



# From Lab to Local: Development of an Internet-Based City Modelling as a Digital Platform for Public Engagement

# 36

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## Abstract

The enhancement of inclusive participation of local communities in sustainable land-use efficiency is an important target to achieve as one of the SDG11.3.1. As consequence, urban designers have been transforming their positions into facilitators using scientific information as the catalyst for debate, negotiation, and collaboration with local citizens to evaluate the impact of design plan on the final decision. And as the time of physical distancing measure has led a sudden shift towards online platforms, giving people considerably more access to information. In turn a mutual platform is required to include ideas and perspectives as much as wider range of stakeholders. This paper demonstrated the use of Internet-based information as a platform for bringing people and organizations together to generate urban data, as well as 3D city modelling as a visual tool that can help researchers collaborate on a common goal of providing high-quality data for efficient decision-making. Using the database retriev-

ing from our previous study on the effects of building height regulations on Chiang Mai's historic landscape as an example of scientific support for practical policies and the accessibility of communication tools via digital devices to aid discussion, negotiation, and regulatory application in the sustainable use of natural resources as cultural heritage. After all paving the way to the accessible digitized urban data while fulfilling the need for equitability of communities to debate their own vision and direction of community design especially in the city where the complexity of land-use efficacy and urban development.

## Keywords

People participation · GIS · Virtual reality · Visual assessment · Urban design

## 36.1 Introduction

Democracy is not only for voting, but rather to offer people an opportunity to equally debate, discuss, and make the decision on concerned issues (Michels and Graaf 2010; Richardson 1983). However, an advanced tool to widely includes people as many as possible is necessary to encourage legitimacy, transparency, and accountability which are essential values in building democratic urban planning. The digital

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era allows retrieving the urban dialogue in various forms. It also provides accessibility for people to share their opinion on the urban project, especially in the historic city where the complexity of issues intertwined.

Meanwhile, the historic Urban Landscape approach has developed the toolkit to support the management of urban heritage in a complex environment. The method argues that interdisciplinary and cutting-edge instruments are required (Bandarin and van Oers 2012, p. 144). The viable methods described as community engagement, should encourage inter-cultural dialogue within communities. The tools should serve as a platform for mediation and negotiation to resolve conflicts between interests and groups. Recent research by the Cities Alliance highlights several approaches for integrating environmental issues into urban planning/design initiatives, as well as the necessity of interaction between the city and its environment. The Cities Alliance chapter recommends policies that emphasize on information, such as written, Internet, or face-to-face counsel. It is preferable to address the environmental effect issue in order to lower the barrier to people's behaviour (The Cities Alliance 2007, pp. 20–21). The statement promotes the value of embracing culture and heritage into environmental considerations. Although the report assessed the techniques that are used to accomplish them, one of the most significant drawbacks is the lack of cultural identity in the balancing of environmental conditions and economic vitality (The Cities Alliance 2007, p. 36).

In this study the database for city-nature heritage will be established, which will focus on the strategy and HUL toolsets, in response to the need for supportive technical tools to engage people in protecting the visual integrity of historic cities that reflect their nature-culture character. To manage the change of the dynamic city as the tidal force of change has an influence and poses a threat to cultural significance and heritage values. As Mumford points out in 1938, 'Cities arise out of man's social needs and multiply both their modes and their methods of expression. In the city, remote forces and influences intermingle with the local: their conflicts

are no less significant than their harmonies' (Mumford 1938, p. 4). Most conservation experts and practitioners agreed, based on exemplary case studies, that there is a risk of community disintegration, undermining the value of regeneration capacities (Jokilehto 1999, pp. 61–68, 2017). Meanwhile, an up-to-date comprehensive theory of urban design in conservation capable of offering a conceptual foundation for addressing the transformational historic urban remains absent (and it will not be due to flexibility which highly needs to be re-conceptualized and integrated into the operational framework) (Bandarin and van Oers 2012, p. 180).

As a result, the technical tool described in this study intends to shed some insight on how to protect a historic city's visual integrity using the Internet as part of the democratic process. Due to the age of the digital, citizen participation in the dissemination of urban issues has never been easier (Carver et al. 2000). The integration of GIS and the Internet to the Internet-based GIS operated by GIS software on a remote host site where the urban data compiled and visualized by experts is extensively utilized to overcome an urban citizen's technological barrier.

