Co-Designing with Generative AI, Reflecting with Communities: Lessons Learned from Image-Based Participatory Design of Communal Neighbourhood Spaces in Nordic Superblocks

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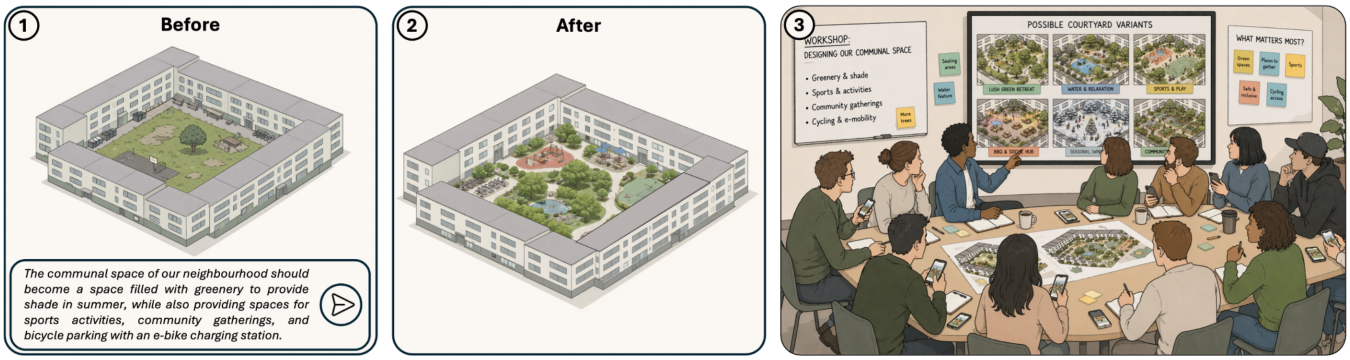

Figure 1: We explore how image-based GenAI can support the participatory design of communal neighbourhoods in the context of Nordic Superblocks. Based on (1) an image of the current state and a written prompt, residents create (2) visual representations of their ideas, which can then (3) be discussed in participatory workshops. (Visual elements were generated using DALL·E [44].)

Abstract

Nordic Superblocks have emerged as a concept to rethink communal neighbourhood life by creating shared spaces for versatile activities. Central to this concept is residents' active participation in redesign, yet translating lived experiences and needs into concrete design ideas remains challenging. Generative AI (GenAI) image generation offers a promising avenue for supporting this process, but its role in participatory design (PD) of communal neighbourhood spaces remains underexplored. We conducted co-design workshops with four neighbourhood communities and an expert workshop, examining the use of GenAI-based image generation to support collective reflection on the redesign of communal spaces. We identified five key lessons for researchers and practitioners, addressing the timing of GenAI use in the design process, the value of imperfect outputs in stimulating dialogue, and critical considerations. These lessons offer empirical guidance for researchers and practitioners seeking to integrate GenAI into PD for communal neighbourhood spaces.

*These authors contributed equally to this research.

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CCS Concepts

• **Human-centered computing → Empirical studies in interaction design**.

Keywords

Participatory Design, GenAI, Neighbourhood Communality, Nordic Superblock

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1 Introduction

With rapid urbanisation, an increasing proportion of the population is expected to live in urban environments [43]. Today, more than 45% of the world's population lives in cities, double the proportion in the 1950s, and two thirds of global population growth until 2050 is projected to occur in urban areas [43]. This raises critical questions about how such spaces can be designed sustainably and to ensure safety and meaningful living [2]. In response, the concept of *Superblocks*, introduced by urban designers initially in Barcelona, seeks to address these challenges by rethinking the design of shared urban space [40, 41]. The Superblock concept typically involves grouping of several city blocks into a larger unit, where vehicular traffic is redirected to perimeter roads, enabling interior streets to be reclaimed and repurposed for pedestrian social activities and urban greenery [40, 41]. The *Nordic Superblock* [1, 56], which forms the context of this paper, builds on this idea, whereby one of its key characteristics is the rethinking of shared communal outdoor and indoor spaces within and across residential blocks [1, 56]. It emphasises shared courtyards and semi-private communal spaces that support everyday social practices. Rather than prioritising urban infrastructure by traffic reduction and mobility [40, 41], the Nordic Superblock foregrounds social infrastructure for community life and shared living [1, 56]. In this context, the role of technology in supporting such social infrastructures is increasingly discussed [34, 35]. To ensure both acceptance and sustainable development of Nordic Superblocks, participatory design (PD) [8], by which people can contribute their needs and everyday experiences to the design process of novel systems, artefacts and spaces, is a key consideration. Alongside established PD practices, HCI research holds a long history to explore how digital approaches can support the PD of public spaces [54]. More recently, this includes investigating how generative artificial intelligence (GenAI) might contribute to such practices, for example, by enabling citizens to translate their ideas for urban development into visual images [32, 48]. Research highlights the potential of image-based GenAI to more effectively engage and empower citizens within the PD process [15, 20, 32, 48, 51, 52]. However, while this topic is gaining momentum, research on image-based GenAI in the context of communal neighbourhoods, such as Nordic Superblocks, remains underexplored, leading to our research question (RQ):

- **RQ:** *How can image-based GenAI contribute to the participatory design of communal neighbourhood spaces?*

To understand how GenAI can contribute to the PD of Nordic Superblocks (see Figure 1), we conducted three research steps. First, we carried out participatory activities with four Nordic residential communities, in which participants used a GenAI application to generate visual ideas for redesigning their communal spaces and to facilitate discussion about potential designs. Second, we conducted a workshop with experts to reflect on the use of GenAI from an organisational perspective. In the last step, we conducted an inductive reflexive thematic analysis [6, 7] across all workshops to derive key considerations for future research and practice.

