CITIES DESIGNED TO SHAPE AND ENABLE NEW MOBILITY

EXPERIMENTATION AT THE INTERFACE OF URBAN DESIGN AND MOBILITY

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ABOUT US

ABOUT ROCKY MOUNTAIN INSTITUTE

Rocky Mountain Institute (RMI)—an independent nonprofit founded in 1982—transforms global energy use to create a clean, prosperous, and secure low-carbon future. It engages businesses, communities, institutions, and entrepreneurs to accelerate the adoption of market-based solutions that cost-effectively shift from fossil fuels to efficiency and renewables. RMI has offices in Basalt and Boulder, Colorado; New York City; Washington, D.C.; and Beijing.

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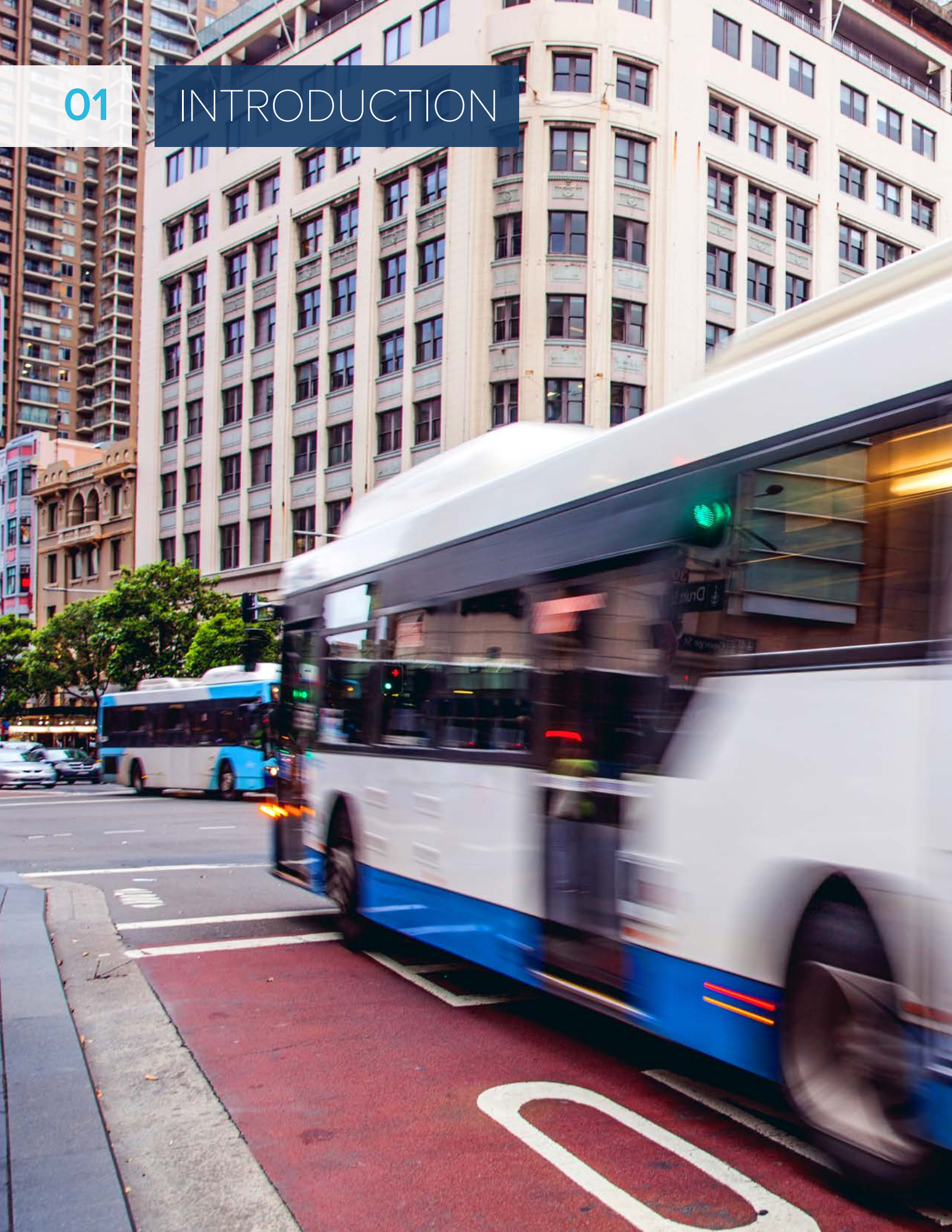
01 INTRODUCTION



INTRODUCTION

The world is moving away from personal gas-powered vehicles and toward automated, electrified mobility as a service.[i] These three parallel shifts—automation, electrification, and mobility as a service—have been characterized as the "three revolutions"[1] of new mobility.

In this paper, we explore the potential to accelerate a fourth revolution that has just begun: the shift from a largely fixed and planned built environment to one that is much more flexible and demand-responsive, particularly when it comes to temporary use of vacant buildings and land; adaptable street design and use; buildings designed to accommodate an adjustable combination of commercial, residential, and public uses in response to seasonal or market changes; and myriad forms of quickly deployable, moveable, and modifiable buildings and infrastructure. The "four revolutions" then collectively underpin the phrase "new mobility in cities designed to shape and enable it."

This new mobility paradigm has the potential to mitigate the effects of climate change by dramatically reducing emissions, equitably enhance human health and wellbeing, and improve the livability of our cities. However, it remains unclear how best to realize this potential while avoiding negative and unintended consequences.

Market forces driven by consumer demand already appear to be leading the shift to new mobility in key urban centers. Many expect this shift to accelerate. Whether and to what degree the shift to new mobility delivers on its potential will largely be determined by the degree to which the built environment actively shapes and enables it. Short-term experimentation is the key to giving the built environment the adaptability and nimbleness it needs to allow new mobility to reach its potential.

With this paper, RMI hopes to (1) offer cities and other mobility and built environment stakeholders an experimentation toolkit that puts them in a position to more quickly unlock the full potential of new mobility in cities designed to shape and enable it, and (2) engage stakeholders in further codeveloping and exploring a concept for living, flexible, and collaborative experimentation sites we're calling MOD Cities.

[i] "Mobility as a service"—allowing travelers to get where they want, when they want, how they want—refers to on-demand availability of multimodal mobility options. Often, these options are best discovered, accessed, and paid for through smartphone applications that offer integrated journey planning, booking, and payment capabilities. Walking, biking, and mass transit are integral to mobility as a service. See https://www.rmi.org/insight/interoperable-transit-data/ for more detail.

02 INTRODUCING MOD CITIES

INTRODUCING MOD CITIES

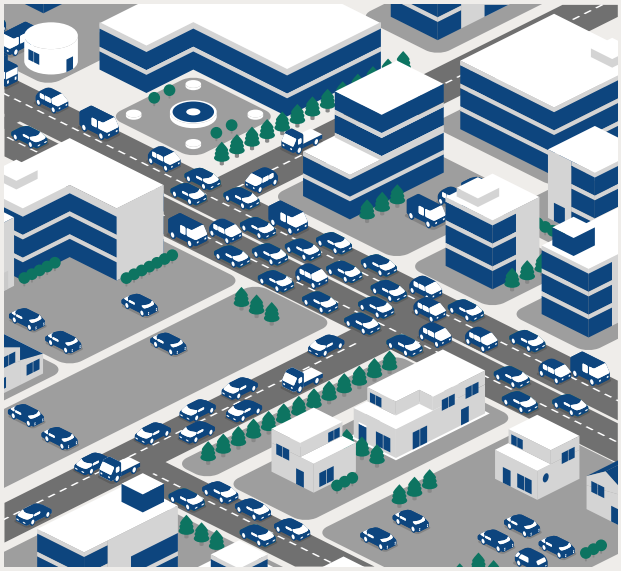
In collaboration with the Robert Wood Johnson Foundation, Rocky Mountain Institute (RMI) is exploring and testing industry interest in a concept we're calling MOD Cities, where "MOD" is short for "modular" and "modifiable" and also stands for "mobility-oriented development." MOD Cities would be living test sites where local municipal governments, developers, financiers, the vehicle-service industry, and urban designers and architects actively collaborate to co-innovate at the nexus of urban design, vehicles, and new mobility services. MOD Cities would put people first and be seamlessly integrated with the communities and urban fabric at their edges.

Imagine a place—or combination of places—where groundbreaking urban design features can be complemented by innovative mobility services. A place where the vehicle-service and built environment industries can experiment in tandem and develop familiarity and ground-tested expertise about the relationship between their respective industries. A place for people to equitably participate in the design process, and where the impact of new design features on their behavior, health, and livelihood can be concretely demonstrated and understood. A place that reduces risk aversion among all stakeholders by providing assurance of customer demand for—and thus financial viability of—new approaches to urban design and mobility. A place where policymakers from across the globe can directly observe the impact of enabling flexible and experimental approaches to urban design by revising zoning practices and land use codes. A place where innovation timescales can be dramatically accelerated.

With sufficient interest, an initial team composed of representatives from key stakeholder groups could take the next steps to further define the concept, develop an operating model, and implement MOD Cities. This report aims to explore the concept of MOD Cities while providing cities and other mobility and built environment stakeholders with a toolkit and illustrative case studies for experimentation that puts them in a position to more quickly unlock the full potential of new mobility in cities designed to shape and enable it.

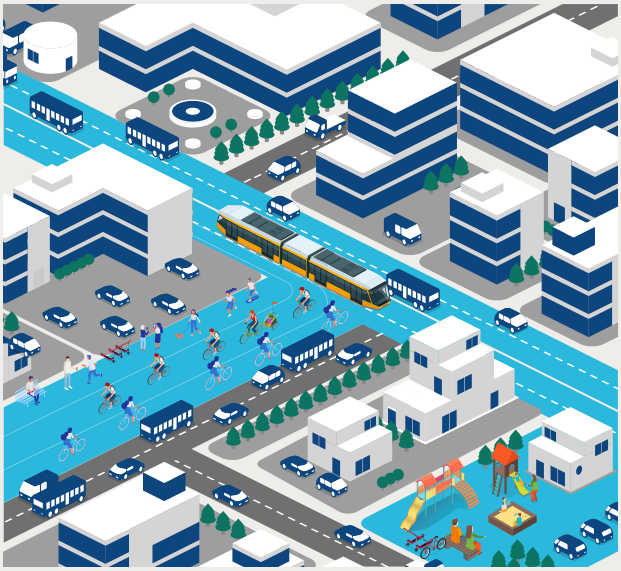
FIGURE 1
MOD CITIES: HOURLY FLEXIBILITY

Traditional City
Morning/Evening



In the traditional city, traffic peaks during the morning and evening commute. Parking spaces are filling in during the morning and emptying out during the evening. On a typical day, parking utilization will peak at less than half of capacity. Space devoted to parking accounts for about one-third of urban land use. The four lanes of the downtown thoroughfare are 12 feet wide and accommodate a mix of freight, transit, and personal vehicles.

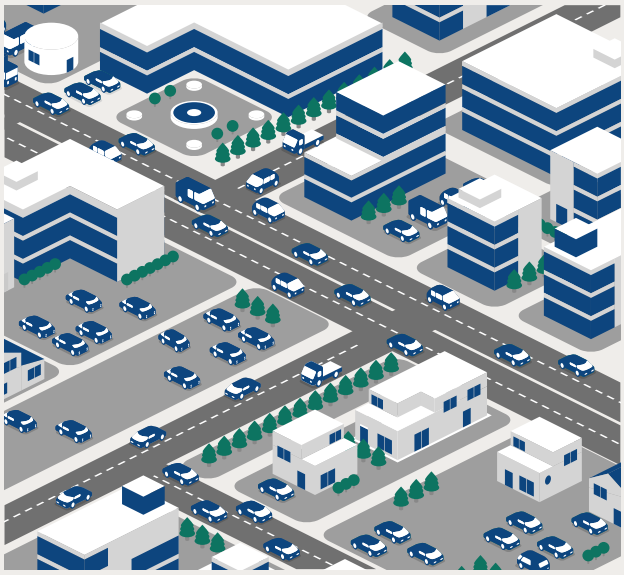
MOD City
`Morning/Evening



In MOD City, changes to the urban form have both shaped and enabled introduction of new mobility services. Underutilized parking space has been converted to bike (and scooter) lanes, pedestrian and social gathering space, and a playground. Corrals host dockless bikes and scooters. An electric, autonomous trackless tram runs along the downtown thoroughfare. Autonomous, electric multi-passenger vehicles have been introduced. Lane space made available from reduced traffic (due to more transit and other mobility service use) and reduced lane width (due in part to autonomous vehicles needing less lateral space) has been allocated to pedestrians, bicyclists, and social gathering space.

