

PAS QUICKNOTES

Extended Reality for Planning

Since the late 1960s, the idea of making digital information, such as virtual buildings, visible within the landscape of the physical world has been at best an aspiration. However, mobile technology advances in recent decades have transformed this aspiration into reality.

With the current refinements in extended reality (XR) hardware and software, planners can now access a range of tools that shifts planning visualization into an immersive experience. Planners no longer must rely on 2D images to provide information about projects and initiatives. Now, XR tools can provide planners with richer ways to convey the nuances of space and place that often determine the success or failures of projects in communities.

BACKGROUND

The term *extended reality* (XR) refers to the spectrum of digital visualization in relation to the physical world.

- *Augmented reality* (AR) uses mobile devices (phones or tablets) to superimpose static virtual objects and information, such as a city scene, onto a tabletop, or insert virtual objects into physical locations, such as a digital representation of a community center next to a city park.
- *Mixed reality* (MR) uses a head-mounted display (HMD) that enables the user to interact with superimposed digital objects (e.g., scrolling through the choices on a virtual menu or moving a digital object to a different location) while at the same time seeing the physical world around them.
- *Virtual reality* (VR) uses goggles to immerse users within an entirely virtual world.

A [survey published in 2020](#) by North Carolina State University of architects, engineers, and contractors indicated that XR is a solidly growing trend, with close to 70 percent of the respondents expecting regular use of these tools within the next five to 10 years. This trend aligns with the significant adoption of XR devices. In 2021 there were about [150 million XR users](#) in the United States.

Each of these tools provides planners with different ways to enrich both planning processes and dialogues with project stakeholders. The immersive visual experiences that XR tools deliver can be used to improve decision-making, help engage community members with special challenges, and enhance understanding of current and future conditions in evaluating zoning and planning scenarios.

INFORMATION OVERLAYS WITH AUGMENTED REALITY

Using AR to superimpose static virtual objects onto the real world is already well supported by many different tool options. The [Oregon Department of Transportation](#) recently used AR to show traffic patterns for a corridor project and explore the addition of wildlife crossing options to a state highway. Using AR rather than a modified 2D image on a desktop gives stakeholders a better sense of important factors, such as the scale of modifications being proposed.

Another area where AR has value is providing perspective in historic preservation and restoration. An example of this is the Palaestra of Olympia in Greece, where a virtual image of the original building has been overlaid on the remaining physical columns. The visualization of the original architecture provides context for preservation decisions. Another example is the Notre Dame Cathedral in Paris, which was damaged by fire in 2019. A [tabletop view](#) of the 12th-century building shows what remains intact after the fire damage. This provides a rapid bird's eye overview for restorers to get an initial sense of the work required. As the restoration work progresses, AR could also be used to show proposed rebuilds or enhancements.

This PAS QuickNotes was prepared by Jennifer Mendez, PhD, Lead Product Engineer, Urban Experiences at Esri.



XR tools make planning visualization an immersive experience. Credit: Esri.



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Creating Great Communities for All

An especially useful application of AR is the visualization of underground utility networks. The [City of Brampton, Ontario](#), uses an AR visualization system to locate underground pipes, valves, cables, and other utility assets when preparing for infrastructure repair as well as planning new development projects, saving significant money and time.

COMMUNITY ENGAGEMENT WITH MIXED REALITY

Community engagement is a natural application of XR. In a recent [university XR study](#), an MR approach was used to explore how a vulnerable population—the elderly—could participate in the planning process and provide valuable input. Elderly community members used HMDs to view a series of virtual options for prospective improvements to an underutilized park, allowing them to clearly visualize and provide feedback on different designs for highway-noise-cancelling walls, benches, lampposts, bathroom pods, walking and biking lanes, and other street furniture. Notable was the elders' enthusiasm for using the devices. Their feedback allowed planners to reimagine an isolated, unsafe park as a modern, safe space where those over 60 would want to go and be active.

This is just one example of how planners can use XR to capture direct inputs from residents to inform concrete design decisions for better community outcomes.

SCENARIO DESIGN WITH VIRTUAL REALITY

VR is an especially effective tool for communicating with residents. The panoramic view that VR provides gives residents a sense of how a proposed project will fit into an existing neighborhood aesthetically and spatially, providing them with a “feel” for the space. Additionally, it can help create immersive interactions for residents to give inputs on how to make spaces into meaningful places.

In designing project scenarios, planners can use both perspectives of VR: the tabletop view, which puts the scenario literally on top of a table, and the world-scale view. In the early stages of design, the tabletop view is useful for visualizing elements such as zoning, density, vegetative cover, and traffic flows, and for enabling interactive collaboration. The world-scale view can be used to better visualize the challenges and constraints of a given physical space. In later project stages, planners and stakeholders can use VR to collaboratively validate the design, using either view to immediately see whether the space “works” as intended.

The [Town of Morrisville, North Carolina](#), used VR to solve a decade-old stalemate on density. Planners created a “digital twin” of the town’s downtown district and used it to visualize the low-density scenario called for in a 2007 plan and a higher-density scenario supported by current residents. After using avatars to walk through virtual versions of both scenarios, both stakeholders and town officials preferred the higher-density scenario, allowing the town to move forward on updating its plans and regulations to create a compact, walkable, vibrant downtown.

CONCLUSION

Planners can use XR for many different aspects of planning work—visualizations with real-world context, community engagement with vulnerable populations, and planning scenario design are just the beginning. XR tools can help resolve even long-standing planning problems while promoting inclusivity. With XR, planners can effectively use virtual technologies to improve the real world.

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FURTHER READING

Published by the American Planning Association

Hurtado, Petra, with Benjamin G. Hitchings and David C. Rouse. 2021. *Smart Cities: Integrating Technology, Community, and Nature*. PAS Report 599. Chicago: American Planning Association.

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Zimmerman, Becky, and Anna Dillé. 2019. “Virtual Horizons.” *Planning*, October.

Other Resources

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