We identified five key lessons. First, GenAI is most productive at early ideation stages, before communities form fixed mental images, as introducing it later risks design fixation and frustration. Second, culturally misaligned outputs, such as visual defaults that do not match the local Nordic aesthetics, can serve as productive provocations that prompt residents to articulate local values and identity. Thirdly, generated images alone are not sufficient to capture residents' needs regarding their communal spaces, which highlights the importance of placing the images in context. Fourth, community backgrounds shape the interaction with GenAI in fundamental ways, including cases where sustainability values conflict with the perceived energy cost of AI models. Fifth, the realism of generated images demands careful expectation management to prevent residents and stakeholders from treating visualisations as implementation commitments.

Contribution: This paper presents the first study on the use of image-based GenAI in the PD of communal neighbourhood spaces in the context of Nordic Superblocks. Based on workshops with four residential communities and an expert workshop, we make an empirical contribution [65] by identifying five key lessons on the use of GenAI in the PD of communal neighbourhood spaces. We discuss how these lessons can inform PD in other settings and outline pathways for their application and extension beyond the communal neighbourhood context.

2 Related Work

We reflect on prior work on the PD of neighbourhood spaces by highlighting different perspectives on what shared space can mean, while also reviewing prior work on the use of GenAI as a PD method for enhancing public spaces.

2.1 HCI Perspectives on PD of Communal Neighbourhood Spaces

To understand communal neighbourhood spaces and how they have been studied in prior work, it is useful to consider different analytical perspectives. Within urban planning, such spaces are often examined across different scales, ranging from macro-level perspectives on metropolitan regions, to meso-level considerations of regions and districts, and down to micro-level analyses of residential blocks and neighbourhoods [33, 36]. While PD approaches can be applied across all of these levels, the nature of participation and the types of outcomes vary depending on the scale and context. In this work, we foreground the micro-level context. Inspired by the concept of *Superblocks*, which aim to prioritise pedestrian life and the shared use of urban space and infrastructure [41], our study is situated within the *Nordic Superblock* context. Next to energy efficiency, this approach places a stronger emphasis on communal life, including shared ownership of neighbourhood space and the fostering of social interactions within it [1, 56]. In this context, communal spaces extend beyond outdoor environments to include also shared indoor facilities, which play specifically in the colder months an important role in everyday neighbourhood life [1, 56].

From an HCI perspective, prior work has further expanded the notion of communal spaces by demonstrating that they are not limited to physical environments. Digital technologies increasingly mediate how communal life is experienced and organised, enabling new forms of interaction and participation that complement and extend physical spaces [34–36]. Here research showed that these spaces can be also viewed from different scales, ranging from micro- (entities for neighbourhood communality), macro- (connections and relationships) and meta-levels (ethical, social and value considerations) [36]. Given that urban and communal life unfolds across these different spatial and technological contexts, it makes PD a relevant approach for residents, as it actively involves them in shaping their everyday environments. Here, prior studies have explored methodological approaches, such as speculative co-design workshop [10] and walk-and-talk formats but also artefact-based approaches such as card-based games [39], social robots [24] and augmented and virtual reality (AR&VR) [55]. This also includes examining a wide range of participants, from senior citizens [37] to younger residents [36], and contexts such as community stewardship in marginalised settings [49].

At the same time, research shows that PD is not a solution in itself, as its effectiveness depends on how these participatory processes are designed and facilitated [11, 12, 67]. In particular, the skills and roles of facilitators play a crucial role in enabling meaningful engagement [11, 12]. Alongside challenges of inclusion [14] and power imbalances in PD, prior research has also cautioned against the use of PD as only a symbolic process [3], highlighting the need to redistribute decision-making power and long term commitment to motivate residents and citizens to engage in the process [57]. Consequently, research continues to explore alternative participatory approaches and formats that enable more motivating, inclusive, and collaborative forms of engagement with residents, including, in recent years, the exploration of GenAI, which we review in the following section.

2.2 GenAI Images for Speculative Urban Design

Over recent years, GenAI has been explored in urban planning for different applications ranging from spatial analysis to planning and design evaluation [30]. Within this broader field, research has also explored various forms of GenAI approaches to support citizens in envisioning future scenarios, covering a range of modalities, settings, and thematic focuses. With regard to modality, research has focused on mobile applications for both in situ and ex situ contexts, and on stationary applications primarily for ex situ explorations. For instance, studies have explored GenAI in the form of mobile applications that allow users to edit either self-captured or provided images of public spaces to generate visualisations of their ideas, deployed on mobile phones [20, 32, 48], mixed reality application [16], or through prototype camera systems with integrated prompting interfaces [45]. In contrast, research has also investigated stationary applications, such as tangible user interfaces for cityscape explorations [42], immersive 360-degree theatre systems [38], and projection-based installations in museum settings [53]. While most of these systems operate using a combination of inpainting selections and written or spoken prompts to generate images, research also explores alternative input formats, such as rough hand sketches [28] or clay sculptures [19], while recent work also seeks to enrich inputs with additional contextual data about the places [27].

Alongside this, much of the literature focuses on envisioning positive near-future scenarios. However, some work has more explicitly explored utopian and dystopian urban futures [51, 52], including the visualisation of climate change scenarios [5, 25], but also retrospective perspectives on local cultural heritage [38]. Furthermore, we observe that much of the prior work has been conducted in settings where individuals generate images independently, with limited attention to how participants subsequently engage with these visual outputs in participatory discussions. While such studies show that the added value of such approaches lies in both GenAI contributing its own ideas to the images and the images themselves contributing to reflection [15, 48, 60], they primarily focus on broader urban contexts rather than on specific communal neighbourhood spaces. For instance, Guridi et al. [15] examined image-based GenAI in interviews and workshops for a public park in Los Angeles, whereas von Brackel-Schmidt et al. [60] explored its use in developing future urban scenarios in Hamburg.

