

# Urban-Engage: Pioneering Urban Planning with Citizen-Driven 15-Minute City Solutions

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## Abstract

We propose an innovative approach to empower urban planners by integrating comprehensive and qualified citizen input into the planning of the 15-minute city (15mC) through immersive digital technologies. Our methodology includes (1) enabling citizens to annotate their real environment using augmented reality, (2) generating urban space alternatives based on generative AI and citizen annotations, (3) allowing modifications to AI-generated alternatives, (4) providing immersive 3D simulation environments for experiencing these alternatives, and (5) facilitating better negotiation between citizens and political players to identify the optimal solution. This process aims to account for diverse stakeholder interests, ensuring inclusive contributions and an experiential understanding of potential urban adaptations.

## Keywords

15-minute city, Urban Planning, Citizen Input, AR, GenAI

## 1 Introduction

The 15-minute city (15mC) refers to a city whose residents can access the most essential activities within a given travel time by using more sustainable travel modes than driving, such as walking, cycling, and public transport. By increasing the proximity to the services through, among others, urban densification and local social

activities, the aim is to reduce resource use and car-based commuting and contribute to neighborhood vitality and sustainability.

The planning of the 15mC needs to cultivate the creation of truly local solutions grounded in the citizens' reality, and foster citizen ownership of new urban city solutions and concepts. Novel solutions should also pave the way to the empowerment of citizens with diverse backgrounds, enable inclusive ways of making well-informed decisions, as well as strive to spur innovation in local communities. Thus, the question of planning 15mC is not a question of creating optimal technical solutions, but a question of including various citizen interests [3].

Growing research on digital civics (e.g., [4]) embraces the potential of such digital technologies to not only support citizen participation in planning but also to empower them. Highly immersive technologies and visual representations in mixed reality (MR) can be powerful tools for engaging citizens in planning [2]. By providing intuitive visualization they can make futures tangible and experiential. Nascent research shows that they can offer more incentives to participate, attract a diverse group of citizens such as young people [12] or under-resourced communities [1], and increase citizen's awareness of their surroundings [6].

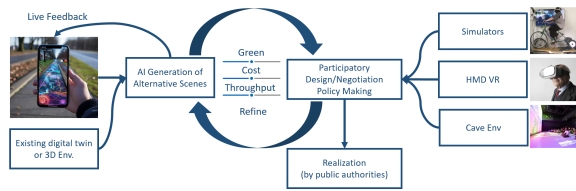
We envision an integration of AR with generative AI (genAI) for future city planning: we plan to expose stakeholders to future realities and empower them to provide feedback both on the go and during participatory design sessions. Thereby, visual tools for annotation augmented and virtual realities ensure inclusivity and accessibility. Citizens' imagination will be supported by GenAI models that incorporate their annotations into existing 3D models of city environments, where users can vary the results by choosing parameters among different scales, e.g. sustainable modes of transport, traffic throughput, costs, etc. These inputs (existing 3D scenery,



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**Figure 1: Urban-Engage will provide applications to include citizens in the design of urban spaces by AI-supported creation of 3D scenes based on simple drawings and annotations. The resulting alternatives of a particular urban environment can be experienced in immersive VR environments such as CAVE, HMD VR, or vehicle/bicycle simulators.**

annotations, parametrization) will serve as input for GenAI models to produce immersive 3D scenes accordingly (similar to<sup>1</sup>, but in real-time, modifiable, and in 3D space). We will then propose ways to incorporate the generated results into immersive, media-enabled co-production for municipal decision-making processes.

## 2 Urban Engage - a Concept for Interactive Participatory City Design

We propose to enhance participatory city planning to move towards the “future 15 min city” in a more informed and democratic way, both from the perspective of citizens, policymakers, and political organizations (see Figure 1). We propose to develop technology that (1) allows citizens to annotate the real environment using augmented reality applications on mobile devices (such as smartphones), (2) can generate appealing alternatives of a given scene based on generative AI by enriching existing 3D models of urban spaces with citizens’ annotations, (3) allows stakeholders to modify AI-generated alternatives by modifying relevant parameters such as transformation costs, throughput, trees, and see the effects on the 3D alternatives in real-time, (4) allows experiencing and adapting the before-generated 3D alternatives in immersive simulation environments like VR caves or driving simulators so that (5) citizens and political players can better negotiate about the potentially optimal alternative to be realized. Our vision is a process that takes the variety of interests and concerns of the different stakeholders into account, which is supported by allowing all stakeholders to contribute to the planning process and experience the implications of possible adaptations.

