

# 2022

APA FORESIGHT

# Trend Report for Planners

Stay a step ahead of the issues impacting planners' work—and our communities, today and tomorrow.

Brought to you by the American Planning Association and the Lincoln Institute of Land Policy.



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## Trends for 2022

The trends in this report are structured in three timeframes, which indicate the urgency of planners' action. Within each timeframe, trends are grouped into themed clusters.



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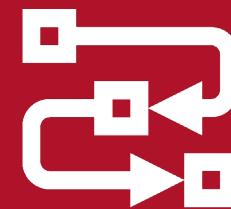
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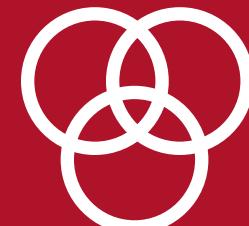
# The framework



About  
This Report



Methodology



Trend  
Patterns

# About This Report

This report was developed by the American Planning Association (APA) in partnership with the Lincoln Institute of Land Policy. The core of this report is a list of nearly 100 existing, emerging, and potential future trends that the APA Foresight team identified as relevant to planning.

The trends are structured within three timeframes (Act Now, Prepare, Learn and Watch), which indicate the urgency of planners' action. Within each timeframe, trends are grouped into themed clusters. For each trend, the report gives insights on what the trend is about and explains why they are important for planners to know about and consider in their work. Additionally, the report describes "trend patterns," which explore the bigger-picture developments rooted in the variety of trends observed and how they affect planning.

Finally, the report addresses the future of planning, explaining

how the planning profession will have to evolve to keep up with a continuously changing world, what new skills planners will have to develop, and which new tools are worth trying.

## How to use this report

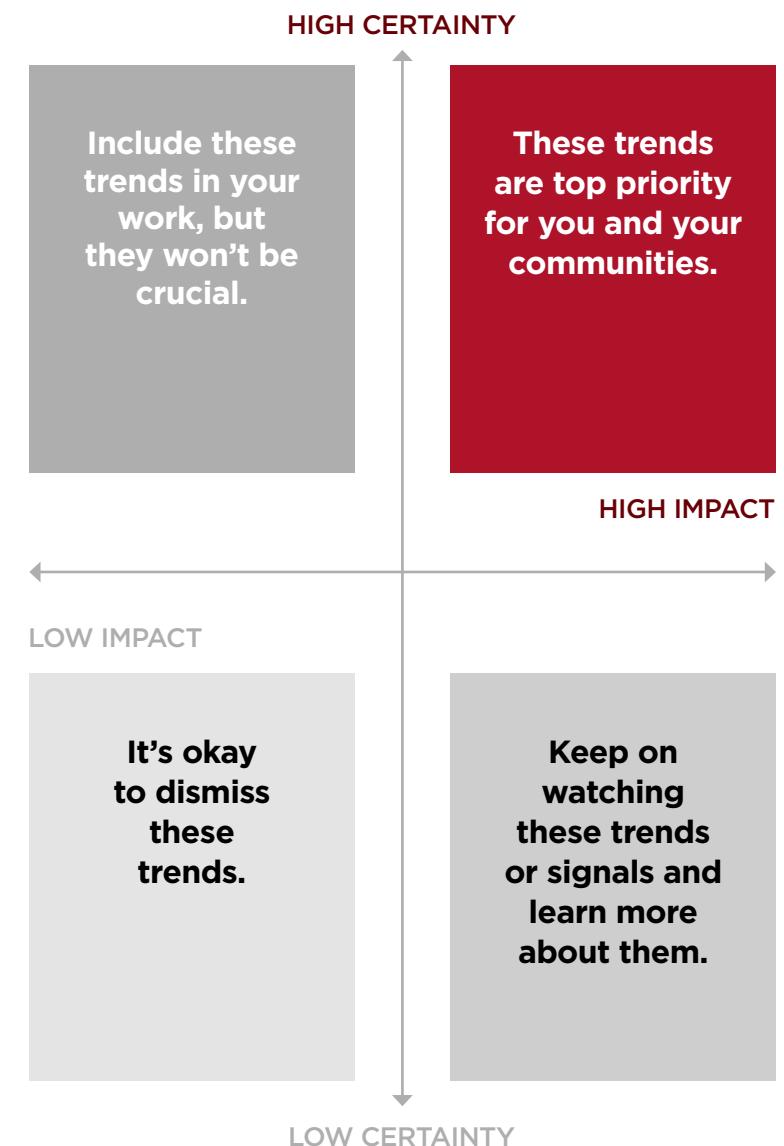
The report is not intended to be read in one piece. Planners can use the trends listed in this report as input for their long-range and current planning processes, to practice strategic foresight during [community visioning](#) processes, for [scenario planning](#), or simply to inform future decision-making. For more on how planners can use the multiple trends

of this report in a foresighted approach, read APA's [PAS QuickNotes No. 94, "Planning With Foresight."](#)

## How to determine which trends to consider in your work

The report outlines almost 100 different trends. To determine and prioritize the most important trends to consider in their work, planners can evaluate and rate the trends based upon (1) the expected extent and severity of the potential impact and (2) how certain or uncertain it is that a trend will occur in a community. The prioritization graph demonstrates how these two factors interact in the evaluation of trends. Trends in the upper right quadrant of the graph—high impact and high certainty—represent the top priority trends planners should pay special attention to.

## Trend Prioritization for Planners



# About the American Planning Association

The American Planning Association is an independent, not-for-profit educational organization that provides vital leadership in creating great communities for all. APA and its professional institute, the American Institute of Certified Planners, are dedicated to advancing the profession of planning, offering better choices for where and how people work and live. The nearly 40,000 APA members work in concert with community residents, civic leaders, and business interests to create

communities that enrich people's lives. Through its philanthropic work, APA's Foundation helps to reduce economic and social barriers to good planning. APA is based in Washington, D.C., and Chicago. Learn more at [planning.org](https://planning.org).

## APA Foresight—learning with the future

APA Foresight helps planners navigate change and prepare for an uncertain future. With foresight in mind, planners can guide change, create more sustainable and equitable outcomes, and establish themselves as critical to thriving communities.

Foresight is not about predicting

the future—it is about understanding drivers of change that are outside of our control, how we can prepare for them, and when it is time to act. APA Foresight identifies emerging trends and how scenarios stemming from each may impact the world, our communities, and the planning profession in the years to come. The path forward requires adjusting, adapting, and even reinventing planning processes, tools, and skills to meet the needs of a changing world. Through APA's foresight practice, planners will find support, training, and new research for making sense of the ever-changing future. For more information on APA Foresight, visit [planning.org/foresight](https://planning.org/foresight).



American Planning Association

*Creating Great Communities for All*



CONSORTIUM FOR  
SCENARIO PLANNING



LINCOLN INSTITUTE  
OF LAND POLICY

# About the Lincoln Institute of Land Policy

The Lincoln Institute of Land Policy seeks to improve quality of life through the effective use, taxation, and stewardship of land. A nonprofit private operating foundation whose origins date to 1946, the Lincoln Institute researches and recommends creative approaches to land as a solution to economic, social, and environmental challenges. Through education, training, publications, and events, the Lincoln Institute integrates theory and practice to inform public policy decisions

worldwide and organizes its work around the achievement of six goals: low-carbon, climate-resilient communities and regions; efficient and equitable tax systems; reduced poverty and spatial inequality; fiscally healthy communities and regions; sustainably managed land and water resources; and functional land markets and reduced informality. For more information visit [lincolninst.edu](https://lincolninst.edu).

## Consortium for Scenario Planning

The Consortium for Scenario Planning at the Lincoln Institute of Land Policy offers a community of practice for practitioners, including access to technical assistance, educational resources, and a network of fellow

innovators. Its mission is to improve the practice of scenario planning and broaden its use in communities of all sizes across disciplines. This community of practice helps to foster growth in the use of scenario planning at all scales. Through research, peer-to-peer learning, networking, training, and technical assistance, we help communities develop better plans to guide a range of actions, from climate change adaptation to transportation investment. In addition to planners, the Consortium also convenes researchers and software providers to develop more effective tools and reduce barriers to entry. For more information visit [lincolninst.edu/research-data/data-toolkits/consortium-scenario-planning](https://lincolninst.edu/research-data/data-toolkits/consortium-scenario-planning).

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# Methodology

## Foresight Methodologies

### TREND SCANNING

Researching existing, emerging, and potential future trends (including societal, technological, environmental, economic, and political trends, or STEEP) and related drivers of change.

### SIGNAL SENSING

Identifying developments in the far future and in adjacent fields outside of the conventional planning space that might impact planning.

### FORECASTING

Estimating future trends.

### SENSE-MAKING

Connecting trends and signals to planning to explore how they will impact cities, communities, and the way planners do their work.

Source: [PAS QuickNotes No. 94, "Planning with Foresight."](#)

## Trend Timeframes

Identified trends are grouped depending on their urgency:

### ACT NOW

Existing trends planners need to act on today.

### PREPARE

Emerging trends planners need to prepare for.

### LEARN AND WATCH

Potential future trends or signals planners need to learn more about and keep watching.

## Five Trend Categories

Five trend categories are at the foundation of APA's foresight research: societal, technological, environmental, economic, and political trends (STEEP). Through these five categories, APA connects emerging trends and potential future trends to planning (sense-making) and creates guidance on how planners can get future-ready (meaning-making).



## Trend Scouting Foresight Community

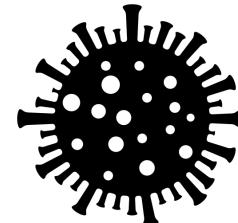
For a successful foresight practice, team diversity is crucial. To capture diverse perspectives, ensure that we identify a variety of trends directly or indirectly connected to planning, and to avoid missing trends or signals only practicing planners in the field are aware of, in 2021, APA recruited its first Trend Scouting Foresight Community, a diverse group of more than 30 forward-thinking thought leaders. The members of the Trend Scouting Foresight Community, planners who work in different planning fields, meet quarterly to share observations, discuss occurring shifts in their communities and in their work, and to hint at signals that could evolve into future trends.

# Trend Patterns

While this report presents a long list of trends relevant to planners today and tomorrow, it is equally important to take a step back, look at the mix of trends from the birds-eye perspective planners usually apply to their work, and understand the bigger-picture developments—the trend patterns, including how trends are interconnected and how they may impact the future of planning.

Currently, the biggest drivers of change and disruption are climate change, the COVID-19 pandemic, the increased awareness of social inequalities, and the accelerating pace of technological innovations. These drivers of change are present in all three timeframes (Act Now, Prepare, and Learn and Watch) and have accelerated, exacerbated, or disrupted existing trends; spurred the emergence of new trends; and are visible in signals that give us cues for potential future trends.

## The COVID-19 pandemic



exacerbated societal and political trends, such as the lack of affordable housing, social inequalities in the health sector, and political polarization.

The COVID-19 pandemic has accelerated many existing and emerging technological and economic trends, such as the digitalization of everything, the automation of work, and e-commerce. Additionally, it has

receive greater attention from practitioners looking for solutions. The remaining question is if planners will find the right means to engage with or even spearhead some of these developments.

Simultaneously, the growing awareness of social inequities has been a driver of change and innovation in all five trend categories. It has created new markets for inclusive design, challenges approaches tech companies are taking to product innovation, amplifies the need for ethical artificial intelligence, elevates the issue of climate justice, and creates new requirements for inclusive data collection and data use, among many others.

## Social inequalities



developed into emerging trends or moved into the Act Now timeframe. In the short term, planners will have to accommodate the impacts of new social and economic experiments that have been initiated due to increased political mobilization and political will (or lack thereof). The 2022 Trend Report for Planners identifies multiple new concepts and programs of equitable community funding that surfaced in 2021 and should

The pandemic and renewed conversations around equity have pushed many political, economic, and societal trends to a tipping point. In 2020, social unrest signaled potential shifts. In 2021, many of those signals have

## Climate change



Climate change continues to be a strong driver of change as well as a catalyst for innovation in all trend categories. Related trends have been identified in all timeframes, which comes as no surprise given the worsening climate emergency.

In terms of priority, climate impacts were rated as high, but the preparedness of planners varies depending on the trends' direct or indirect connection to planning. For instance, many resources are available on mitigation and adaptation planning, and planners have the available tools, competencies, and approaches to make change happen. However, trends such as

political polarization and related political pendulum shifts pose major obstacles to implementing the necessary response to the climate emergency. [As discussed in last year's trend pattern analysis](#), new approaches and outside-the-box and systems thinking are key to resolving the challenges resulting from persistent or worsening trends like climate change. In addition, trends such as digitalization can be mistaken for climate action, when, in reality, they exacerbate climate change. The working-from-home trend, specifically during the first few months of the COVID-19 pandemic, resulted in a massive decrease of commuter traffic and transportation-related greenhouse gas emissions. However, the digitalization of everything creates greenhouse gas emissions elsewhere, mainly at [data centers](#) that consume massive amounts of energy and water for cooling.

## Technological innovations

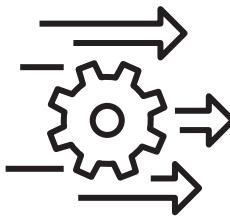


Technological shifts and innovations is still the trend category with the lowest preparedness among planners, as pointed out in [last year's analysis](#).

The transportation sector in particular is currently one of the most technologically disrupted. The myriad emerging transportation modes and services that the private sector is adding to the transportation network are becoming difficult to manage. These include transportation network companies (TNCs) and mobility-as-a-service (MaaS) providers, [shared micromobility](#) options, autonomous deliveries and passenger transportation, and [urban air mobility](#). Planners need to understand these new technologies so they

can provide the right policies and implementation strategies to ensure equitable and sustainable deployments. They need to know how artificial intelligence (AI) algorithms work in autonomous vehicles and that fifth generation wireless (5G) coverage is needed to efficiently implement them. Planners need to understand what policies apply to the sky and who creates regulations for flying taxis. Most importantly, planners should seek dialogue and collaboration with private-sector companies to find equitable and sustainable solutions together, instead of opposing or simply ignoring them, risking disruptions much worse than the ones experienced with Uber, Lime, and others.

## The evolution of planning



To select what trends are most important to present in this trend report for planners, the APA Foresight team added a third layer to the above-described trend prioritization methodology: the preparedness of planners. All identified trends have been prioritized by potential impact on communities or the planning profession, the general certainty of the trend's occurrence, and additionally, how well-prepared planners are for the trend (based on available APA products (e.g., policy guides) and community goals expressed in the official plans of U.S. municipalities, among others).