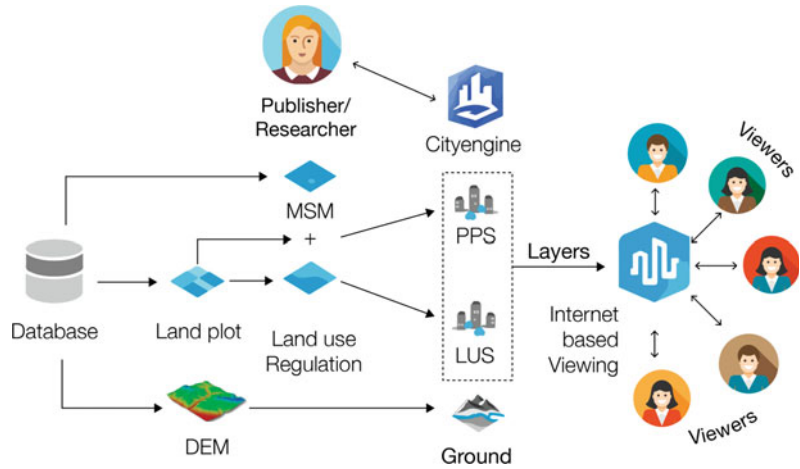
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## 36.2 Material and Method

This study will use web-scenes and 360VR, a GIS Internet-based innovation by ArcGIS online, to comply with the exploration of the implementation of scientific measurement to a broader audience such as stakeholders and decision-makers in the visual assessment that can be compared with economic indicators. Geospatial content represents as a scenario to visualize and display analytic geographic data in an interactive 3D environment. The web-scene components are comprised of the following elements: (see, Fig. 36.1).

- Layers—geospatial data, in this study is the Land-Use Scenario (LUS) where the 3D building will generated according to land-use regulation height control and Proposed Scenario (PPS) where the LUS scenario

**Fig. 36.1** Method of data gathering and compilation. Source Adapted from ESRI (2020)



combined and superimposed with Mountain Skyline Map (MSM) that obtained from the ACS will determined as the weight of the building height. For example, in PPS the land plot adjacent to the historic area will generate the building with decreased building height from 1 to 2 floors. On the contrary, the land plot located further from the historic area, it will generate higher with additional 1–2 floors depend on the Mountain skyline map.

- Basemap—A basemap provides a background of geographical context for the content in your scene.
- Ground—The terrain with elevation data that can be turned on and off. In this study, the terrain elevation determined by the DEM that used in the visual analysis.

### 36.3 Result and Discussion

The comments from many perspectives will reinforce and suggest appropriate measures to mitigate and cope with the impact of urbanization near to the historic area. These rule-based packages (ACS, LUS, and PPS) are the land-use ordinance’s representative, and they can be adapted/re-edited based on the comments of the viewers (ESRI 2019a, b) (see Fig. 36.2). This process directly the critical and being the quick concise response to evaluate the Land-use

ordinance that will enact in the interest area. The type of 3D presentation in this study is in the form as follow:

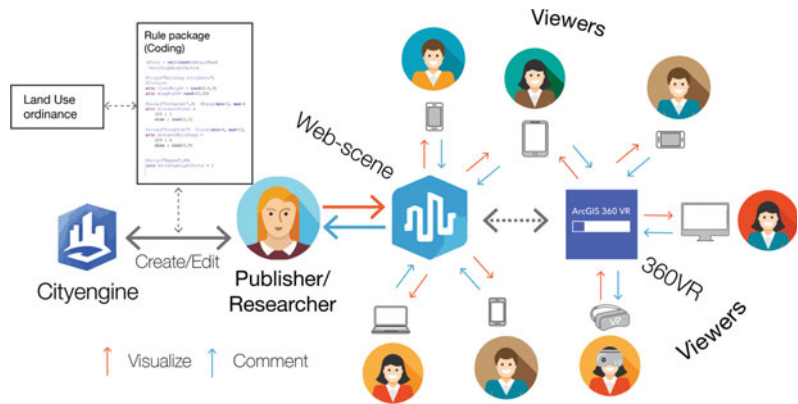
#### 36.3.1 Web-Scene: Internet-Based GIS

