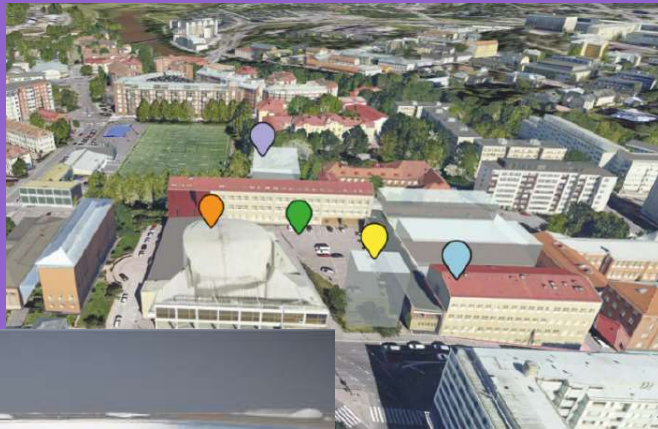# 3D visualizations supporting participation and collaboration in land use planning

Adjunct Professor (Docent)

Academy Research Fellow

Nora Fagerholm

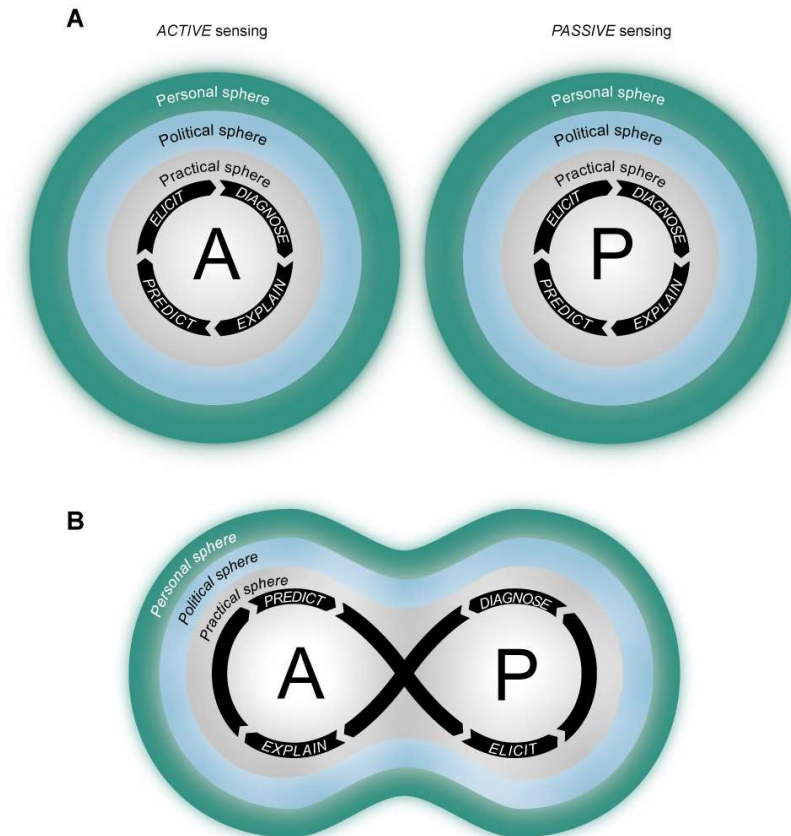**Department of Geography and Geology**

University of Turku, Finland

ESPON digital planning online workshop

November 29, 2021

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How to direct urban development towards more inclusive, resilient and sustainable smart & digital urban systems?

