TECHNOLOGY IS SHAPING URBAN AND REGIONAL PLANNING

How Advanced Geospatial Tools Are Leading a More Equitable and Data-Driven Approach to Planning

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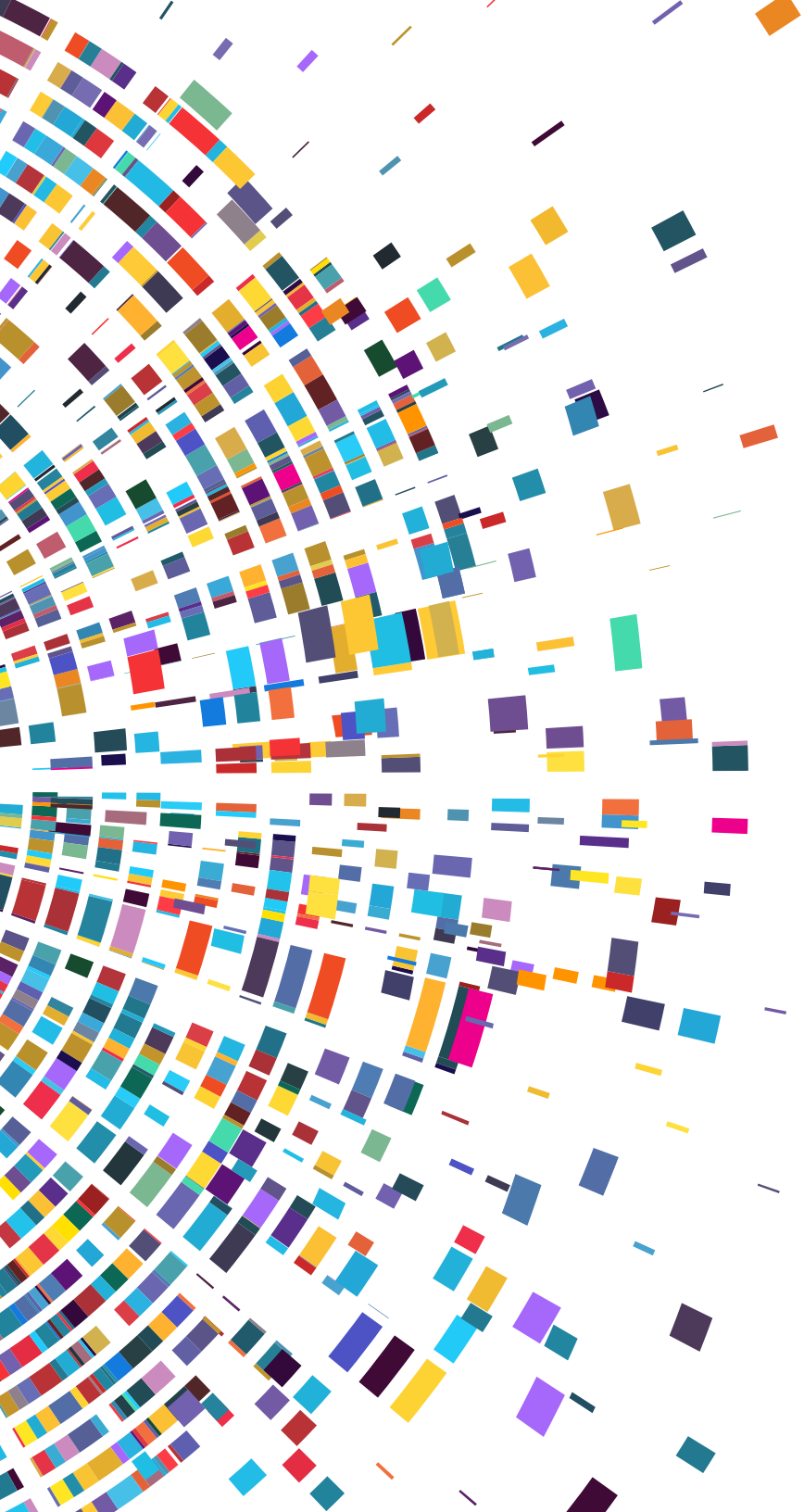
WHAT'S INSIDE



Executive Summary

The Need and the Capabilities

The Big Idea

Planning and community development have always been a balancing act. Residents, businesses, and elected leaders are wide-ranging with often diverging viewpoints. A city's economic health needs to be considered along with its environmental impact and quality of life. It's a task that requires both short- and long-term thinking to understand how individual projects can drive a city toward future goals.