Using this trend prioritization method, the top high-priority trends were identified in the Act Now timeframe. Trends from all five categories are represented in this timeframe. Additionally, almost all the top high-impact trends are in the Act Now

timeframe. This indicates the increasing challenges of high importance that planners need to handle in their work, as most of these high-impact trends are directly connected to planning and are clearly a responsibility of planners (e.g., trends related to the climate emergency, housing, new transportation modes and services, digital inclusion, and built environment-related impacts on public health, among others).

In general, planners are not well prepared for a constantly changing world. Planners are busy with what is happening today. Thinking of—much less preparing for—the future is becoming ever more complex. These increased complexities and the accelerated pace of change are challenging current planning approaches and processes.

Planning needs to evolve with this changing environment. The profession needs new approaches that can handle the continuous next. This includes the need for more agility and openness for collaboration with other disciplines, as well as a potential need to disconnect planning from politics or find ways to navigate extreme shifts in political directions by amplifying or redefining the voice of planning.

Icon credits: NounProject.com: methodology, Rflor; COVID-19, ainul muttaqin; inequalities, Creative Mania; climate, Ayub Irawan; technology, Maxim Basinski; evolution: da-vooda/iStock/Getty Images Plus

# The trends we need to act on now

The list of high-priority trends on which planners need to act now is long. The COVID-19 pandemic is not the only reason for that. The increase of mental **health** issues rises to the top and reflects inequitable **access to nature**, a lack of affordable **housing**, and the need for more **inclusive design**.

The **digitalization** of everything spurs major **economic restructuring** and poses the risk of creating additional inequities in society. Additionally, **political polarization** makes it hard to set effective policies and actions to combat the **climate emergency**, the biggest threat of this century.



# The Climate Emergency



Buffalo, New York, is taking advantage of its unique location, infrastructure, and amenities to accommodate those displaced by climate change—making it one of the first “Climate Refuge” cities. Photo by Michael Shriver/buffalophotoblog.com.

Climate change is no longer “just” a crisis, but a full-fledged emergency. The [2021 International Panel on Climate Change \(IPCC\) report](#) is clear that the impacts of a changing climate hastened by the global failure to radically reduce greenhouse gas emissions are already here. While progress has been made, more drastic and swifter action will be necessary to keep warming below the 1.5°C threshold identified by climate scientists.

Given the inevitability of disruptions due to climate change based on current levels of atmospheric warming, adaptation at the local, regional, and national level will be necessary in the coming years. Additionally, ambitious mitigation efforts to reduce greenhouse gas emissions in line with the global targets of the Paris Agreement is essential to staving off more significant repercussions associated with warming beyond 1.5°C. This need for both adaptation to deal with the active reality of a changing climate and mitigation to prevent

more significant climate disruptions highlights the challenge faced by the global community.

Sea level rise, even with significant greenhouse gas mitigations and reductions, will continue for decades. Impacts in coastal communities are already being felt directly in the form of more severe flooding due to coastal storms, higher high tides, and regular tidal inundation. Sustained action on the part of planners and communities will be necessary to adapt to the threat of sea level rise, especially in the areas of infrastructure adaptation and

the relocation of people and homes away from at-risk areas.

With the increase in global temperatures, extreme heat events are becoming increasingly commonplace. In 2021, these events were most notable in the Pacific Northwest, where temperatures reached 116 degrees in Portland, Oregon, smashing previous heat records across the region and leading to hundreds of deaths and significant disruptions to infrastructure. These types of extreme events, along with sustained higher average temperatures, can act in concert with other natural disasters like drought and wildfire to threaten public health, food supplies, and infrastructure and require sustained action on the part of planners and communities to adapt.

Climate change is increasing both the frequency and severity of natural disasters (such as coastal storms, severe flooding, and wildfires) that lead to loss of life and

major impacts on communities and infrastructure. These broad challenges, and the particular threat to local and regional infrastructure, are further explored in APA's [PAS Report No. 596, Planning for Infrastructure Resilience](#). Natural disasters threaten physical and mental health and can cause sustained displacement and migration away from affected areas. The role of climate change in compounding the already significant impacts associated with natural disasters can also cause more significant disruptions outside of these affected areas by threatening regional economies and flows of goods, services, and energy, and can lead to uncertain downstream impacts that can destabilize established ways of life.

### Climate justice

Climate change disproportionately affects underserved communities, largely due to policies that have resulted in direct environmental harm, increased exposure to natural disasters, and significant

underinvestment and neglect. These harms are reflected in a variety of ways in underserved communities, ranging from direct climate impacts in the form of heat and flood impacts, to chronic disinvestment in public health.

In taking action to adapt to and mitigate climate change, planners need to apply an equity-first lens that accounts for these historic and ongoing harms. APA's [Planning for Equity Policy Guide](#) offers a comprehensive look at the role of planners in advancing equity.

### Climate migration

Related to both the overexposure of underserved communities to climate change and the impacts that are already taking place, climate migration is a trend of growing importance across the globe. The population of climate migrants is increasing, particularly due to relocation and displacement following natural disasters and rising sea levels.

Cities may feel the effects of climate migrants on local housing

availability and affordability in the short to medium term. [Buffalo, New York](#), is one of the first U.S. cities that integrated expected climate migrants in their comprehensive plan. Planning for infrastructure investments in the long term should reflect expected population changes without contributing to "climate gentrification."

### Climate impacts on local and regional economies

Climate change will also impact local economies in unpredictable ways. In many cases, local and regional economies may face direct impacts to dominant industries. This is particularly true for economies based around tourism, agriculture, or fishing. Climate change and the role played by atmospheric and oceanic temperature changes can greatly influence the success of any tourist season, the type of crops that can grow in particular areas, or the health of an ocean ecosystem. Even in the absence of larger-scale natural disasters, it is critical for planners

to prepare for these broader downstream impacts on the health of local economies.

### Digitalization and digital emissions

Everything that is done online—sending an email, hosting a Zoom call—requires energy, and in the absence of carbon-neutral alternatives this leads to greenhouse gas emissions. Data centers, which store the vast amounts of data necessary for digitalization, use huge amounts of potable water (often millions of gallons each day) to prevent the overheating of file servers and other computing technology.

As more of life shifts to digital spaces, the energy required for storage and transmission of data will increase. Digital technologies now emit four percent of greenhouse gas emissions, with consumption increasing by nine percent each year. To decrease greenhouse gas emissions from digitalization, planners can support the installation of renewable energy, improve efficiencies

in the built environment, and optimize locations of data centers.

### Water scarcity

As cities continue to grow, and climate change-induced drought and natural disasters impact reservoirs and riverine water resources, cities are already developing strategies for a future of water scarcity. In 2021, water levels in Lake Mead, which supplies water to Nevada, Arizona, California, and Mexico, reached its lowest recorded levels. This follows the Cape Town, South Africa, water crisis of 2018, which saw the city narrowly avoiding "Day Zero" and becoming the first major city in the world to run out of water.

This has brought renewed attention to the role of land use and planning in managing water resources.

[Recent guidance from the Lincoln Institute of Land Policy's Babbitt Center](#) has outlined how planners can integrate land use and water management (see also [PAS Report No. 588, Planners and Water](#)).

# Climate Innovation



McDonald's is taking the leap towards sustainable building design with its first Net Zero Energy restaurant. The flagship store in Orlando, Florida, uses renewable energy produced on-site and other innovative features, like plant-covered walls, to reduce its greenhouse gas emissions. Photo by Kate Joyce, courtesy Ross Barney Architects.

Innovations from both the public and private sectors are driving positive developments in the sustainability and climate mitigation arenas. These developments are crucial to meeting the targets outlined by the IPCC and the Paris Agreement.

## New political emphasis on climate action in the U.S.

Under the Biden Administration, the U.S. is reversing course on climate action and related policies. While many municipalities in the U.S. continued to implement climate action and adaptation plans during the Trump Administration, renewed action at the federal level along with dedicated funding and political support for climate change mitigation and adaptation can be expected. This shift is most evident in the climate change associated investments in the \$1 trillion Infrastructure Investment and Jobs Act passed in November 2021, and the more significant mitigation

and adaptation investments under negotiation as part of the Build Back Better bill. APA's [Climate Change Policy Guide](#), published in December 2020, is a timely resource.

## Decarbonization and electrification

Eliminating dependence on fossil fuels will likely require cities to plan for the extensive deployment of sustainable electrical infrastructure. This renewed push for electrification follows both increasing demand from the private sector to drive adoption of consumer-focused goods and services such as electric vehicles and at-home solar,

and from the public sector, especially through the Infrastructure Investment and Jobs Act of 2021, which expands sustainable electrical infrastructure. For more on trends in decarbonization, refer to the [Decarbonization of Transportation](#) section of this report.

### **Grid-connected solar and wind and smart grids**

Aging and outdated electricity infrastructure must be modernized for cities to maximize investments in smart city technologies and facilitate electrification and decarbonization of infrastructure systems. Consumers, private corporations, and the federal government are driving more widespread adoption and installation of grid-connected sustainable energy to meet this critical need.

As a result, grid modernization policy and deployment actions are increasing. The federal government, through the 2021 Infrastructure Investment and Jobs Act, is investing \$65 billion in upgrading the electric

grid to accommodate sustainable energy storage and capacity needs within the electric grid. These investments are essential to hastening the transition to sustainable energy in the short term.

### **Green building**

Land use and building construction plays a critical role in driving greenhouse gas emissions. Growth in green projects, including rating systems such as LEED at all scales (from buildings to entire cities) is likely to continue.

Green building codes and site standards impact development, site planning, construction, and operation and are essential to reducing energy needs and water resources. Planners can play a major role in not only incentivizing green building standards but also in linking green building with denser patterns of development that broaden emissions reductions and resource savings well beyond individual buildings and new construction.



Sustainable shopping in “zero-waste” shops, which sell everything from bamboo toothbrushes to beeswax food storage wraps, is becoming more popular. Photo by aldomurillo/E+/Getty Images.

### **1.5-degree lifestyles and ethical consumption**

Among individuals and consumers, awareness is growing about the links between lifestyle and climate change. However, while the markets for sustainable lifestyle products are

booming, these products tend to be targeted at wealthier consumers, limiting their long-term impact on emission reductions.

Land-use decisions, availability of sustainable transportation systems, and the design of the built

environment can play a role in changing behavior and lifestyles towards more sustainability as well. It will be important for planners to apply strategies that equitably support sustainable lifestyles and behaviors.

# Decarbonization and Diversification of Transportation



As the demand for climate-friendly alternative modes of transportation grows, charging stations for e-bikes are popping up in communities across the globe. Photo by Paul Henri/Pixabay.

The transportation sector is undergoing unprecedented changes due to advancements in technology, such as the invention of the smart phone and automation, and the imminent threat of climate change. Currently, the most significant changes are in fuel technology and the way people move, especially micromobility and shared mobility. These changes in the transportation sector, as well as the pandemic, have changed people's behavior. For instance, young people

increasingly prefer alternative transportation over the automobile because they have access to different modes of transportation that are cheaper, timesaving, and environmentally friendly.

## Decarbonization of transportation

Transportation (mainly road transport) has been the biggest direct source of greenhouse gas emissions in the U.S. since 2016. Considerable decarbonization efforts are underway to move away from petroleum

products, including switching to electric and lower-carbon fuels, improving vehicle efficiency, and advancing the use of [autonomous vehicles](#) and vehicle sharing. The use of several non-petroleum-based fuel alternatives such as natural gas, biofuels, hydrogen, and electricity is increasing. The challenge is to make sure that they are cost effective and their production does not emit more greenhouse gases than are produced by the use of conventional fossil fuels. Efforts are underway to make the production of these non-petroleum-based fuels

emissions-free. While the electrification of transportation has been a growing trend, planners should keep watching the decarbonization developments around hydrogen and other non-petroleum-based fuels and their pros and cons.

## Electric vehicles

As of 2020, Americans owned nearly 1.8 million electric vehicles (EVs), more than three times as many as they owned in 2016. EVs are projected to grow at a rapid pace in the next three decades, and several major automakers plan to electrify their entire offerings in the next 10–15 years. Recent improvements in battery technology make the transition from fossil fuel-powered vehicles to electric vehicles more attractive and affordable. If the electricity is renewably sourced, the transition to electric vehicles can reduce greenhouse gas emissions.

Holistic energy planning is needed so that e-mobility can achieve the goal of net-zero emissions. Additionally, planners need to think smartly about accommodating EV-related infrastructure, such as [charging stations](#), in their cities and communities. With \$7.5 billion in funding allocated to EV charging stations and infrastructure in the new infrastructure bill, the demand and requirement to accommodate EV infrastructure in plans and policies is crucial moving forward. Moreover, the equitable distribution of such infrastructure is critical. Planners should also consider installation requirements at residential and commercial buildings in zoning codes and other regulations.

## Micromobility

In 2019, the micromobility industry was projected to be worth \$300 to \$500 billion. The use of micro-mobility solutions such as bikes,

electric bikes (e-bikes) and electric scooters (e-scooters) has declined drastically since 2020 due to the pandemic. For instance, e-scooter systems declined from 239 systems in 2019 to 183 systems in 2020.

However, micromobility is expected to have a strong post-pandemic recovery. The market for e-bikes or motorized bikes is expected to show significant growth in the U.S. between 2021 and 2026. Similarly, the global market for e-scooters is expected to expand at the annual growth rate of 7.6 percent from 2021 to 2028. The encouragement to no-carbon mobility solutions through policies such as tax rebates for purchasing e-bikes in the new infrastructure bill provides more positive indications of the growing market for micromobility.

Due to the increasing popularity and use of lightweight, usually single-person vehicles, planners need to meet the demand for micromobility by rethinking designs and plans, including bike plans, street and sidewalk management plans, bikeway design, and policies related

to the “first-mile/last-mile” problem. Planners should also think about reinventing infrastructure such as mobility hubs, which support various modes of transportation, in ways that [support micromobility](#).

### Mobility-as-a-service

The innovations in vehicle technology and the rise of mobility service providers such as transportation network companies (TNCs) and mobility-as-a-service (MaaS) have resulted in a wide range of transportation options. TNCs (e.g., Uber and Lyft) have created an uprising in the transportation industry in recent years. Similarly, though not as prevalent as TNCs, MaaS is gaining traction in cities around the globe. MaaS provides the option to access different types of transportation systems through one platform, including trip planning and purchase of tickets. These mobility service providers have a large-scale impact on various factors that planners are interested in and working on, such as traffic congestion, transit ridership,

vehicle ownership, air quality, and urban mobility. Street designs will need to be multipurpose, adaptable, and flexible to accommodate rapidly changing transportation options. Planners should encourage design and transportation policies that are safe, accessible to all, environmentally friendly, and deployable in equitable ways.

### Rethinking the public right-of-way

Recent developments, including the COVID-19 pandemic, increased demand for micromobility solutions, and accelerated technological development, have created a need for planners to rethink the design and planning of the public right-of-way.