FIGURE 1 (CONTINUED)
MOD CITIES: HOURLY FLEXIBILITY

Traditional City
Midday



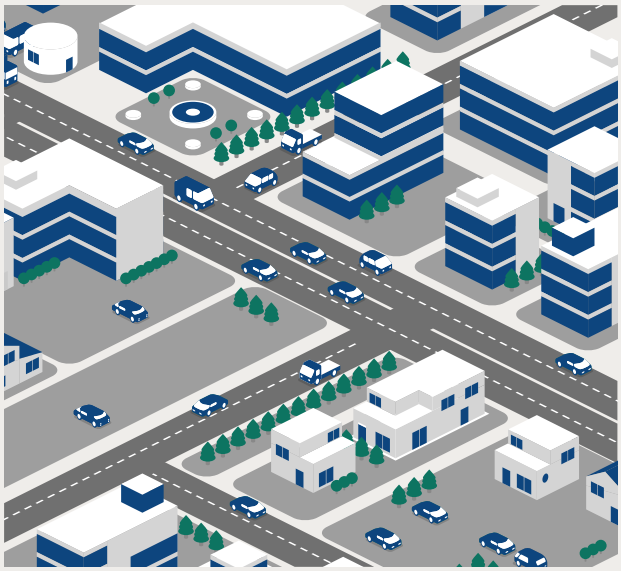
At midday in the traditional city, parking use has peaked and relatively few cars are on the streets.

MOD City
Midday

At midday in MOD City, space no longer needed to accommodate the morning commute of bicycles and scooters has been repurposed as social gathering and dining space. Mobile food carts serve lunch.

FIGURE 1 (CONTINUED)
MOD CITIES: HOURLY FLEXIBILITY

Traditional City
Night/Weekends/Holidays



Overnight and during weekends and holidays in the traditional city, few cars are parked or on the streets. Freight vehicles conduct overnight deliveries. Underutilized space abounds.

MOD City
Night/Weekends/Holidays

Overnight and during weekends and holidays in MOD City, modular, stackable housing structures introduced in unused parking lots and unused lanes on the downtown thoroughfare flexibly serve housing demand. In some cases, flexible-use buildings have switched use from office space to housing. Mobile carts serve food, and tables provide dining and social gathering space. A narrow lane accommodates a mix of bikes, scooters, and pedestrians. Freight vehicles continue to conduct overnight deliveries and are electrified and in some cases autonomous. A street has been cordoned off to serve as a short-term charging station for shared electric vehicles, including autonomous vehicles, scooters, and bikes.

FIGURE 2
MOD CITIES: MONTHLY FLEXIBILITY

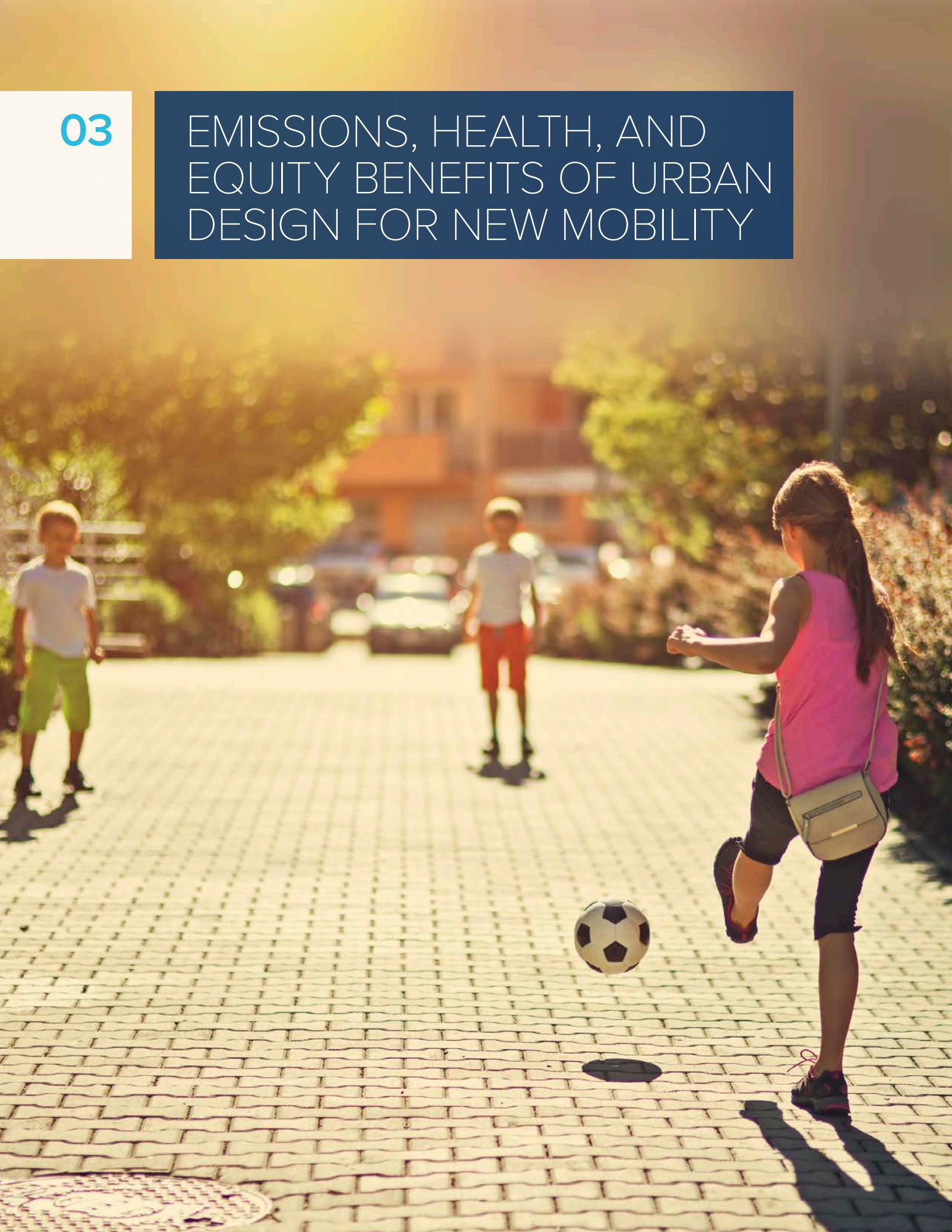
MOD City
Summer

MOD City's urban form and mix of mobility services morphs not only in response to daily or hourly fluctuations in demand, activities, and uses, but also to longer-term—such as seasonal or event-related—fluctuations. MOD City's summer configuration hosts various warm-weather activities and mobility options.

MOD City
Winter

MOD City's winter configuration hosts various cold-weather activities and mobility options. Modular, stackable housing structures serve seasonal housing demand.

03 EMISSIONS, HEALTH, AND EQUITY BENEFITS OF URBAN DESIGN FOR NEW MOBILITY



EMISSIONS, HEALTH, AND EQUITY BENEFITS OF URBAN DESIGN FOR NEW MOBILITY

Urban areas that are designed to shape and enable new mobility—by rethinking streets, parking, and more—can lower emissions, enhance health, and improve equity.

EMISSIONS

Urban form plays a key role in reducing transportation emissions by addressing both transportation supply and demand. On the demand side, compact, mixed-use development that puts less distance between uses and potential users reduces trip lengths and the likelihood that a private car is the necessary or preferred travel option,[2] particularly when combined with access to transit. Average annual carbon emissions per household vary from five tons for an urban density of three dwelling units per acre (e.g., a suburb) to one ton for an urban density of sixty units or greater (e.g., a mixed-use neighborhood in Barcelona or New York).[3]

On the supply side, built environment features play a fundamental role in the way mobility services are hosted and sited, and therefore in whether users know they are available (in real time, e.g., visibility), feel assurance regarding their predictable availability (e.g., in planning a future trip), feel comfortable and safe waiting for or accessing them, and have a positive user experience at the beginning and end of their trip.

HEALTH

Many of the aspects of the built environment that enhance or detract from users' mobility access experience also affect their health. A positive experience accessing a mobility service due to, for example, a well-lit, safe, and appealing access point or "mobility access hub,"[4] generally translates to a positive impact on mental wellbeing relative to the experience without an access point or hub, while physical space enhancements designed to enhance mobility service access can also easily be chosen to enhance users' sense of inclusion and social connectedness.[5,6] An access point or hub within walking distance of a user invites use of active travel modes that replace what would have been vehicle trips and can contribute to increased physical activity as well.

Dedicated loading zones can enhance the safety and user experience associated with accessing ride-hail services,[7] while cities worldwide, largely inspired by Copenhagen and other bike-friendly cities, are increasingly providing lanes, signage, signals, and waiting zones designed to enhance bicycle safety. More recently, cities have been grappling with whether and how to provide appropriate infrastructure for "micromobility" services, such as free-floating scooters, bikes, and e-bikes, which are in the midst of a global surge,[8] and for which a host of safety questions have recently arisen.[9]

EQUITY

For a median income household in the United States, the cost of personal mobility is the second-highest contributor to annual expenses.[10] For low- and middle-income households, personal mobility is often the single highest expense. Although several factors are at play, this expense is due in part to the fact that low- and middle-income communities are increasingly located in areas with urban form characteristics that aren't conducive to being profitably or effectively served by providers of mobility as a service, including transit, taxis, ride-hail, and, more recently, micromobility services. These communities tend to fall on the losing end of the ridership vs. coverage tradeoff faced by transit agencies and other service providers.[11]

The positive effect of built environment features on walking and active transport is well established, but recent evidence suggests these improvements may only be benefiting socioeconomically advantaged groups.[12] Susan Henderson, a principal at urban design firm Placemakers who helps cities revise their land use codes to enable more walkable, transit-friendly, and livable cities, contends that "zoning is one of the classic ways to legally guarantee segregation."[13]

These factors combine to make the communities that would benefit most from independence from personal vehicles the most dependent on them. In many cases, the cost of a vehicle is out of reach, which effectively leaves residents without regular access to any mobility at all, leaving them further cut off from opportunities for employment and access to healthcare, healthful food, recreation, and opportunities for social interaction.[14] But there may be a way to design near-term mobility and urban design interventions that can begin to tackle this inequity and position more communities to benefit from mobility as a service.

The physical location of a mobility access point or hub, as well as design features within it, can help ensure greater equity of access to services as compared with better served parts of a city. Merely concentrating mobility services in a geographic area, including as a "package" that providers collaborate to offer, puts mobility service providers in a position to profitably serve a previously underserved area, even if they offer discounted services in that location. Mobility services introduced near existing transit stops, including dockless or free-floating scooters, bikes, carshare, or ride-hail, can serve to increase the reach of transit services by providing a first- or last-mile connection, increasing transit's effective service coverage area. Point-concentration of services also potentially puts cities in better position to direct subsidies (e.g., discounts for riders or incentives for providers) to areas that need them most. This approach becomes particularly relevant on the outskirts of central business districts where economically distressed neighborhoods, vacant or underutilized land, and sparse transit and other mobility service coverage are more common. This approach of concentrating mobility services at a "hub" can be combined with the introduction of physical design features and placemaking amenities to further enhance the inclusivity of a space and help draw economically diverse users.[15]

04 PROMISE OR PERIL? AN UNCERTAIN FUTURE

PROMISE OR PERIL? AN UNCERTAIN FUTURE

Credible transportation thinkers have painted future scenarios at the extreme ends of a startlingly large spectrum of possibilities for the future of cities as influenced by autonomous vehicles (AVs)—and everywhere in between. An *Economist* special report on how AVs will reshape cities put it thus: "Building cities around cars increases congestion, discourages the use of public transport, and encourages sprawl, all of which urban planners generally disapprove of. The odd thing is that autonomous vehicles could either reverse or accelerate each of these trends."[16]

On one side, the proliferation of AVs could lead to an unintended "hell"[17] scenario in which vehicle trip lengths, urban sprawl, and gridlock (along with its drain on economic productivity) increase as longer trips in mobile indoor spaces equipped with movie theaters, offices, and even beds make long commutes not only tolerable but preferable. As the per-mile cost of new mobility drops, as it is expected to do with further electrification and automation,[18] people may not think twice about sending empty vehicles all over the city "to pick up the groceries and the dry cleaning."[19] In this scenario, vehicle miles traveled and congestion increase, human interactions decrease, and health generally declines.

On the other end of the spectrum is a "heaven" scenario in which "new mobility in cities designed to shape and enable it" increases the affordability of mobility for all, enhances public health and social cohesion, and contributes to the reclamation of auto-oriented urban space for people-oriented uses and development of healthy, compact, connected communities and cities.

What are some tangible examples of how urban form could fundamentally change with new mobility?