In summary, the related work highlights the potential added value of GenAI technologies compared with other approaches in democratising urban planning processes and supporting a shift in power dynamics between public authorities and citizens [47, 48]. While this area is gaining momentum, research on GenAI has primarily focused on modalities, technical implementations, and individual use, with limited attention to how the resulting artefacts unfold within participatory discussions.

3 Methodology

We conducted exploratory workshops in four neighbourhood communities situated within the same Nordic city, followed by an expert workshop. The goal of these activities was to explore how participants, both community members and experts, perceive the usage of image-based GenAI in such a participatory setting. Local university regulations did not require formal full ethics review and informed consent was obtained by all participants.

3.1 App Overview

In this work, we employed the *CitizenVision* mobile app developed by Lützelschwab et al. [32], which enables participants to visualise their urban development ideas using GenAI. In a first step, the app allows participants to browse nearby participation projects on a map (Figure 2; Step 1). After selecting a project, participants see a project overview with a short description (Figure 2; Step 2). In the third step, participants edit base images by generating elements of their ideas for enhancing public spaces, based on inpainting selections and written prompts (Figure 2; Step 3). To do so, the base image, a binary mask of the inpainting selection, and the written prompt are submitted to the inpainting API from Stability AI [46], which generates and returns the edited image. Participants can accept and further iterate on, decline the proposed enhancement or attempt a regeneration (Figure 2; Step 4). Upon acceptance, the generated image is displayed in a shared community space alongside other proposed ideas (Figure 2; Step 5). We tailored the app to our context by including only the communities studied in this

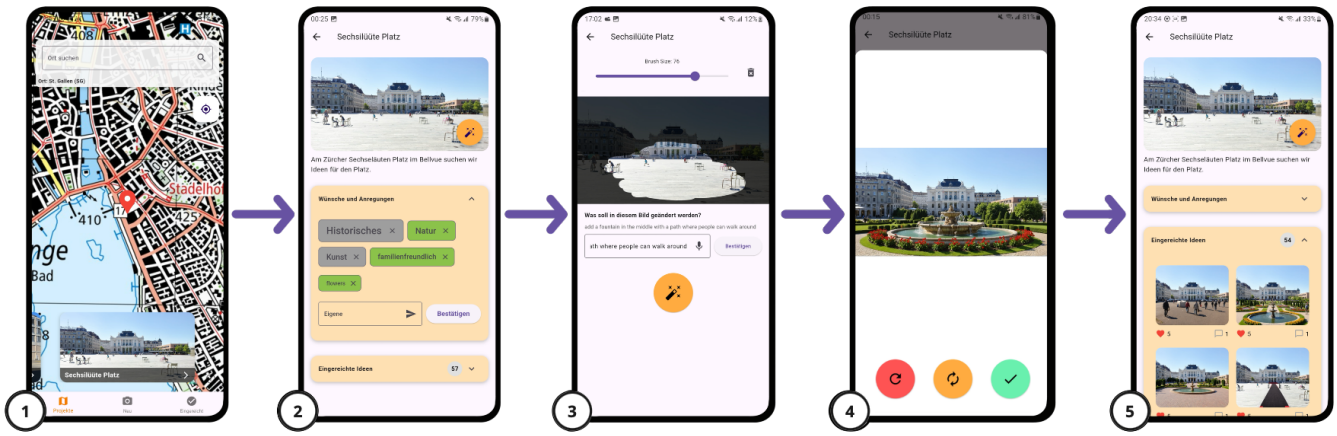

Figure 2: Overview of the *CitizenVision* mobile app [32]: (1) A citizen can select nearby projects, (2) view project details and vote on community preferences, (3) edit the current location image by drawing a mask and add a text prompt, and (4) decide whether to accept the AI generated visualisation and further edit it, reject it, or to attempt a regeneration. The generated visualization will then be shared in the community space (5) allowing to view and vote on other citizen-generated images.

work as participation projects (see section 3.2), along with a demo project used to introduce the app to participants and illustrate its basic functions. As the app does not provide participants the option to upload their own images for editing, we provided 3–4 base images representing the current state of different areas within each community space. We treated this as a methodological choice, as identical base images allow direct cross-participant comparison of generated outputs from consistent perspectives. The base images used in the workshops were selected in prior agreement with the local residential neighbourhood communities. The app was deployed on pre-configured Android devices and provided to participants for use during the workshops.

3.2 Community Workshops

We conducted exploratory co-design workshops across four residential neighbourhoods, aiming to investigate how residents perceive the use of GenAI to express their needs and ideas, while also observing how the generated images may shape the dynamics within such workshop settings.

3.2.1 Communities. We conducted in-person activities in four different residential neighbourhood communities (see Table 1 in Appendix A for an overview and brief descriptions). All four communities are located within the same Nordic city but are distributed across different districts, thereby reflecting diverse settings. The *Rowhouse Block* and *Historical Block* represent communities with a stronger communal identity, characterised by established shared spaces grounded in longer-standing communal practices, and predominantly homogeneous group of well-educated residents. In contrast, the *Modern Block* and *Westside Block* are more recently developed residential blocks, both being partially social housing programs. Although shared spaces and facilities are available in both neighbourhoods, a sense of community identity is not yet fully established. However, the resident groups are more heterogeneous and appear open to developing communal practices over time. In total, 15 residents (9 male, 5 female, 1 non-binary) participated across the four communities, with an average age of 56 years (min = 37 years, max = 72 years, SD = 10.6 years). More detailed descriptions of the communities can be found in Table 1 in Appendix A. Participants were recruited through posts on noticeboards, invitation letters delivered to mailboxes, and email announcements.