- Recent years have seen a massive development of sensing systems allowing to capture and monitor human presence, action and even intention
  - **Passive sensing:** fast wireless communication, cyberinfrastructure and the IoT, real-time (*EO technologies, geospatial social media, mobile phone records, population density measures*)
  - **Active sensing:** voluntary contributions of people to collect geospatial data (*survey research, Public Participation Geographic Information System (PPGIS), serious games*), aims to support consultation, engagement and empowerment of diverse stakeholders in urban planning through inclusion of the individual as both 'being the sensor' and being sensed

- Traditional urban planning systems treat these sensing systems in isolation
  - Should feed into a dynamic relationship between the passive and active sensing, supporting knowledge co-creation processes and fostering dialogues and social learning about transformation opportunities and risks among scientists, planners, businesses, governments, and citizens

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(Grêt-Regamey et al. *Nature Urban Sustainability,* accepted for publication)

3D visualizations supporting participation and collaboration in land use planning context

- Digital 3D tools and approaches supporting participation and collaboration in land use planning have been developing fast in the past two decades (Billger et al., 2017)

- Public participation and collaboration requirement for democratic planning processes at different levels
  - ➢ *3D visualizations attract attention in their capacity to support citizen and stakeholder participation*

- But do they work with the lay people?
  - credible, salient, legitimate, realistic, interactive, immersive

- Studies on how useful 3D visualizations are among planners and professionals (e.g. Batty & Hudson-smith, 2014; Herbert & Chen, 2015) but less on how they are used for and how they can support participatory and collaborative planning
  - Ongoing: systematic literature review

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GreenPlace project (2019-24) utu.fi/greenplace

Wellbeing benefits of urban green infrastructure mapped through participation and 3D virtual landscapes (GreenPlace)

- Increase knowledge of the potential of mapping perceived place-based wellbeing benefits related to green infrastructure among urban dwellers with the use of a 3D landscape platforms

- Apply modern 3D mapping technologies and demonstrate their advantages for capturing place-based physical activities and health benefits of urban dwellers related to UGI in the context of landscape sustainability science

- Evaluate the potential and challenges of these approaches in planning future cities

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GreenPlace team

Salla Eilola

Post-doctoral researcher
PhD

Kamyar Hasanzadeh

Post-doctoral researcher
PhD

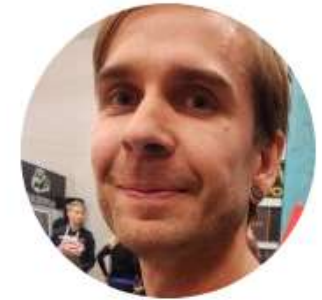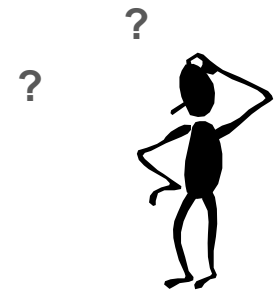**Topi Tanhuanpää**

Post-doctoral researcher
(in 2020)
D.Sc.

Johanna Jämsä

PhD student

MSc

Vesa Arki

researcher (in 2020)
MSc

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Mapping placed-based perceptions in a 3D landscape to support urban planning
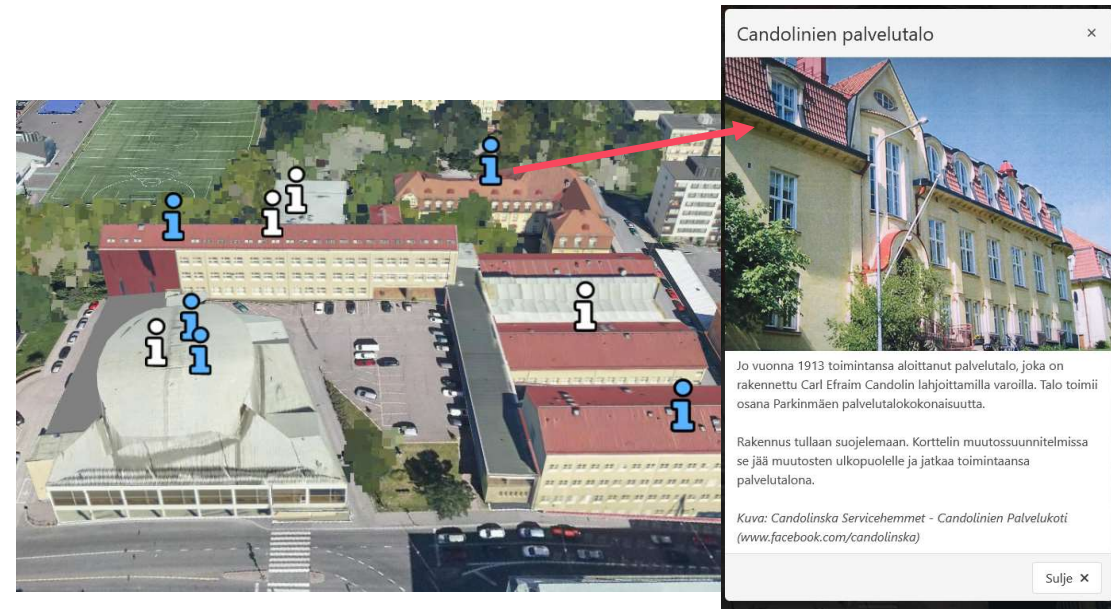