05 POTENTIAL IMPACTS

POTENTIAL IMPACTS

REALLOCATING URBAN SPACE

Historically, with shifts in the availability of mobility options, there have been attendant shifts in the urban form. These shifts have been underpinned by changes to policy and planning theory among cities, urban planners, and engineers for how cities should—or should not—adapt to accommodate the introduction of new options for getting around. Likewise, the design and means of mobility have adapted alongside the evolution of our cities. The last major disruption in the relationship between mobility and the urban form came a bit over a century ago with the introduction of the automobile, and nothing has since influenced our current built environment or the form of our cities more.

PARKING

One of the expected impacts of the proliferation of new mobility on the built environment is a dramatic reduction in demand for parking as the price, convenience, and quality of new mobility services increasingly competes with personal vehicles.[20] Adoption of ride-hail services, while a mere proxy of what new mobility could ultimately become, has already been correlated to a significant reduction in on- and off-street parking demand in city centers on weekend nights[21] (as well as other effects, such as more crowded and contested curbs).[22] If this trend continues, parking, which currently accounts for about one-third of land space allocation in cities, could soon represent the greatest opportunity for reallocating underutilized urban space from auto-oriented to people-oriented use since the advent of the automobile.

If demand for parking continues to diminish with the advent of new mobility, as it is expected to do,[23] cities may be in a stronger position to eliminate minimum parking requirements, which in the United States have been by far the single greatest policy contributor to building cities around cars. Donald Shoup of the University of California at Los Angeles and others have suggested that eliminating parking minimums could contribute to greater availability of affordable housing and more proportionate distribution of societal costs associated with transportation infrastructure. "Required parking disproportionately increases the cost of low-income housing," Shoup contends, contributing to, on average, an "increase [in] the rent carless households pay for their apartments by 13%" and showing that "cities care more about free parking than about affordable housing."[24]

CURBS

Curbs, an already increasingly contested urban commons due to growth of ride-hail services in many cities,[25] may need to be reconsidered as well. New mobility might contribute to a general blurring of the lines of demarcation between space allocated to people and space allocated to vehicles in such a way that the two could commingle in widened streets opened up for unrestricted pedestrian use, or, in some cases, shared, off-street public spaces.[26]

STREETS

A growing contingent of academic researchers, transportation professionals, urban designers and architects, and municipalities have suggested that, in addition to parking, other elements of city infrastructure—such as streets, street networks, street lane widths and markings (where lanes still exist), traffic barriers, street drainage systems, signage, and stop lights, to name a few—could similarly become obsolete or merit reallocation or a complete rethinking with the advent of the new mobility paradigm. The most commonly cited cause of this disruption is AVs, but, increasingly, "micromobility"—dockless scooters, bikes, and unforeseeable future micromodes—which is in the midst of a global surge, is cited as well. Some transportation analysts argue that micromobility alone is already profoundly influencing the built environment and could be a sign that the next major transportation-driven disruption of urban design norms is already underway.[27]

FUTURE IMPACTS

Scarcely imaginable future mobility services and transportation technologies, particularly as they potentially expand into the vertical dimension, both upward and downward, could entail similarly new, yet to be imagined, and even more dramatic and disruptive possibilities for urban infrastructure than those entailed by the continued adoption of these readily foreseeable services.

CITIES FOR PEOPLE

New urbanists and others have long known and championed the idea that vehicles can be rendered largely or completely unnecessary in the presence of adequate walking and biking infrastructure within mixed-use, compact developments.[28] The shift to mobility as a service, by offering increasingly robust alternatives to personal vehicle trips, in some ways offers an opportunity to return to the fundamentals of pre-car urban development,[29] when city streets were considered a shared public place for pedestrians, pushcart vendors, horse-drawn carriages, streetcars, and children at play.[30] However, in the mid-1920s, automakers, dealers, and enthusiast groups, responding to an increase in pedestrian deaths that threatened the growth of the auto industry, lobbied to legally redefine the street so that pedestrians, rather than cars, would be restricted. The concept of "jaywalking," along with the now-standard legal precedent that pedestrians cross streets only at 90 degree angles and at crosswalks, subsequently took hold. If we consider that safety was the primary consideration in the legal redefinition of the street from a shared space to one prioritizing vehicles, aren't we now in a position to consider whether a new generation of non-accident-prone, computer-operated vehicles (or reduced vehicle demand more generally) could return some of our streets to shared use and unrestricted pedestrian and other people-centered activity?

Leading urban designers believe mass transit—due to its unparalleled ability to efficiently move people; its proven capacity to help create compact, connected, livable, and economically productive communities in its proximity and facilitate social interaction;[31] and its ability to equitably make mobility service available to citizens—will be a critical component of creating cities for people. In addition, they believe mass transit should serve as an anchor of new mobility technologies, including taking priority in incorporation of AV technology.[32]

Perhaps as with most things related to the "organic, spontaneous, messy, complex" evolution of cities,[33] there is likely a hybrid future that reflects both the fundamentals of walkable, bikeable, socially connected communities and a new-mobility-enabled evolution in urban form that only the iterations of urban form experimentation can fully reveal.

NEW URBAN FORM POSSIBILITIES THROUGH REDESIGNED VEHICLES

The dramatic influence that vehicle design can have on building and urban form is probably best illustrated through the example of emergency service vehicles, particularly fire trucks.[34] Starting with the assumption that fire trucks follow a particular and inflexible design paradigm—seven- to nine-feet wide, 40- to 50-feet long, capable of accommodating as many as seven firefighters and 400 to 500 gallons of water—has influenced countless street widths and parking regulations nationwide for the past century. By law, these trucks must be able to complete a U-turn in particular rights-of-way in cities across the United States, which translates to a more than 90-foot street width.[35] Cities have two choices if on-street parking is a concern, which it is in many cases: prohibit it and move it off-street, allocating valuable urban space to vehicles rather than people, or increase the street width by another 24 feet, which of course has the same effect. The unintended consequence of this well-intentioned accommodation of a safety-oriented public good is to erode the safety of the street itself because wider streets have been shown to encourage higher vehicle speeds and decreased pedestrian safety.[36] Rethinking the fire truck could unlock all-new design possibilities for urban form, as many European countries and Singapore, among others, have helped illustrate.[37]

It's easy to imagine that rethinking today's vehicles could have a similarly profound effect on urban form. The shift to new mobility concerns two fundamental shifts in vehicle design and operation (from human to self-drive and from fossil-fueled to electric), which alone would entail significant urban form impacts, as well as a third, parallel shift to mobility as a service. This third shift would mean a potentially dramatic increase in the volume and variety of modes and service types available for any given trip. By forcing a fundamental rethinking of which types of vehicles are appropriate for which uses, this third shift to mobility as a service could be even more influential on the built environment than the first two shifts. Today, we largely expect a single "tier" of vehicles—cars—to serve a wide array of uses, including spanning a very wide range of operating speeds.[38] Mobility as a service, however, enables services and vehicles (for cases in which "vehicles" are applicable at all) to be increasingly "purpose-built" for specialized uses and appropriate urban scales and speeds.

URBAN REWILDING: CREATING BIODIVERSE AND BIOPHILIC CITIES

One of the most promising applications for land potentially made available as a result of the shift to new mobility is greater presence of nature in our cities. As we consider the reallocation of urban space away from machines and machine storage and toward life, we can put cities in position to unlock the many health and wellness benefits of metro nature, including parks, gardens, the urban forest, and green spaces.[39] An ongoing study at the University of Illinois at Urbana-Champaign suggests that the health benefits of doing so can directly reduce healthcare costs. Matt Browning, assistant professor at the University's College of Applied Health Sciences, says the study team is expecting to find "a 1:10 to 1:100 ratio for investment in urban green space with regard to reduction of healthcare expenditures."[40] Cities with goals related to proximity to nature and recreation, such as New York City, whose PlaNYC sets a goal of each New Yorker being within ten minutes' walk of a park or playground, could be in better position to regreen their urban environments.

Wild environments more akin to those in which our species evolved, as well as a general blurring of the lines between "built" and "natural" in our urban environments, could become increasingly possible. Alan Berger, professor of landscape architecture at the Massachusetts Institute of Technology, suggests that "with much less redundant paving and more undisturbed land, autonomous suburbs will expand parks, bike trails, and farms, and reduce forest fragmentation. All the land we've given to the automobile can be put back into landscape and

ecological functions."[41,42] Such ecological functions could include critical habitat and corridors for migratory species and pollinators.

But the possibilities offered by new mobility for rewilding extend beyond the matter of availability of space. The criteria long, straight, paved, and level that generally dictate the design of today's urban streets—and largely resulted in the United States from the limitations of first horse- and then human-driven vehicles and the infrastructure they require—might become less relevant as vehicles capable of navigating much wilder (e.g., more undulating, slanted, forested, unpaved, and ecologically and geologically diverse and less manicured) environments get introduced.

The benefits would accrue not only to humans in cities, for whom the health and wellness benefits of proximity to nature or time in biophilic and bio-inspired public spaces and buildings have been well documented,[43,44,45] but also to major ecological systems more broadly, particularly with respect to biodiversity. Though the effect would likely be relatively small compared with other measures related to reducing greenhouse gas emissions, by rewilding their built environments with more and more diverse forms of life, cities can also enhance natural carbon sequestration.

TOWARD A CLIMATE-RESILIENT BUILT ENVIRONMENT

Climate-related stresses, particularly stronger storms, drastic changes in precipitation levels, temperature extremes, and land subsidence, are increasingly motivating cities to enhance their "urban resilience," defined by the American Planning Association as "the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience." Rockefeller Foundation's 100 Resilient Cities initiative was able to quickly enlist the interest and participation of some of the world's largest and most dynamic cities. Many of these cities have recently been hit by natural disasters illustrating the degree to which urban planning can enhance or detract from climate resilience.

Impervious surfaces—a dominant and often mandated feature of today's auto-centric built environment—have been implicated as a major cause of cities' vulnerable stormwater management systems. The Environmental Protection Agency's Green Streets program is working to address this by encouraging techniques such as introduction of vegetation or permeable pavings for capturing "rainwater at its source, where rain falls."[46] Managing the stormwater that enters cities by forcing it back out again could increasingly become a woefully inadequate strategy,[47] as what were once characterized as "five hundred year storms" increasingly become annual occurrences.[48]

Beyond increased pervious surfaces in cities, the potential resilience benefits of demand-responsive mobility and urban design solutions could extend to a city's and community's ability to prepare for storms, sustain less storm damage, and recover more quickly from damage sustained. If the built environment and mobility systems together become more demand responsive (due to, for example, a shift to mobility as a service along with more temporary use and modular, modifiable, and movable buildings and public spaces), they will inherently also become more storm- and disaster-responsive. Cities are also responding to a warming planet by replacing paved surfaces and hot, black roofs with trees and plants or white, low absorbance surfaces.

06

NAVIGATING RISK AND UNCERTAINTY THROUGH EXPERIMENTATION

NAVIGATING RISK AND UNCERTAINTY THROUGH EXPERIMENTATION

The broad spectrum of possibilities presented with equal fervor by transportation professionals at the extreme ends of the "heaven" and "hell" spectrum of scenarios points to a promising but fundamentally uncertain future. Rather than try to plan the future, as cities and planners have traditionally done via comprehensive land use and transportation planning, cities can best position themselves to achieve the version of "new mobility in cities designed to shape and enable it" that delivers on its full potential—enhancing health, reducing emissions, and improving equity—by adopting an iterative, experimental, failure-friendly approach guided by directional metrics reflecting city and community values. Comprehensive plans could still play an important role, but their role may shift from setting a destination to setting a direction.

EXPERIMENTATION THROUGH THE SMART CITIES CHALLENGE

In 2016, the US Department of Transportation created the Smart City Challenge (SCC), an unprecedented $40 million federal award to a single midsized city with the best plan to develop "ideas for an integrated, first-of-its-kind smart transportation system that would use data, applications, and technology to help people and goods move more quickly, cheaply, and efficiently."[49] A total of 78 cities applied. The SCC signaled a change in the way the federal government was thinking about the future of transportation. Typically funding national initiatives, the federal government was now primarily concentrating funding to a single demonstration city. Rather than fund a planned effort, it was now encouraging cities to try new ideas and experiment with a "first-of-its-kind" transportation system. The winning city would be able to share lessons from the ideas it tested with other cities, scaling impact nationwide.

One similarity among the top seven finalists' proposed approaches was telling of some of the common operational realities cities are facing. Each of these seven cities—Austin, Texas; Columbus, Ohio (the eventual winner); Denver; Kansas City, Missouri; Pittsburgh; Portland, Oregon; and San Francisco—proposed, to varying degrees, a means of conducting demonstration pilots. The cities had largely independently recognized that to navigate the new realities of multiple parallel revolutions in mobility, they needed a way to try, fail (fast), adjust, try again, fail again, adjust again, and so on. Those "fail" and "fail again" components—a concept familiar to the private sector[50]—was and remains in many cases a new and untested concept for cities subject to the expectations of taxpayers. Creating a culture amenable to it, rather than one that tries at all costs to avoid it, is perhaps the greatest challenge that cities still face in navigating their uncertain futures.

