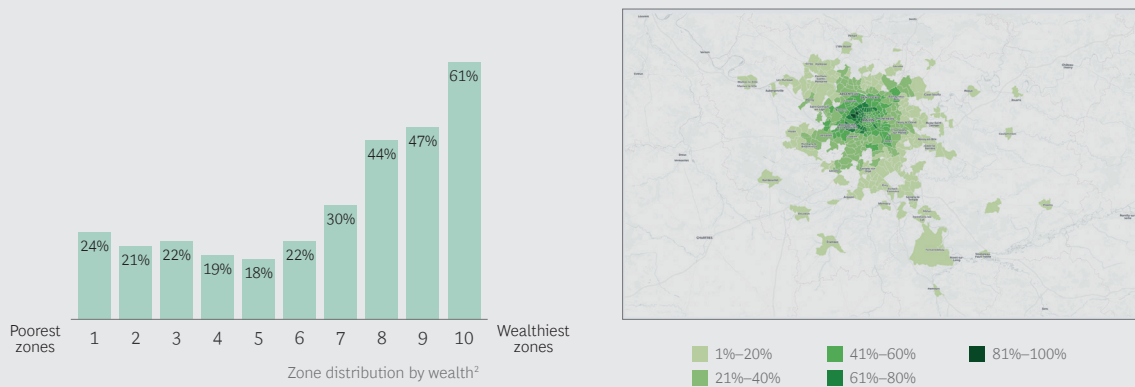
ulations and destinations. Moving many people at a fast pace in dense areas is vital for cities; they don't want people or businesses, frustrated by congestion, unreliable public transit, and increased travel times, to leave.

Access increases productivity by allowing a better pairing between job demand and work supply. It is priced into land value—individuals and companies pay premiums for high-access locations. Our research, illustrated in Exhibit 1, shows the strong correlation between the areas where the wealthiest people choose to live and the areas with the greatest access to top jobs. (See the sidebar.) Access also draws commerce to a city by attracting companies looking to benefit from a large pool of talented workers. Last but not least, access fosters social and economic inclusion by increasing exchanges between the different parts of a metropolitan area.

But urban mobility is at an impasse. Cities have not been able to increase access using traditional techniques (building new roads or extending transit lines). Worse, rising congestion (TomTom traffic data shows that from 2008 to 2016, congestion levels increased by 10 to 15 points in New York City, Los Angeles, San Francisco, and other major US cities) along with the unsustain-

EXHIBIT 1 | Wealth and Access to Top Jobs Are Correlated in the Paris Metropolitan Area

% of white-collar and "gray-matter" jobs[1] accessible within 30 minutes using the fastest mode of transportation

Legend: 1%–20%, 21%–40%, 41%–60%, 61%–80%, 81%–100%

Bar chart (Zone distribution by wealth[2]): Poorest zones 1: 24%, 2: 21%, 3: 22%, 4: 19%, 5: 18%, 6: 22%, 7: 30%, 8: 44%, 9: 47%, 10: 61% Wealthiest zones

Sources: INSEE; Google Maps; TomTom; BCG analysis.
Note: Accessibility during the morning peak on a weekday in 2018 using public transport or private car. For reasons of simplification, we looked only at the most populated subzones, amounting to 90% of the total population of the Paris metropolitan area.
[1]Jobs of "Cadres et professions intellectuelles supérieures" as defined by INSEE in 2015.
[2]Per decile, based on declared revenue per household in 2015.

HOW WE MEASURE ACCESSIBILITY

Our objective was to measure access to opportunities within a city using a location-based approach. Our two main constraints: the measure should be easy to understand, and it should allow a meaningful comparison between cities around the world, regardless of the mobility modes available in individual cities.

We used two metrics:

- **An Accessibility Index.** This shows the percentage of jobs in the metropolitan area that can be reached within 30 minutes from a given subzone using the fastest transportation mode at a peak travel hour.

- **A Compactness Index.** This measures the percentage of jobs in the metropolitan area that can be reached within 30 minutes on average per inhabitant. It is the average of the accessibility indexes of all subzones weighted by the population of each subzone.

To compute the figures, we used population and job location data from offices for national statistics (such as INSEE in France). We simulated travel times by leveraging Google Maps for public-transit time and TomTom data for driving time.

able levels of carbon and particle emissions and pressure on public-transport finances, threaten to decrease access. This presents clear challenges to the economy and the environment; it also sets the stage for troubling social outcomes in which mobility depends on income and magnifies income inequality.