3.2.2 Procedure. The community workshops were facilitated by two to three researchers per session. We followed at each community the same procedure, starting with an introduction by the researchers and participants. After this, a reflective discussion was facilitated to explore participants' lived experiences, needs, and challenges within their shared communal spaces and what first ideas they might have. We then introduced the *CitizenVision* app by showcasing its basic functions through projected slides, followed by a short live demonstration. Subsequently, we handed out mobile phones with the *CitizenVision* app to participants and asked them to visualise their discussed ideas. Participants were not limited to focus only on one image, instead they could generate as many they wished. Subsequently, after roughly 20–30 minutes of individual app use, the generated images were projected onto a wall or displayed on a large screen, where each participant had the opportunity to describe their visualisation, followed by a discussion of each generated image. Throughout the session, we, as moderators, used open prompts to distribute speaking turns but did not intervene in the substance of generated ideas. Lastly, the workshop concluded with an overall reflection about the workshop procedure. Each community workshop lasted between 1.5 to 2 hours.

3.3 Expert Workshop

The aim of the expert workshop was to explore perceived potentials and concerns regarding the use of image-based GenAI in PD, and how to make sense of the generated images. The workshop was conducted subsequent to the four community workshops, enabling the images generated by residents to be used as probes to support expert discussion.

3.3.1 Participants. We recruited four experts for this workshop. Three participants were property managers and project engineers, two of them representing housing companies responsible for the management of such communal residential facilities, while one was responsible for the development of such areas. Critically, two of the property managers were each responsible for one of the four communities in which we conducted resident workshops, enabling direct cross-perspective reflection on those specific sites. In addition, we recruited one researcher with more than five years of experience in design research, PD, and human-AI interaction. Three of the experts reported using GenAI regularly, primarily for brainstorming but also for rewriting, summarising, and translating text.

3.3.2 Procedure. The expert workshop was facilitated by two researchers, both of whom were also involved in facilitating the community workshops. After welcoming the participants and collecting demographic information, we introduced the concept of shared communal spaces in the context of Nordic Superblocks, and the idea of residents using GenAI to visualise their ideas for such spaces. We then briefly introduced the *CitizenVision* app and allowed the experts to try it themselves. We subsequently conducted an initial discussion round to capture first impressions of the concept, including how participants perceived working with such visual inputs generated by residents, but also perceived challenges and potential limitations. Following this, we presented the visual outputs from the community workshops. Specifically, we showed the base images (as "before" images) alongside the residents' generated visualisations, using them as probes to facilitate discussion. Experts were asked to reflect on how they perceived these visualisations, particularly when considering scenarios in which residents use this format to express their ideas and needs. We further explored what they found useful or lacking in the images, and which directions they would propose for future work.

3.4 Data Collection & Analysis

The community- & expert workshops were audio-recorded, verbatim transcribed, and translated where necessary. In the community workshops, we collected the generated images and written prompt inputs from the app, including both accepted and rejected generations by participants. Across all workshops, four researchers served as moderators, with each session facilitated by two to three researchers, including one present throughout all sessions.

In this work, the aim of the analysis was to investigate how the use of image-based GenAI shaped workshop dynamics among residents and how it was perceived. The needs and ideas discussed during the workshops serve in this paper as contextual background for our analysis, rather than as the focus of an in-depth examination to directly inform the redesign of the spaces. In addition, the aim of the expert workshop analysis was to investigate how experts perceive the use of GenAI in such workshop settings. Accordingly, we did not limit our analysis to individual workshops, but instead considered the findings and workshop contexts as cases in relation to one another by comparing similarities, differences, and limitations. Through this analytical lens across the workshop cases, we aimed to derive lessons learned that serve as an empirically grounded starting point for future work on the use of GenAI in participatory workshop settings.

The data from the community and expert workshops were analysed by two researchers (first two authors) using an inductive reflexive thematic analysis approach [6, 7]. Both researchers read the transcripts, marked relevant passages, annotated observations, and organised the selected quotes and annotations together with participants generated images on a Miro board. In subsequent reflexive iterations, they met regularly to discuss, cluster, annotate and reflect on emerging themes across six sessions, each lasting between 1.5 and 2.5 hours. The analysis combined participants' verbal accounts with researchers' observations and reflections from the workshops. Consequently, the resulting themes are not solely grounded in direct quotations, but also in interpretative insights derived from cross-case analysis and reflexive discussion. Following these sessions, a final reflexive meeting was conducted with all four researchers, who had been involved in the facilitation of the workshops. During this session, the first two authors presented their findings, while the third and fourth authors critically reflected on and contextualised these insights based on their workshop experiences, resulting in the final findings and lessons learned.

4 Findings

Based on our analysis, we report the findings from both the community and expert workshops.

4.1 Findings from the Community Workshops

The aim of the community workshops was to understand how participating residents (R) perceive the use of image-based GenAI, and to observe how its use shapes workshop dynamics. Accordingly, we present findings from our analysis across all four communities, rather than reporting results from each setting in detail.