Increasingly, experimenting with short-term, on-ground mobility solutions at the city scale is part of a broader global approach of short-term experimentation in cities among mobility service providers, transportation organizations, developers, and urban designers and architects.[51] Synthesizing learning across this relatively recent wave of pilot activity surfaces three key enablers to successful experimentation and best practices associated with them: metrics, flexibility, and collaboration.

07 THE FIRST EXPERIMENTATION ENABLER: METRICS

THE FIRST EXPERIMENTATION ENABLER: METRICS

Janette Sadik-Khan, New York City transportation commissioner under Mayor Bloomberg who oversaw the transformative shift of Times Square from primarily auto-oriented to people-oriented use, said, "If you're not measuring it, you're not managing it." The long-term redesign of Times Square was preceded by short-term pilots—guided by metrics—that allowed the pilot team to "measure the street."[52] They temporarily opened street space for public use by re-striping, installing moveable traffic barriers, and introducing planters and chairs. Times Square's visitors quickly embraced the changes and the impacts to traffic flow were minimal, providing Sadik-Khan and her team with the evidence they needed to make the changes permanent.

One of the biggest challenges facing cities with respect to defining metrics for mobility is that transportation metrics have historically focused on the abstract and fundamentally nonhuman concept of "traffic"—that is, vehicles—rather than people. As Sadik-Khan emphasizes, "transportation data is so poorly evolved that there are few metrics to determine a street's success or failure beyond how many cars and crashes there are on a particular street."

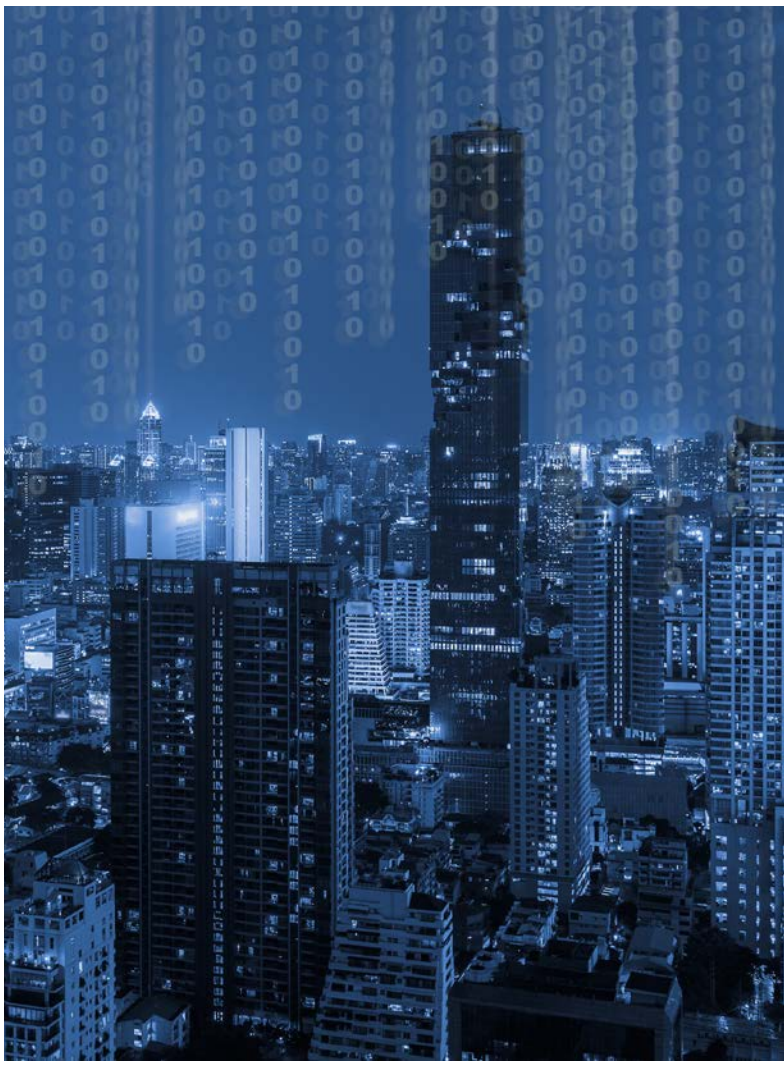
Despite the challenges, a few notable steps have been taken toward principles around or frameworks for such metrics. The Shared Mobility Principles for Livable Cities take a key step toward codifying a shared set of values relating to health, equity, and emissions, among other community values, that could help set the direction for the future of mobility and urban design.[53] Gehl Institute has created an Inclusive and Healthy Places framework providing metrics that can help cities move in a positive direction with respect to health, emissions, and equity in public spaces. Urbanism Next is an effort incubated by the University of Oregon that works to actively address "a shortage of systematic exploration on [AVs'] secondary effects on city development, form, and design, with implications for sustainability, resiliency, equity, cost, and general livability." The Urbanism Next framework provides a "list of impacts we should all be considering when looking at the [impact] new mobility, e-commerce, and the sharing economy will have on cities."[54] Despite the fundamental uncertainty of destination, cities and communities can nevertheless define and hold themselves to metrics that help define a shared *direction* allowing continuous shaping and enabling of new mobility and urban design in line with shared community values.

By doing so, cities have an opportunity to measure themselves against more people- and community-oriented outcomes. In an episode of the NPR show "TED Radio Hour" focused on the theme of building humane cities, host Guy Raz asked architect Liz Ogbu whether "cities could take...big chunks of land and do something very different with that land." Ogbu's response:

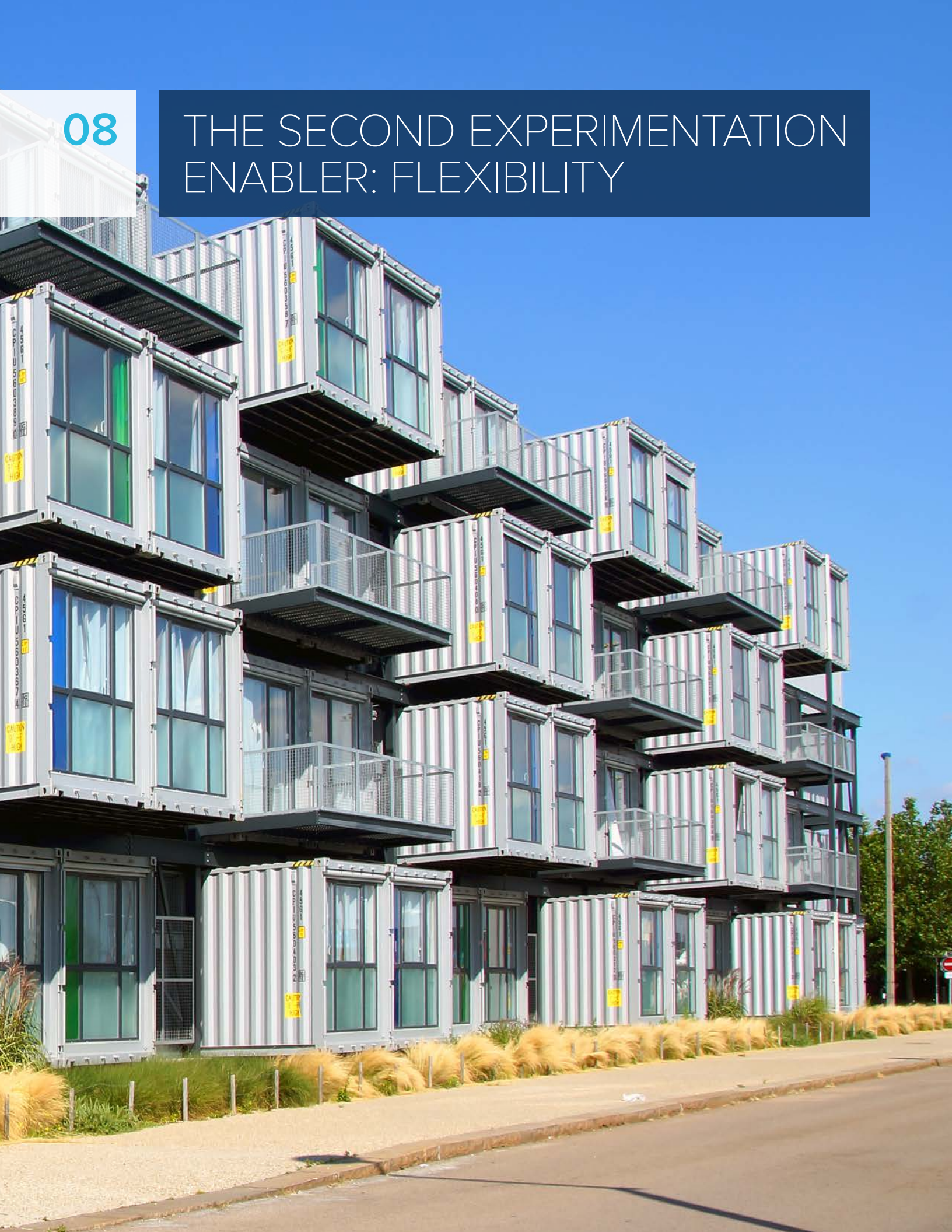
> It's a huge bit of risk. And it would require you setting up other metrics of success, right? I think it's completely reframing how we think about this ...shouldn't we be judging it in terms of number of better lives lived? It's harder to figure out how to measure that. But I don't know if this grand project that we call the city ultimately can work if we don't start to measure our success in those terms.

DATA

Once metrics are established, they can only be accurately evaluated with high-quality, available, and easily accessible data. To this end, many cities have created open data portals[55,56] to centralize data that is already publicly available to help identify gaps. The much more challenging aspect of accessing high-quality data relates to data owned by private entities, particularly private mobility service providers reluctant to share usage data for their services for fear it could undermine their competitive advantage. Several cities have nonetheless made significant progress toward establishing data sharing agreements with private mobility service providers that outline appropriate parameters and limitations to the data designed to address private company concerns. With regard to data related to use of public space, Gehl Institute has created a Public Life Data Protocol[57] to facilitate data centralization and access. SharedStreets is an effort geared toward creating a clearinghouse and common standards for data related to street and curb use that facilitates sharing of usage data from private mobility service companies. A consortium approach to data sharing and standardization, through which public and private entities can collectively agree on shared standards and protocols for data sharing, can also help facilitate greater availability, accessibility, and quality of public and private mobility data.[58,59]



08 THE SECOND EXPERIMENTATION ENABLER: FLEXIBILITY



THE SECOND EXPERIMENTATION ENABLER: FLEXIBILITY

Urban form flexibility takes two forms: regulatory and physical.

REGULATORY FLEXIBILITY

US cities have largely been designed and developed in accordance with highly rigid land use regulations aimed at separating uses (e.g., residential, commercial, and industrial). Euclidean (or single-use) zoning emerged during the Industrial Revolution, when separating homes from industrial uses was a very real public health concern. However, the practice has had many adverse consequences for design of cities, particularly since the advent of the automobile. Post-automobile (and in particular, post-WWII) city design combined with these regulations to create environments that are harder to travel through, amenities and vital needs that are harder to reach, and communities that are divided and often segregated. The automobile caused cities and planners to take single-use zoning to the extreme by moving commercial and employment centers far away from where people lived.

In the past two decades, progressive individuals and organizations in the planning world have sought to reverse the ills of single-use zoning. Groups such as the Congress for the New Urbanism and other urbanist organizations have championed alternative, more flexible approaches to designing our cities. These include form-based codes—land development regulations that employ physical form rather than use as the organizing principle of the code—and Pink Zones—areas where red tape is relaxed to remove impediments to economic development and community building.