Some might think that the solution to all these challenges lies in new technologies. Indeed, technology will be part of the eventual solution. But on its own it will not provide simple, quick fixes; in some cities, it is actually exacerbating near-term challenges. Cities have not yet figured out how to steer new technology opportunities toward desirable ends.

An Untapped World of Opportunities

Urban mobility has never moved so fast. A combination of disruptive technologies and changes in the aspirations of city dwellers (shown in Exhibit 2) is setting the stage for a revolution that could, if correctly managed, open up a new world of opportunities for cities.
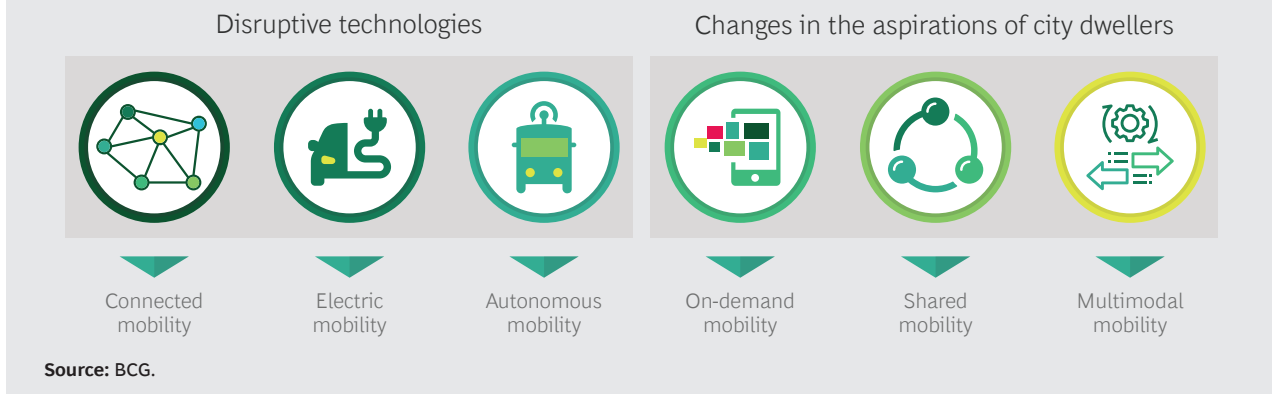
From physical infrastructure to digital platforms, the mobility value chain is rapidly becoming more connected, emission-free, autonomous, shared, on-demand, and multimodal. Already, mobile apps have allowed the development of on-demand mobility services such as ride hailing and free-floating vehicles as well as real-time travel assistants; both types of innovation have started to change the way people move in cities. But much more is coming. Autonomous and electric vehicles, combined with the tremendous improvements in data generation, collection, and processing, could provide crucial elements of the solutions that cities are looking for.

If properly leveraged, disruptive technologies could—eventually—help cities pursue sustainable growth. What could the new urban mobility look like? Attractive possibilities exist in several areas:

- **Economic Performance.** Commuters could reclaim time and peace of mind by stepping out of their individual cars and relying instead on an integrated combination of new modes of transportation, such as ride sharing and free-floating vehicles. Maximizing the number of passengers per car would reduce congestion. With better access, opportunities for economic transactions—and therefore the wealth of a city—increase.

Exhibit 2 | Drivers of the Urban Mobility Revolution

Disruptive technologies

Changes in the aspirations of city dwellers

Connected mobility | Electric mobility | Autonomous mobility | On-demand mobility | Shared mobility | Multimodal mobility

Source: BCG.

- **Environmental Sustainability.** Environmental benefits could be gained as a decrease in congestion reduces idle time per car, as electric vehicles replace gasoline-powered cars, and as new, lighter vehicles multiply.

- **Social Equity.** Cities could reinvigorate access through the thoughtful deployment of new modes of transportation that ensure inclusive access to all, across geographic areas of the city and income bands.

- **Funding.** Funding concerns could be alleviated as costly capital investments in new infrastructure are replaced with asset-light initiatives, thereby increasing the efficiency of existing public and private assets.