While theories, practices, and disciplines have evolved significantly, one constant has not only remained but become more prominent. Location is the common factor that influences how, where, and when planners and developers design their communities.

Municipalities have relied on geospatial technology, an advanced geographic information system (GIS), to support planning. Rather than react to unanticipated growth, cities can stay ahead of needs by testing land-use and zoning codes; reviewing development applications; and improving communication.

Here's the *Why*

Cities are enormously complex. A few small changes could spark an economic resurgence in one neighborhood, while doing little in a seemingly similar area. What works is identifying the ingredients in one's community—the people, businesses, transportation networks, available land, public assets—and determining how these pieces could be reapplied in a more impactful fashion. Decision-makers and planners would undoubtedly benefit from a system for planning and managing urban development that enables them to see the current condition of their city. They could then use that knowledge to create strategies for long-term sustainability. ▶

Executive Summary (continued)

GIS technology can help accomplish these interwoven objectives, providing a suite of tightly integrated tools that can achieve several goals simultaneously:

- **Establish greater community participation–**Use web-based community engagement tools that support participatory planning to increase trust and transparency. By using digital maps to engage with residents, you can collect crowdsourced inputs from residents and easily generate usable insights.
- **Test land-use and zoning codes–**Visualize new opportunities by establishing a GIS-based zoning and land-use map. By testing proposals such as land-use change requests or zoning variances, you can better evaluate short- and long-term impacts to the community.
- **Understand build-out scenarios–**Illustrate planning scenarios with 3D modeling tools directly in the web browser. Lay out a vision for any parcel, district, or neighborhood, starting with a sketch. Further refine your designs with feedback from custom metrics.
- **Perform market analysis and site selection–**Make smarter decisions by combining maps and reports—as well as demographic, lifestyle, behavioral, and spending data—with location-driven analytics. Identify the underperforming markets, pinpoint the right growth sites, find where target customers live, and share the market research across your organization.
- **Review development applications–**Automate tasks by sending public notifications and answering land-use inquiries. Complement the existing permitting process with digital submissions, more streamlined analysis, and options for online citizen engagement.
- **Facilitate better collaboration–**Support scenario planning and the communication of important policy decisions internally across teams. Focused engagement tools provide the ability for planners to cultivate long-term partnerships with their residents.

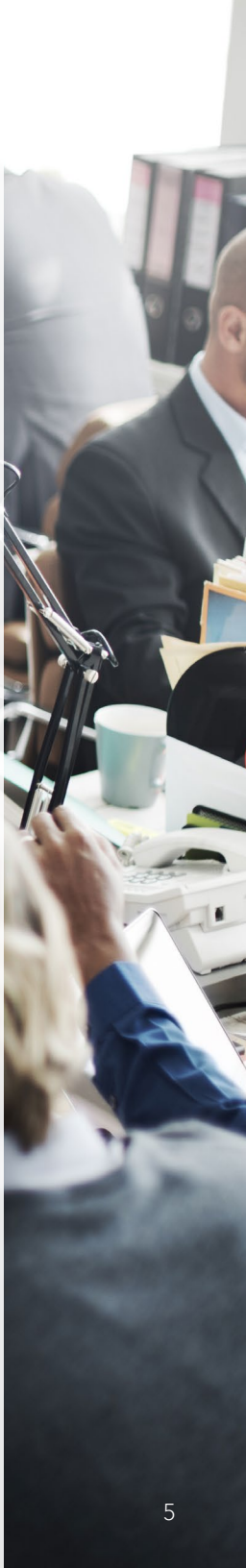
GIS manages this level of complexity while bringing visibility to problems and supporting awareness of progress toward the sustainability goals that define a resilient city for the 21st century. ■