As seen in Fig. 36.3(a), the observer’s able to control the model to response their interest, where the user can choose between LUS and PPS. The feature of the web-scene, as shown in Fig. 36.3(b, c) is the ability to compare the scenarios. According to the study, this feature fits with the finding to engage a better understanding of the land-use ordinance. The viewer has the option of dropping a comment connected to the location of concern and scenario (see Fig. 36.4). The information tab in Fig. 36.5 is the feature to comprehensively perceive the in-depth information of the selected building; in this study, the configuration via coding set the report of information consisting of Area, Build-up Area, FAR, GFA, and the number of floors.

#### 36.3.2 The Virtual Experience of Future (Scenarios) City Through 360 VR

In terms of scientific value, the availability of Virtual Reality (VR) allows for the use of

**Fig. 36.2** Visualization and sharing urban data. *Source* Adapted from ESRI (2019a, b)



simulation modelling to examine urban challenges, as well as responding to practical evaluation through public participation. The study 3D model is able to add Augmented Reality (AR) or in near future the Extended Reality (XR) (Chuah 2018). In architecture/urban design, for example, VR may be used to construct a walk-through simulation of the inside of the city (see Fig. 36.6), while AR can be used to highlight the new building(s) superimposed on a real-life view (Carmigniani et al. 2011; Ma et al. 2014; Dudhee and Vukovic 2021a, b).

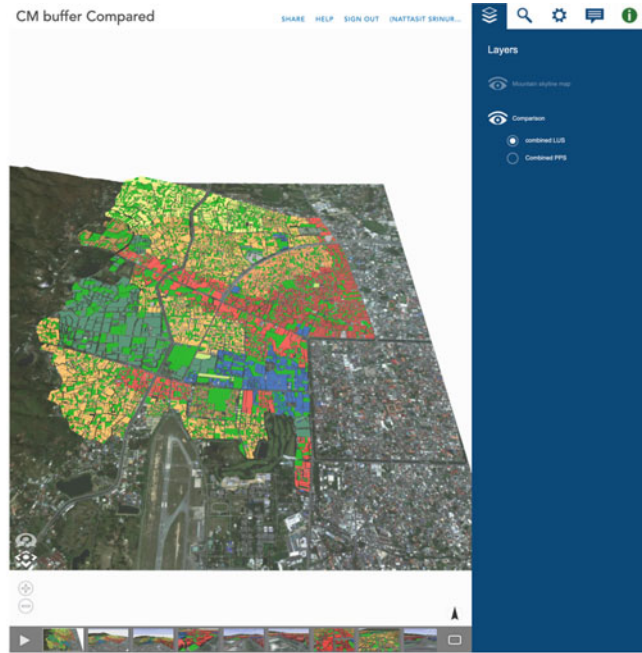
## 36.4 Conclusion

To establish active citizen involvement as the highest level of participation, i.e. citizen control and delegated power through participation in the evaluation of the impact of any design plan on the final decision. The accessibility/transparency/integrity of the information is critical for the event. As urban designers, they are transforming their positions into facilitators, using scientific information as the catalyst for debate, negotiation, and collaboration with local citizens. The Internet-based GIS is becoming more appealing for urban solutions. Following COVID-19, people have reduced computer and Internet illiteracy and use the Internet as a primary communication channel. However, there is still a lack of the essential commercial and political motivation to boost public participation, particularly in urban decisions via the Internet, which may provide us

insight into information response from all sections of city inhabitants. As Carver noted in 2000, developing user-friendly Internet-based GIS may be one of the possibilities to offer an inclusive dialogue of consultation and encourage a significant level of public participation. Additionally, the voices of the people may help to address the need for innovation to deal with the challenge of the Historic Urban Landscape, which is the delicate balance of change between conservation and development. In the HUL, a value-based approach is taken towards the people who live in and own the historic city the most. Therefore, the digital media is one of the accessibility tools to debate their opinion which create democratic solution for the city.