Today, sidewalks are not only used by pedestrians; they also accommodate scooter riders, skateboarders, and even outdoor dining. Soon, they might become the path for small robots making autonomous deliveries. Similarly, there is increased demand for streets to accommodate vehicles with different

speeds, such as scooters and bikes, in addition to automobiles. Communities around the country are facing challenges to amend and reevaluate their rules and regulations to accommodate these new changes. The lack of necessary and appropriate laws has in some cases created chaos on public rights-of-way and harmed public safety.

Due to multiple users, functions, and purposes of public rights-of-way, there is an increasing demand and necessity for planners to redefine the public right-of-way using plans, policies, and regulations. They especially need to focus on the most vulnerable users of public space such as people with disabilities and the elderly.

### Curb management and technology

Increased dependence on e-commerce, food delivery, and ridesharing services has created conflicts over curbside space and a concomitant need to change curb pricing models that have

not changed for decades.

Cities around the country are taking steps to organize and monetize their curb space. Communities such as Raleigh, North Carolina, and Alexandria, Virginia, are converting curbside parking spaces to high-turnover pickup or delivery zones serving essential businesses. The rapid growth of designated curbside pickup spots during the COVID-19 pandemic shows that this trend has accelerated since the pandemic. At least 15 U.S. cities, including Aspen, Colorado, and Chicago, are reforming their curb space with curb management tech, which uses digital data such as curb availability and demand, collected by cameras, sensors, and geofences, to develop curb pricing models. Transportation planners can use curb management tech to manage congestion (e.g., charging higher prices during peak hours), improve safety, and generate revenue for the city. It will be crucial to implement equitable curb management solutions that don't harm the most vulnerable.

# Digitalization of Everything



Despite the potential benefits, some might struggle to participate in an increasingly digital world. Wi-Fi-enabled school buses were a temporary solution during COVID-19-related stay-at-home orders, providing internet access to families without it. Photo by Jeff Scheid.

Digitalization has been a trend for over two decades, but the COVID-19 pandemic and the related need to physically distance ourselves from each other accelerated this trend and resulted in a transition to a digital environment almost overnight. With the turn of the millennium, the world started shifting from the information age towards a digital era spurred by big data, the Internet of Things (IoT), and artificial intelligence (AI), prompting shifts in entire societies,

economies, and the built environment. Today, advances in digital technology affect almost every aspect in life: how people live, work, study, shop, date, and move around town; how businesses connect with their customers; and how we communicate with one another. However, not everyone has access to or the ability to access the digital world.

According to the Brookings Institution, tens of thousands of Americans do not have access to broadband internet or can't afford high-quality internet. Low-income households and communities in

rural areas are mostly affected. In February 2020, about 50 percent of U.S. households with incomes under \$30,000 did not have broadband. In a world where access to internet equals access to jobs, education, social life, and transportation, solutions to combat the digital divide and implement broadband as an essential utility are ever more critical.

The digitalization trend is connected to myriad other trends described in this report, ranging from trends that were accelerated during the COVID-19 pandemic, such as [working from anywhere](#) or

[economic restructuring and e-commerce](#), to trends that affect the way planners think about transportation or do their daily work, such as [mobility as a service](#) and [new planning tools](#). In addition, also related to digitalization, the report includes separate sections on [artificial intelligence](#), [automation of transportation](#), and new forms of data collection and processing. The report will also dive into the extreme version of digitalization of everything, the [metaverse](#), and potential implications to planning.

## Digital inclusion

The accelerated digitalization of everything is amplifying the need for equitable solutions for digital inclusion. In 2019, the city of Detroit was the first city in the United States that hired a digital inclusion officer, whose responsibility is to make sure everyone in Detroit has access to the digital world. Many more cities have

followed, which can be monitored on [the National Digital Inclusion Alliance's website](#).

Solutions to the digital divide are threefold: improving digital literacy, equitable access to devices, and universal broadband. While planning for and installation of broadband has the closest connection to planning, this effort has mainly been driven by for-profit provider companies who are focused on their return on investment (ROI). Planners should plan for the common good and should therefore get involved to plan for an equitable distribution of broadband, as described in APA's [PAS Report No. 569, Planning and Broadband: Infrastructure, Policy, and Sustainability](#).

Additionally, planners can create spaces for digital education and collaborate with local organizations and libraries to improve access to devices. Information on how Austin, Texas, and Vienna, Austria, are dealing with the digital divide can be found in APA's [PAS Report No. 599, Smart Cities: Integrating Technology, Community, and Nature](#).

### **Hybrid community engagement**

Digitalization also has the potential to create more inclusion in specific planning processes. The adoption of virtual meetings and online public engagement has been accelerated by the COVID-19 pandemic and the related need to physically distance. While this development has resulted in more inclusivity in some cases, it also created additional challenges related to the lack of equitable access to internet. Some communities included call-in options or broadcasted their public meetings on local TV stations to make them more inclusive. The pandemic started multiple testbeds on how to best include every individual of the community.

Moving forward, a hybrid that offers equitable community engagement through multiple channels will be imperative for planners to consider a wide variety of needs of specific community members, including elderly people, people with visual or hearing impairments, non-English speakers, people who don't have access to broadband, and

people who can't attend in person, among others.

### **Smart cities—the digital transformation of cities**

Smart cities are a logical consequence of the digital era we live in today. While this concept is mainly seen as the digital transformation of cities, handled by tech companies with profits in mind, it can be much more than that if handled with equity and the common good in mind. Smart cities provide an opportunity for digital solutions for inclusion, environmental sustainability, and civic co-creation, among other benefits.

Today we live in a digital era, and smart cities should be the state of the art of planning practice. Planners need to learn about smart city concepts and integrate them into their daily work. It is important for planners to understand how to use smart city tech and how their communities can benefit from these applications instead of being harmed by them. Additionally, the digital era and the era of smart cities

provide new planning tools (e.g., see the [City Digital Twins](#) section of this report) and the opportunity to make certain planning processes more efficient and agile. For planners to stay relevant in this digital era, they must learn about smart tech and acquire new skills to handle them.

More insights into how the concept of smart cities can be used to create equitable and environmentally responsible cities, to spur active participation and co-creation, and to improve plans through testing and prototyping, can be found in APA's [PAS Report No. 599, Smart Cities: Integrating Technology, Community, and Nature](#).

### **From 4G to 5G to 6G**

Broadband internet is the foundation of smart cities and the concept of digitalization of everything. When it comes to wireless networks, in the near future, most communities will have transitioned from 4G to 5G. Meanwhile, the development of 6G, the sixth generation of wide-area wireless technology, is underway.

5G—and in the far future 6G—will be the backbone of the Internet of Things, including connected and autonomous vehicles and other smart city infrastructure and services.

### **Digital vulnerability**

With the increase in digitalization, including governmental functions and planning processes, the vulnerability to ransomware and other cyberattacks is growing. There is an increasing need for cybersecurity solutions tailored to public sector needs (e.g., for online public meetings). Additionally, ever more governments acknowledge the need for data protection regulations, especially in the context of the Internet of Things, big data, and surveillance, among others.

While these are not direct responsibilities of planners, they are becoming ever more important to the work planners do, and planners should be aware of these risks and vulnerabilities and collaborate with the respective experts needed to implement the required solutions.

# Economic Restructuring



Communities are seeing an influx of fulfillment and distribution centers due to the popularity of same-day delivery options. These sites can be sources of local employment, but are a threat to small businesses and even shopping malls. Photo by Jillian Cain/iStock Editorial/Getty Images Plus.

The digitalization of everything, including automation and related developments, has spurred a major restructuring of the economy over the last several years. The COVID-19 pandemic accelerated this trend. In addition, a new emphasis on equity and inclusion requires new approaches, processes, skills, and systems. New forms of employment, new business models, and new priorities for economic land uses are just some of the trends that are advancing these larger changes.

Planners should pay attention to how this will affect their local and regional land-use plans, economic development strategies, and even the practice of planning in the future. Many of these trends require action now to ensure major economic change does not disrupt the livelihoods and economic stability of communities.

## E-commerce

A well-known example in this category is the tremendous growth of e-commerce over the last two

decades and its acceleration due to COVID-19. Planning- and land-use-related impacts such as decreasing demand for brick-and-mortar retail space and its implications for main streets, shopping malls, and related multiplier effects from retail sales in local economies are not new.

Today, companies such as Amazon and Walmart are seeking to move from one-day deliveries to 20-minute deliveries. This new trend results in an increased demand for distribution and fulfillment centers closer to the customer,

more delivery vehicles on the roads, and greater competition for curb-side space. APA's [Zoning Practice 2020\(1\), "E-Commerce and the Future of Land Use."](#) gives some insights on how this trend may require a fundamental rethinking of zoning and land use at the local level.

## Upskilling and reskilling

Similar to how entire economic sectors such as retail have changed over time, professions have evolved with changing environments, shifting eras, technological and social innovations, and new challenges. Some professions have become obsolete or replaced by technology (e.g., typesetters or switchboard operators), while others have made a comeback (e.g., the milkman of today is called Instacart and takes online orders). What is different today is the pace of change that requires faster shifts in how certain

professions respond to changes involving their customers' preferences, new tools and processes, and the needed skills of a successful workforce.

Upskilling, and in some cases reskilling and unlearning, have become essential ingredients to stay relevant for employers and for entire professions, including the planning profession. In today's world, this specifically includes building the human skills necessary to address equity, diversity, and inclusion efforts, as well as the tech skills related to the use of information and communications technologies (ICTs) and artificial intelligence, among others. Relevant shifts in the planning profession are described in the [Future of Planning](#) section of this report.

### **Everything as a service**

As part of the digital transformation of industry, most sectors are transitioning their offerings towards subscription services and the concept of "as a service." The



People with varying needs might use a Mobility-as-a-Service provider to access multiple forms of transportation, all through one app on their smartphone—whether they need a combination of public transit, rideshare, or even micromobility vehicles to reach their destination. Photo by kovacic/E+/Getty Images.

automobile industry is expected to gain most of its profits from subscription fees and software updates instead of car sales in the future.

The "as-a-service" movement is also impacting planning-related sectors. One of the most popular examples is mobility-as-a-service

(MaaS), which is based on the shared mobility trend and described in the [Decarbonization and Diversification of Transportation](#) section of this report.

Another example of "as a service" relevant to planning is "procurement-as-a-service," which in most cases entails outsourcing procurement services to a procurement service provider and the deployment of an automated procurement platform that allows for real-time processing of data, data analytics, and market intelligence for process improvements, as well as risk management. Planners need to understand these concepts and their benefits, but also should act now to ensure equitable implementation.

### **Gig work and polyworkers**

The option to digitally communicate with potential customers and the opportunity to reach vast numbers of people through social media make nonemployer work more attractive and efficient. While this is certainly not the only reason

why gig work is increasing (there are many more, including working conditions, lack of benefits, need for flexibility, etc.), it is notable that younger generations of gig workers are pursuing multiple functions or clients in parallel, a concept called "polywork."

Cities are increasingly struggling with how best to accommodate new services and service delivery models without sacrificing worker protections or undermining the community's vision for growth and change. Planners should act now to advocate for the needs and rights of these workers in local and regional economic development strategies; otherwise, communities may lose valuable sources of productive labor. This is also relevant to the planning profession as many planners operate sole proprietorships, offering their services on an as-needed basis.

# Health Equity and Nature



The Neponset River Greenway in Boston gives residents a place to spend some time in nature. Photo by Anton Grassl.

**Health is an equity issue in the U.S. While there have been some health improvements in recent years (e.g., a decreasing infant mortality rate), health disparities persist—and in some cases have grown. The COVID-19 pandemic has only further exacerbated them. In addition to taking the lives of 800,000 Americans in the first two years, the pandemic has also negatively impacted people's mental health. The increase in mental health issues has elevated**

the importance of public spaces, green space, and especially biophilic spaces where people can relax and safely socialize.

Wide physical and mental health disparities persist among groups with certain socioeconomic characteristics. For instance, between 1999 and 2018, Black adults had higher age-adjusted mortality rates than white adults. This gap was even larger in rural areas (76.2/100,000 for Black adults vs. 37.2/100,000 for white adults). Similarly, females have a

70 percent higher rate of depression than males.

These disparities in health outcomes are not random but are due to the systems in place, including unequal distributions of factors that planners can influence, such as access to healthy food, access to healthcare services, and the creation of safe and healthy communities. Planners can implement [policies, systems, and environmental changes](#) in communities that have been historically underinvested to reduce health disparities.

## Declining life expectancy

Between 2014 and 2018, life expectancy in the U.S. declined from 78.9 years to 78.7 years. COVID-19 has exacerbated this downward trend: according to the Centers for Disease Control and Prevention (CDC), life expectancy at birth saw an unprecedented decline in 2020 to 77.3 years, the lowest since 2006.

These long-standing trends are driven by existing inequities and unequal mortality rates among groups with certain socioeconomic statuses. The built environment being a major social determinant of health, planners play an important role in improving the health and overall well-being of people.

Quality access to healthcare is another factor that influences human longevity. Not all areas in the country have equal access to in-person healthcare services. In such a situation, telehealth can enable people to get medical help without traveling long distances. The use of telehealth

has increased 38 times since the pandemic began. However, the rural and small communities that lack access to healthcare may also lack broadband access, thus creating barriers to using telehealth. Moreover, the increased dependence on telehealth may also influence the distribution of healthcare facilities, further negatively affecting such communities.

## Worsening mental health

Mental health issues, including mental illness and suicidal ideation, are increasing among youth and adults. Communities were facing mental health challenges pre-COVID-19, but pandemic-associated factors, such as lack of social interactions, increasing economic burdens, and rising mortality, have worsened mental health. The number of people suffering from moderate to severe symptoms of depression and anxiety remains higher than before COVID emerged.

Health, including mental health, is influenced by the environment in which an individual lives. Planners play a role in influencing environmental factors such as noise levels, access to nature, and perceptions of safety, which are related to mental health.

#### **Pandemic cave syndrome**

New mental health issues, such as Cave Syndrome, have emerged due to the COVID-19 pandemic. The term refers to the uneasiness or anxiety people experience when they attempt to socialize after being at home for almost two years due to the pandemic. According to a [survey done by the American Psychological Association](#), nearly half of Americans (49 percent) said they feel uneasy about adjusting to in-person interaction after the pandemic. This anxiousness and uneasiness demotivate people to leave the cave (home) and explore outdoors or socialize.