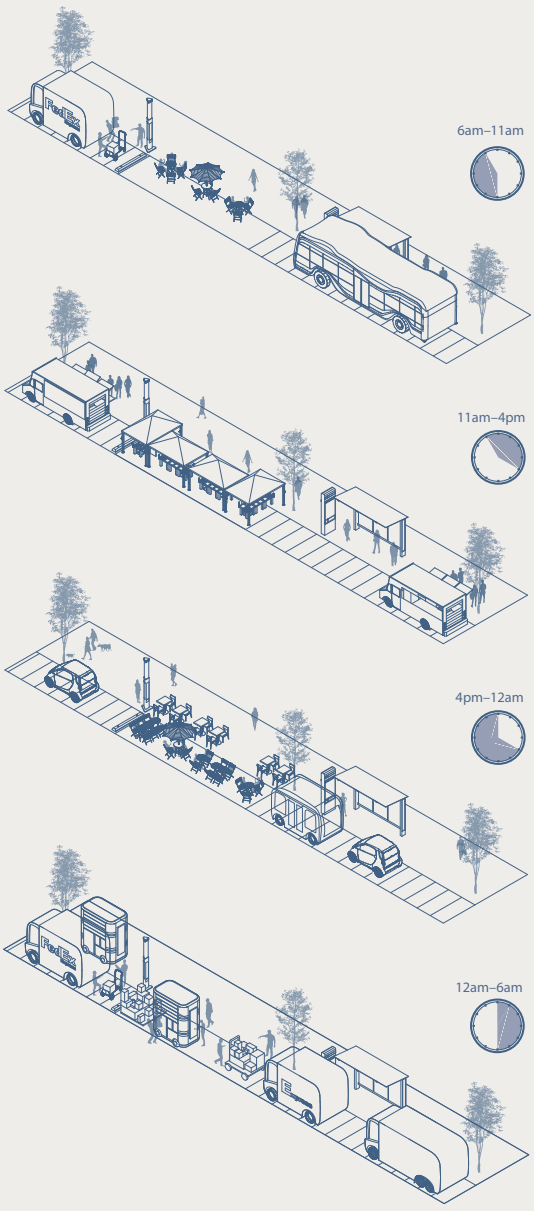
FORM-BASED CODES

The "form-based code" is arguably the most prominent alternative to single-use zoning to emerge in recent years. The form-based code seeks to create a framework for desegregating uses while allowing planners and communities to agree on building form. It aims for a contextually sensitive approach to achieving a diversity of uses consistent with a desired direction for a community. Simply put, the form-based code allows developers and planners to adhere to the existing "fabric" of a community (i.e., the size and style of buildings) while ensuring that new uses can grow and evolve. According to Placemakers, 387 cities in the United States have adopted codes meeting criteria established by the Form-Based Codes Institute.[60]

Arguably the most significant contribution of form-based codes to urban design and planning has been to give cities, planners, and developers (both large and small) a toolkit for increasing the flexibility of uses. Of course, mixed-use developments have existed for decades, but the permitting and "entitlements" process associated with building them has and continues to be extremely resource-intensive. Form-based zoning essentially paints a brush over a site, neighborhood, or city and allows a variety of housing and business types to commingle without the burden of red tape. This form of zoning set the stage for more recent, much more flexible urban forms that can continuously evolve into new forms over time.

FIGURE 3

THE NATIONAL ASSOCIATION OF CITY TRANSPORTATION OFFICIALS (NACTO) ENVISIONS CURB SPACE EMPLOYING BOTH REGULATORY AND PHYSICAL FLEXIBILITY THROUGH "CURBSIDE FLEX ZONES," WHICH CAN PLAY MANY ROLES, FROM PUBLIC SPACE TO LOADING ZONES. THEY COULD CHANGE USE OVER THE COURSE OF THE YEAR, WEEK, OR EVEN THE DAY.



Morning

Before the peak of the morning rush, freight deliveries arrive to stock stores with their goods for the day.

By 7:30, delivery vehicles give way to vehicles dropping off employees, many enjoying breakfast or coffee in a parklet on the way into work.

Mid-day

Late morning brings some deliveries of packages and mail to businesses and residents. At noon, the lunch rush begins bringing many people to street vendors to enjoy their mid-day meal.

By 2:00, most diners are back inside and light delivery activity continues until the evening rush.

Evening

The evening rush stops delivery activity as street and vehicle capacity is shifted to move people instead of goods. Passenger movement continues into the evening as people grab dinner or drinks, pick up children, or head to evening events.

Automated evening and late-night delivery activity allows for easy movement of large goods on underutilized streets.

Late night

Late at night the curb prioritizes freight vehicles. Passenger movement is at a minimum through the early hours of the morning, leaving more space for increased delivery services in cities. Delivery ease is increased through the use of nearby storage lockers.

In the morning, freight makes way for transit vehicles.

Image courtesy of the National Association of City Transportation Officials (NACTO)

PINK ZONES

In 2016, the James L. Knight Foundation funded an initiative in Detroit to pilot the creation and development of Pink Zones, where the existing restrictive and segregated zoning rules would be relaxed in an effort to spur small-scale, experimental development on shorter timelines than had previously been possible. The Project for Lean Urbanism expands on the idea of Pink Zones to recommend and in many cases offer parts of a full toolkit "to enable and encourage small-scale development and community-building." The recommendations and toolkit include not only a flexible and permissive approach to land use regulations and zoning rules, but a streamlined project approval process; permitting fee reduction or elimination; guidance for would-be small developers to navigate financial, regulatory, and bureaucratic processes; de-risked investment options in Pink Zones, identifying the least burdensome sources of debt and equity financing for the developer; a "platform" approach to pooling resources and supporting emerging markets within the Pink Zone, including shared space and equipment for similar business types and a defined pathway from temporary use to full-fledged brick-and-mortar retail operations; and small-scale economic development through land assembly, mentorship, pre-negotiation with local government, or crowd-sourced or cooperative financing.[61] The City of Detroit has selected a few key corridors to be revitalized through these flexible approaches to small-scale development. These innovative zoning districts will enable new businesses to emerge that can bring basic necessities closer to where people live, in turn making Pink Zone communities more self-reliant and reducing the need for vehicle trips to reach basic necessities.

CASE STUDY: FLEXIBILITY-FRIENDLY PERMITTING IN MEMPHIS

For nearly a decade, Memphis, Tennessee, has been a leader in "tactical urbanism," defined by the Tactical Urbanist's Guide to Materials and Design[62] as "an approach to neighborhood building that uses short-term, low-cost, and scalable interventions and policies to catalyze long-term change." Some would argue that the concept of tactical urbanism originated in Memphis. What makes Memphis unique, though, is the flexibility it has enabled through an innovative permitting system. In most cities, tactical urbanism and placemaking efforts can require time-consuming and often expensive permits, often for one-off events or demonstrations. In some cities, simple space improvements, such as sidewalk cafe seating or planters, can cost as much as $1,000.[63] Memphis, however, has created a permit that enables longer-term demonstration of the value of tactical urbanism efforts than many other cities can provide.

Led by Livable Memphis, the Memphis Medical District Collaborative, and Street Plans Collaborative, the City of Memphis created special events and temporary use permits that extend from thirty days to six months. The longer permits have enabled organizations to test the viability of a number of interventions, such as street designs and temporary retail. This approach also provides the opportunity to prove a case for making more permanent changes, such as bike lanes or public plazas.

CASE STUDY: TEMPORARY USE AS A TOOL FOR URBAN REGENERATION

Temporary Use as a Tool for Urban Regeneration (TUTUR) is a project formed through the European Union's URBTRACT initiative, which is focused on cities and urban redevelopment. TUTUR's primary mission is to improve the ease of establishing and to foster the growth of small-scale activations and tactical urbanism projects in cities throughout Europe. TUTUR also serves as a toolkit for cities, organizations, and individuals interested in breathing new life into forgotten or underutilized spaces, such as brownfields, abandoned buildings, parking lots, or any other space that is ripe for renewal.

In Bremen, Germany, an organization called ZZZ (ZwischenZeitZentrale) has used the TUTUR framework to revitalize vacant and underdeveloped land. Since 2009, TUTUR and the City of Bremen have identified and activated a multitude of sites, creating temporary shops, community gardens, and public spaces. On a regular basis, ZZZ hosts workshops with locals and practitioners within empty and un-leased retail spaces, an abandoned sausage factory, and other places that represent what the initiative is trying to transform.

In Budapest, Hungary, Lakatian, another TUTUR-inspired initiative, has sought to make use of underutilized spaces. Working with a range of partners, the initiative developed a framework and set of policies aimed at making it easier for organizations and individuals to access vacant properties. In addition, the Municipality of Budapest's Planning Department developed a database of properties owned by the city that could be put to better use. One of the more notable projects to emerge from this effort has been the Festival of Empty Shops, which was a month-long initiative through which vacant shops were transformed into event spaces, new retail opportunities, and other improved uses.

CASE STUDY: FLEXIBLE INTERPRETATION OF EXISTING LICENSING REGULATIONS IN PORTLAND

Food carts are now a mainstay in Portland, Oregon—the city is now considered one of the pioneers of a global food cart movement. Until 1997, licensing regulations prevented vendors from preparing food onboard or from occupying a location for more than a few hours at a time, and there was no regulation governing food carts operating on private property. Growing interest in food carts in the early 2000s put pressure on the city planners to develop a formal approach for regulation. Rather than create a new ordinance and set of regulations, city planners chose to reinterpret existing codes—a much faster process. Ingeniously, they created criteria by which food carts could be designated as commercial vehicles, effectively exempting them from most zoning and building codes: less than 16 feet in length and possessing a working axle and wheels allowing them to be moved at any point.

THE ROLE OF REGULATORY FLEXIBILITY IN ADDRESSING UNCERTAINTY AND FACILITATING COMMUNITY ENGAGEMENT

Given the uncertainty of emerging mobility services (and the way people use them), flexible zoning practices such as form-based codes and Pink Zones are critical for enabling cities to adapt and respond in a way that ensures the most positive outcome for their citizens, such as lower emissions and improved health and equity. In many parts of cities facing dire housing shortages, large-scale development is necessary. However, every city—even the high-demand, rapidly growing cities—has ample opportunity to facilitate flexible, temporary, and neighborhood-scale improvements that will help incrementally evolve the patterns of development in a way that harmonizes the rise of new mobility technologies and services with urban design.

PHYSICAL FLEXIBILITY

Buildings and public spaces appear to be in the early phases of a shift characterized by less permanence and greater emphasis on temporary uses, in turn making our built environments more dynamic, flexible, adaptive, and nimbly responsive to new needs. "Both theory and practice in urban planning and design, which has traditionally been overwhelmingly concerned with permanence, are increasingly showing signs of openness to a role for temporary activities, interim phases of development," and, in some cases, an acknowledgement that temporary uses are "intrinsically valuable," inherently fluid, and merit becoming "permanently flexible."[64] Cities are increasingly experimenting with "looser planning visions and design frameworks linked to phased packages of smaller, often temporary initiatives designed to unlock the potential of sites now rather than in 10 years' time." With the embracing of such flexibility and demand responsiveness comes an attendant decrease in risk aversion within the development community, which is fundamentally expanding the diversity of uses possible within spaces and contributing to a more experimental and iterative attitude among urban designers, planners, and developers. "Contemporary experiments in building with, for example, shipping containers…offer quick, inexpensive, and experimental solutions to a range of urban issues."[65]

DEMAND FOR PHYSICAL FLEXIBILITY: A BOOM IN MOBILE SERVICE INDUSTRIES

Driven by consumer demand, a trend toward demand-responsive business and service provision that emphasizes temporary or short-term use and is less rooted to a permanent place is observable in today's cities. Enabled in most cases by permissive and flexible land use regulation and driven in part by economic benefits to landowners and landlords associated with what would otherwise be vacant space,[66] food carts have become a phenomenon in several US cities and now account for over 4,000 locations employing 14,000 people and generating $2 billion in annual revenue.[67] Although this is still a minute fraction of the $800 billion restaurant industry in the United States, growth outpaced the restaurant industry by a factor of four from 2011 to 2016 and hasn't showed signs of slowing.[68] This is far from a fringe element of the restaurant industry—a food stand in Singapore was the first to be awarded a Michelin star in 2016, and several more of the coveted designations have been handed out to food carts since.[69]

Citing the benefits of lower rents, less commitment, and better ability to be geographically flexible and responsive to changing demand in an increasingly fast-paced retail marketplace relative to brick-and-mortar operations, giant corporations and start-up retailers alike have embraced the "pop-up shop."[70] In 2016, the "pop-up segment" was collectively valued at $50 billion in the United States.[71]

Mobile health clinics are also on the rise and have been shown to be very effective serving vulnerable populations and providing high-quality care at low cost. In 2014, an estimated 1,500 mobile clinics received 5 million visits nationwide per year. "Qualitative studies indicate that clients appreciate the convenient neighborhood locations that only mobile clinics can occupy" while addressing one of the most commonly cited barriers to healthcare access, particularly for vulnerable and underserved populations: transportation challenges.[72] Mobile health services have been projected to grow at a compound annual rate of over 30%, becoming a ~$200 billion market by 2025.[73]

Food carts, pop-up retail, and mobile health clinics are just a sampling of temporary use activity illustrating a broader shift to demand-responsive use of urban space in cities globally. Other examples include rapid growth in ad hoc community events, farmers' markets, festivals, concerts, and art installations, as well as moveable schools.[74]

In some cases, vacant land or underutilized parking is used as a temporary staging area for hosting or operating mobility services. Commuter shuttles serving major tech companies in the Bay Area have already begun using church parking lots (which generally sit underutilized for 164 of 168 hours per week) to stage their shuttles when not in use.[75] Community mobility access hubs such as those recently piloted in Austin[76] and Ontario, Canada,[77] offer a means of concentrating mobility services and other community amenities that would otherwise not be easily accessible in a single location, benefiting landlords, land owners, mobility service providers, city governments, and, most importantly, local communities—particularly those disproportionately affected by lack of access to food, health services, or affordable mobility.