- Piloting a 3D PPGIS

- Aninkainen block in Turku & future development

- Survey for everyone to respond (open in April 2021)

Technically integration of:

1. *Maptionnaire* map-based survey platform
2. *S3D-Maps*:
   - 3D city model
   - Laser scanning and oblique aerial photos
     - E.g. trees as point clouds
   - Through WMS/WFS service
   - Browser based

Features for respondents:

1. Read information about the history with photographs
2. **Predetermined 3D fly-through around the area**
3. **Navigate and click on information boxes in the 3D view (about history and planned buildings)**
4. **Place future ideas using map markers (i.e. PPGIS)**
5. Describe the ideas in words

Candolinien palvelutalo

Jo vuonna 1913 toimintansa aloittanut palvelutalo, joka on rakennettu Carl Efraim Candolin lahjoittamilla varoilla. Talo toimii osana Parkinmäen palvelutalokokonaisuutta.

Rakennus tullaan suojelemaan. Korttelin muutossuunnitelmissa se jää muutosten ulkopuolelle ja jatkaa toimintaansa palvelutalona.

Kuva: Candolinska Servicehemmet - Candolinien Palvelukoti (www.facebook.com/candolinska)

Sulje ×

135 respondents made 368 place markings

Green to the city
24 % of all markings
(88 markings, n=65)

Preservation of exisitng vegetation
3 %

No comment
8 %

Restaurant/cafe next to park
3 %

Green on buildings
15 %

More vegetation
26 %

Modification of Aninkainen street to be more pleasant
3 %

Park/square in the middle of the block
37 %

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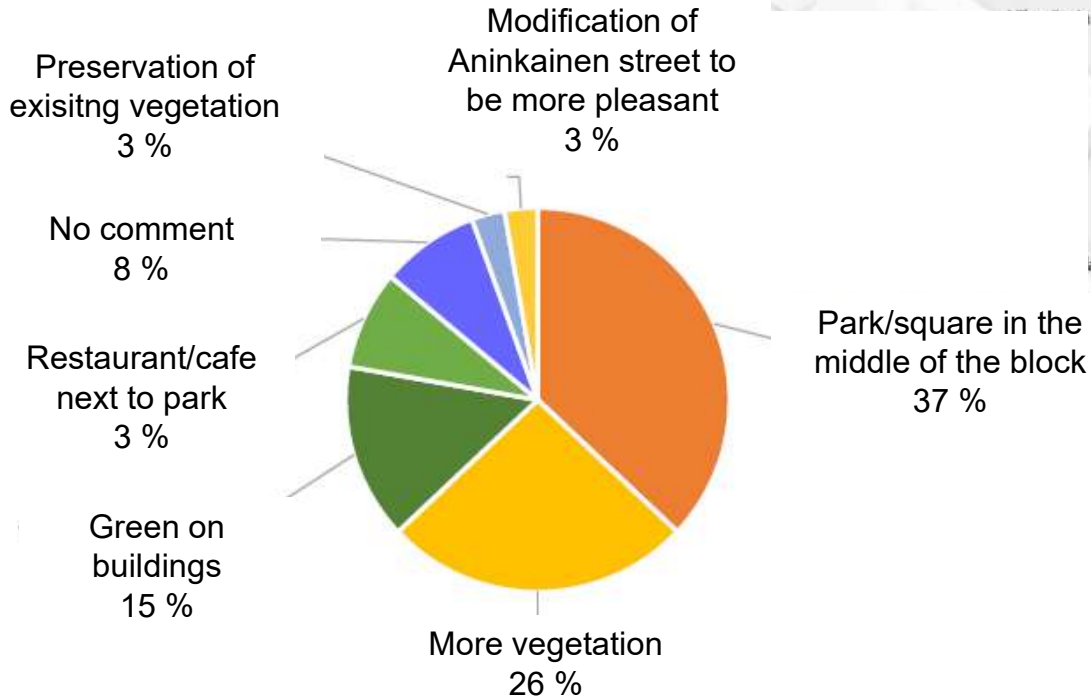
User experiences
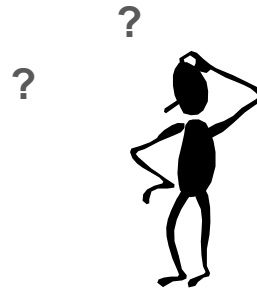
- Those who completed the entire survey used mainly a proper desktop computer