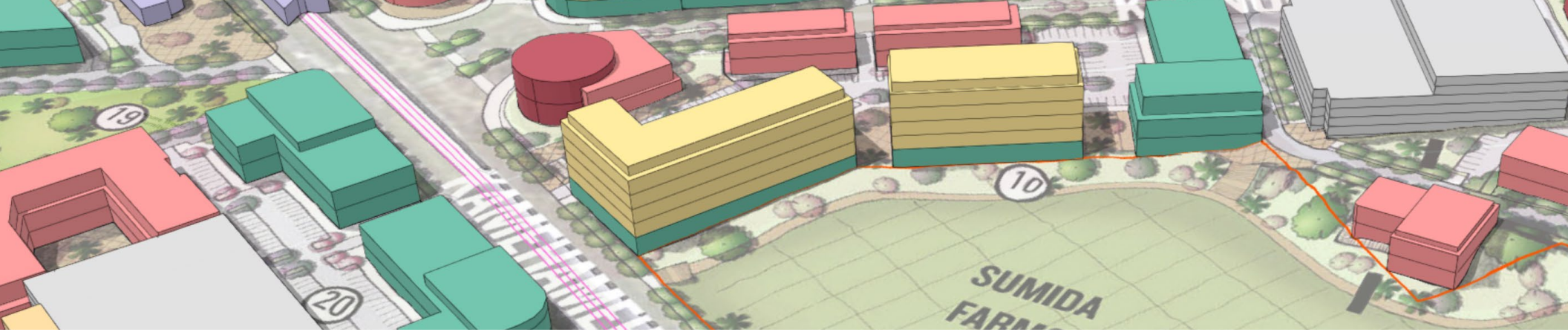
SECTION 1

ESTABLISHING A MODERN DATA-DRIVEN COMMUNITY PLAN

Planners no longer have to wait for a developer to submit a site plan or a subdivision review. Using GIS to design communities, cities can go from reacting to proactively planning, without needing to hire a consultant or dedicate an inordinate amount of staff time.

The approach saves developers, administrators, and colleagues time, money, and headaches. ▶





Section 1 (continued)

Three ArcGIS® products add important location intelligence to enhance planning and stakeholder engagement:

ArcGIS Urban is cloud-based, 3D scenario planning software for cities and regions. Test land-use and zoning codes, build out planning scenarios with 3D modeling and custom metrics, and streamline the design review process by analyzing development proposals in context. As web-based software, ArcGIS Urban can improve collaboration across multidisciplinary teams, departments, and the private sector with map-based feedback and discussions.

ArcGIS Hub℠ is cloud-based engagement software as a service that lets organizations work more effectively with their communities. With ArcGIS Hub, you can share data and create open data portals. You can also build modern websites about topics of interest, work with teams of people including members of the community, and manage progress toward shared initiatives. Together, this allows you to meet transparency goals, work collaboratively with the public, and achieve a positive impact in the community.

ArcGIS Business Analyst™ helps organizations with project planning, site selection, and demographic and economic analysis. It provides data, maps, reports, infographics, and analysis tools that let users conduct market research, locate the best sites, evaluate local economic performance, and share results.

Each of these tools and other resources strengthens an organization's ability to address issues like housing availability, sustainability goals, and economic changes that are compelling cities to better plan for the future. Planners and design professionals in both the public and private sectors need to collaborate across teams and manage geospatial information that supports scenario planning and impact assessment.

The discussion evolves from what a project would look like, to how many people it will house, the project's impact on impervious surfaces, and traffic. The technology can take into account the number of jobs a development is expected to create and the impact on taxes. All of this can be designed and measured through web-based GIS tools that planners can have up and running in a fraction of the time that it would have taken 20 years ago.