CASE STUDY: BARCELONA SUPERBLOCKS—RECLAIMING THE STREET

Designed by Idefons Cerdà in the 1850s, Barcelona's L'Eixample district is composed of five- to eight-story buildings arranged around octagonal blocks, known as superilles (or superblocks). The design was meant to efficiently accommodate population growth and the physical expansion of the city. And indeed it has. On a per acre basis, Barcelona is one of the densest cities in Europe, despite lacking the massive-scale high rises that are associated with urban density. In recent decades, however, these superblocks have been clogged with personally owned vehicles—negatively affecting the walkability and safety of the city.

In an effort to reclaim space for pedestrians and cyclists, Salvador Rueda and his organization, the Urban Ecology Agency of Barcelona, developed a groundbreaking pilot project in the Poblenou neighborhood in East Barcelona. Launched in 2016, this new Superblock initiative transformed the interior of nine square blocks into pedestrian places and plazas, entirely through low-cost and tactical modifications. By placing traffic barriers, container trees, and playgrounds in the center of the octagonal blocks, Rueda and his team created an entirely new environment free from vehicular traffic. On the outer edges of the blocks, vehicles have been rerouted to circle the blocks, prioritizing peripheral parking and drop-offs within short walking distances to key destinations.

The superblocks initiative has gained worldwide attention as a community and governmental collaboration that showcases the potential of improving public space through cost-effective and adaptable means. The City of Barcelona has been closely examining the impact of the project and has observed a mere two- to three-percent increase in congestion on the outer edges of the blocks. Within the interior, public life has thrived and given rise to new developments, public space improvements, and successful businesses.

CASE STUDY: BETTER BLOCK FOUNDATION—ROCKSTARS OF TACTICAL URBANISM

Founded by Jason Roberts in the Oak Cliff neighborhood of Dallas, Texas, Better Block has had a significant impact on the way cities and community stakeholders participate in and collaborate around improvements to the urban form.

Better Block began as a guerilla effort to showcase highly desired community improvements. Over a weekend in 2010, Roberts and his team transformed a corridor in Oak Cliff by painting temporary bike lanes, trucking in large container trees, and filling sidewalks with homemade furniture. Virtually every element was technically illegal under existing Dallas code, so Roberts invited the city's policymakers to come visit the Better Block as an illustration of the regulatory barriers to improving cities. Prior to the modifications, the corridor resembled a classic auto-centric thoroughfare, but through these simple modifications, the environment transformed into a human-scale, vibrant center, more akin to a European boulevard.

Since launching Better Block, Roberts' organization has grown into an urbanist phenomenon, giving rise to copycats and a network of enthusiasts across the globe. In doing so, Better Block has dramatically changed the conversation around urban design, demonstrating that improvements to urban design need not require long, top-down, and capital-intensive infrastructure development, but that ground-up, temporary changes can have tremendous impact on quality of life.

CASE STUDY: CICLOVIAS

The Ciclovia (or cycle-way) movement grew out of a number of South and Central American cities, most notably, Bogota, Colombia, and Mexico City. Every Sunday, Bogota shuts down 76 miles of auto-dominated streets for reuse as cycle-paths and pedestrian plazas.[78] Although seemingly simple in nature, the initiative requires significant collaboration between communities and government. The result is a profound demonstration of how a city can, overnight, transform into a healthy, people-centric environment.

TECHNOLOGY ENABLERS OF PHYSICAL FLEXIBILITY

Several enabling built environment technologies that have become available in the past 10 or so years are further enabling and contributing to a shift to flexibility of uses in buildings and public spaces.

Modular Construction

The modular construction industry has been projected to grow at a compound annual growth rate of 7.1% starting in 2018 to a more than $100 billion global industry by 2023.[79] The majority of this growth is expected to be for permanent structures, but relocatable buildings are expected to comprise a growing source of demand as well.[80]

The key innovation in modular construction is prefabricated "volumetric construction modules" or standardized cubic structures (comprising, for example, an entire apartment unit) that are built off-site and then assembled into finished structures on-site. Interoperability is ensured by standardized electrical, plumbing, and structural connections between the units. Beyond volumetric construction modules, prefabrication methods associated with modular construction include structural insulated panels, curtain walls, and cross-laminated timber. These methods have been estimated to reduce construction costs relative to conventional construction by up to one-third,[81] while modular construction can save around 40% of construction time compared with traditional construction.[82]

In cities with an affordable housing shortage such as Austin, demand for "micro units" is on the rise, as is demand for quickly deployable, flexible, and modular housing.[83] This demand growth is fueling the rise of new companies specializing in modular residential construction.[84]

Manufacturing Process Improvements and Innovations

Additive manufacturing, such as 3D printing, as well as other forms of manufacturing process automation, are further contributing to cost and time-of-construction reductions in the built environment, in turn further enabling physical flexibility. In 2018, the first permitted 3D printed home, a 650-square foot unit comprising a living room, kitchen, bedroom, bathroom, and shaded porch, went up in the United States, going from "zero to finished in less than 24 hours and costing less than $10,000."[85]

Adaptable-Use Buildings

In 2017, Sidewalk Labs responded to and won an innovative request for proposals released by a tri-jurisdictional governmental partnership between Toronto, Ontario, and the Canadian government defining a multiyear partnership to build a smart city. A core aspect of Sidewalk Labs' submittal is buildings that accommodate a mix of uses and are reconfigurable to respond to changing demand. Sidewalk aims to demonstrate "a flexible building typology, Loft, with a strong shell and minimalistic interior that makes it quick and easy to convert building uses."[86] Such concepts aren't necessarily new—convertible buildings have a history at least as long as cities themselves—but potentially offer a means of achieving flexible use in the face of modern design challenges.

Developers in Mexico City, several US cities, and beyond are increasingly building for anticipated adaptive reuse of parking garages, allowing them to be easily converted to residential or commercial use with the anticipated reduction in demand for parking that they expect will come with the advent of new mobility.[87,88]

Movable and Relocatable Buildings

Sidewalk's Loft concept was no doubt inspired by a prior project undertaken by Dan Doctoroff, Sidewalk's CEO, while he was deputy mayor for economic development and rebuilding under Mike Bloomberg in New York City. The prior project was called the "Shed," a building designed to host myriad cultural events that "is like a transformer—the building literally moves."[89]

According to the Modular Building Institute, "Relocatable buildings are designed to be reused or repurposed multiple times and transported to different building sites. They are utilized for schools, construction site offices, medical clinics, sales centers, and in any application where a relocatable building can meet a temporary space need. These buildings offer fast delivery, ease of relocation, low-cost reconfiguration, accelerated depreciation schedules, and enormous flexibility. Relocatable buildings are not permanently affixed to real estate but are installed in accordance with…local code requirements." Flexible housing[90] that can temporarily accommodate spikes in demand for housing, particularly in the many cities facing a housing shortage, has become in many ways a robust design methodology complete with best practices around material choices, design for adaptive reuse, and design for expansibility.

09

THE THIRD EXPERIMENTATION ENABLER: COLLABORATION

THE THIRD EXPERIMENTATION ENABLER: COLLABORATION

CROSS-INDUSTRY COLLABORATION

Unlike the first two enablers, metrics and flexibility, which also represent observable trends, the third experimentation enabler, cross-industry collaboration, represents more of a gap that has yet—but needs to—become a trend. The collaboration that is needed is among the built environment, vehicle, and mobility service industries. Collaboration between the vehicle and mobility service industries,[91] despite instances of still working through operational challenges,[92] is observable to such a degree that they can be increasingly thought of as a combined vehicle-service industry. In addition to recently established partnerships between automakers and mobility service providers, there are cases of migration across the increasingly blurry line between them, as in several automakers' recognition that their future revenues may depend on their ability to sell miles rather than steel. Examples include BMW's efforts to enter the on-demand mobility space;[93] the establishment of Ford's Smart Mobility unit;[94] BMW and Daimler's collective investment in multimodal, on-demand mobility systems;[95] and Audi's move into the shared mobility space.[96] Of course, new entrants, such as Waymo, which is relatively new to both the mobility service and vehicle industries, are now leading the development of AV technology. Waymo's entrance is nonetheless a further illustration of the blurring line between mobility services and vehicles, as their efforts have involved key partnerships with the likes of Fiat Chrysler, Lyft, Avis, and Jaguar Land Rover.[97] The key missing collaboration link is between the built environment and the now largely combined vehicle-service industry.

Despite the influence that mobility and the built environment exert on one another, and despite the fact that leading practitioners within each of these industries acknowledge the influence of the other on their work,[98] there are few entities or efforts devoted to facilitating active collaboration or integration between these co-influencing industries. This lack of collaboration is particularly concerning when considering that both are in the midst of disruptions that will only increase their respective influence on one another. A notable exception is Urbanism Next's annual conference, one of the few convening mechanisms expressly geared toward facilitating collaboration at the leading edges of the built environment and mobility-service industries.

COMMUNITY ENGAGEMENT

> "Cities have the capability of providing something for everybody, only because, and only when, they are created by everybody."[99]
> —Jane Jacobs, author of *The Death and Life of Great American Cities*

Although built environment practitioners often have mechanisms for engaging local neighborhoods and organizations as part of the development process, the influence of citizen input is often limited to either incremental changes to pre-established development plans or blocking developments altogether.

As discussed in the previous section on flexibility, flexible approaches to development enable people to continuously respond to changes and inform the future development of their communities. Neighborhoods, which are often notoriously influential in blocking *potential* developments for fears of potential outcomes, are given the opportunity to experiment with a variety of uses and scenarios either continuously or before long-term and large-scale development takes place. Ultimately, these approaches help create consensus among residents about what they want.

MOD CITIES: KEY ELEMENTS

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The five elements of MOD Cities reflect the three experimentation enablers—metrics, flexibility, and collaboration—plus two elements related to people-orientation and ensuring integration with the communities and urban fabric at their edges.

METRICS

Just as metrics can help cities navigate uncertainty while ensuring positive outcomes with respect to shared human and community values and imperatives, experimental activity within MOD Cities would need metrics to help assess the success of built environment and mobility design experiments and thus guide the direction of subsequent design iterations. Guiding metrics for MOD Cities would ideally mirror broader city and community values and have the support and ownership of a breadth of community stakeholders. Human metrics related to improving overall health, health equity, safety, resiliency, affordability, and emissions reduction would likely play a prominent role given that they hold a consistent place in many cities' comprehensive plans. Of course, experiments would likely be subject to expectations among the stakeholders participating in them, particularly private sector companies, related to operational feasibility and profitability tied to consumer adoption as well. However, these are factors that would likely be driven by market forces and wouldn't require shared city or community metrics.

FLEXIBILITY

The establishment of MOD Cities would depend on regulatory flexibility allowing for built environment and mobility experimentation. A MOD City site would ideally be flexibly zoned, whether through an existing form-based code, establishment of a Pink Zone, or another means such as reinterpretation of land use regulations to allow for temporary use and experimentation. A MOD City site would also ideally benefit from a flexible licensing and permitting structure (e.g., one built around permissiveness of temporary uses) or by defining minimum requirements (e.g., related to adherence to land and building codes) for a broad range of uses that, if continuously met, wouldn't require traditional licensing and permitting at all.

The key function that MOD Cities would serve with respect to flexibility fall roughly into two categories: flexible demonstration of permanent new-mobility-oriented urban design and development, and flexible demonstration of flexible new-mobility-oriented urban design and development.

In the permanent case, MOD Cities would be places to test, in a flexible, rapidly iterative manner, solutions that could then become permanent, whether at or within a portion of a MOD City site that becomes permanent, or as part of replicating a solution from a MOD City to another location. In the flexible case, if users of MOD Cities see value in enduringly flexible solutions, they would be able to experiment with and refine adaptable technologies and operating models enabling ongoing and real-time demand responsiveness (e.g., to seasonal, daily, or even hourly demand).

COLLABORATION

MOD Cities would provide physical locations where the full suite of mobility and built environment stakeholders (i.e., cities, urban designers and architects, developers, financiers, automakers, and mobility service providers) could innovate and experiment in tandem with integrated combinations of built environment configurations, mobility services, and vehicle designs, including those never before conceived. The physical design space provided by MOD Cities would ideally be accompanied by a convening and incubation function allowing teams of stakeholders to regularly come together and identify opportunities for the most promising experiments while accelerating collective learning by regularly sharing their experiences and insights with one another.