Mostly, though, cities have been standing aside, and as a result the first wave of the urban mobility revolution has been somewhat chaotic. Public authorities lack the tools to work with the newcomers, and so regulatory progress is lagging, meaning that in many cases operators of new mobility modes either are able to operate unfettered or are unduly restricted. The uptake of ride-hailing services such as Uber, Didi, and Lyft has turned the old taxi industry upside down; such services are also directly competing with public transport through pooling and microtransit services. The development of free-floating services, such as some bike- and scooter-sharing models, has presented a new challenge to city officials, who are used to traditional sharing systems with docks or

dedicated spaces and have no policies in place for new approaches. Further, cities now have to deal with a high number of mobility players, instead of the few, well-known providers.

There have been some attempts to regulate new forms of mobility, but they (two acts in France that aimed to regulate ride-hailing services in just two years, for instance) have so far been scattershot rather than strategic.

Cities' uncertainty about how to proceed might be explained by the fact that new mobility services have not yet begun to deliver on the above-mentioned attractive possibilities, despite massive investments from venture capital funds, tech giants, and car manufacturers. As of today, what matters most—the daily commute—has not changed. Ethnographic research that we conducted in the summer of 2018 in partnership with the French digital agency My Little Paris found that even though 75% of Parisians aged 25 to 45 have tried new mobility services, less than 6% rely on them for their daily commute.

New mobility services have also not been reducing congestion. For instance, a 2017 report from former US Department of Transportation official Bruce Schaller concluded that ride-hailing services had worsened traffic on the busiest streets of New York City, inspiring the recent decision to cap the number of for-hire vehicle licenses (used by drivers of Uber, Lyft, and their equivalents) there. Our research shows that

without optimization mechanisms that consider all vehicles, autonomous vehicles are likely to further impede traffic flows in already congested situations.

All of the above findings, though they come somewhat early in the mobility revolution, strongly suggest that cities are not yet on the right track. In general, cities acknowledge that new mobility services can generate tremendous socioeconomic value at a lower cost than investments in traditional infrastructure, but they are struggling mightily to understand how to unlock this potential.

The Imperative for Cities: Solve the "Cooperation Paradox"

Cities need to be part of the mobility revolution, for the sake of economic development, for their own financial viability, for the cause of fighting against climate change, and for the well-being of their residents. Indeed, without proactive moves on the part of cities, new mobility services could deliver more downsides than upsides, leaving cities ensnared in any of several potential mobility dystopias: paralyzed cities, for example, or cities dominated by private players that have commandeered public space and optimized mobility for their own narrow interests.

It is true that cities' interests conflict with those of new mobility providers. Cities want to achieve "asset moderation," a scenario that maximizes utilization of modes of transportation—ensuring, for instance, that each vehicle on the road carries as many passengers as possible. Many private players, on the other hand, want to pursue a model of "asset proliferation": more vehicles, roads, parking spaces, and hours of hired-vehicle time. These clashing goals create a cooperation paradox that needs to be resolved. But which stakeholders should cities work with to find solutions? It is hard to identify partners, though it's clear that cities can't rely on one player for all the right competencies.

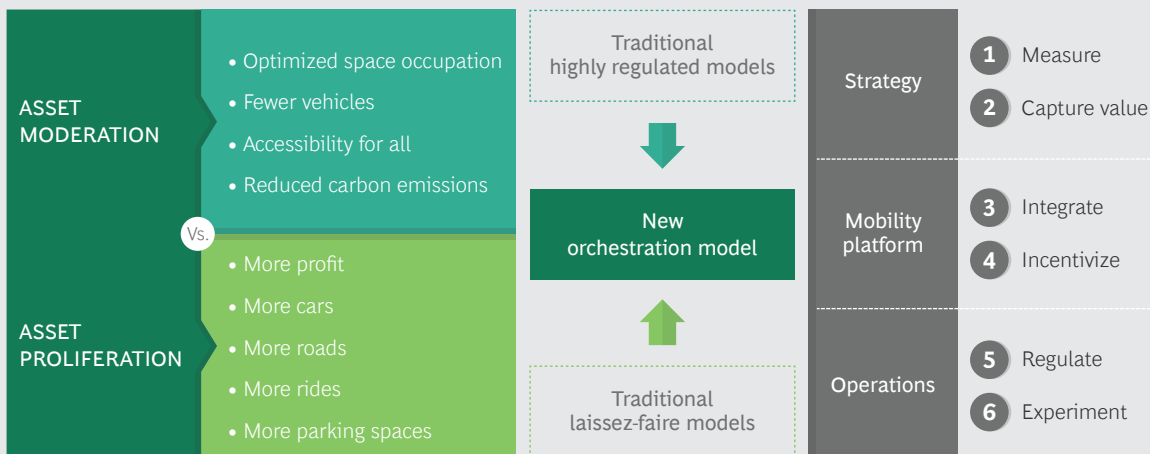The imperative for cities, then, is to become orchestrators of mobility.