GIS stopped being a luxury and started becoming a necessity for planning professionals years ago. Now, with the ability to design, analyze, and collaborate over a secure web system, planners can quickly find the best, most sustainable development path forward—in both the short and long term—for their community. ■

CASE STUDY

UPPSALA

A Detailed Digital Twin in Sweden to Enhance Sustainability

The Situation

As Sweden's fastest-growing and fourth-largest city, Uppsala has been attracting new residents based on both its reputation as a research center and its ambitious sustainability policy. The city is expected to grow from about 230,000 residents to 350,000 by 2050, a more than 50 percent increase in the next 30 years. The local government is designing a district that will add 33,000 housing units to accommodate 50,000 new residents.

"We started off thinking of the model as a tool for communication, and after we built the model, we realized that it provided a way to study and share scenarios in a simple way that makes urban planning much more understandable."

SVANTE GUTERSTAM,
STRATEGIC COMMUNITY PLANNER,
CITY OF UPPSALA

The Challenge

The city needs to house this growing population while maintaining its pledge to be fossil-fuel free by 2030 and climate positive by 2050. It also needs to move quickly to ensure that it secures Swedish commitments to build a new tramway, rail station, and railway to Stockholm. Early in the planning process, the planning team struggled with the amount of tabular data about project requirements. The number and size of spreadsheets kept increasing, and having data in that format made it tough to engage and collaborate with the multiple city departments involved. It was also hard to conceptualize and share a physical representation of the complex district plan.

The Solution

To create a southeastern city district, the city planners adopted a data-driven and modelcentric approach to scenario planning that's powered by GIS.

A detailed zoning plan and 3D model, built with ArcGIS Urban, has helped planners visualize and present plans for the new city district. The city has also been able to maintain full control of the model instead of having it be the work of an external consultant. Changes based on feedback have been made far more quickly than if the model hadn't been a city creation. That is helping Uppsala stick to a 2025 date to begin constructing hundreds of homes in order to secure Sweden's promised infrastructure investments.

The scope of the southeastern city district exceeds that of not only past plans but also the work experience for most of the project's planners, architects, engineers, and researchers. The model helps everyone see the project's scale and grasp what works and what doesn't. ▶

Uppsala (continued)

The 3D model is built on top of a digital elevation model captured with lidar scanners to show the real topography as well as existing buildings and trees. The realistic model enables everyone to see how the proposed development will look in the context of the current city. It has helped the planning team test approaches and configure new areas. Ultimately it will help the city and its residents make informed and sustainable decisions.

The plan's sustainable transit-oriented design—being centered around the new tramway and rail network and encouraging pedestrian and cycling access—aims to improve residents' quality of life, maintain the area's biodiversity, and cut carbon emissions.

The Results

The city is at the proposal stage now, and another rigorous set of revisions will follow initial detailed planned work using the 3D model to visualize streetscapes, determine the scale of the buildings, consider the right mix of forest and trees, and review water and stormwater processes. The visualization will also help determine the materials used to construct the buildings and infrastructure. While plenty of parallel processes are taking place ahead of any construction, having a detailed 3D model to both communicate plans and test scenarios has already proved valuable. ■