## 3 Research Agenda and Challenges

GenAI and AR/VR/MR are novel technologies that have not yet reached maturity or wide-reaching social acceptance. Consequently, future work should not only develop but also to evaluate the tools in the context of the following objectives:

- **Inspiring Stakeholders - Expose to Potential Future Realities:** Citizens should be immersed in future alternatives to encourage broad understanding and participation in planning. An important objective in this regard is to complement the state-of-the-art by digital means, such as GenAI,

AR/VR/MR devices, GIS mapping, online surveys, social media engagement, (3D) visualization, or citizen reporting apps.

- **Participation of Stakeholders - Empower to Co-create:** Citizens should be empowered by easy-to-use, accessible tools for digital annotations such that they can co-create and provide alternative planning solutions based on their genuine needs. Using our tools together with GenAI, citizens create public spaces in 3D, without becoming 3D modeling experts. This can support bottom-up issue formation and the formation of the public.
- **Sustainable City Design:** In the context of the 15mC, future tools should educate, encourage, and empower citizens. Potential solutions will integrate annotation, visualization, and citizen data with planning processes. This collaborative platform brings together citizens, local businesses, civic initiatives, and local authorities to create a cohesive and sustainable 15mC environment. Ultimately, citizens benefit from information on available sustainable modes of travel in their area, local business support, community engagement, and, in general, an enhanced quality of life.
- **Community-Driven Implementation:** Forming partnerships with municipalities, regions, or local actors, such as NGOs, citizens, or community groups, we enable community-driven decision-making and implementation will be necessary. This tackles the diverse needs and expectations of various stakeholders. The solution may then be implemented by educating citizens and receiving their feedback.

## 4 Approach

First, we propose to review existing city planning processes (including existing participatory design) and city demographics.

Second, we call for developing mobile AR applications that allows citizens to annotate their environment and thereby influence the 15mC transformation process [5]. To accomplish this, the existing 3D models of the cities could be mapped via GPS so that a direct connection from the real to the virtual environment is given. The main feature of such an application is that users can comment on existing scenery and submit their own design proposals in the form of texts, sketches, uploaded 3D models, or using pre-defined objects. Further, a discussion function will allow citizens to contact each other and the municipalities. These apps will provide in-situ visualization of already existing proposals, maps of the accessible infrastructure (i.e., bicycle/pedestrian paths, etc.), and visualization of location-specific data related to already planned projects (i.e., future buildings). Additionally, we argue the app should be connected to the GenAI model, including users’ input, to generate new 3D models of the scene. Users should also be able to modify the resulting scene (i.e., the connected GenAI) by using controls that customize in terms of implementation costs, traffic throughput, and the number of natural elements such as trees.

Third, we call for a multi-user simulation that provides an experience of extended city models [8] from the first person’s perspective. Here, the 3D environment should be adapted in real-time, either parametrically, or by a GenAI model.

<sup>1</sup><https://dutchcyclinglifestyle.com>

Fourth, an AI model provides an on-the-fly generation of planning alternatives that are based on (1) the existing 3D city environments, (2) 3D model object databases, (3) the AR annotations, and (4) the parametrization as given by user controls in the AR app and the simulation environment [7]. The model will incorporate state-of-the-art methods for AI content generation (such as generative adversarial networks or reinforcement learning with human feedback).

Finally, it must be explored how organizations would modify their work and handle the new forms of citizen-institution interaction seamlessly. As a first step to contribute to this research agenda specifically, we will design a generic application blueprint and test and refine it.

## 5 Expected outcome

By examining the transformative potential of these technologies and the role of AI, we provide a research agenda that aims to uncover their impact on civic contributions and inclusive solutions for socially sustainable mobility within the 15mC paradigm. We suggest exploring the intersection of technology, citizen empowerment, and urban planning to shape more informed and inclusive approaches to future cities on hand of the following research questions:

- To what extent does the use of AR/VR/MR by citizens influence the level of civic participation and the quality of ideas contributed to the context of 15mC?
- How can AI and immersive technologies be used to overcome the challenges of citizen participation in urban planning processes and promote more inclusive solutions for the 15mC?

- How can technology-enabled citizen participation contribute to ensuring socially sustainable mobility and equity in the implementation of the 15mC?

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