Cave Syndrome may also move people, especially children, away

#### **INSIGHT FROM OUR TREND SCOUTS**

**'There were some trends in the food system that have been accelerated by COVID, namely, increasingly online access to food and more home delivery—the “Amazonification” of the way we get our food. I think that's really impacting the way that food moves through our cities.'**

—Ben Kerrick, Senior Consultant at KK&P (Karen Karp & Partners)

from the real world to a digital world, making them addicted to digital spaces. Digital products (infinite gaming, e-sports, social media, streaming services) rely on habit-forming features for success, but those same features can negatively impact health. According to

a study done in 2014, six percent of people worldwide are addicted to the internet. In 2021, 31 percent of U.S. adults reported going online constantly, which is up from 21 percent in 2015. The percentage will increase as more and more people have better broadband access. Staying indoors and maintaining a sedentary lifestyle is a leading cause of obesity, including childhood obesity. To change people's behavior, planners can design places that encourage chance encounters and spaces that motivate people to get out of their caves and enjoy life.

#### **Nature-based solutions**

More and more jurisdictions acknowledge the many benefits of nature and biodiversity, especially since the pandemic began. Thus, an increasing number of municipalities are considering [urban forests](#), greening, and the integration of [nature-based solutions](#) (NBS) to solve myriad challenges ranging from climate change to mental health. They are also allocating separate budget

items towards this purpose. Planners do [green infrastructure](#) (GI) work, but these efforts are usually applied in a more piecemeal fashion, while [NBS encourages systems thinking](#).

For communities to realize the full benefits of nature, planners should use NBS in their day-to-day work. Considering the role that nature, especially freely and easily accessible nature, plays in alleviating mental health and climate change issues, planners should rethink the design of public spaces around nature. APA's [PAS QuickNotes No. 87, "Biophilia,"](#) explains the importance of biophilia when planning for mental health.

#### **Local food systems planning**

The advancement in agricultural technologies, the ongoing trend of urban agriculture (see [PAS Report No. 563, Urban Agriculture: Growing Healthy, Sustainable Places](#)), the COVID-19 pandemic, and food justice movements have impacted many aspects of food systems planning, from production to delivery. The

proliferation of emerging food production technologies and methods, such as vertical farms, may depend on the rate of adoption by agriculture workers and communities.

More communities are gravitating toward locally sourced foods to combat climate change, improve health, and advance equity. Urban and rural areas alike will need to prepare for the impacts of food production on land use, the local economy, and sustainable resource use. To achieve this purpose and other goals such as food security, cities around the country are adopting food systems plans (see [PAS Report No. 554, A Planners Guide to Community and Regional Food Planning](#)).

COVID-19 has accelerated digital access to food, whether it is for ordering meals or buying groceries. This fast-growing food-delivery ecosystem impacts land use and zoning, urban design, transportation, and economic development. The pandemic also has highlighted the role of municipal governments in food procurement and equitable distribution among residents.

# Housing Affordability, Availability, and Accessibility



Housing encampments, like this one at the Venice Beach Boardwalk in Los Angeles, signal major issues in local housing affordability. California governor Gavin Newsom has committed to expanding housing programs to address some of the root causes of homelessness. Photo by Jessica Pons/*The New York Times*.

**Movements for safe, healthy, and accessible housing contributed to the development of contemporary planning and are deeply embedded in the work of planners today. As displacement, homelessness, and housing costs continue to increase, both the public and private sectors are working to confront these challenges through both policy change and technological advances in housing construction and development. These emerging trends reflect the need for**

action on the part of planners to ensure that communities are prepared for and can flourish in an era of rapid change.

## **Increasing homelessness**

While federal, state, and local action related to the COVID-19 pandemic helped to suspend the continued rise in poverty and homelessness in communities across the U.S., the expiration of eviction moratoria and the end of pandemic-related financial support signal a return of increasing rates of homelessness once

again. Rising costs of food, goods, and housing driven by pent-up demand and supply chain disruptions similarly point to a future of constrained household budgets that threaten people and families most at risk of homelessness. In many cities, demand for shelter beds and social services far outstrips supply, further threatening individuals and families experiencing homelessness. In the absence of safe, accessible, and affordable housing, some cities have also turned toward punitive measures, such as the clearing of unofficial encampments for

individuals and families experiencing homelessness.

While ensuring the availability of housing supply is critical to meeting demand and stabilizing housing costs, new development also has the potential to drive gentrification and increase the displacement of existing residents. This tension between housing development and homelessness reveals the need for broad-based action centered on ensuring that housing is not just available, but also affordable and accessible.

## **Gentrification and displacement**

A confluence of factors, including housing cost and availability, is driving housing displacement in cities across the U.S. Displacement can require people to move far from their places of work, family and friends, and supportive systems and services. In cases where housing is both unaffordable and inaccessible,

homelessness can result. For cities and communities, involuntary displacement due to gentrification often leads to a decrease in racial, ethnic, and economic diversity. This loss of diversity can limit a city's economic resilience and potential for economic growth.

As in the case of rising homelessness, the question of housing cost and access is central to avoiding displacement. Nearly half of all renters nationwide are paying more than 30 percent of their income toward housing costs. For renters, this has led to renewed interest in tenant protections under federal, state, and local legislation. However, even as activism around tenant's rights takes hold, the lack of affordable housing is still contributing to growing rates of poverty across major metropolitan areas. Emerging strategies related to [eliminating restrictive and exclusionary zoning codes](#) are targeted at significantly increasing housing supply, reducing costs, and expanding housing choice.

### Zoning reform

States and cities are rethinking zoning to make housing more affordable and accessible, as described in [Zoning Practice 2019\(6\), "Housing Reform Through State Legislation and Local Zoning."](#) Single-family housing is the dominant residential land use in the U.S., largely due to local zoning codes and maps that have remained unchanged for decades. These regulations keep densities low, but also limit overall supply, increasing housing costs in both suburbs and central cities. Additionally, these regulations have often codified racist and exclusionary policies that serve to segregate communities along racial lines.

California and Oregon have both banned single-family-only zoning at the state level, while some cities have revised their zoning codes to permit "missing middle" housing types in single-family districts. At the federal level, legislators are attempting to tie local funding to the revision of exclusionary zoning regulations. These measures are gaining momentum in states

### INSIGHT FROM OUR TREND SCOUTS

**'A couple of bills in Congress are talking about zoning and removing zoning barriers, especially exclusionary zoning, as a way to get to funding or as a prerequisite to new funding. [This has] really put zoning at the forefront in ways that it has not been before.'**

—Brian Loughlin, AIA,  
Director of Planning and Urban Design, Magnusson Architecture and Planning PC.

and cities across the U.S. as housing costs, displacement, and homelessness continue to rise.

### Yes in my backyard (YIMBY) movement

The legislative push at the local, state, and federal levels is being bolstered by a growing movement of Yes In My Backyard (YIMBY) advocates. Proponents of the YIMBY movement are working to counter resistance to new housing development by identifying and championing the discrete benefits that denser patterns of development can bring to communities. YIMBY advocates have been active in removing exclusionary policies such as single-family-only zoning regulations in favor of building local support for "missing middle" housing, limiting parking requirements, building housing in areas with significant transit access, advancing the role of renters in public engagement, and growing local racial, ethnic, and income diversity. YIMBY advocates have been critical to the success of

plans and legislation, such as recent efforts to eliminate single-family-only zoning in [Minneapolis](#) and statewide in California and Oregon.

### 3D printing of homes

The private sector is also developing new ways to reduce supply constraints, lower costs, and grow housing availability. 3D printing of homes is an emerging trend that has the potential to disrupt the home building industry and reduce the time and complexity involved in new construction. Multiple companies across the globe have 3D printed houses for much lower cost and in less time than conventional building construction. This trend is described in more detail in the [3D Printing](#) section in this report.

# Political Shifts and Polarization



The pro-Trump mob that stormed the Capitol building on January 6, 2021, clearly shows that strong political beliefs, harmful rhetoric, and the spread of misinformation can have major ramifications if they go unaddressed.  
Photo by Jason Andrew/The New York Times.

Planners must navigate politics on a day-to-day basis. Political will is a major factor that planners must consider when making recommendations to elected officials through their plans and programs. They must keep up with changes that are happening in local, state, and federal governments, while simultaneously balancing the political beliefs of the people they serve. But the range of political beliefs is widening, and the intensity of people's beliefs is getting

stronger. Trends related to political ideologies have implications for how planners do their work, particularly public engagement and public participation.

## Public trust

Generally speaking, public trust in the federal government has been declining, while the public remains more trusting of local governments in recent years. Yet many planners are experiencing an increase in interruptions, chaos, and even beratement during public meetings.

This indicates that public trust in planning work is weakening in communities with very conservative or very progressive constituents.

Local governments and planning organizations should work to maintain local trust and build confidence in their work, such as continuing to highlight accountable implementation of projects and initiatives. Local governments might need to collaborate with federal and state counterparts to minimize the undermining of local goals and visions.

## State-level intervention in local affairs

State-level governments are increasingly getting involved in land-use planning and other planning domains. Legislators are preempting local regulations or adding a secondary layer of state intervention to project approvals. In states such as California, legislators are using state bills to make progress on planning issues—such as affordable housing—by superseding local regulations and streamlining development and review processes. This is known as [preemption](#), and while it can effectively overcome political standstills at the local level, special interest groups can also misuse pre-emptive laws to prevent equitable planning at the local level.

This trend has implications for the future of collaboration between local, state, and federal governments. Planners need to act now to maintain or reestablish productive partnerships that promote equitable

outcomes with their state and federal counterparts, ensuring that the rise of preemption as a path of least resistance does not become the only solution for controversial planning concepts.

#### Political polarization

Misinformation around various topics, such as the COVID-19 pandemic and climate change, is contributing to political polarization in the U.S. A full 77 percent of Americans believe their country is now more divided than it was before the pandemic, as compared to a median of 47 percent in 13 other nations surveyed. Planners will have to learn to work in this fragmented environment, such as adapting or refining their consensus-building and facilitation skills to run successful public meetings.

#### Policy “pendulum shifts”

Long-range planning is becoming ever more challenging with polar-opposite policy changes

#### INSIGHT FROM OUR TREND SCOUTS

**‘Transportation planners have experienced a policy shift from President Bush to President Obama when evaluating the project need for surface transportation projects, it was a little bit of a pendulum swing. And then we went from Obama to President Trump, and there was quite a bit of a pendulum swing. And now we’ve gone from Trump to President Biden, and there is a massive pendulum swing. It’s really hard to forecast out five to 10 years when we have these massive policy shifts that happen every four to eight years.’**

—Robert McHaney, AICP CTP, ENV SP,  
Chief Project Officer for The Goodman Corporation

occurring every few years, especially on the federal level. For example, the Biden Administration’s renewed federal focus on addressing climate change follows four years of relative inaction at the federal level, and while this new federal leadership opens new doors for getting projects off the ground, there is no guarantee this will be the case during the next administration.

Planners must be poised to take advantage of new funding opportunities as they arise, but any policy reversals in the future could damage the viability of longer-term programs.

#### Special-Interest online communities

In our increasingly digital society, special-interest online communities are influencing public dialogues and encouraging public participation in specific topics. Members of these digital spaces can either live near each other or far apart. Some of these online communities offer an opportunity to introduce topics and advance new ideas in geographically isolated communities. Some residents may become experts on specific topics and can provide insight during public decision-making processes. Yet they may also

contribute to the trend of political polarization if online communities become echo chambers, reflecting back limited information and points of view. Similarly, social network apps with geographic limits, such as NextDoor or Citizen, are local examples of special-interest online communities. They are also often sites of local political discussion.

There is criticism of these types of sites for increasing racial profiling and surveillance of visible minorities, especially in homogeneous or gentrifying neighborhoods. Local and nonlocal types of special interest online communities offer

important data on the experiences and concerns of residents. Planners can keep an eye on place-based social networking for insight on political ideologies in the geographically defined communities they serve and how this may affect local community engagement or project implementation.

# Population Diversity and Inclusive Design



Years of strident public protest and legal action culminated in the 2021 removal of this statue of Robert E. Lee in Richmond, Virginia. Photo by Ken Cedeno/UPI/Alamy Live News.

The demographic makeup of the U.S. is changing. People are central to planning processes and planners will need to understand how social characteristics and identities relate to people's preferences, behaviors, and access to resources. Cultural humility, inclusive practices, and diversifying the planning profession itself are just a few of the actions that planners can take now to address ongoing and future population changes.

## Aging U.S. population

The number of older adults (aged 65 and over) in the U.S. could nearly double to about 90 million by 2050. Yet few cities have the physical and social infrastructure to successfully support aging in place, so planners need to act now to start creating [aging-supportive communities](#). An aging population also has economic implications, such as slower economic growth and a higher dependency ratio.

## More racial and ethnic diversity

Census projections suggest that the country will be "minority white" by 2045. This means that current racial and ethnic minorities, such as Asian, Black, Latinx, and multi-racial populations, will surpass the non-Hispanic white population in number. These populations, as well as individuals within these groups, have special and varying needs that communities will need to adapt to. And as of now, the planning profession itself does not adequately reflect the makeup of society; it must

also diversify and adapt to facilitate inclusive planning processes and equitable outcomes.

## Youth movements for social change

Young adults and youth are getting more involved in planning-related movements, such as [Yes in My Backyard \(YIMBY\)](#) or climate activism. While young people have been agents of social change in the past, the energy for mobilization is higher than ever due to social media. Planners need to be aware of these movements and ensure that young people can participate in planning processes.

## Diversity awareness

The increase in racial and ethnic diversity in the U.S. has led to more awareness of these changes. During the COVID-19 pandemic in particular, racial and ethnic groups,

women and gender minorities, people with disabilities, and other marginalized groups have demanded more attention to the fact that they have been, and continue to be, traditionally underrepresented and underserved by institutions and governments.

Planning efforts need to meaningfully address growing diversity across communities and regions. Planners may need to pay closer attention to those they are leaving out from the programs they design or those that other governmental responses are not reaching. Planners should advocate for groups that the profession has historically underserved, such as gender minorities, racialized groups, and people with disabilities.

### Acknowledging and righting historical planning wrongs

Planners need to act now to address trends in demographic changes and social awareness, but this does not mean they should only be looking forward. Acknowledging

#### INSIGHT FROM OUR TREND SCOUTS

**'Youth is where a lot of the energy for mobilizing for social change is coming from right now, partly because of the internet. We need to support that, lift it up, and feed off of it. That energy is amazing and transformative.'**

—Karen Chapple, PhD,  
Director of the School of Cities and  
Professor of Geography & Planning,  
University of Toronto, and  
Professor Emerita of City &  
Regional Planning, UC-Berkeley

and righting historical planning wrongs is also an ongoing process. Planners need to act now to address the lingering impacts of past planning decisions and to re-evaluate the historical reasoning for today's practices. Past planning has resulted in segregation in the built environment. For example, planning professionals and elected officials intentionally used the construction of the interstate highway system to further segregate and disrupt Black and other racialized communities. In policy conversations at all levels, there has been a call to action to reconnect and restore the affected communities. This trend indicates a general interest in amending both the intentional and unintentional effects of previous planning and land-use decision-making processes. But planners today will also need to consider the potential displacement and gentrification that may occur when attempting to reconnect these communities. They will need to supplement physical linkages between communities with social and economic resources.