PEOPLE ORIENTATION

One of the greatest sources of uncertainty regarding the future of the built environment and new mobility involves their greatest beneficiary: people. Consumer adoption today remains more art than science, as do attempts to predict people's response to disruptive technologies and business models. The startlingly wide spectrum of "hell" and "heaven" scenarios regarding the adoption of AVs alone—just one of of the four parallel revolutions associated with new mobility in cities designed to shape and enable it—is driven by uncertainty regarding how people will react to the technology, from both inside and outside the vehicles. The answer to this question alone will have profound impacts on design choices made by urban planners and designers for decades to come and can likely only be meaningfully illuminated by introducing the changes and seeing what works best in a real-world environment populated by people. MOD Cities, rather than being artificial test environments, will need to reflect such an environment, operating as "living laboratories." People would ideally live there, and at a minimum, would need to spend significant time recreating or dwelling there by choice. If it's not an attractive enough environment to draw people, it isn't worth pursuing and solutions developed there won't be scalable.

Because the buildings and public spaces within MOD Cities are likely to be reconfigured and even entirely moved or replaced on a fairly regular basis, the people living there would need to be comfortable with regular relocation. Examples of customer segments that might be open to such an "enduringly temporary" housing arrangement are nonetheless myriad. An increasing body of evidence indicates that millennials, urban professionals, and empty nesters are trending toward a desire for not only shorter leases but also less housing space (particularly when it comes in exchange for a greater sense of community or less distance to work),[100] the desire for geographic flexibility within and among cities, and flexibility to adapt single structures to changing needs.[101,102] A recent surge in start-up activity around housing-as-a-service models[103] in which the process of leasing an apartment increasingly resembles the process for securing a short-term stay in a furnished apartment á la AirBnB, and in which people are increasingly leasing a predesignated quantity of space rather than a *particular space*, suggests robust demand for flexible, diverse, and demand-responsive housing options.

This is not to suggest that residents of MOD Cities would be transient, at least not entirely. The communities within MOD Cities could benefit from a modicum of permanence even if their built environments are inherently impermanent.

INTEGRATION AT THE INTERFACES

In initial interviews with built environment and transportation planning practitioners geared toward testing the MOD Cities concept,[104] RMI received feedback that consideration of the scale of MOD Cities, both in terms of their physical boundaries and the scope of consideration of interventions conducted there, would require careful consideration. Urbanism Next has created a Sustainable Urban Design Framework[105] to define four different urban scales: Regional, District/Neighborhood, Block/Street, and Project/Parcel. At a minimum, MOD Cities would probably need to encompass the Project/Parcel scale as well as the Block/Street scale, but depending on the appetite of an initial group of stakeholders willing to explore it further, or its inherent scalability beyond its initial borders, MOD Cities could extend their reach to the District/Neighborhood or even Regional scale.

Assuming MOD Cities start at the smaller end of the scale, the way they would integrate with the surrounding urban fabric and existing transportation infrastructure would require careful consideration. No parcel, block, or neighborhood is an island; a designated zone for a MOD City would have to integrate with existing transit hubs and corridors. The design parameters of each MOD City would thus be highly location dependent and influenced by surrounding conditions with respect to existing mobility options and surrounding urban form. In this sense, MOD Cities would ideally reflect urban design and transportation best practices in terms of the way they integrate with their surroundings at the edges.

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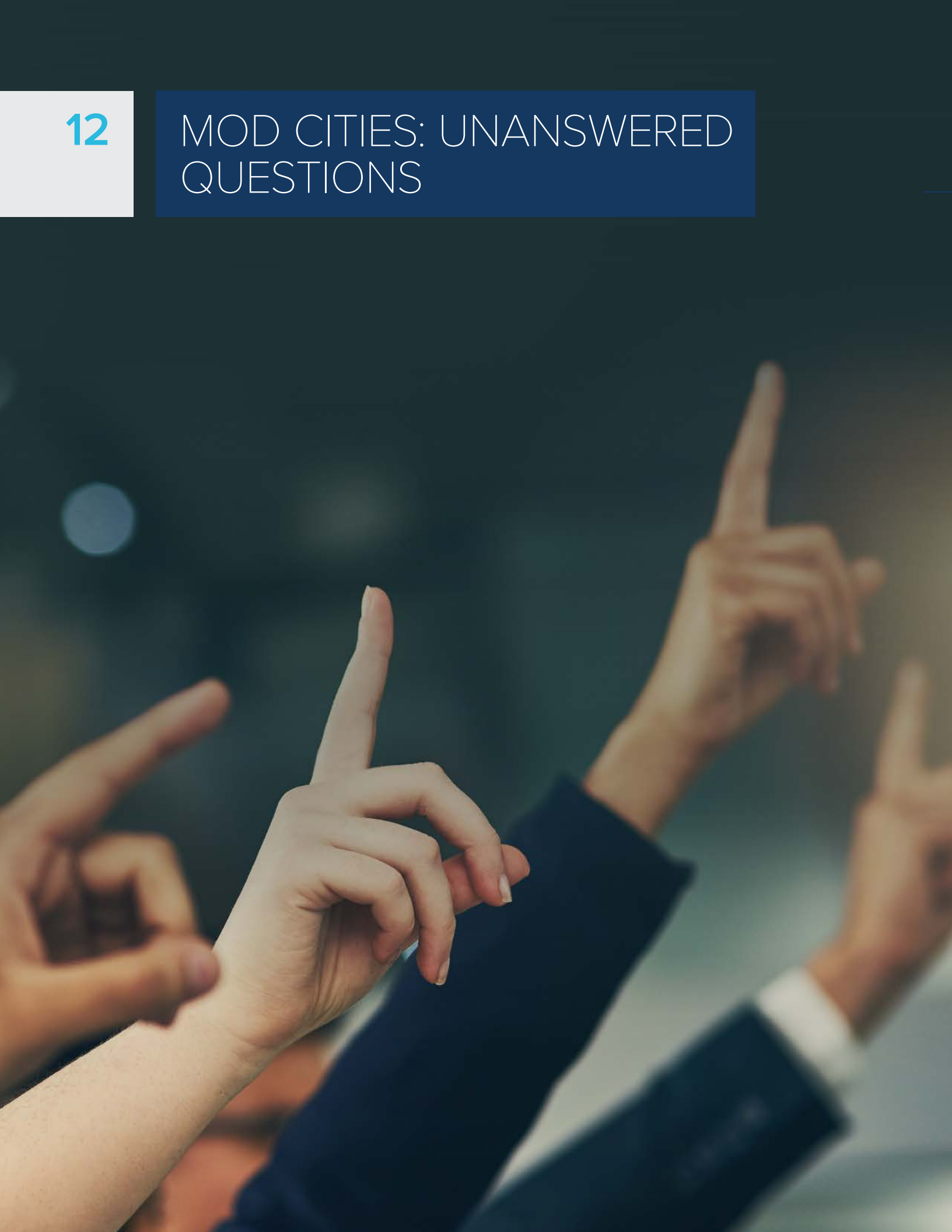
MOD CITIES: VALUE PROPOSITION BY STAKEHOLDER

MOD CITIES: VALUE PROPOSITION BY STAKEHOLDER

STAKEHOLDER GROUP	VALUE
FINANCIERS	A potential proof point that urban form that shapes and enables new mobility will enjoy sufficient consumer acceptance and demand relative to car-centric development, will generate attractive and stable financial returns, and is therefore an opportunity to win early market share on the leading edge of a potential paradigm shift
DEVELOPERS, URBAN DESIGNERS, AND ARCHITECTS	A potential opportunity to verify consumer acceptance and operational feasibility of developments amenable to new mobility, and therefore an opportunity to win significant competitive advantage; also the potential opportunity to explore, on shorter and lower-cost iteration cycles than otherwise possible, human-scale, new-mobility-oriented urban forms and building designs and configurations never before conceived
AUTOMAKERS AND MOBILITY SERVICE PROVIDERS (THE VEHICLE-SERVICE INDUSTRY)	An opportunity to experiment with the "art of the possible" and its associated consumer acceptance and operational feasibility, particularly with respect to the co-optimization of urban form, vehicles, and new mobility services, including the opportunity to completely reimagine vehicles' potentially blurry and overlapping interface with the built environment
LANDOWNERS	An opportunity to reduce the costs of vacant spaces and improve the physical condition of buildings[106]
CITIES/POLICYMAKERS	A potential proof point regarding people's willingness to try to use new mobility and live in communities that shape and enable it, and therefore a foundation from which to change policies to those enhancing new mobility-friendly design
ALL	Means of collaborative, rapid experimentation to identify, refine, implement, and scale mutually beneficial solutions

12

MOD CITIES: UNANSWERED QUESTIONS



MOD CITIES: UNANSWERED QUESTIONS

WHAT WOULD MOD CITIES ACTUALLY LOOK LIKE AND WHAT TYPES OF EXPERIMENTS WOULD HAPPEN IN THEM?

Although the elements of MOD Cities are relatively easy to describe, what they would actually look like is inherently less so. In the same sense that cities can know their direction but not their destination, MOD Cities represent an invitation, framework, and enabling infrastructure for co-innovation and experimentation guided by metrics that ensure mutually desirable outcomes, including emissions reduction, health, health equity, and affordability. What happens in them within those parameters will be largely up to the experimenters who use them and the precise metrics that guide the experiments. Just as a national lab can't prescribe or foresee the discoveries and advances that will occur within its walls (but can nevertheless predetermine criteria to determine which projects to fund), the potential solutions that could emerge from MOD Cities at the nexus of urban design, vehicles, and new mobility services are inherently unpredictable (but can be guided by predetermined metrics informing which projects to pursue and how to assess their success).

As Dan Doctoroff puts it, when speaking of the flexible design principles underpinning Sidewalk Labs' Loft concept as well as the Shed project at Hudson Yards in West Manhattan:

> Nobody's smart enough to predict the future. So you cannot plan to the detail or even…the gross level what's going to happen in the future. Instead, what you can do is create the infrastructure. That might be physical, it might be digital, might be some ground rules, et cetera, that enable people to project their own ideas and innovations onto it as taste, technologies, and trends begin to change.[107]

WHO WOULD MANAGE MOD CITIES AND HOW WOULD THEY BE PAID FOR?

Should the MOD Cities concept garner sufficient interest among a cadre of willing stakeholders, a key next step would be to determine an operating and revenue model. Would cities define the length of experiments and coordinate stakeholder teams to use the site, or would a third party comprising representatives from across the industry be more appropriate for that? Would MOD City sites be "enduringly temporary," with a maximum experimentation length defined, or would it make sense for successful experiments to be granted permanent "residence" at MOD City sites? Would the revenue model work just like it would for traditional residential and commercial developments, or would other stakeholders, such as mobility service providers and automakers be willing to "pay to play" at MOD City sites? If so, how would that revenue be managed and to whom would it accrue? Would housing at MOD City sites be subsidized, either through local or federal budgets? Should MOD City sites prioritize low- and middle-income areas in cities? If so, would they be eligible for federal incentives such as the recently established "Opportunity Zone" tax incentive?[108]

13 RECOMMENDATIONS AND NEXT STEPS

RECOMMENDATIONS AND NEXT STEPS

With this report, RMI hopes to (1) provide cities and other mobility and built environment stakeholders with an experimentation toolkit that puts them in a position to more quickly unlock the full potential of new mobility in cities designed to shape and enable it, and (2) engage stakeholders in further codeveloping and exploring the MOD Cities concept.

In essence, the concept of MOD Cities is geared toward enabling city experimentation. The "experimentation toolkit," below, can both inform standalone experimentation-oriented projects and provide steps along the way to more comprehensive MOD Cities implementation.

RECOMMENDATIONS AND NEXT STEPS: THE EXPERIMENTATION TOOLKIT

Next steps that cities and other built environment and new mobility stakeholders can take reflect the experimentation enablers: metrics, flexibility, and collaboration, and are drawn from illustrative case studies such as those previously explored in this report.

METRICS

Effective experimentation requires a shared sense, among involved stakeholders, of what success looks like. Because much of the value of experimentation can result from the unpredictability of precise outcomes, success is often best defined as a direction rather than a destination. Metrics provide the "guard rails" that can help cities and other mobility and built environment stakeholders define—and assess whether they're moving in—a shared and desirable direction. Metrics can also serve as criteria for helping stakeholders identify and prioritize the most promising experiments, as well as a common language for describing their potential impact.