The axial role of plan delegation is to make the proposed plan as accessible to as many people as feasible. The visualized spatial environment, represented by technical tools, strives to address the misinterpretation and/or undervaluation of urban data while simulating the projected environment of determining land use. Especially in a historic city where multiple layers of heritage management are one of the keys to a sustainable future. Meanwhile, on a global scale, land-use efficiency is the focal point in the SDG11 that cities must achieve in order to preserve their finite resources for future generations. Chiang Mai is a multi-character where the historic city collides with modern development. The answers to cultivate and sustain the city resource may line within the unique city culture where natural-cultural intertwined as one of the most beautiful

**Fig. 36.3** Snapshot from ArcGIS online of the study web-scene layer feature **a** overview of model **b** sliding comparison **c** fixed comparison. *Source* Author (2022)



(a)

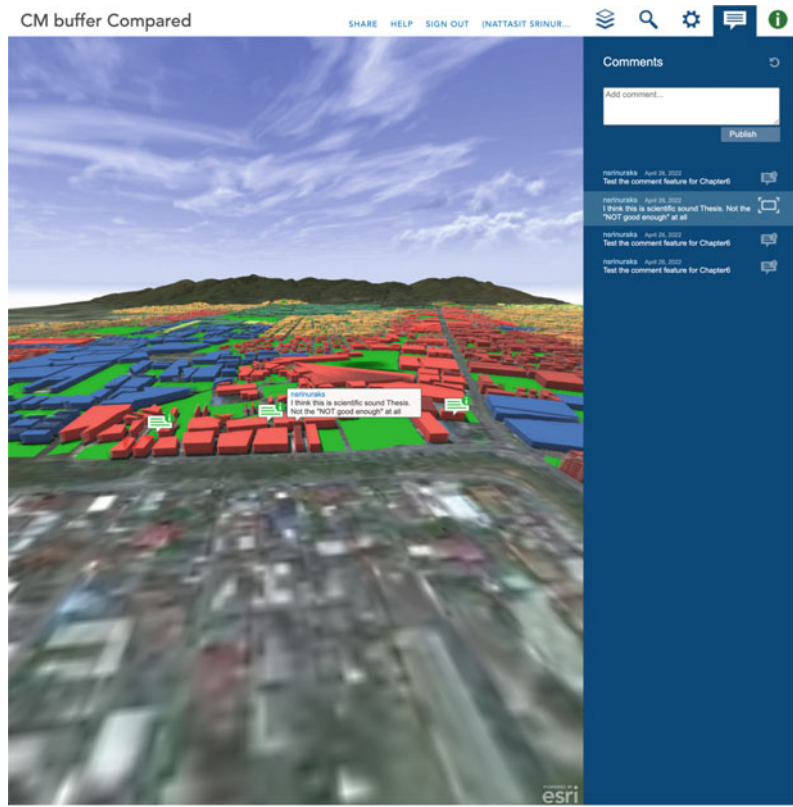


(b)



(c)

**Fig. 36.4** Snapshot from the study's web-scene: the comment from viewers feature tab. *Source* Author (2022)



human settlements for 700 years. The cultural heritage could become the driver of bottom-up policy recommendations as suggested in SDG 11.4 and 11.4 “Enhance the inclusive and sustainable urbanization and capacity of participatory...” and “Strengthen efforts to protect and safeguard the world’s cultural and natural heritage” respectively, along with SDG 4.7 “Ensure inclusive and equitable quality knowledge and skill...” SDG 8.3 “Promote development-oriented policies and access through financial service.” And SDG 8.9 “Devise and implement the policies to promote sustainable tourism that promotes local culture...” all of these targets are highly needed for the increased participation of citizens. (United Nations 2015) As the digital platform serves as the management hub, the resource, public, and communities serve as the material/user to promote sustainable urban development.