#### Removal of controversial symbols

Many people are questioning the presence of controversial symbols in their communities, such as Confederate monuments and streets named after contentious historical figures. Controversial symbols can reduce the sense of belonging in public spaces for certain populations and individuals and can detract from other equity, diversity, and inclusion efforts. Conversations about removing these controversial symbols from public spaces are becoming more common, and in some cases, these conversations have led to removals.

There is also a corollary push to have a more equitable distribution of street names, statues, and other features in public spaces that reflect the history of marginalized or underrepresented groups. These symbolic changes to urban space to make it more inclusive must be accompanied by functional changes—such as changes to the built environment that accommodate people's differing social and cultural

practices—in addition to meaningful policy and practice changes that produce equitable outcomes.

#### Surveillance tools

Increasing access to video surveillance and facial recognition tools has popularized these products in many communities. Facial recognition and other software attempt to identify people's race, age, gender, and ethnicity, so there is growing wariness of these privately and publicly used surveillance tools and the negative impacts they may have on vulnerable populations.

Surveillance tools may lead to profiling of individuals who belong to vulnerable or historically marginalized population groups. On the other hand, some communities might use surveillance tools to make spaces more secure for some population groups (e.g., women and gender minorities). Planners need to consider the impact of surveillance tools on equity, diversity, and inclusion in public spaces, as well as in commercial districts and residential areas.

# The trends we need to prepare for

There are dozens of technological and social innovations on the horizon. Now is the time for planners to start preparing for them, to adopt competencies and knowledge on how to handle them, and to provide the policies needed to implement them equitably. Social innovations, such as a variety of different **private-sector community investment** programs, should be used to support the individuals in the community who need them the most. Technological innovations around **artificial intelligence, automated transportation, and data analytics** need to be understood and used in inclusive ways with equitable outcomes in mind.

# Artificial Intelligence and Ethics



Autonomous vehicles use AI for driver control systems, connecting information from sensors, cameras, and other programs, to make decisions on actions such as steering or breaking. Photo by metamorworks/iStock/Getty Images Plus.

Artificial intelligence (AI) has been in development since the 1950s. However, due to the availability of big data and increased computing power, the AI market has grown substantially over the last decade and is expected to grow 20 percent annually over the next few years. Because AI is already reshaping the local landscape, it is important to understand how planners can use AI equitably and productively. Some important issues to consider are privacy

concerns, data quality, and the potential bias of AI algorithms.

While the data-based automated decision-making capabilities of AI will create myriad opportunities to improve current planning processes, existing data gaps and algorithmic bias pose the risk of creating additional inequalities in the future. Planners and allied professionals should have a strong understanding of the potential impacts and benefits posed by AI to the profession and the communities they work for.

The growing popularity of AI is causing the negative impacts of algorithmic biases to become increasingly difficult to manage. The decision-making capabilities of algorithms and AI programs can reify or reinforce discriminatory planning practices. While AI can make community decision-making, planning, and services more efficient, researchers are still questioning the ability of AI to be wholly objective and fair to all populations.

## AI in everyday life

AI is already being used in many applications of everyday life, including recommendations on what to purchase on online retailer websites, who to become friends with on Facebook and other networks, what company to work for on LinkedIn, and even who to date on online dating sites. The impacts of algorithms on society and individuals' decision-making are visible and not always beneficial.

Other examples include smart navigation apps such as Waze that analyze complex traffic information and use this real-time data to recommend less-congested routes to drivers. While this will result in time and cost savings of the individual using the app, those redirected cars will bring noise, pollution, added stress on surfaces, and potentially more dangerous conditions to neighborhood streets.

## **Urban infrastructure and AI**

AI's wide-ranging applications can help improve government responsiveness, compensate for limited capacity, and reduce the burden of repetitive labor-intensive tasks. The deployment of AI systems for urban tech and different urban infrastructure systems is growing in both the private and public sectors, ranging from automation of systems including their maintenance, to algorithm-based decision-making, to process optimization, among many others. The resulting impacts of widespread adoption of AI technology are diffuse and uncertain, though recent evidence points to the need for an agile, equitable, and thoughtful response to potential challenges.

For planners, the automation of transportation and its impacts on cities and communities will be most disruptive and therefore something they need to prepare for now. Read more on this in the [Automation of Transportation](#) section in this report.

## **AI-based planning tools and upskilling needs**

In addition to the expected impacts on cities and communities and the resulting effects on planners, the planning profession itself is likely to face disruption due to AI. For example, the deployment of AI systems for testing, modeling, and other use cases is growing. Planners can use city digital twins to model future scenarios, evaluate proposed development impacts, and analyze urban systems. Adoption of tools such as city digital twins is expected to continue—for more on that, see the [City Digital Twins](#) section in this report. While most discussions on AI suggest that at least for now, AI will mainly serve to assist with specific tasks and processes instead of completely replacing the human role, the market for advanced tools that automate traditional planning tasks and processes (such as development review and zoning revision or administration) is expected to continue to grow.

Planners will have to adjust their skillsets and learn how to work

### INSIGHT FROM OUR TREND SCOUTS

**'Most of the interesting activity in data science and AI is happening outside of planning. And I really worry about the future of our planning programs—and planning careers, frankly—if we can't become part of this conversation quickly.'**

—Karen Chapple, PhD,  
Director of the School of Cities and  
Professor of Geography & Planning,  
University of Toronto, and  
Professor Emerita of City &  
Regional Planning, UC-Berkeley

with these emerging AI tools and applications. This upskilling must include critical thinking about existing processes and how they may have to be improved to create equity and sustainability. For example, an algorithm designed to interpret a zoning code and graphically display what can be built and where is only as good as the underlying zoning code. This can have significant impacts on a community if the underlying code is based on a legacy of redlining and exclusionary zoning. Planners and the communities they serve must work diligently to prevent these sorts of inequitable and avoidable impacts.

## **AI ethics**

The growth of AI technology markets demands a commitment to ethical standards. Current applications of AI technology have limitations. Human rights, civil liberties, privacy, and social equity considerations are key areas of concern when adopting AI systems in communities or using AI as a

planning tool. Planners need to understand AI applications relevant to planning (e.g., planning tools, urban infrastructure systems, etc.) and participate in the discussions around their development to ensure ethical use and that AI deployment in planning can result in sustainable and equitable outcomes.

Planners, therefore, have a critical role to play in preparing for the downstream effects of widespread adoption of AI.

# Automation of Transportation



Delivery robots can help to minimize car traffic on streets, but even the smallest ones have the potential to be an obstruction to people using sidewalks. Photo courtesy Kiwibot.

The transportation sector is one of the most disrupted planning sectors. The invention of the smart phone and recent developments in artificial intelligence and automation combined with the success of the sharing economy have resulted in the biggest disruptions in this sector. And a growing demand for micromobility options has spurred additional innovation. For planners it will be important to understand these emerging transportation systems,

the needs of their users, and—most importantly—the opportunities they provide to fill existing gaps in the transportation network if implemented with equity in mind.

## Autonomous vehicles

APA published its first comprehensive report on autonomous vehicles (AVs or self-driving cars) and how planners can prepare for them in 2018: [PAS Report No. 592, Planning for Autonomous Mobility](#). At that time, this technology was expected to hit the roads by 2020. Today, the

buzz around AVs has gotten quieter, and it is uncertain when fully automated cars will be seen on the streets. Multiple cities have been piloting self-driving cars, 29 states have enacted AV legislation, and the governors of 11 states have issued executive orders regarding AVs.

For planners, it is important to proactively prepare cities and communities for AVs, including impacts on street design, curb design and management, adjustments of parking needs, and many more as outlined in the above-mentioned PAS Report. Additionally, planners

should be aware of potential shortfalls of this technology. For instance, AV researchers at the Georgia Institute of Technology showed that self-driving cars were more likely to run over people of color than white people, partially due to a machine-learning photo database that largely excluded people of color. Based on this photo database the machine learned to avoid driving into white people, but it didn't learn to avoid driving into people of color.

This experiment raised many questions, such as: What sort of data is used for machine learning? How will an autonomous vehicle decide between running over an elderly woman or running over a young man? What will teach the algorithm to make the right ethical decision, and what is the right ethical decision? Planners need to prepare plans and policies to be ready once AVs hit the road; at the same time, they need to keep watching and learn about how this technology is developing and improving over the months and years to come.

### **Autonomous deliveries**

A growing number of cities allow for automated ground deliveries. Advancements in AV and robotic technology and increased demand for delivery services during the COVID-19 pandemic have created a growing market for delivery robots. Detroit, Miami, Pittsburgh, and San Jose, California, for example, are currently conducting pilot programs with the start-up company Kiwibot. Delivery robots can help to minimize car traffic on streets for deliveries, but they compete for space with people on sidewalks. Effective solutions and the right policies to ensure safety and equitable street use are needed. Planners should prepare those now so they are in place once this technology becomes mainstream.

### **Urban air mobility**

Aerial AVs, such as delivery drones and flying taxis, are an emerging use of AV technology that can expand urban mobility beyond streets and sidewalks. Drone-based delivery



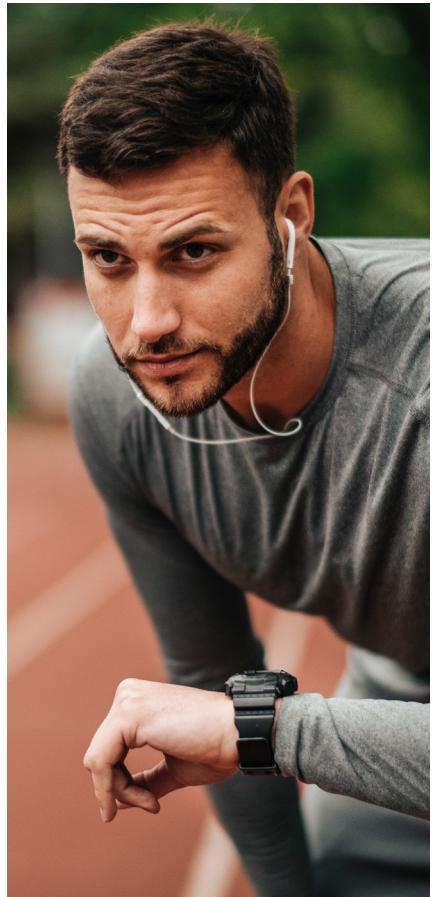
The “smallest airport in the world,” dedicated to eVTOL air taxis and drone operations, is slated to open in Coventry, United Kingdom, in early 2022. The landing pad lifts and lowers, giving access to flight lounges, as well as charging and maintenance areas. Image courtesy Hyundai.

of goods and flying taxis will have the potential to reduce sidewalk and street congestion but will also require new systems of air traffic control and right-of-way regulations. While planners usually don’t make plans for the sky (airspace is regulated by the Federal Aviation Administration, as explained in

[PAS Report No. 597, Using Drones in Planning Practice](#)), it is important for planners to be involved in this aerial local and regional transportation system. Learning from past mistakes in transportation planning will be imperative to ensure equitable and sustainable outcomes with these emerging systems. Currently,

multiple cities in the U.S. and across the globe are piloting drone deliveries and flying taxi systems. The Coventry urban vertiport in the U.K.—the first of its kind—is planned to open in 2022. Paris is already planning for flying taxi service for the 2024 Olympics.

# Data Collection, Use, and Protection



Wearable technologies with data capture capabilities make daily activities like exercising or walking to work a new source of data.  
Photo by milanvirijevic/E+/Getty Images.

Vast improvements in data collection methods are giving planners more access to higher-quality and real-time data in the form of large datasets, also known as big data. New approaches are also developing to reflect increasingly diverse experiences, especially in the societal realm. Together, these trends are changing what data is relevant to planning work and how planners integrate data into their decision-making processes, plans, and recommendations. Meanwhile, new

applications for and uses of data in and outside public governmental use, such as the rise of various forms of “scoring” populations, are also bringing attention to data privacy and protection concerns.

## Individual identities

It is becoming more common for people to identify with complex identities at the intersection of multiple social characteristics. Planners should prepare for new approaches, such as considering life at the

individual level instead of continuing to rely on traditionally defined population groups as the default.

Data collection on demographics and population will require new approaches that can adequately and accurately reflect diversity. Planners should prepare to consider that people exist across various identities (such as race, age, gender, ability, or religion) and avoid assuming homogenous groups that have the same values or needs. More dynamic solutions are necessary, especially ones that planners can

adapt or tailor based on the needs of complex individuals, especially those who have been traditionally underrepresented, underserved, or harmed by policies.

## The complexities of integrating EDI in planning efforts

There is a rapid growth in mandates from local, state, and federal programs that require communities to explicitly measure and identify equity, diversity, and inclusion efforts in local planning work. However, this data can be very difficult to collect and may require asking or inferring very personal information from populations, such as religion or sexual orientation. To prepare for emerging mandates, planners need to reflect on their current approaches to data collection and project evaluation in order to meet important requirements for equity, diversity, and inclusion.

## Recognizing the importance of intersectionality

The planning profession, planning academics, and related professions increasingly focus on one social characteristic when recruiting the next generation of planners (e.g., race or gender). The profession needs to prepare to do a better job of reaching out to people with lived experiences at the intersection of multiple social identities (e.g., disability and class, in addition to race and gender). Ideally, the recognition of these complex identities will improve the range of perspectives represented in the planning profession.

## Scoring systems

Police, immigration officials, banks, universities, and other private institutions are increasingly using scoring systems to inform their decisions, despite persistent issues with bias. AI typically

powers these scoring systems to measure different social attributes, qualities, or characteristics. If planners begin to use similar technical programs or scoring systems, they can further formalize harmful biases in planning and land-use decision-making processes.

Planners should prepare to consider the risks of using scoring systems in their work, such as when attempting to measure neighborhood success. For example, using scoring systems can lead to unintentionally reproducing maps that score neighborhoods based on social characteristics but miss other factors at play across the whole community (essentially reproducing social “blight” maps, which may have harmful outcomes).

## Crowdsourcing

A growing number of governments of all scales have adopted crowdsourcing, often to increase accessibility for residents and reduce public participation costs. Crowdsourcing is a supplement for

or alternative to the use of big data for decision-making or scenario planning that promotes consensus building, learning from local knowledge, and mobilization of residents. Crowdsourcing can be a formal iteration of civic tech, and one outcome could be large amounts of data provided directly from residents that reflects the preferences of population groups.