4.1.1 Diverse meaning, interpretation and needs of shared communal spaces. Across the communities, participants discussed different types of needs and requirements for their shared spaces, reflecting their specific local context. In particular, discussions in the *Historical Block* and *Rowhouse Block* focused more strongly on shared activities and practices related to communal use. This aligns with their backgrounds, as both residential neighbourhoods already exhibit an established sense of community identity with shared practices.

For example, discussions in the *Rowhouse Block* centred on redesigning the barbecue area to encourage shared evenings at the fireplace as in the past, repurposing an old shed to enable pottery activities, and redesigning outdoor sport facilities such as bouldering, basketball and a gym. Similarly, participants in the *Historical Block* discussed ideas for communal activities, including the design of a stage for community festivals, the shared terraces with tables, pools for the sauna and table tennis facilities and the integration of an e-bike charging station to support shared mobility practices (see Figure 3). In contrast, the *Modern Block* and *Westside Block*, which do not yet exhibit a strong sense of community, initially focused their discussions more on pragmatic concerns. Prominent concerns included adapting outdoor areas to weather conditions, such as rain, heavy snowfall, and rising summer temperatures, through measures such as installing shelters for bicycle parking, redesigning courtyards to facilitate efficient maintenance, and providing cooling solutions.



Figure 3: Extracts of before-and-after images generated by participants during the workshops. From top to bottom: the *Historical Block*, the *Modern Block*, the *Rowhouse Block*, and lastly the *Westside Block*. These images depict a range from rather pragmatic oriented ideas to solve particular need towards more communal oriented ideas.

Compared to the *Rowhouse Block* and *Historical Block*, there was initially less emphasis in the *Westside Block* and *Modern Block* on enhancing communal living through shared practices and activities within these spaces, with participants instead expressing more individual needs. This focus, however, shifted through the discussion of the images over the course of the session, as outlined later in section 4.1.3. Understanding these differing community contexts and discussions is particularly important, as they influenced how participants approached the generation- and consequently also the results of generated outcomes. We observed that participants who had concrete measures in mind (e.g. adding a *"maple tree"* or removing a fence) where more likely to be sufficiently visualised compared to participants who included particular needs in their prompts without an actual measure (e.g. *"chilling out place" or "make the area more relaxing" (prompts of a participant in Modern Block)*). This is most likely due to the way LLMs are trained to add specific elements to an image, whereby needs or contextual information (e.g. wished atmosphere) cannot be directly translated into concrete visual elements.

4.1.2 Timing of GenAI usage. Our analysis indicated that the timing of GenAI use in the ideation process also influenced workshop dynamics and participants' perceptions of its usefulness. In the *Modern Block*, *Rowhouse Block*, and *Westside Block*, participants had not yet collectively discussed concrete ideas for their shared spaces, aligning with the idea of initial kick-off events aimed at gathering diverse perspectives and ideas. In these settings, the GenAI tool was primarily perceived as a source of inspiration, enabling participants to explore and test initial thoughts and rough ideas. For instance, R13 explored the idea of an outdoor gym as an alternative to an indoor gym, where *"the air isn't so nice"*, but reflected: *"I don't think I would actually want it. I just wanted to see how it looks."* In this way, the generated images represented individual perspectives while serving as stimuli for collective discussion and reflection, as participants recognised that *"even if [they] can't make the image exactly [the way they] want, [they] can still agree with others (R14)"*, particularly when *"using it together, and maybe also having some prior discussion on what [they] actually want to change (R14)"*.



Figure 4: At the *Westside Block*, participant generated a fountain that was perceived as misaligned with the local Nordic aesthetic and identity of the neighbourhood. This prompted participants to reflect on locally anchored alternatives, leading to the idea of installing a statue of a well-known ice hockey player who had previously lived in the district to represent their local identity. *Disclaimer: The image on the right was generated with DALL·E [44] by the authors and is intended as an illustrative representation of their observation.*

Particularly in the *Westside Block* and *Modern Block*, where residents did not yet share a strong sense of community, the generated images acted as ice-breakers, supporting participants in getting to know one another. In contrast, participants in the *Historical Block* had already discussed specific needs before the workshop, such as a temporary stage for community events, although its specific design remained open. While this appeared to be a promising starting point for prompting, in line with our previous findings in section 4.1.1, most of the resulting images were perceived as insufficiently detailed and misaligned with the spatial dimensions and context of the site. Whereas other communities used the GenAI-generated images as discussion starters, participants in the *Historical Block* expected more concrete design recommendations or detailed visualisations. This expectation is also reflected in one participant's prompt: *"performing stage for poetry festival, temporary and removable when needed"*. This mismatch between expectations and the capabilities of GenAI, led to frustration and shifted the discussion towards the tool's limitations rather than the discussion of ideas for the shared space itself. However, participants also reflected that they may have held more concrete mental images that could not be adequately translated into generated outputs, as R7 noted: *"This could be quite good, for a basic apartment building block with basic tasks. We had quite challenging tasks here."* They suggested that such tools may be more valuable in earlier stages of participation, for instance when exploring potential future scenarios or attracting residents to engage in participatory processes, for example by advertising events with provocative redesign ideas on flyers. As R8 noted, *"it would be fun to scare people [with such images]"*, using such visuals to provoke interest in participation.