SECTION 2

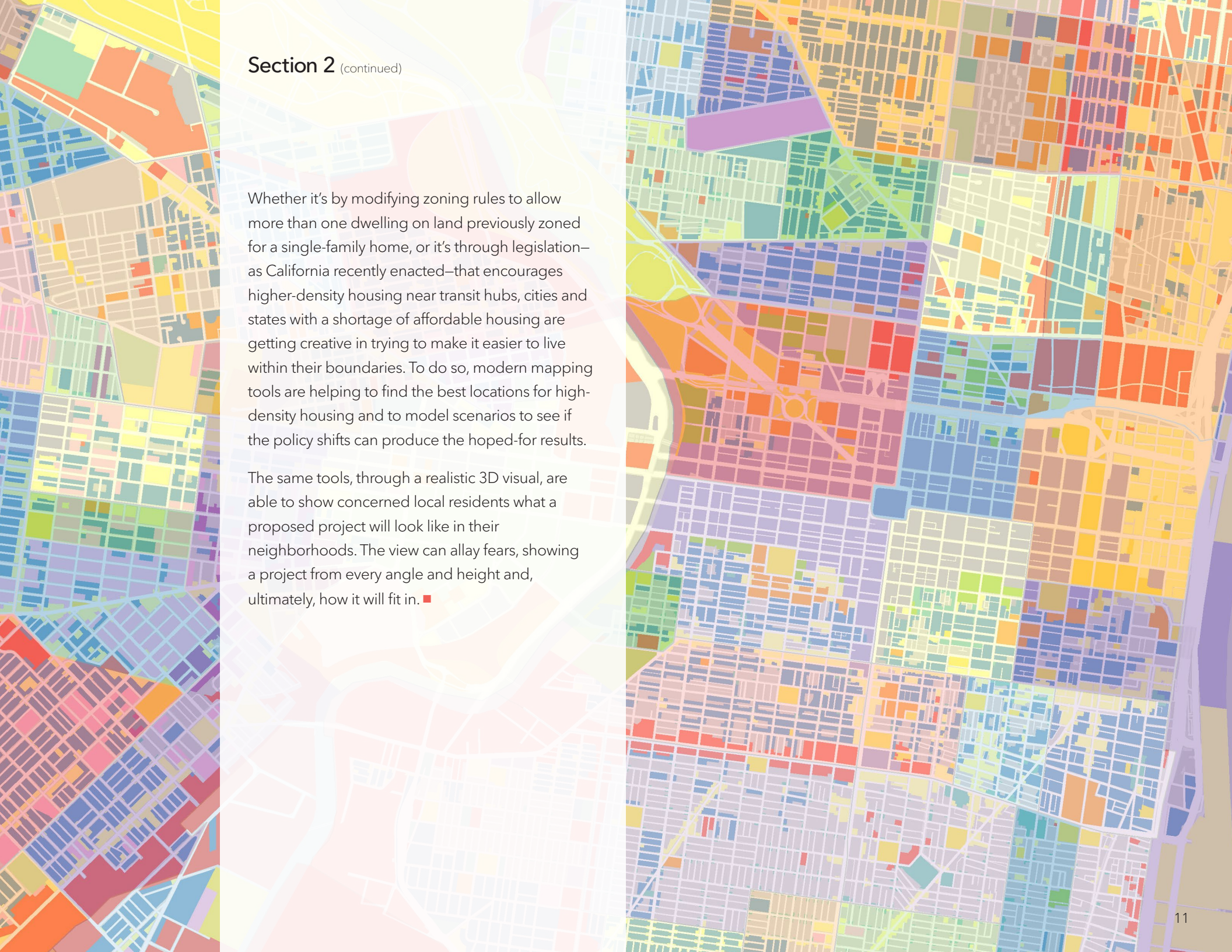
MANAGING HOUSING AND GROWTH CAPACITY

Housing availability and affordability are among the greatest challenges of the 21st century. Cities are seeing scores of new residents drawn by jobs, a lifestyle, or both. The latest US Census data revealed what many city planners have long witnessed firsthand. In the past 10 years, metropolitan areas have watched their populations grow by 9 percent, far outpacing the 1 percent growth in rural areas. Cities are growing fast, and not all of them are ready to strategically accommodate the influx of people moving in, who often risk displacing existing vulnerable populations, especially if there's not enough available land for the city to expand outward. Cities must examine the available opportunities between existing buildings and neighborhoods to accommodate more space.