Planners should prepare for an increased interest in crowdsourcing from local governments, as well as how to deal with the influx of new kinds of data that may bring other findings than their traditional data collection methods.

## Wearable technology

Wearable technology is maturing, and product capabilities are expanding, particularly those related to health, finance, and communication. Through monitoring and location-based services, data from wearables can provide insights on local activity patterns in urban environments. This information

## INSIGHT FROM OUR TREND SCOUTS

**‘I’m working to best determine how to define what constitutes a minority religion, or how to best identify what folks’ sexual orientation is and where they live because the federal government is starting to give [EDI considerations] more weight when evaluating projects in discretionary programs. How do we as planners start to think about how we evaluate projects [for EDI considerations]?’**

—Robert McHaney, AICP CTP, ENV SP, Chief Project Officer for The Goodman Corporation

is beginning to become widely available, and planners will need to prepare now to leverage this. This may include partnering or communicating with data providers to garner new insights on local residents using their specific datasets—which likely haven’t been available to planners before.

The constant development and refinement of new tools for data collection will continually affect how planners collect data, and what types of data they have access to. In addition to crowdsourcing and wearable technology there are other developments on the horizon. See the [PlanTech](#) section of this report

for more information on emerging technologies with applications for data collection that planners should watch for.

## Data protection and privacy

The increased use of big datasets is prompting growing concerns about data privacy, resulting in the need for more regulation of access to data and data collection, ethical data use, and storage and ownership of data. Currently, the EU’s General Data Protection Regulation is the strictest such regulation globally. Some U.S. states have started to implement data protection regulations

as well, with the California Consumer Privacy Act being the most comprehensive.

As planners get more access to new kinds of data, they will also need to understand how these data protection regulations affect how they can use data. This will be particularly important when implementing [smart city applications](#) to mine data from sources such as sensors and the Internet of Things, among others.

# Private-Sector Community Investment



By establishing the launch pad for SpaceX in Boca Vista, Texas, Elon Musk has prompted safety and quality-of-life concerns for the residents of this small community—but there is also the promise of a boost to a region of the U.S. facing economic distress. Photo by Christopher Lee/The New York Times.

The private sector has always played a notable role in funding programs and projects for communities. With the rapid growth of technology companies and other lucrative tech-related businesses, private-sector leaders have a growing interest in shaping communities using their financial capital. Similarly, there is motivation from private foundations to further their own principles and goals in communities. Often there is alignment with the vision of the community and the potential

for co-benefits, but planners should be careful when this is not the case. The value of private-sector community investment is the ability to work outside the political constraints of public spending.

## **The return of company towns**

The combination of generous tax incentives from state and local governments, plus the increasing influence of tech and tech-adjacent companies, are leading to the return of “company towns.” While over the past decade large campuses from

tech giants such as Google, Apple, and Microsoft have become more common in certain regions, more recently, companies such as Amazon and SpaceX have begun exerting much more influence on the administration of incorporated jurisdictions. One recent example is Boca Chica, Texas, the site of SpaceX’s private spaceport, as mentioned in the [Space Colonization](#) section of this report.

Privately run corporate communities aren’t new, but their reemergence is a trend that planners should be aware of. One issue

of concern is increasing corporate control over existing public administration, or the takeover of public administration by a single corporate entity. This, and other new developments, may have negative implications for public outreach, public safety, and a dedication to the public good if planners are not able to influence or manage these large, often powerful private companies with varying interests.

One recent development that might impact this trend is the adoption of “work from anywhere” policies by major companies. With fewer people working in a physical office, there may be less demand for real estate. However, these workers might still concentrate in specific regions and continue to have an economic impact on nearby communities.

### **Big tech-funded affordable housing**

Major tech companies (e.g., Amazon, Facebook, and Google) have begun investing in affordable housing programs in communities

near their operations. As of now, this primarily includes research and development for factory-built homes, as well as financing or contributing to local affordable housing efforts.

Private-sector involvement in housing requires input from planners, who can provide insight on the root causes of displacement and gentrification, among other considerations. Planners also need to be at the table during these conversations to advance equity, health, sustainability, and economic development principles—all of which are necessary to support and complement the creation of affordable housing.

### **Digital dividends**

Tech companies are considering using digital dividends, or the profits from AI’s economic efficiencies, as a way to “pay back” communities that have experienced job losses or economic distress due to the rise of automation and AI. Planners will need to consider how these private investments in

### INSIGHT FROM OUR TREND SCOUTS

**‘We’re seeing more investment from foundations into projects that have an intersectional approach and are bringing humanities into the public realm. One example is the work of reimagining monuments and memorials that Mellon is funding, which addresses how public art affects who is welcomed into public space—and who is not.’**

**‘Another example is the Kresge Foundation’s investment in creative placemaking as an opportunity to address issues of climate change, racial equity, and community building. I think this is something that is happening outside of the planning field that’s worth thinking about and being aware of.’**

—Annis Sengupta, PhD, Director of Arts and Culture, Metropolitan Area Planning Council

communities affected by AI and automation will impact local economies and employment levels.

In general, when looking at the impacts of AI and automation, a long-range and future-focused lens will be necessary. In this case, if digital dividends are provided as recurring payments, they may become a viable way to fund entire communities. On the other hand, if companies provide digital dividends as one-time payments, there are equity implications—such as

determining who controls the process of distributing funds and who benefits.

### **Increased funding from foundations**

More private and philanthropic foundations are offering funding for community development. This gives planners an opportunity to use funding that is independent of governmental priorities but still compatible with important activities such as arts

and culture or social improvement. These private sources of funding can further equitable improvements in communities that may be more difficult to achieve using public funds, since the latter require the approval of elected officials who may have differing political priorities. Planners should leverage this type of funding to meet the needs of the communities they serve.

# The signals we need to learn about and watch

While the future is more unknowable than ever before, there are a few signals on the horizon we should learn more about and keep watching, as they give us cues on how the future might unfold. Many of them are linked to technological innovations such as **3D printing**, the **metaverse**, **robotics**, and the privatization of **outer space**. Others inspire us to try out new solutions to societal and environmental challenges, such as **equitable community funding** innovations and emerging **green markets**. Economic shifts during the pandemic leave us with many unanswered questions and just as many plausible scenarios for the future.



# 3D Printing



In 2020, ICON partnered with a housing nonprofit to establish a community of 3D-printed homes in Mexico. ICON is developing a new project near Austin, Texas, which will be the largest neighborhood of 3D-printed homes in the U.S. to date. Photo by Joshua Perez/ICON.

3D printing, or additive manufacturing, is a process of creating three-dimensional objects based on a digitally designed model. It has evolved over many years and is becoming ever more sophisticated, while the cost has been going down. Today, multiple materials can be mixed into one print. In the future, we might be able to 3D print anything anywhere. Most relevantly, 3D printing has made significant progress in the construction and infrastructure

sector. The market is expected to grow substantially over the next years.

Compared to conventional construction, 3D printing can be done at lower cost with fewer emissions in shorter times. Entire houses can be printed within a few days; a smaller workforce is needed due to robotic automation, which seems beneficial during times of labor shortages; and building materials can be used more efficiently.

## 3D-printed homes

In recent years, companies across the globe have 3D printed houses. Successful examples can be found in the U.S., Europe, United Arab Emirates, Mexico, and India. The largest development of 3D-printed houses in the U.S. thus far is expected to be implemented near Austin, Texas, in 2022 by the 3D printing company ICON, the home construction and real estate company Lennar, and the architecture firm BIG-Bjarke Ingels Group. The project is committed to 3D print 100 energy-efficient homes

that promise to be more affordable, resilient, and longer lasting than conventional construction.

### **3D-printed infrastructure**

In July 2021, the first pedestrian steel bridge was 3D printed and installed in Amsterdam as a collaborative effort from Joris Laarman Lab, the Dutch company MX3D, and the Imperial College London. This 39-foot bridge also functions as a living lab, a prototype for future infrastructure, and is equipped with numerous sensors to collect data about how the bridge changes over its lifetime and to track people's interactions with it. The data feeds into a digital twin of the bridge in real time so engineers can monitor its changes and be alerted to any potential issues.

A joint venture between three construction companies, Skanska from Sweden, Strabag from Austria, and Costain from the UK, is using a 3D printing technology called "Printfrastructure" for the installation of a 330-mile



The opening of a 3D-printed bridge in Amsterdam—which has a prize-winning design by Joris Laarman Lab—included a visit from the queen of the Netherlands on July 15, 2021. Photo by Rotalpool/Remko de Waal/Albert Nieboer/Netherlands OUT/Point de Vue OUT/dpa/Alamy Live News.

high-speed rail system in the U.K. Concrete structures are printed on site, which results in more efficient use of concrete, no need to

ship prefabricated slabs or mixing and pouring on site, and potential reductions in carbon emissions by 50 percent. The first phase, linking

London to Birmingham, is projected to be finalized by 2026.

3D printing could prove to be an attractive solution to multiple

challenges the U.S. is currently facing, from the housing crisis to the infrastructure crisis. It may also resolve issues such as supply chain issues caused by the COVID-19 pandemic and labor shortages.

### **3D-printed anything**

In addition, the possibility to 3D print anything anywhere could disrupt retail and entire supply chains. Some companies are even exploring 3D printing food. If we can 3D print anything anywhere, people may buy a design or idea for a product online and go to their local 3D print store to print it. This might have major impacts on what main street and shopping malls may look like in the future.

Planners should keep watching the development of this technology and learn about its successes and failures to inform future decisions about using it as a solution to many existing challenges, as well as its disruption potential for communities, when it comes to retail, supply chains, and labor markets.

# Community Funding for Equity



Using lawn signs like this, residents in Evanston, Illinois are showing support for the newly created reparations program. This program commits funds to directly address historical racism and housing discrimination. Photo by Akilah Townsend/The New York Times.

With an increasing recognition of the inequities of traditional community funding methods, multiple communities across the country have been piloting and testing out alternative community funding mechanisms that explicitly address equity considerations. These equitable community funding attempts may have implications for public budgets and spending, which directly affects planning work. Planners should pay attention to these programs and consider how they might help to improve equity in their communities.

## Rematriation through land taxes

Communities are taking the first steps in support of rematriation, or the return of Indigenous lands, such as by paying land taxes to local Indigenous groups. In June 2021, the Alameda, California, City Council voted to pay Shuumi Land Tax to the Indigenous people living in the Bay Area of California. This agreement establishes payments in the amount of \$11,000 per year for two years. Other communities may consider similar pilot tax programs

that they could expand beyond the initial term.

In order for rematriation of Indigenous lands to occur, planners would need to reflect on the role of previous and current land-use and development processes in removing Indigenous people from their ancestral lands. Planners would need to collaborate with local Indigenous groups and current residents to find the most equitable way forward. The rematriation of Indigenous land has positive implications for sustainability, resilience, and health, as well

as equity, diversity, and inclusion, so planners should watch and learn from these programs to see how they will impact and potentially uplift common planning goals.

## Reparations programs

A handful of communities are piloting, or considering, programs that explicitly address the history of injustices that have led to lower socioeconomic status, on average, for racialized populations. Evanston, Illinois, a suburb of Chicago, is one community that has begun a reparations program. The city is aiming to distribute \$10 million to those who have suffered from housing discrimination and its impacts, with the first phase being given out as housing grants towards repairs, mortgages, or down payments for homes.

Planners should similarly address the legacy of exclusionary planning and land-use processes and their impacts on the

socioeconomic status of individuals, populations, and entire neighborhoods. Because of this, they should learn from the success and failures of the leaders who are negotiating these programs, as well as the factors considered in establishing and implementing these programs. Planners should also watch to see how they can assist in aligning these programs with plans that address economic development.

### **Universal basic income pilots**

There is a growing interest in universal basic income across the U.S., with many communities piloting guaranteed income programs for targeted groups.

As of 2021, universal basic income pilots are underway in major cities such as New Orleans, Denver, Chicago, and Atlanta. Many of these programs provide monthly payments to a select number of individuals or families, with some choosing to target specific economically disadvantaged areas. Smaller communities across



The universal basic mobility program in Oakland, California, provides selected residents with preloaded debit cards, increasing their access to services such as the Bay Area Rapid Transit (BART) system. Photo by Sundry Photography/iStock Editorial/Getty Images Plus.

the country, including Stockton, California; Chelsea, Massachusetts; and Gary, Indiana, are also piloting similar guaranteed income or “free money” programs.

Planners need to consider the impact universal basic income

programs may have on economic development, and how they may lead to changes in commercial investment and the socioeconomic status of disinvested neighborhoods.

### **Universal basic mobility**

Communities are launching pilot programs that give everyone access to basic mobility services, such as transit or shared mobility projects, to advance related social and economic development goals.

One recent example is Oakland, California, a city that has begun a universal basic mobility pilot program that provides eligible residents with up to \$300 on preloaded debit cards for transit and shared mobility services, specifically targeting those who live in East Oakland.

Universal basic mobility addresses the root cause of many inequities: physical access to economic, educational, health, and recreational opportunities. Many communities are offering universal basic mobility in the form of direct financing of mobility services for individuals or through general subsidizing of mobility services. Planners should watch and learn from the communities that are implementing these programs to discover the effects they will have on those communities and determine if similar programs may result in equitable socioeconomic outcomes in their communities.

# The Great Resignation and Dislocation of Work



The COVID-19 pandemic has led to major labor shortage across various industries. Storefront signs like this are becoming more prevalent as understaffed businesses continue to be unable to fill vacant positions. Photo by Heidi Besen/Shutterstock.

Long-term signals point to significant changes in not only the wider job market, but also in the nature of employment and the role it plays in daily life. While partially ushered in by the economic shifts accompanying COVID-19, these changes are also linked to a variety of other trends, including more robust systems of federal aid for childcare and living expenses, digitalization-induced shifts in where and how people work,

pent-up demand for goods and services and the role it plays in driving economic change, and automation across economic sectors.

## The Great Resignation

In April 2021, the National Federation of Independent Business reported that a record 44 percent of small-business owners reported job openings they could not fill in the current period, up from 24 percent in April 2020 and the average of 22 percent over the past 48 years.

The labor shortage has hit the construction, manufacturing,

transportation, and restaurant sectors particularly hard. This shortage has reverberated across the economy and is due to a variety of factors, including large numbers of retirement-age workers leaving the workforce, more parents choosing or being forced to remain home with school-aged children, more robust aid from the federal government due to the pandemic that has helped to shore up household savings, and lagging wages in the service industry that are only beginning to adjust to new market rates.