4.1.3 Technical limitation or just a starting point for discussions? As outlined in the previous sections, the quality of the generated outputs varied across workshops and participants and was influenced both by the nature of the prompts and by the technical limitations of the GenAI. While generally sufficient to convey participants' overall ideas, the generated images, as shown in Figure 3, sometimes did not align in terms of style or positioning, and occasionally altered or removed background elements that had not been specified by participants. Notably, in the *Modern Block*, *Rowhouse Block*, and *Westside Block*, where participants had not yet developed concrete ideas, expectations regarding the level of detail of the outputs were relatively low. Rather than expressing frustration when images were less successfully generated, participants engaged in reflective discussions about *why* the outputs were not fully satisfactory. This was particularly evident in the Nordic context of these neighbourhoods, as some of the generated images did not match the local architectural styles or traditions. Instead of rejecting these outputs, participants often acknowledged that the overall direction was appropriate, while suggesting that the style required adaptation. For example, in the *Westside Block*, a participant proposed adding a fountain. However, the generated design appeared out of place and misaligned with local Nordic aesthetics and neighbourhood identity (see Figure 4). This led to a discussion about what type of structure would be more appropriate, including considerations of the neighbourhood's history and which elements should be represented in such a design, as can be seen in the following discussion between two participants:

> **R2:** *"I would prefer some kind of humorous statue instead this fountain. Something that would reflect [city] identity or this area — we have a lot of that kind of history."*
> **R1:** *"I've been told who has lived here: [ice hockey player], so a statue of him could certainly be an option. And what's her name… That singer girl, [singer]. And everyone knows [another ice hockey player] as a [city district] native."*
> **R2:** *"The [city] Cannon!"*

We observed in the *Rowhouse Block* similar discussions about a perceived mismatch between the local context and the aesthetics of the generated images. However, the example from the *Westside Block*, which does not yet exhibit a strong sense of community identity, highlights how such limitations unintentionally can stimulate and provoke participants to reflect on the values and history they wish to see represented, thereby also serving as an ice-breaker.

4.1.4 Perceived tensions between community backgrounds and values in relation to the use of GenAI. Although the overall use of GenAI was perceived by participants as a fun and engaging way to

express their ideas, two main concerns were raised regarding its use as a participatory approach. The first concern related to data privacy and the environmental impact of AI models. Some participants indicated hesitation when considering sharing private or sensitive information without clarity on how such data would be used or stored. In addition, some participants perceived the use of GenAI as *"playing around with GenAI, which is something that [they], as a principle, [are] a bit against because of the energy consumption, especially in this [AI] generations (R12)"*, reflecting a conflict with their values around environmental sustainability.

Second, while most residents acknowledged the potential of such tools, they expressed scepticism about whether these approaches would be adopted in practice in the near future. While some apartments and houses are privately owned by residents, others are provided by stakeholders for rent, and some involve mixed forms of ownership. Consequently, participants were uncertain whether private owners or housing companies and their facility management teams could adopt and support such GenAI approaches.

4.2 Findings from the Expert Workshop

We conducted an expert workshop aiming to explore how they perceive the use of GenAI in the PD of communal neighbourhoods. The experts (E) engaged with the app and reflected on the outcomes from the community workshops.

4.2.1 Perceived Potentials. Stakeholders acknowledged that they often have limited insight into the everyday lived experiences within the residential blocks they develop or manage, which makes engaging with residential communities in participatory ways both necessary and challenging. Further, they also noted the difficulty of reaching residents through conventional formats, such as forms or small-scale events, which are often perceived as insufficiently engaging. In this context, stakeholders saw potential in the use of GenAI-generated images to attract broader participation. In particular, they highlighted the accessibility of such tools, enabling laypersons and residents without specialised expertise to express and communicate their ideas more effectively, as *"everyone can use it"*, providing *"a good way for ordinary people to discuss [...] ideas so they don't need to be like engineers (E1)"*.

At the same time, experts emphasised that, beyond supporting individual expression of needs and ideas, these tools should facilitate dialogue between facility management and residents, but also among community members themselves. As E2 reflected, while an image might initially express a desire for a pavilion, the underlying need may simply be *"a space to meet people and have a moment together"*, highlighting that *"getting that out might not come through pictures, but it might come out of the discussion with the pictures (E2)"*.

Accordingly, stakeholders expressed greater interest in the meanings and narratives underlying the images rather than in the images themselves. As the visualisations are unlikely to be implemented directly, they emphasised the importance of interpreting the needs behind the images, which could then inform the development of more grounded design concepts through subsequent discussions.

4.2.2 Raised Concerns. During the session, experts raised two main concerns and challenges regarding the use of image-based GenAI for PD of communal spaces. The first concern related to the overall approach. While the format was seen as engaging and potentially effective in attracting residents, the experts expressed concern that it might be perceived as overly gamified. This raises the risk that without appropriate facilitation individuals may not reflect carefully on their needs and ideas, but instead engage in a more playful manner *"to generate bad stuff for an area they don't like [or] just fun stuff they don't actually would add on to it. [...] So there might be things that are just funny and aren't actually contributing to [the discussions] (E2)"*.

This concern is closely linked to the realism of the generated images. Although such visuals may support communication and make ideas more tangible, their high fidelity may also lead to unrealistic expectations among residents, who might assume that the depicted ideas will be implemented as shown. Experts therefore emphasised the importance of careful facilitation and clear communication regarding the purpose and limitations of GenAI-generated outputs. This is necessary to manage expectations in a way that maintains engagement while ensuring that residents understand how their contributions will be interpreted and used. Another approach to managing expectations was to reconsider the visual fidelity of the generated images, for instance, by using more stylised or *"cartoony"* representations, *"so they're not building these expectations (E2)"*. As E2 suggested, GenAI could generate *"the symbol of grass"* rather than a realistic depiction, allowing residents to *"implant that there [and note it won't look like this later]"*, as otherwise they might *"get disappointed when [they] don't [get] this [visualisation as it would look like later] (E2)"*.