That's where zoning changes and fresh land-use regulations can help balance projected growth with actual growth. In many cases, what remains of the limited available land continues to be underutilized either because of structure height and population density restrictions or because the city is not pushing for developments that reach the maximum density allowed. Modern mapping tools can be used—before projects are built—to visualize what maximum use might look like, generating scenarios and comparing growth targets to what could be built. In addition to considering land-use designations and zoning regulations, the same tools and analyses can look at potential available land; consider a variety of variables such as infrastructure gaps, achieved densities, improvement to the land-to-asset value ratio, market studies, and historic records; and determine if the land is suitable for future development. That kind of work resulted in the rapid build-out of available land in more than 30 neighborhoods in Seattle. ▶

Whether it's by modifying zoning rules to allow more than one dwelling on land previously zoned for a single-family home, or it's through legislation—as California recently enacted—that encourages higher-density housing near transit hubs, cities and states with a shortage of affordable housing are getting creative in trying to make it easier to live within their boundaries. To do so, modern mapping tools are helping to find the best locations for high-density housing and to model scenarios to see if the policy shifts can produce the hoped-for results.

The same tools, through a realistic 3D visual, are able to show concerned local residents what a proposed project will look like in their neighborhoods. The view can allay fears, showing a project from every angle and height and, ultimately, how it will fit in. ■



CASE STUDY

SEATTLE

New Residents and Tech Boom Called for Agile, Long-Term Growth

"We have to do some creative thinking to understand the implications of the new zoning rules. As we get into our next planning phase, there's going to be some reflection to learn the impacts of what we've done in the past."

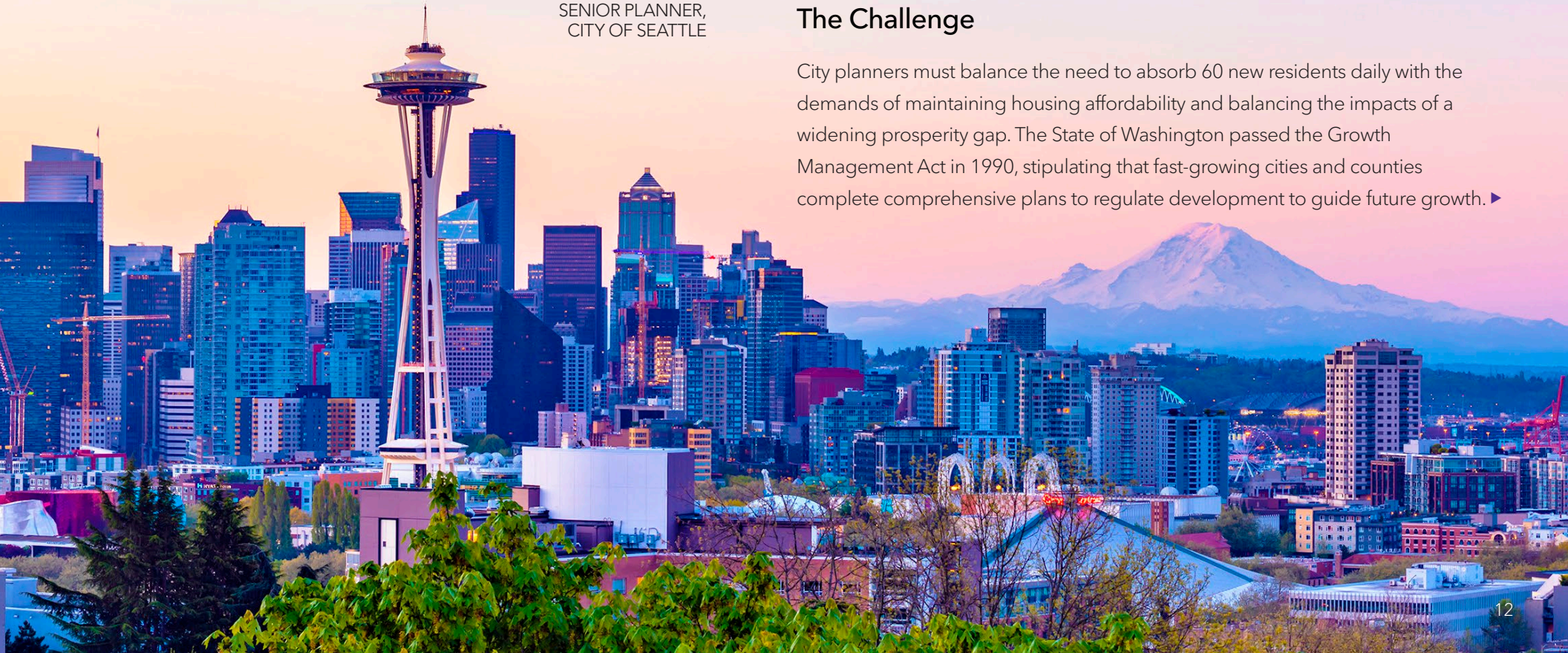
JENNIFER PETTYJOHN,
SENIOR PLANNER,
CITY OF SEATTLE