The longer-term implications of this trend are potentially significant

in a wide variety of industries spanning manufacturing, service, retail, healthcare, and in white-collar professions and office work. The concurrent emergence of advanced technologies such as robotics, automation, and advanced connectivity enabling the digitalization of work are likely to play into this trend well into the future. The effects of these major sectoral changes on the built environment will require planners to be nimble in helping communities adapt.

## Robotics and automation

Trends in robotics and automation have accompanied ongoing labor shortages, which have been exacerbated by COVID-19, particularly in the service industry. AI-powered robots are now being used in recycling facilities, for food deliveries, and in many other service industries. Automated checkout technologies have long been a part of grocery

and convenience stores, but they are now also becoming a fixture in restaurants and other commercial establishments. KFC opened its first contactless, robot-based restaurant in Moscow in 2020.

While these developments can be seen as an attempt to temporarily fill existing labor gaps, there is significant potential for their expansion into new sectors and industries over the coming years, including areas such as public safety and office and knowledge work. The broader impacts on the economy are uncertain over the long term, though planners should be prepared for the role that automation may have at the community scale.

### **Working from anywhere**

An increasing number of companies and public agencies are allowing their employees to work from anywhere. This might lead to a redistribution of highly skilled workers across the nation and might break up clusters such as Silicon Valley.



The first cashier-free, robot-based KFC opened in Moscow in 2020. Photo by Gavril Grigorov/TASS/Alamy Live News.

Additionally, companies are rethinking their real estate needs for office space. Cities have traditionally been the job centers of the country. If jobs are no longer the reason for people to move into cities, planners need to come up with new concepts to make cities attractive for people to want to live in them. In addition,

entire downtown areas will have to be rethought due to obsolete office spaces. Cities will see shrinking demand for physical office space and lower local multiplier effects from office workers. Multiple U.S. cities have already started to convert office space into residential space, including Chicago, Cleveland,

Los Angeles, and Nashville, Tennessee, among others.

Cities will need infrastructure upgrades to accommodate increased online traffic with low latencies. At the same time, during the pandemic millions of new businesses have been founded and are currently operating online. Many companies haven't made a final decision between remote work, a return to the office, or a hybrid approach. While there is significant uncertainty here, planners can start preparing for different scenarios so they are ready once it becomes clearer what the future of work will look like.

### **Pent-up demand**

Following the initial waves of COVID-19, there has been a huge release of pent-up demand for both goods and services. In combination with ongoing labor shortages, this has impacted a variety of major economic sectors, including construction, tourism, travel, entertainment, recreation, and sports. Sixty-three percent of U.S. adults said they're

excited about the opportunity to take a vacation once the pandemic is under control and the economy has fully reopened. Data suggests pent-up demand is far from spent, with labor and goods shortages creating a feedback loop causing demand to stay stubbornly high.

While the release of pent-up demand may have positive impacts on local economic development and growth, it also relies on available labor, reliable scheduling (particularly in the case of air travel and worsening cancellations), and affordable prices. Recent developments point to higher rates of inflation due to pent-up demand, more disposable income due to COVID-19-related federal support, and the inability of both manufacturing and supply chains to keep up. The degree to which these challenges will continue remains uncertain, though planners should be aware of these broader economic shifts and the role they play in local economies.

# Green Signals



Like many other European cities, the city of Ljubljana, Slovenia, converted its downtown into a car-free area to enhance quality of life and encourage people to use alternative means of transportation. Photo by BalkansCat/iStock Editorial/Getty Images Plus.

While this report has already laid out multiple trends around actions U.S. planners are taking in their communities to mitigate climate change, APA's Foresight team identified several additional green trends from other countries and industries that could be important signals to planners here.

## Car-free cities and hyperlocal solutions to people-centric planning

Many European cities have been converting their downtown areas or city centers to car-free areas (e.g., Oslo, Norway, and Ljubljana, Slovenia) or have implemented or are planning extensive car-free zones throughout cities (e.g., Paris, Vienna).

During the COVID-19 pandemic, some U.S. cities temporarily converted some of their streets into shared streets or pedestrian zones as well; some will stay this way permanently. Giving cities and streets back to the community as places where people can spend

their leisure time has been a trend and should continue to be considered by planners when planning for healthy, environmentally responsible communities.

Additionally, Paris mayor Anne Hidalgo revived the idea of a 15-minute city, a walkable and locally focused urban concept, well-known from previous planning literature (e.g., Jane Jacob's *The Death and Life of Great American Cities*). By stating the goal to make Paris a 15-minute city, she prompted a new trend among many planners globally. Stockholm went even farther, promoting the 1-minute city, a hyperlocal concept of people-centric urban planning.

**INSIGHT FROM  
OUR TREND SCOUTS**

**'We're seeing some of the best examples of planning coming from the international community, and we're not capturing those things nationally—whether it's sponge cities in China, or clean energy, or transportation initiatives in Latin America. Some of the best planning in the world is not happening in the United States, and I think we're failing to capture that and distribute that to our membership.'**

—Michael Kolber, AICP, PP,  
Senior Planner, City of Trenton,  
New Jersey



Explosive growth in the synthetic meat industry, particularly the development of plant-based beef, is turning food-tech companies like Beyond and Impossible into household names. Photo courtesy Beyond Meat.

#### Short-distance flight bans

European countries (namely France, the Netherlands, and Austria) are exploring options to ban short-distance flights (flights that could be replaced by train rides less than 2.5 hours) to reduce CO2 emissions.

France passed legislation banning all internal short-distance flights in April 2021, and others are considering imposing additional fees for those flights.

This is not a trend yet, but it raises the question if this could

become a topic for discussion in the U.S. as part of the global climate debate. However, the U.S. railway network would need substantial improvements to make similar approaches feasible.

#### Circular economy

The circular economy is an approach to sustainable production and consumption that prioritizes sharing, leasing, reusing, repairing, refurbishing, and recycling of products and materials. In 2018, China stopped taking plastics from many countries, including from the U.S. As a result, the Western world had to start thinking more creatively about what to do about its waste. The EU adopted the Circular Economy Action Plan (CEAP) in 2020, a mix of legislative and nonlegislative measures.

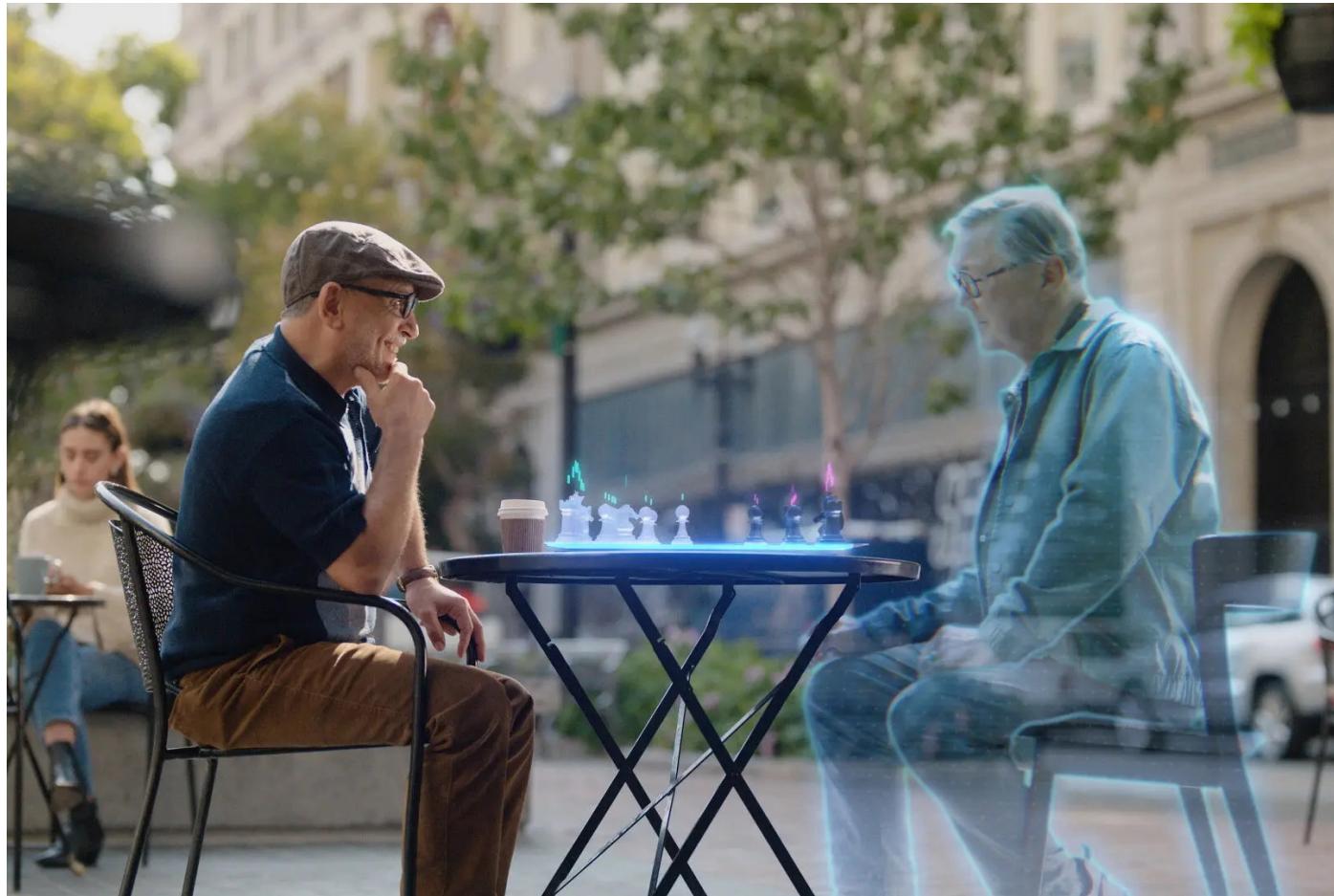
The circular economy is starting to grow in the U.S. as well, and more retailers are exploring buyback and recycling programs. As supply chain delays continue, this emerging trend could further accelerate.

#### Synthetic/lab-grown meat

There has been explosive growth in the synthetic meat industry, exemplified by food-tech companies such as Beyond and Impossible and their development of plant-based beef. Adoption by the public and restaurant industry has been rapid.

While lab-grown meat might not completely replace meat from real animals, it might have some impacts on the consumer's choice. The potential climate consequences are significant, given the role of industrial cattle farming in driving greenhouse gas emissions. And it can be produced locally within cities, without having to keep animals in disturbing conditions or transporting them or their meat across the country.

# The Metaverse



While online hangouts aren't entirely a new idea, the development of the metaverse has the potential to change how people interact in digital spaces through their personalized avatars. Photo courtesy Meta.

The metaverse doesn't yet exist, but it has been declared the next step in the evolution of the internet. The metaverse is the ultimate digitalization of life. It is a digital, computer-generated universe or “extended reality” that combines augmented, virtual, and mixed reality. In the metaverse people can, through their lifelike avatars, “live” and perform activities they used to in real life—only digitally.

In an announcement, Meta founder Mark Zuckerberg says he envisions the metaverse to be “an embodied internet, where instead of just viewing content—you are in it. And you feel present with other people as if you were in other places, having different experiences that you couldn’t necessarily do on a 2D app or webpage, like dancing, for example, or different types of fitness.” Participants will be able to buy digital outfits for their avatars and create the identity they want in virtual life.

## Growing interest from big tech

The term “metaverse” was coined in 1992 but only gained attention recently, when Facebook changed its name to Meta in October 2021. Technology companies such as Meta/Facebook and Microsoft are investing considerable capital in the research and development of the metaverse. It is expected to be as transformative to the ways we live, work, and play as the cellphone was.

According to some, the metaverse will be the new way to socialize, do business, work, and live in a virtual 3D space. While

the metaverse is still not fully developed, many companies are experimenting with the technology. In 2020, tens of millions of people attended an in-game live concert of Travis Scott organized by Epic Games (creator of the game Fortnite). Companies such as Decentraland and Upland are selling digital real estate, avatars, and other digital assets. These endeavors provide a glimpse into the virtual world of the metaverse.

### Live, work, play virtually

The metaverse will have impacts on the field of planning and what planners do. If engaging in daily activities such as shopping, schooling, working, socializing, and recreating is happening in digital space instead of brick-and-mortar buildings, it will have major implications on how planners design physical spaces and the built environment. Case in point, Barbados is opening its diplomatic embassy in the metaverse. Shifts like these will require planners to rethink



Festivals of the future could range from on-site VR experiences to live in-game performances organized by companies such as Epic Games (creator of Fortnite). Photo by David Jense/EMPICS Entertainment/Alamy.

how they work and plan.

A recent APA blog post highlighted [the implications of digitalization on planning](#). The metaverse will only heighten these impacts of digitalization on land use and zoning, urban

design, transportation, economic development, and other planning domains. The outcomes may be positive or negative. Living in digital space may reduce vehicle miles traveled, but it may also increase sedentary lifestyles and

thus harm people's mental and physical health.

### Increasing equity concerns

The repercussions of the metaverse on equity are huge. People with

higher incomes and education may be able to engage in the metaverse, while it may not be available to people with lower levels of socio-economic status. Lack of broadband access and unaffordability are some of the reasons why this may happen. It is integral that technology such as the metaverse does not further broaden existing inequalities.

So far, it's not clear what the metaverse will mean for privacy, how inclusive the experience will be, or how harmful content will be mitigated or avoided. There's obviously a lot to unpack about something that doesn't even exist yet, but it could have enormous impacts on the trajectory of our future. We face high risks repeating past mistakes from the analog world in a digital society. Ultimately, we need to think carefully and critically about how people will engage with this platform—and how that will change lifestyles, behaviors, and ultimately the work of planners.

# Privatization of Outer Space



The SpaceX Crew Dragon Endeavour departs the International Space Station with four commercial crew astronauts on board as both spacecraft were orbiting 259 miles above the Jaluit Atoll in the Marshall Islands. Photo courtesy NASA.

A new space race is underway, this time between private corporations like SpaceX, Blue Origin, Virgin Galactic, and the United Launch Alliance. This competition is fueling a revolution in launch capabilities in the U.S. and internationally that is leading to major cost reductions and sustained interest in the commercialization of space. This commercialization and privatization can generally be explored in the context of three emerging trends: growing competition for commercial

satellite launches, space tourism, and the longer-term colonization of space. While the impacts on Earth are uncertain, they do signal some potential changes and disruptions for cities and planners.