As is often the case with work involving cities with similar conditions, challenges, and aspirations, metrics development can be rapidly advanced by understanding what metrics and methodologies have already been successfully adopted and applied. Metrics that cities have already adopted, as well as the data collection approaches that inform them, are strikingly similar and, with few exceptions, include emissions, health, and equity to varying degrees. For a list of next steps and applicable resources see the Appendix.

FLEXIBILITY

Regulatory flexibility (e.g., a wide variety of permissible land uses) and physical flexibility (e.g., building materials and techniques that allow quick and cost-effective means of modifying public space and buildings) together determine how much freedom stakeholders involved in an experiment have in identifying novel solutions. In general, more flexibility means more innovation. With respect to regulatory flexibility, several cities are already employing techniques ranging from designated flexible-use zones to reinterpretation of existing land use codes to allow a wide variety of temporary land, public space, and building uses, almost always doing so with a limited geographic scope, at least to start. With respect to physical flexibility, developers, urban designers, and mobility service providers are making more use of temporary structures and features in combination with quickly deployable mobility solutions to repurpose underutilized land. The Appendix lists possible next steps to take and resources to employ to increase flexibility in land use, parking, regulation, street use, and mass transit.

COLLABORATION

For opportunities that require collaboration among people with differing views and expertise, such as experimenting at the nexus of new mobility business models and a flexible built environment, a carefully designed collaborative process is critical. Many cities have mechanisms in place to convene different city departments, government jurisdictions, and, in some cases, the private sector. However, with a few notable exceptions, collaboration mechanisms to bring together built environment and mobility practitioners, regulators, and financiers are few and limited. The Appendix presents a few ideas for areas where stakeholders can put collaborative processes in place, as well as ideas for setting up ongoing interactions with key stakeholders.

RECOMMENDATIONS AND NEXT STEPS: MOD CITIES

RMI is testing interest in further discussions and a potential convening in 2019 to accelerate new mobility in cities designed to shape and enable it by (1) further fleshing out and applying the experimental toolkit described here, and (2) further defining the MOD Cities concept. Depending on interest, this could include discussing applicable governance processes, identifying viable locations, confirming interest among willing stakeholders, and beginning to define an operating model. We invite questions and feedback on the overall content of this report, as always, and encourage you to indicate your interest in participating in the conversation by contacting us.

14 APPENDIX: THE EXPERIMENTATION TOOLKIT PATHWAY

APPENDIX: THE EXPERIMENTATION TOOLKIT PATHWAY

METRICS

POSSIBLE PATHWAYS	LED BY
Research existing city-level metrics frameworks and select the elements of each that are most applicable to the local community and built environment and mobility experimentation.	City planners, community-based organizations, neighborhoods, citizens
Characterize the needed processes for running experiments of various kinds (including creating a list of opportunities of interest) and evaluate how data could be used to support and drive these. Consider existing and likely future data gaps, for instance, and how and where high accuracy is required to determine success. And evaluate how data can support critical data enabling metrics-based measurement and evaluation, including data gaps.	Cities, analytical support/consultants, public and private data consumers and producers
Engage a neutral entity to help provide best practices and highlight applicable evaluation frameworks for experimental approaches to new mobility service and built environment interventions.	Nongovernmental organizations (NGOs) such as Victoria Transport Policy Institute (VTPI) or RMI
Test, via a workshop, online portal, or similar, a draft list and description of ideas, processes, and metrics with community stakeholders to garner public comment, ensure inclusivity, and enhance a shared sense of co-ownership in the city's experimental future.	Cities, community-based organizations, neighborhoods, citizens
Investigate existing methodologies and best practices—for data collection, objective observational techniques, and vehicle GPS and usage data from public and private mobility service providers—that can help measure the success of built environment and mobility service experimentation.	Cities
Replace "level of service" as the predominant method of measuring traffic with "vehicle miles traveled."[109]	Cities and states
Explore existing open data portals, data standardization, and exchange tools to increase the availability, quality, and accessibility of data that can inform use of mobility services, streets, and public space, including appropriately characterizing which data applies before, during, and after an experimental built environment or mobility service intervention.	Cities, supported by regional/state authorities and regulators
Create/source a data management system for data enabling metrics-based measurement and evaluation.[ii]	Cities, public and private "smart cities" players including data consumers and producers

APPLICABLE TOOLS AND RESOURCES

- US Department of Transportation SCC vision narratives (https://www.transportation.gov/smartcity/visionstatements/index) and full proposals
- The Circles of Sustainability model developed by the UN Global Compact Cities Programme (https://www.circlesofsustainability.org/)
- The Green City Index (http://etms.espon.eu/rankings/2012_European_Green_City_Index_sum_report.pdf)
- The IESE Cities in Motion Index (http://citiesinmotion.iese.edu/indicecim/?lang=en)
- The Gross National Happiness index (https://ophi.org.uk/policy/national-policy/gross-national-happiness-index/)
- Inclusive Healthy Places framework developed by Gehl Institute (https://gehlinstitute.org/wp-content/uploads/2018/07/Inclusive-Healthy-Places_Gehl-Institute.pdf)
- Transportation for America's Performance Measures Report: Measuring What We Value (http://t4america.org/maps-tools/performance-measures-report/)
- Shared Mobility Principles for Livable Cities (https://www.sharedmobilityprinciples.org/)
- RMI's publications pertaining to mobility data collection and management systems, including Data-Driven Mobility, prepared for the government of India (http://niti.gov.in/writereaddata/files/document_publication/Mobility-data.pdf); A Consortium Approach to Transit Data Interoperability (https://rmi.org/wp-content/uploads/2017/03/consortium_approach_to_ITD_report2016.pdf); and Interoperable Transit Data: Enabling a Shift to Mobility as a Service (https://www.rmi.org/insight/interoperable-transit-data/)
- Gehl Institute's Public Life Data Protocol (https://www.planetizen.com/news/2017/11/95666-new-public-life-data-protocol-aims-revolutionize-public-life)
- SharedStreets public data commons approach (https://sharedstreets.io/)

[ii] A data management system includes a means of hosting and organizing publicly available data, such as an open data portal, as well as a means of collecting privately owned data, including defining licensing terms, ensuring data privacy and security, and pursuing, where necessary, data sharing agreements with private data producers.

FLEXIBILITY

	POSSIBLE PATHWAYS	LED BY
LAND USE	Create a public listing and schedule of municipal land available for temporary or experimental use.	Cities
	Host or facilitate the creation of a public listing of private land available for temporary uses along with conditions of its use, where applicable.	Cities or landowners
	Issue guidelines to built environment practitioners and mobility service providers clarifying permissible temporary or experimental use of vacant or underutilized land and applicable mobility-related regulation governing mobility service pilots.	Cities
	Create a central website for public and private owners of underutilized land clarifying the value proposition and return on investment potential associated with different temporary use cases.	Cities, public and private landowners, software entrepreneurs
	Conduct a public and private land utilization study to identify potentially promising sites for temporary or experimental use such as underutilized parking lots.	Cities, NGOs, and/or landowners
	Create or facilitate the creation of a working group to characterize the value proposition (e.g., return on investment potential) and impact potential of various temporary uses, ideally referencing metrics reflecting shared community values (e.g., emissions, health, and equity)	Cities or NGOs
	Actively disseminate information regarding the revenue opportunity associated with temporary and experimental uses to mobility service providers and built environment practitioners.	Cities and NGOs
	Issue individual competitive bids to invite temporary and experimental uses among built environment practitioners and mobility service pilots, including, ideally, evaluation criteria reflecting metrics informed by shared community values.	Cities
	Create an unsolicited bid process to allow for ongoing solicitation from built environment practitioners and new mobility providers for temporary and experimental land uses and mobility service pilots.	Cities

	POSSIBLE PATHWAYS	LED BY
LAND USE	Issue competitive bids, guided by metrics, for mobility service pilots to demonstrate public demand and operational feasibility of new services.	Cities
	Create a marketplace resembling an "Airbnb for urban space" to facilitate transactions among landowners, developers, and temporary users such as retailers, housing providers, and event planners, including clarifying pricing and use requirements for different land use cases.	Cities, landowners, developers, software entrepreneurs
PARKING	Engage the private sector to understand the latest offerings in demand-responsive and data-driven approaches to managing parking, including low-cost sensors and real-time pricing.	Cities, parking management service providers, smart parking technology providers, parking experts within academia
	Engage parking experts and cities that have undergone parking regulation reform to understand applicable policy, best practices, and practical approaches to reducing parking.	Cities
LAND USE REGULATION	Engage other cities to create a "Land Use Regulation Exchange" to identify and share examples of land use code revision zoning approaches and permitting structures that have played a role in enabling personal-vehicle-alternative mobility and non-auto-centric experimentation and development in cities.	Cities
	Establish "flexible-use zones" (e.g., Pink Zones) within cities to streamline or eliminate the permitting process for small-scale activations, tactical urbanism projects, and other temporary uses enabling experimentation at the nexus of the built environment and new mobility.	Cities
	Re-interpret existing land use regulations to allow for temporary uses such as food carts, pop-up retail, farmers' markets, modular educational facilities, community festivals and gatherings, and mobile health clinics.	Cities

	POSSIBLE PATHWAYS	LED BY
LAND USE REGULATION	Adopt a form-based code in geographic areas best positioned to benefit from a diversity of uses.	Cities
	Adopt a form-based code, ideally including guidelines enabling temporary and experimental use.	Cities
STREETS	Investigate best practices and frameworks regarding flexible street design and management.	Cities and transportation NGOs such as National Association of City Transportation Officials (NACTO) and Smart Growth America
MASS TRANSIT ROLES	Create a working group to explore and implement experimental and technology-enabled mass transit solutions including autonomous rail rapid transit, integration with private services, road trains, and integration of app-based journey planning and digital booking and payment.	Transportation NGOs such as RMI and Urbanism Next
	Pilot and experiment with new service offerings and routes, such as demand-responsive and flexible services.	Transportation NGOs such as RMI and Urbanism Next

APPLICABLE TOOLS AND RESOURCES

- Smart Growth America's Complete Streets resources (https://smartgrowthamerica.org/program/national-complete-streets-coalition/)
- NACTO's Urban Street Design Guide (https://nacto.org/publication/urban-street-design-guide/)
- NACTO's *Blueprint for Autonomous Urbanism* (https://nacto.org/publication/bau/curbside-management/)
- Shared-Use Mobility Center's Shared Mobility Policy Database: (http://policies.sharedusemobilitycenter.org/#/)
- Lessons learned from demand-responsive and smart parking pilot projects (http://sfpark.org/)
- Existing transaction exchanges for developable land (https://oppsites.com/)
- Transit agencies conducting experimental and technology-enabled pilots, including Capital Metro (https://www.capmetro.org/About-Capital-Metro/Media-Center/News-Stories/2018-News-Stories/4294970588/) and Massachusetts Bay Transportation Authority (https://www.mbta.com/accessibility/the-ride/on-demand-pilot)

COLLABORATION

POSSIBLE PATHWAYS	LED BY
To streamline metrics development, flexible-use evaluation, and applicable permitting and policy-related enablers of temporary and experimental land use and mobility service pilots, create a Built Environment and New Mobility working group. This group should have a clear charter, consisting of city departments traditionally focused on transportation with those focused on transportation infrastructure and the built environment (e.g., Transportation Department, Public Works, Planning and Zoning)	Cities
Create an intergovernmental working group among relevant government entities to facilitate cross-jurisdictional decision-making related to temporary land use and mobility service pilots (e.g., municipal transportation and land use departments, state departments of transportation, county government)	Cities or counties or regional government groups
Create, via an online portal, regular meetings, or similar, a community engagement mechanism to allow citizens to regularly participate in and provide input on temporary and experimental land uses and new mobility pilots.	Cities
Create or facilitate the creation of a multistakeholder working group or convening to identify, govern, finance, and monitor and evaluate temporary land use and mobility service pilot opportunities (e.g., automakers, mobility service providers, developers, landowners, financiers, community-based organizations, citizens)	NGOs such as Urbanism Next and RMI

APPLICABLE TOOLS AND RESOURCES

- Victoria Transport Policy Institute's online resources highlighting best practices and evaluation frameworks for experimental approaches to new mobility service and built environment interventions (http://www.vtpi.org/)
- Urbanism Next's Sustainable Cities Initiative (https://sci.uoregon.edu/urbanism-next-0)
- Community engagement tools and initiatives created by organizations with a history of creating people-oriented cities, such as Knight Foundation (https://knightfoundation.org/press/releases/major-5-25-million-knight-foundation-initiative-puts-people-at-the-center-of-local-self-driving-vehicle-programs), Public City (https://public-city.org/), Gehl (https://gehlpeople.com/) Gehl Institute (https://gehlinstitute.org/), and Better Block Foundation (http://www.betterblock.org)

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ENDNOTES

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