By doing so, they will figure out the right balance of regulation and innovation. Traditional highly regulated models have value because they protect players and the public interest, but they can go too far and stifle innovation. On the flip side, an extreme laissez-faire approach allows innovation to flourish but also lets certain players act in ways that might not be wholly beneficial to the city. Cities can orchestrate the new mobility by taking six interlinked and sustained actions. (See Exhibit 3 for an overview.)

EXHIBIT 3 | Why Cities Must Become Orchestrators of Mobility—and How

To solve the cooperation paradox…   …cities need to find the right model…   …which involves six key actions

ASSET MODERATION
- Optimized space occupation
- Fewer vehicles
- Accessibility for all
- Reduced carbon emissions

Vs.

ASSET PROLIFERATION
- More profit
- More cars
- More roads
- More rides
- More parking spaces

Traditional highly regulated models

New orchestration model

Traditional laissez-faire models

Strategy
1 Measure
2 Capture value

Mobility platform
3 Integrate
4 Incentivize

Operations
5 Regulate
6 Experiment

Source: BCG.

It's important to emphasize that cities will be orchestrating these activities, not performing them on their own or in a silo. Other stakeholders, such as the new mobility operators, will play important roles in carrying out these actions, negotiating with one another, and putting their findings to work.

MEASURE

What doesn't get measured doesn't get done.

To drive the urban mobility revolution, cities should start by putting in place the tools to understand its advantages and disadvantages in detail. They should equip themselves with a measurement framework that can help inform policies. This framework should be a common one, used by all cities, so that they can share their findings and insights.

This effort is not just an updating of existing measures. Indeed, traditionally, cities and transport authorities have assessed ease of movement rather than the interactions between movements and places. Today's in-depth socioeconomic analyses are limited to large infrastructure projects that cannot be easily adapted to asset-light initiatives. Current measurement systems also lack user centricity, which is needed to build a mobility offering that truly addresses the needs of residents instead of just optimizing each mode in a series of silos.

Cities need a way to monitor the socioeconomic value of asset-light initiatives, looking for signs of almost immediate implications as well as user satisfaction. Indicators should be available at both the urban and district levels to assess potential differences. They should also be de-averaged, by mobility service, to reveal the contribution of each service to the mix. This measurement will instruct pilots as well as policy decisions. (Exhibit 4 shows examples of indicators to monitor.)

CAPTURE VALUE

Cities need to figure out where the value (economic, environmental, and societal) of the new mobility offerings goes and capture the fair share to be reinvested in balanced, integrated solutions; this is the great, wealth-creating lever effect of urban mobility. It is essential to attain the right balance of funding sources for the mobility system overall. Three types of value sources are commonly used to fund mobility: general funding, user fees, and indirect, targeted funding such as development impact fees and land value taxes. The last category is particularly informed by insight into value—it tells authorities which private parties can derive value from the new mobility, particularly if they help to fund it.

This value capture plan will also help cities address urban mobility in the broader context of urban planning—to align planning and mobility decisions, ideally across a metropolitan area. It will force cities to consider actual interaction patterns rather than mere incremental shifts, and it will inform a shared goal of all stakeholders: improving sustainable accessibility for all in the city.

INTEGRATE

Most transportation systems have been developed to address singular modes (car, public transit, or bike, for example) rather than to offer a comprehensive transportation approach that considers users' varied needs. In some cities, different modes and infrastructures are governed by different entities, limiting the ability to organize and synchronize the mobility ecosystem. Fragmented governance is posing a problem in the face of a convergence of mobility players and the desire to promote multiple modes. The rise of digital platforms that can integrate multiple modes of transport and multiple services (for example, booking, ticketing, and payment) gives cities a new opportunity to tackle this old issue.

Cities should integrate all mobility modes and services in a single platform to offer a seamless experience for users and to equip themselves with a powerful tool to supervise and orient flows. They should also use the platform to unify governance across modes of transportation and types of mobility infrastructure. In short, cities should pursue a smart and user-centric integration of public policy and new technology.