The Situation

With the boom of Amazon, Microsoft, and the many internet and health-care companies that call the Seattle area home, the city has added 138,000 new residents since the beginning of 2010 and was recognized as the decade's fastest-growing US city. The 23 percent growth in population was driven by a 30 percent increase in employment during those 10 years. The jobs bring the city not only people and economic rewards but also planning-related issues.

The Challenge

City planners must balance the need to absorb 60 new residents daily with the demands of maintaining housing affordability and balancing the impacts of a widening prosperity gap. The State of Washington passed the Growth Management Act in 1990, stipulating that fast-growing cities and counties complete comprehensive plans to regulate development to guide future growth. ▶



Seattle (continued)

Every seven years, the buildable-lands inventory measures development and reviews population densities compared to the prior plan's growth forecast. However, some neighborhoods are more constrained than others.

The Solution

To meet the state mandate of increasing housing capacity while protecting resources and controlling urban sprawl, Seattle city officials rely on zoning maps as a primary tool to guide density-based decisions. Each jurisdiction is looked at for its total land, what's currently there, and which areas have restricted growth. Zoning regulations are then layered on top of the map to understand where the city can put more people. If there's not enough room, then the city looks at zoning changes. To create more housing choices for people of all incomes, Seattle passed a zoning change that allows for taller buildings and requires developers to create affordable housing.

In recent years, Seattle has pursued several strategies to encourage more accessory dwelling units (ADUs) in single-family neighborhoods, including removing regulatory barriers, streamlining the permitting process, and trying out an affordable financing tool. These ADUs take many forms, such as garage or basement conversions, backyard cottages, and additions often called carriage houses. ADUs can provide new, space-efficient rental homes in neighborhoods where housing is often ▶

Seattle (continued)

unaffordable to most people. For their owners, ADUs offer flexibility to meet changing household needs or generate supplemental income. The goal has been to make these benefits available to a wider range of residents.

As part of this strategy, Seattle implemented a new building permit system and invested in 3D capability to visualize the whole city alongside zoning requirements, using ArcGIS Urban.

"The renderings we get from the architects are lovely, but it's nice to be able to see the bigger context and help people recognize where change is happening more easily," said Jennifer Pettyjohn, senior planner at City of Seattle. In addition, the classifications of zoning codes—which, if printed out, would create a stack of paper at least 10 inches high—have all been incorporated into ArcGIS Urban to improve understanding.

The Results

More than 30 years after the passage of the Growth Management Act, Seattle has continued to provide available density to developers, carefully growing the city while preserving open land. Anticipating continued growth and tight land constraints, the city will continue to fine-tune its zoning regulations to accommodate more people. Establishing a strong 3D infrastructure has helped decision-makers see and discuss where to grow the city next. ■

SECTION 3

RECONNECTING COMMUNITIES AND ACHIEVING EQUITY

It's become abundantly clear: To have connected, thriving communities, highways and interstates shouldn't carve through the hearts of our cities. The already weighty and puzzling task of building communities that are more equitable—and, as a result, thriving—is made even more problematic when we consider the effort required to heal communities that were cut apart in the 1950s, '60s, and '70s. Many of those physical divisions remain deep and wide, including freeways constructed nearly a century ago that cut off a community from both its former neighbors and future opportunities. The separations can also be as simple as a wall or fence that signals to the residents and businesses on one side that they aren't part of the other.