- 80 % of those using a tablet or a computer with a small screen (n=74) did not finish

- Reasons:
  - Technical challenges (small screens of smartphones limit the functionalities for complex tasks and map reading)
  - But may also reflect that people on mobile devices have possibly less time to focus on taking part in a survey
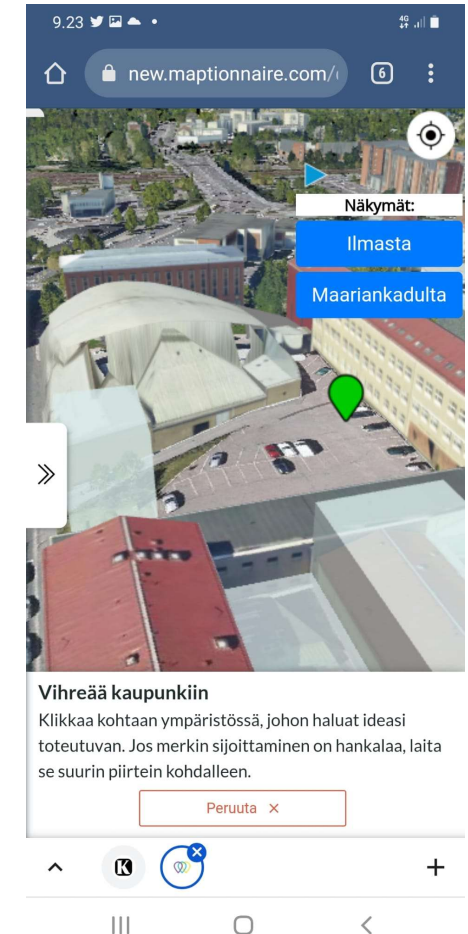