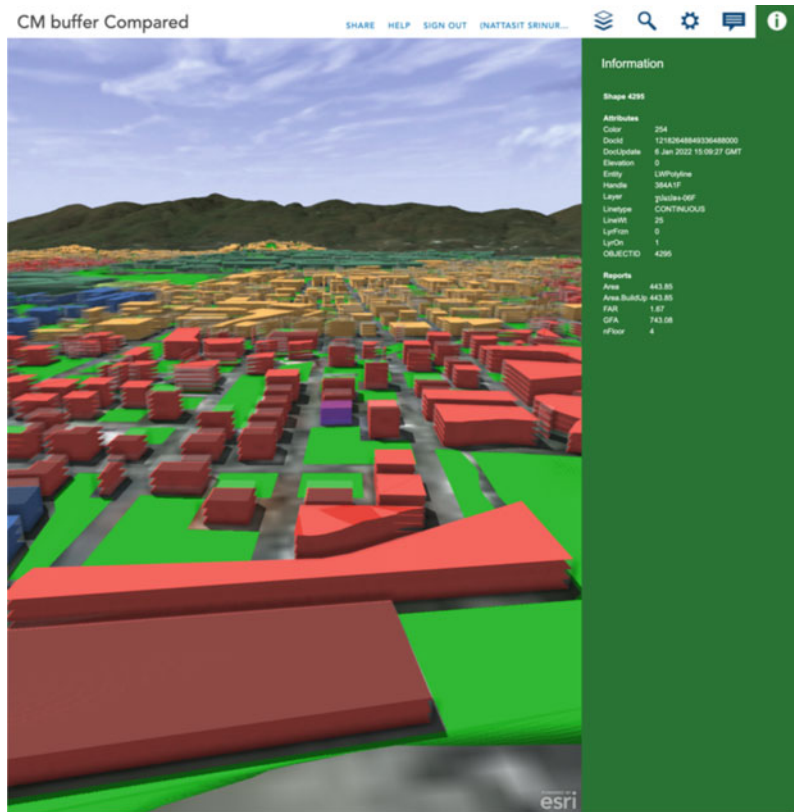
The internet-based paves the way to the inclusive communication of urban data while fulfilling the need for community engagement

with technical tools suggested by the HUL approach. Their attribution and ability of urban data consist of collaboration, accessibility, data exchange, multidevice integration, accountability, and transparency are the requirement of future urban data. The models from scenarios are tested as the urban data package for sharing to the public participation. This paper aims to contribute, transform, and initiate the scientific support of visual integrity to the practical policies and accessibility of communication tools via digital devices. The database from this study (wishfully) is able to initiate the negotiation in the sustainable use of natural resources which express through their cultural heritage, especially in Chiang Mai heritage city where the complexity of urban development usually overlies the urban conservation.

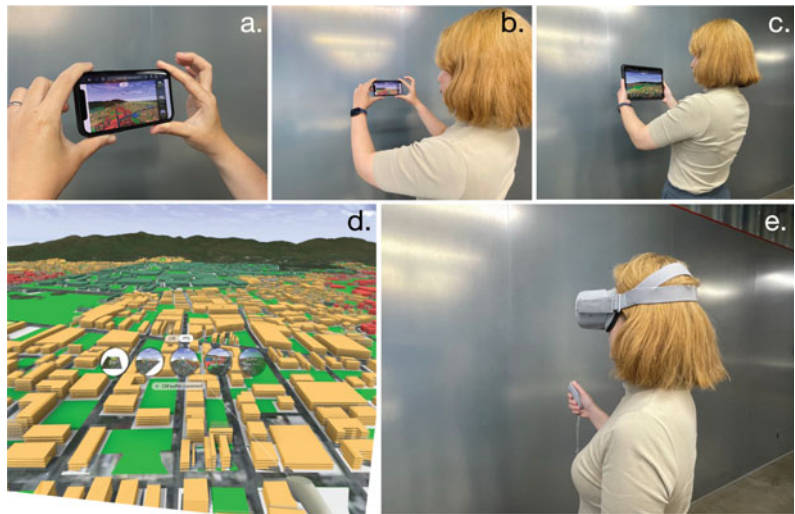
### Role

J. S. was in responsible of the research design, analysis, interpretation of the conclusion, and

**Fig. 36.5** Snapshot from the study’s web-scene: information report of building (s). *Source* Author (2022)



**Fig. 36.6** Showcase of the study’s modelling on VR devices **a** close-up mobile phone **b** mobile viewing **c** tablet viewing **d** view inside VR headsets **e** VR headsets. *Source* Author



contribution of the finding. N. S. as corresponding author was responsible for drafting, revising the article and communicating with peer-review throughout the publication process.

J. S. and N. S. conceived the study and discussion of the analysis. All persons designated as authors qualified for authorship, they sufficiently in the work to take public responsibility for

portions of the content. All author(s) read and approved the final manuscript.

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