Advocates of the projects, at the time, likely pointed to population growth and traffic problems in need of solving. What we know now, with hindsight, is that the urban planning of that era fostered social and economic divisions and was often done without the input of those whose neighborhoods were literally and figuratively paved over.

Modern mapping tools offer the chance for change.

There have been broader awareness and momentum to right some past planning wrongs, with groups—including community members, traffic engineers, and elected leaders—coalescing around making tangible changes and restoring some of these communities to what they ▸

looked like before on-ramps, off-ramps, and interstates cut through them. Funding was even sought and secured in a massive infrastructure bill passed by Congress, though the amount of dedicated funds was ultimately shrunk to $1 billion. The amount disappointed advocates who saw it as a hollow gesture, the bare minimum to create plans but not enough to do the work. Nonetheless, it's a start.

The sheer volume of data, newly available analytical tools, and the ability to more easily collaborate online among stakeholders—including affected community members—make it possible to push forward with innovative designs, so long as local government leaders prioritize projects that will make a difference. That's especially true for beginning to map and model possible fixes to long-ago mistakes, and for planning strategically for the future as it relates to transportation and housing. There remains a disconnect between the places where people want to live—places that are walkable, safe, and equitable—and what continues to be systematically built. Looking at urban design holistically—considering livability, sustainability, and climate resiliency—may take a bit more time and investment, but it reaps long-term rewards. ▶

Planning that focuses on this kind of all-encompassing geodesign is already happening along the winding, concrete bed of the Los Angeles River. An LA-based design firm is looking at how to integrate 300 recreation and conservation projects along the banks of the 52-mile river. Studio-MLA is studying the inhabitants in the communities along the river's edge and using a county equity index to ensure that their needs are served.

"We're layering all of this qualitative data on top of the quantitative—park assessment, household income, what the schools are like, and what the crime rates are like—to get a more well-rounded picture of where parks should be going in these areas," said Jean Yang, a senior associate with Studio-MLA.

The key is human intervention. Technology alone can't undo decades of divisive city design. It takes the ingenuity of planners, designers, architects, engineers, elected leaders, and analysts to work together with the community to come up with the best possible role for a place. ■

CONCLUSION

TRANSFORMING CITY AND REGIONAL PLANNING

A Data-Driven Approach for Ensuring Community Resilience

As threats from climate change and pandemics unfold, political divisions deepen, and awareness about social and economic inequities grow, it's worth remembering that a person's life is where they live, a place that is far more than a single location on a map. That place, when designed well, can offer a sense of safety, encourage walking and cycling, foster neighborhood interactions, and create thriving business districts. It can make life better amid those larger external issues, helping to even solve some of them. To do so, urban planning and development can and should be rooted in data-driven processes that align with long-term sustainability. Esri's advanced geospatial technology is a comprehensive information system that allows cities to diagnose land-use economics with data, illuminating the most resilient and proactive solutions for investment. With that location intelligence at the foundation, planners can provide stakeholders and community members access to contribute, accelerating the design process and modernizing collaboration. After all, who knows a place better than the people who live there?

To find out more about how ArcGIS Urban can help your city get ahead of future growth and create a vibrant community, visit esri.com to schedule a demonstration of the software. ■

Learn More

Esri, the global market leader in geographic information system (GIS) software, location intelligence, and mapping, helps customers unlock the full potential of data to improve operational and business results. Founded in 1969 in Redlands, California, USA, Esri software is deployed in more than 350,000 organizations globally and in over 200,000 institutions in the Americas, Asia and the Pacific, Europe, Africa, and the Middle East, including Fortune 500 companies, government agencies, nonprofits, and universities. Esri has regional offices, international distributors, and partners providing local support in over 100 countries on six continents. With its pioneering commitment to geospatial information technology, Esri engineers the most innovative solutions for digital transformation, the Internet of Things (IoT), and advanced analytics.

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