Another concern related to the image generation process itself. On the one hand, experts noted that the realistic style of the generated images may lead to design fixations. Residents may repeatedly edit images to correct specific elements that do not match their expectations, resulting in iterative generation loops rather than reflecting on whether the overall idea is adequately conveyed. On the other hand, such fixations may shift attention away from the actual space, with residents *"thinking that this is the world in that picture and that [they] get easily tracked in that picture and the possibilities of that picture (E3)"*, without considering how proposed ideas would translate into the lived environment and its constraints.

Furthermore, experts were *"wondering if it's a limitation that the [base image] is always already set [in the app]"*, as this might *"force [residents] to change certain things from a certain perspective (E2)"*. They discussed whether residents should also be able to capture and use their own images. For example, *"if somebody was in a wheelchair coming there, there is like to be too high perspective"*, illustrating how *"from which point of view you're generating in that area is already [...] a kind of a choice (E2)"*. Allowing residents to capture their own images may better reflect their situated viewpoints and priorities, whereas provided images by stakeholders may inadvertently bias both the generated outputs and the topics discussed.

4.2.3 Images alone may not be enough. When reviewing images from the community workshops, experts found some visualisations, such as the addition of an outdoor gym, relatively straightforward to interpret, while others were more difficult to understand. Although experts initially assumed that the images would be self-explanatory,



Figure 5: Examples from the *Westside Block* in which the intended idea or underlying need is not fully captured by the generated images alone.

it became increasingly evident throughout the session that understanding the narratives behind the images was essential to grasp the underlying needs they represented.

This was particularly the case when elements were removed rather than added. For example, in the *Westside Block*, the removal of a bicycle stand that obstructed an informal shortcut used by residents, pointed towards broader spatial considerations, such as the need to reconsider path design within the communal space (see Figure 5; top example). In another example, in the *Westside Block*, residents envisioned a shared space for relaxation and spontaneous encounters; however, the GenAI generated only a single person on a deck chair holding a drink, without any elements that would suggest opportunities for spontaneous interaction (see Figure 5; bottom example). While the missing elements could be contextualised through residents' reflections during the session, this intention cannot be conveyed by the image alone. Based on these reflections, experts emphasised the importance of complementing images with annotations or short descriptions, particularly when submissions are collected through online formats. In workshop settings, they highlighted the added value of listening to and observing the discussions accompanying the generated images to fully understand their meaning.

5 Discussion

Building on our main research question, we discuss in the following our findings in the form of lessons learned, acknowledge limitations and outline directions for future work.

5.1 How can image-based GenAI contribute to the PD of communal neighbourhood spaces?

Through our reflexive approach (see section 3.4), we discuss our findings in relation to the literature, deriving lessons learned from the process. These lessons aim to serve as grounded starting points for researchers and practitioners, offering pathways to extend and apply insights on GenAI in the PD of communal neighbourhoods.

5.1.1 Lesson 1: Image-based GenAI is most effective in the early stages of participation. Our findings indicate that timing, that is, when GenAI is introduced in the design and ideation process, plays a crucial role. On the one hand, when introduced too early in the design process, we observed that some participants struggled to formulate precise prompts, as they focused more on their needs (e.g. cooling the courtyard) rather than having measures in mind to prompt (e.g. a tree). On the other hand, when introduced after concrete design directions and requirements had been established (e.g. a temporary, removable performing stage with a specific layout), residents in the *Historical Block* became more constrained by design fixations [23], aiming to reproduce mental images or holding high expectations regarding the level of detail in the outputs. While prior work has reported similar cases in individual settings [48, 61], our findings suggest that these effects may be amplified in workshop contexts, potentially influencing workshop dynamics.

Although these challenges may be perceived as technical limitations that could be addressed in future work, for instance by rethinking purely text prompt-based interfaces [26, 28, 68] to better accommodate user way of expression or by translating needs into design proposals [48], we argue against framing them solely as technical problems to solve. Instead, we emphasise the role of facilitation in reflecting on the respective contributions expected from GenAI and from participants within participatory settings, and in positioning its use as part of an iterative process.

Our findings show that GenAI images can provide value as an icebreaker and discussion starter in participatory workshops. Rather than accelerating the process towards premature solutions, future work could also consider how to foreground participants' needs more prominently in generated images, for example by emphasising lived experiences, challenges, and potential utopian or dystopian consequences [51, 52] to stimulate discussion. In this sense, image-based GenAI should be understood as a means to foster reflective dialogue among the participants in the beginning of the design process, rather than as a tool for rapidly producing solutions without collective reflection.

5.1.2 Lesson 2: Imperfect outputs can serve as catalyst for discussions. Across all communities in this work, our findings show that the generated images did not always fully match participants' expectations. However, in line with prior work [15, 48], the images were still perceived by most residents as sufficiently accurate to capture the overall idea or to serve as a stimulus for further iteration. In addition, the Nordic context of this work highlights how biases in the training data of GenAI models shape their default visual outputs [13]. In particular, the generated visualisations were often culturally and locally misaligned, and were perceived as misplaced with the Nordic context of the communities, failing to reflect local aesthetics and community values. Interestingly, rather than creating resistance among participants, these imperfections prompted reflection on their own values and on the styles they would prefer to see represented in their shared spaces. Our findings on the potential of GenAI biases to act as catalysts for discussion extend the work of Guridi et al. [15] on *"conversational imperfects"* as boundary objects [15, 59], suggesting that imperfect GenAI outputs may hold greater potential to foster discussion than more detailed outputs.