EXHIBIT 4 | Select Indicators of a Mobility Revolution

Economic performance	Accessibility	Average number of jobs people can reach within 30 minutes at a peak hour of travel using the fastest mode of transportation
	Peak efficiency	Difference in accessibility between peak and nonpeak hours
	User satisfaction	Percentage of users satisfied with current offerings, overall and per mode of transportation
	Reliability	Continuity of accessibility at a peak hour during weekdays over the year
Environmental sustainability	Green accessibility	Average number of jobs people can reach within 30 minutes at a peak hour of travel by walking or biking
	Climate impact	Annual CO_2 emissions linked to urban mobility per capita
	Air quality	Average air quality index at the metropolitan level
	Asset utilization	Ratio of passenger-kilometers to vehicle-kilometers
Social equity	Public transit accessibility	Average number of jobs people can reach within 30 minutes at a peak hour of travel using public transit
	Geographic equity	Standard deviation of accessibility indexes per zone
	Affordability	Average cost of commuting as a percentage of average net hourly income
	Inclusiveness	Percentage of inhabitants not making a trip because of lack of access
Funding	Mobility budget	Total mobility spending across modes of transportation and infrastructure per year as a percentage of GDP
	User contribution	Percentage of the mobility budget coming from users (vs. general funding or indirect beneficiaries)
	Maintenance budget	Percentage of the mobility budget dedicated to the maintenance of existing infrastructure and vehicles
	Budget growth	Ratio of yearly mobility-spending growth to GDP growth

Source: BCG.

INCENTIVIZE

As mobility becomes integrated, authorities can begin to pilot a comprehensive social transportation policy. They could offer user-based incentives that emphasize particular modes, travel hours, and population categories. They could also incentivize mobility providers, which could be paid in exchange for an improvement in access or quality of service, for instance.

Based on the predefined measurement system, the incentives should focus on big-picture outcomes (an increase in travel speed, for instance, or a reduction of pollution) rather than contributing effects or inputs (for example, the percentage of on-time trains or the share of electric vehicles).

REGULATE

It's clear that new forms of mobility call for new policies and regulations. The recent demise of the Autolib' electric-car venture in Paris is a signal that cities need to be nimbler in the way they deal with the private sector. Instead of following the tenets of traditional contracts, cities should limit their intervention. They should offer greater flexibility to private players (by, for instance, not requiring them to predefine transport routes).

When it comes to the new mobility, cities will benefit from balancing what is and is not regulated. New ecosystems need efficiency and guardrails, but they also must allow for diversity, initiative, and innovation. This requires positive partnerships and a

great amount of trust between cities and private players, not reactive regulations.

Seattle's newly issued permitting system for free-floating bike sharing is a good example of the new form of regulation that cities should implement. The policy focuses public intervention on select steps of the value chain such as data sharing, parking, safety, and equity while maintaining the diversity and flexibility (regarding detailed pricing structure and user interfaces, for instance) of private operators.

EXPERIMENT

The mobility revolution is going to be rapid, and it is going to require major adaptations. Cities don't have time to wait for definitive solutions. They must learn by experimenting. Some experiments will fail. Given that, cities would benefit from sharing their experiences with other cities. And partnerships between cities and individual mobility players will be beneficial as well; more and more of these partnerships are being put in place, which is a good start for instructional experiments.

For instance, before implementing its permitting system for free-floating bike shares, Seattle used a "sandbox" approach, which included a pilot with LimeBike, ofo, and Spin in 2017 to better understand how to regulate and leverage this new mode of transportation.

SINGAPORE, DUBAI, HONG Kong, and London are regarded as exemplars of urban mobility. It is not a coincidence that these city-states (or close approximations thereof) have autonomous governing bodies that control the entire metropolitan area's transportation systems. They also have a clear understanding that transport and accessibility are the keys to success. Other cities can look to these standouts as models of best practices.

Indeed, looking to other cities and even joining forces with them will be a key advantage, given the magnitude of changes ahead.

Cities do share a common destination: a comprehensive mobility system that provides easy access and encourages participation in all sorts of commerce throughout the metropolitan area. The journey to that destination will vary as each city works, alongside stakeholders, through the six imperatives to find the best solutions for its future and the future of its residents.

This article is the first in a series on the future of mobility. In subsequent publications, we will explore the six actions in more detail, drawing on the findings of our soon-to-be-launched research platform; we welcome the input and participation of cities and private players.

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Acknowledgments