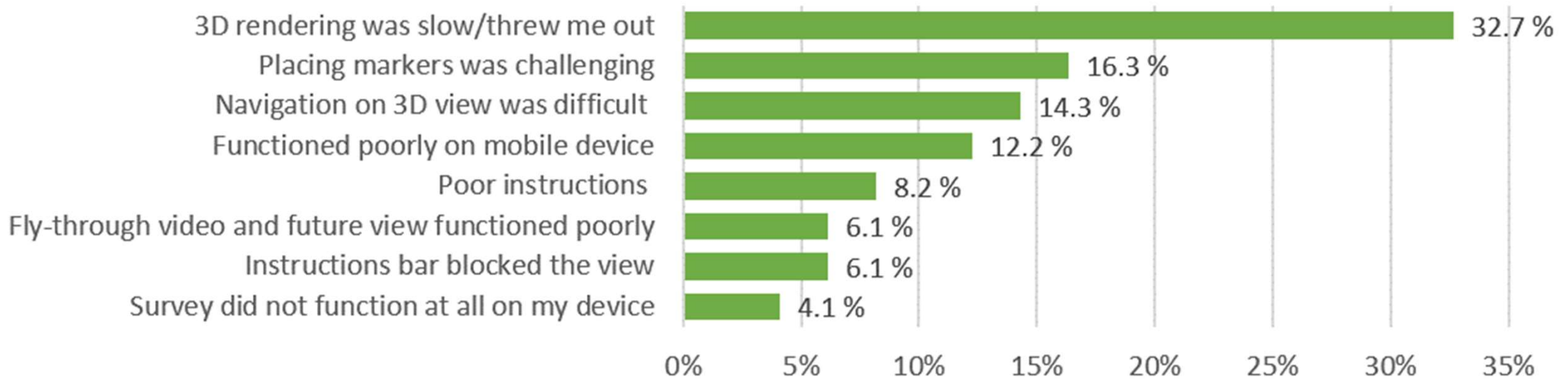- Usability challenges faced by smartphone users are evident also when looking at survey user feedback (26 respondents with nearly equal gender distribution and mostly 30-64 years)
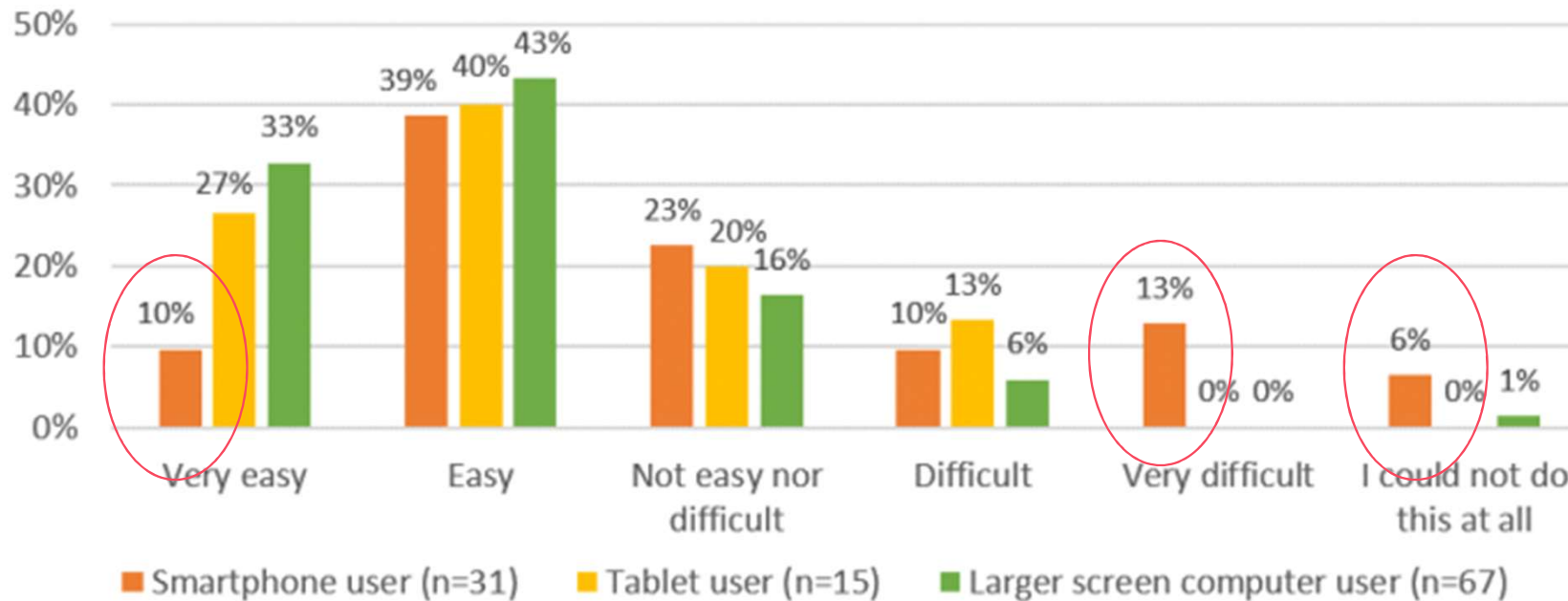
Answers to the feedback question "How did you experience the task to place markers in the 3D view?" categorized based on the device used by the respondent.