## **The growth of private space industries**

Since 2011, private corporations have increasingly filled the void left by the cancellation of the Space Shuttle program. Corporations such as SpaceX and the United Launch Alliance have performed hundreds

of launches over the last decade, owing to technological advancements that have reduced costs for contractors. Since 2020, NASA has relied entirely on SpaceX for crewed launches, a job once handled by NASA itself or its Russian counterpart Roscosmos. Smaller startups and larger launch providers (such as Jeff Bezos's Blue Origin) have also sprung up in the competition for lucrative private and public space launch contracts. SpaceX's Starlink program, which aims to provide high-speed and low-cost internet via a series of satellites to people

across the world, including in rural areas, signals both the growing maturity of the private sector in space and the potential for benefits here on Earth.

Concurrent with the growth of launch contracts is the emergence of space tourism. In September 2021, four tourists in SpaceX's Dragon capsule became the first all-civilian crew to orbit the Earth. This comes on the heels of shorter sub-orbital tourist trips with Blue Origin and Virgin Galactic. While these are not the first tourists to visit space, they do signal growing access and reduced costs due to increasing competition between private corporations. New developments, such as an October 2021 trip to the International Space Station by a Russian film crew, have the potential to drive further interest in space tourism. Space tourism is still largely in its infancy, though the rapid growth of air travel in the early- to middle-20th century may hold some lessons for communities on the potential for the industry.

While the implications of growing space-based industries may seem remote in current planning practice, they do point to the potential emergence of new roles for planners both here on Earth and in space. The continued growth of these industries requires substantial amounts of both resources and land to function at scale. This use of land and resources comes with environmental and social costs that planners will likely play a role in addressing at the local level. Additionally, the growth of the private corporations driving this development is noteworthy as an equity issue, given the vast sums of money and venture capital investment involved. The choice to expend both the effort and financial resources speculatively on emerging space-based industry rather than on well-documented and chronic problems on Earth has real consequences for communities.

### Space colonization

Longer-term ambitions for corporations like SpaceX and Blue



Mars and the moon are in the sights of corporations for colonization, but planners with a vision can play a critical role in ensuring these places are functional, and liveable. Images courtesy NASA/KSC.

Origin have recently coalesced around colonization of the moon and Mars. SpaceX recently won a major contract to use its in-development Starship rocket to land astronauts on the Moon for the first time since 1972. SpaceX's goals with the Starship rocket are

to provide a sustainable platform for human habitation and colonization of low-Earth orbit, the moon, and Mars.

While the realization of these goals is likely many years away, impacts on communities are already being felt. SpaceX's choice

of Boca Chica, Texas, as the site of its Starship development and testing facility has led to major changes for the small town almost overnight. Between test launches, launch failures, road closures, tourism, population changes, and the environmental impacts of a rocket launch facility, the effect of SpaceX's long-term ambitions on one small community may offer a signal for the role similar corporations may play in the future.

Additionally, there may be roles for planners in the design and function of space-based colonization and settlement. Should colonization of space truly be viable, it will likely be accompanied by many of the familiar challenges of planning, building, and maintaining communities here on Earth. Even with the vastly different circumstances of life in new environments, planners can still play a critical role in ensuring that these places are not merely functional, but also livable.

# The future of planning

The trends of upskilling and reskilling due to digitalization and other drivers of change were mentioned in the Economic Restructuring trend cluster. The planning profession will have to evolve as well, including the **skillset** that makes a good planner, the **processes and methodologies** planners apply in their work, and the **tools** they can use to make planning more efficient and effective. Planning **priorities and goals** will also need to be adjusted to a changing world.



**Planning Competencies and Skills**



**PlanTech:  
Updating the  
Planner's Toolkit**

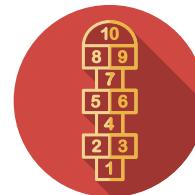


**Conclusion**

# Planning Competencies and Skills

The APA Foresight team and the members of the Trend Scouting Foresight Community have identified multiple deficiencies in current planning methods and processes during their daily planning work. This section explains what those are and offers initial ideas on what needs to change and how. In addition, APA has started its initiative to Upskill Planners, which will dive deeper into skills gaps and will provide trainings and education to help futureproof the planning profession in the months and years to come.

## Planning for change and the need for agility



During the COVID-19 pandemic many land-use decisions had to be resolved faster than the usual processes would allow, which was made possible through emergency orders. For example, streets were closed for car traffic to support outdoor restaurant seating, a process that would typically take months if not years. With the increased pace of change communities are experiencing in all five trend categories (societal, technological, environmental, economic, and political), more flexible planning solutions will continue to be needed. In some cases, conditional use permits have served as interim solutions; however, sustainable planning and design solutions that can accommodate continuous change will be needed to make planning more agile.

In general, built environment professions are shifting towards designing adaptable buildings and infrastructure systems that allow more flexibility in terms of target user groups. This is not entirely new ground; architecture has created adaptive use designs for a long time. The increasing need for agility in planning reflects the importance of considering continuous change in planning as well. [Integrating foresight approaches into planning](#) and emphasizing the use of [scenario planning](#) or [design thinking methodologies](#) are examples of how more agility can be added to planning processes.

## INSIGHT FROM OUR TREND SCOUTS

**'We have a lot of underrepresented people who don't know anything about planning. And they need jobs. And they need help in many different facets of society. It's difficult to get those folks involved because our planning world is not simple. We use a lot of [specialized] terminology.'**

—Vidal F. Márquez, Assistant Planner,  
City of Orange, California

## Increased complexities require interdisciplinary collaboration



With increased shifts and changes in all five trend categories and the high potential for continuous disruption, planning challenges and the task of planning are becoming ever more complex. To be able to respond to the complexities around us, planners increasingly collaborate with other disciplines, including disciplines outside of the usual built

environment professions (e.g., artists, psychologists, IT experts, public health experts, etc.).

For successful cross-sector collaboration, planners will need to adjust processes to allow for more interdisciplinarity, build a network of subject matter experts outside of the planning profession, and be open to explore and accept other disciplines' approaches and processes, including their professional language and jargon.

## Human skills



The increased complexity of community challenges also affects how planners communicate with the communities they serve and the increased need for inclusion and equitable solutions. The connection to the individuals of a community is the most important link to success. Planners should consider concepts such as citizen planners and participatory co-creation for more active and equitable ways of community engagement.

Many people do not know what planning is or what planners do. Recently, planning has received more attention in news outlets and the media—but this attention has not necessarily represented the positive aspects of the profession (e.g., redlining and other discriminatory or racially inequitable decisions and actions). It is important for planners to be able to explain and showcase the value of planning.

While many past planning mistakes still need to be corrected, planners need to build upon the positive effects planning can have on communities. Especially among underrepresented communities, the value of planning is not always clear. Cultural

### INSIGHT FROM OUR TREND SCOUTS

**'One of the trends that we're seeing in design professions is Design for Change. The idea is to design everything, from the beginning, to be adaptable to change—meaning change in the way people live, work, recreate. It's an approach that is inherently far more sustainable and resilient than current processes.'**

**'So the question for planners is, how do we support this sustainable and resilient approach through zoning, regulatory processes, economic incentives, etc.—all the systems and processes that underlie the ability to Design for Change in our built environment?'**

—Merrill St. Leger, AICP CUD, LEED AP, Principal, Urban Design and Planning, SmithGroup

humility and building trust with community members are key.

Active community engagement is becoming ever more important, as discussed earlier in this report. Planners plan for the future of their communities, affecting how people live, work, play, and move around town. The combination of the purpose of planning and the increased division of the country result in many different emotions during engagement processes. Planners need to know how to diplomatically navigate heated discussions, facilitate among different opinions, and most importantly practice empathy and compassion. Human skills are crucial in planning today and will gain ever more importance in the future, especially in the contexts of equity, diversity, and inclusion.

# PlanTech: Updating the Planner's Toolkit

Alongside GovTech, FinTech, and MedTech, the planning profession can coin its own term for technology being used in planning: PlanTech. This section will provide information on new and emerging planning tools that might be worth taking a look at and trying out. The ones that rose to the top are related to visualization, simulation, and experimentation in the virtual world, including scenario planning, and new tools for data collection and surveying.

## Scenario planning tools

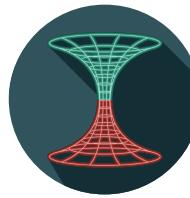


Scenario planning is becoming ever more popular as a methodology to make sense of the future. To make sense of the trends listed in this trend report, planners can use [scenario planning](#) and prepare plans for multiple

plausible future scenarios of their communities. Depending on how the trends develop over time, this allows planners to pivot and adjust in real-time.

There are several software tools that planners can use to create digital scenarios and play out implications of different strategies and futures. Envision Tomorrow, UrbanFootprint, CommunityViz, and ArcGIS Urban all serve different purposes and can be used alone or in combination. These software tools allow planners to visualize tradeoffs of different interventions at a range of scales in the built environment, test their strategies in a digital future world, and determine which strategies will help them be prepared for a range of futures.

## (Smart) city digital twins



IBM defines a digital twin as “a virtual representation of a physical object or system across its lifecycle, using real-time data to enable understanding, learning, and reasoning.” In the planning context, city digital

twins and smart city digital twins of entire cities can be used for

simulation, virtual experimentation, and testing to optimize a plan or a policy. Additionally, they can improve visualization and enhance the presentation and elaboration of plans during community engagement processes. Platforms to create city digital twins are available from companies such as Esri, Cityzenith, Bentley Systems, and others.

According to the tech market advisory firm ABI Research, the number of communities deploying digital twins as “multi-purpose urban decision and management tools” is expected to increase to over 500 by 2025. Planners need to understand how these applications collect and process data, adopt processes that prevent data gaps, and eliminate algorithmic bias to ensure equitable outcomes.

APA’s [PAS QuickNotes No. 89, “Smart City Digital Twins”](#), gives guidance on how this emerging tool can be used to support better decision-making, more effective stakeholder engagement, and more robust scenario planning processes. The [Planning article “Smart City Digital Twins Are a New Tool for Scenario Planning.”](#) provides insights on equity considerations when using digital twins and how to make their outputs more inclusive. And the recent [PAS Report No. 599, Smart Cities: Integrating Technology, Community, and Nature](#), explains how planners can use digital twins to plan with smart cities, using the data mined by smart city applications for smart decision-making.

## Virtual reality and game engines



The market for virtual reality (VR) and augmented reality (AR) is expected to grow substantially within the next decade. VR and AR tools can be useful to enhance the visualization of plans and policies and to make complex conditions understandable through experience.

Advances in game engine technology make it possible to combine GIS and digital twin technology with VR/AR. For example, data from Esri's 3D-modeling software CityEngine can be exported to the video gaming engines Unreal and Unity to create a virtual master plan. The user can walk around this virtual reality and experience what the implementation of the plan would look like. These tools are specifically useful to test and prototype plans and to detect potential deficiencies, and they can be used to make public participation more engaging, moving from plan illustrations to experiencing plans in the virtual world.

Additionally, these tools can be used to help planners understand the variety of ways community members experience their city, neighborhood, public spaces, or public transit. Putting themselves into other people's shoes by experiencing their daily hurdles and constraints in virtual settings will bring planning closer to all community members and can train planners to practice empathy.

More on different applications of VR, AR, and game engines can be found in APA's [PAS Report No. 599, Smart Cities: Integrating Technology, Community, and Nature](#). It also includes

the story of how the urban planning consulting firm Houseal Lavigne combined digital twin and VR technologies to help Morrisville, North Carolina, decide between two scenarios for its downtown plan.

## Diminished reality



Diminished reality (DR) is a form of augmented reality that hides existing elements from the physical environment. Examples for existing tools include noise-cancelling earphones or smart glasses. DR could become an interesting tool for planners to visualize what a community could look like under certain circumstances.

Planners should also be aware of the potential risks related to this technology. Using smart glasses to simply cancel out anything or anyone we don't like to see might affect how society prioritizes environmental pollution, homelessness, and other challenges.

## Drone technology



Drones as a means of transportation were discussed in the [Automation of Transportation](#) section of this report. Additionally, drones can be used as a planning tool for surveying, real-time mapping, and data collection, among many other things. For more on how planners can use drones in their work, read APA's [PAS Report No. 597, Using Drones in Planning Practice](#).

## Commercial quadrupedal robots



Robots have been mentioned in various instances throughout this report. While they have been in use for certain manufacturing processes for a while, the latest innovations—commercial quadrupedal robots—could become a part of the planner's toolkit soon. These are four-legged robots that look like dogs and can move around difficult terrain.

The company Boston Dynamics started selling their model in October 2019. Its deployment as Digidog, a digital dog for the New York Police Department, was unsuccessful. It was meant to protect New York's residents, but instead was perceived as a dystopian nightmare of surveillance of underserved population groups.

If deployed the right way, equitably and with community members in mind, these robo-dogs can serve as very useful tools for various planning activities. Similar to drones, these robots can map environments, navigate difficult terrain, and interact with objects in both the natural and built environment. Planners can consider applications for inspections and surveying in difficult terrain, maintenance of infrastructure and buildings, and emergency response or disaster recovery.

# Conclusion

**The future is more unknowable than ever before. While the COVID-19 pandemic has turned the world upside down, myriad other drivers of change make it hard to understand developments of today, let alone the future. The almost 100 trends and signals listed in this report show the complexity and continuous acceleration of change in the world we live in today.**

The purpose of this report is to help planners navigate these changes, make sense of a constantly changing environment, and prepare for what is on the horizon. Not all trends and signals listed here will be relevant to all types of communities; however, systems thinking will be important. For example, a trend that seems to apply only to big cities might have implications for smaller or rural communities and vice versa.

Most trends listed in the most urgent Act Now timeframe are no news to us, except for the ones the COVID-19 pandemic has recently created, such as the pandemic cave syndrome. The high number of trends and drivers of change in this timeframe shows the complexity of our current situation. Prioritizing what to focus on while allowing for agility and considering multiple future scenarios when planning for the long term are ever more important.

Trends in the Prepare timeframe are partly emerging and partly already existing. Almost all of them are private-sector (mostly tech-sector) driven. It will be important that planners understand developments and innovations coming from this sector and how they will impact communities and the ways planners do their work. Seeking a dialogue and collaboration to create solutions that allow for equitable and sustainable implementation is key. Planners should embrace innovation where it can make their processes more efficient and where it will benefit the members of the community.

While many of the items listed in the Learn and Watch timeframe are categorized as signals—potential future trends—planners will benefit if they start considering them in their plans today. As described in APA's [PAS QuickNotes No. 94, "Planning with Foresight."](#) in today's complex world, it is ever more important to create a nimble plan that allows us to watch and observe how some of these signals will develop over the next few years and pivot or change directions when needed.

APA and the Lincoln Institute of Land Policy provide guidance on many of the opportunities and challenges resulting from the trends and signals outlined in this report. And we will continue updating you on future developments and emerging trends and will provide you with the right guidance, knowledge, and successful practices so you can focus on the challenges of today while preparing for an uncertain future.