Eilola et al. 2021. *GreenPlace blog.*

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- Most common challenges or difficulties reported highlight in future focus should be on developing technological interface, using the 3D-based mapping, and navigation in order to more effectively collect citizens' insights.

Challenge	Percentage
3D rendering was slow/threw me out	32.7 %
Placing markers was challenging	16.3 %
Navigation on 3D view was difficult	14.3 %
Functioned poorly on mobile device	12.2 %
Poor instructions	8.2 %
Fly-through video and future view functioned poorly	6.1 %
Instructions bar blocked the view	6.1 %
Survey did not function at all on my device	4.1 %

The most commonly mentioned challenges in using the online 3D-based survey tool reported by the respondents. Altogether challenges were reported by 35 % of the respondents (n=124).
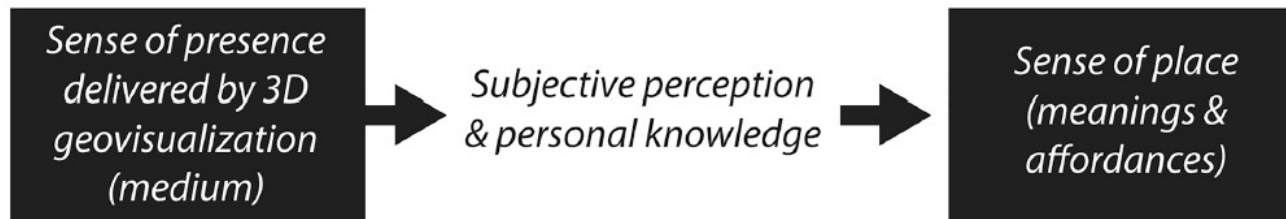
Positive views

- Despite the difficulties, interestingly **over half of all the respondents, who completed the survey, perceived the functionalities to be easy or very easy to use** (n=124-125).

- The majority (84 %, n=125) would recommend the use of the 3D-based mapping solution for digital participation in planning.

  ➢ Those who had the skills and proper device to respond to the survey, found the experience very positive

Conclusions

- 3D geovisualization are powerful platforms for provoking place-based values
  - ***Both sense of presence and sense of place should be delivered – work in tandem***

| Sense of presence delivered by 3D geovisualization (medium) | → | Subjective perception & personal knowledge | → | Sense of place (meanings & affordances) |

(Jaalama et al. 2021. *Landscape and Urban Planning*)

- ***Usability challenges exist especially with smart phones!***
- 3D & green infrastructure:
  - Green roofs and walls have a lot of potential for 3D visualization
  - Presentation of vegetation in 3D not as developed as building and infrastructure

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Conclusions

- While web-based solutions potentially reach people more widely and easier, **the digital divide** due to varying skills, competencies and access to technological devices (Van Dijk, 2017) urges practitioners to consider carefully when these tools are most appropriate for participatory urban planning.
  - In our case, unemployed, retired and minority groups were underrepresented. The usability of digital participatory tools among these various groups is a concern highlighted by the Turku city planners involved in the pilot study.
  - *How to develop digital participation so that no one is left behind?*
  - 3D visualizations are best used as supportive tools in communication for urban planning
- ***The 3D city model of Turku will be integral part of urban planning process in the future*** and the planners stated the pilot gave them valuable insights on how it can be used with citizens
  - For example, that 3D visualisation offers citizens a possibility to study the planned area from different perspectives.
  - ➢ Towards the integration phase of digital plans
  - – digital governance
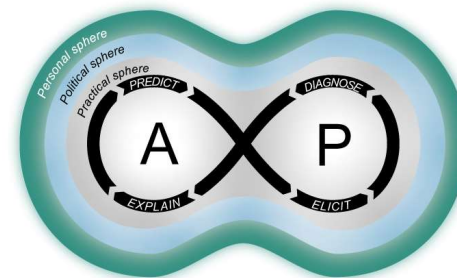
Thank you!

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GreenPlace project: www.utu.fi/greenplace