However, although these biases contributed in our study to a productive discussion, it is important to emphasise that it may not generalise to all settings. From a global perspective, the Nordic context still falls within WEIRD (Western, Educated, Industrialised, Rich, and Democratic) populations [18, 29], whereby the training data may not reflect the Nordic context specifically, while still largely covering the broader WEIRD context. For researchers and practitioners seeking to adopt image-based GenAI in PD, it is therefore important to acknowledge these biases and reflecting on how to deal with them [29]. While imperfect outputs can stimulate valuable discussions, a lack of awareness of such limitations may also lead to frustration, depending on the specific community context. Besides improving and training such AI models to adapt to specific values and regions [22], which is largely beyond the scope of facilitators seeking to use GenAI in PD, a more pragmatic initial approach would be to brief participants about the existence of such biases and encourage them to reflect in advance on how to address them depending on the context. This highlights that the responsible use of GenAI in PD requires certain skills on the part of facilitators including empathy, responsiveness and attentiveness [11, 12].

Following this discussion, the added value of generated images lies in the fact that GenAI does not merely translate participants' prompts into images but acts as a co-creator, adding its own interpretations to the generated imagery [48]. While this has the potential to inspire speculation and provoke discussion, it raises, in line with our findings, the concern that images alone may not sufficiently communicate the underlying needs they represent, as it remains unclear what comes from the participant and what from GenAI [47]. This highlights, on the one hand, the value of using such approaches in in-person settings, where participants can present and directly discuss their outcomes. On the other hand, approaches that employ image-based GenAI in asynchronous settings, such as crowdsourcing or online forms, need to consider how to enable participants to express additional thoughts alongside the images, while also fostering opportunities for discussion rather than mere submission. While prior work has proposed solutions such as community platforms with like and comment functions [32, 48], our findings suggest that in-person use of GenAI has particular potential to unfold richer discussion dynamics, which may be difficult to replicate in asynchronous contexts.

5.1.3 Lesson 3: Images alone are not enough to represent the communal space. The experts in our study emphasised the concern that the use of GenAI, particularly when a starting base image is provided as default, may shift residents' focus towards generating and editing specific elements in the image rather than reflecting on the space as a whole. This aligns with our findings that generated images and edits may omit relevant contextual information, highlighting potentials and risks. As suggested in the expert workshop, future applications could consider allowing participants to upload their own images, captured from their individual perspectives. Such images may already convey aspects of the stories participants wish to share. For example, children may perceive and represent a space differently from adults. Discussing these images from multiple perspectives can itself serve as a valuable probe to stimulate discussion [62, 63], whereby generating images could be done in further iteration round.

Furthermore, our findings indicate that reflections on communal life in shared spaces are not limited to adding or removing physical elements. Rather, residents' ideas span a spectrum from pragmatic concerns to more hedonic visions. In *Westside Block* and *Modern Block*, discussions focused on pragmatic aspects, such as optimising outdoor spaces for snow removal in winter or improving cooling during increasingly warm summers. These ideas are relatively straightforward to depict visually, for example by removing bushes or adding trees for shade. In contrast, residents also expressed needs related to the atmosphere and social experience, such as creating spaces for barbecuing or spending time together outdoors. These aspects are more difficult to capture through generated images, as they are challenging to articulate in prompts and to render in ways that meaningfully convey their intent. Therefore, the most relevant data for stakeholders and facilitators may lie less in the generated images themselves and more in the accompanying prompts, descriptions and discussions [47].

Taken together, these examples suggest that while GenAI can support the visualisation of specific elements, it is crucial to foreground the underlying needs, atmospheres, and qualities that residents envision for shared spaces. Moderation therefore plays an important role in guiding discussions beyond the generated images and towards these broader considerations [47].

5.1.4 Lesson 4: Neighbourhood community backgrounds matter for the acceptance and applicability of GenAI. While we observed the use of image-based GenAI in the workshops as an engaging way to stimulate discussion among residents, it also became clear that it may not be suitable for all settings. In particular, the characteristics and values of a neighbourhood play a crucial role in determining whether its use contributes to the intended goals. The communities in our study represented diverse settings in terms of ownership and responsibilities: some were privately organised by residents themselves, while others comprised mixed forms of privately owned and rented apartments, often involving various stakeholders and facility management.

Consequently, in some communities residents act in such participatory events as both participants and facilitators, whereas in others there is a more top-down dynamic from stakeholders to residents [17]. These differences reflect discussions on inclusion in PD [14] and varying power dynamics within communities and in their relationships with stakeholders [3, 17, 57]. As highlighted in the previous lessons, the use of GenAI in PD also depends on facilitation, making it contingent on the values and capabilities of those facilitating these processes. As an example, reflections from the *Rowhouse Block* indicated that, although participants enjoyed using GenAI, they would likely prefer alternative approaches. This was largely due to the community's strong emphasis on sustainable living, which they perceived as being in tension with the energy consumption associated with AI and its impact on sustainability, reflecting ongoing discussions and research on this issue also in the research community [4, 9, 21, 31, 50].

Furthermore, as observed in our study and discussed in prior work [48], the use of GenAI may require a certain level of digital literacy, particularly when navigating the app or when formulating prompts [68]. While some residents in our workshops shared devices and collaboratively developed prompts, demonstrating that

such barriers can be mitigated through in-person collaboration or by rethinking the prompting interface as outlined earlier. These findings nevertheless highlight that adopting GenAI in workshop settings requires careful consideration of the specific community context, including participants' values and abilities [47]. This aligns with prior work, that technologies aiming to support communality in Nordic Superblocks need to consider multiple scales, ranging from micro-level (entities for communality) to macro-level (connections and relationships) and meta-level considerations (ethical, social, and value-related aspects) [36].

5.1.5 Lesson 5: Expectation management is needed for residents, stakeholders and facilitators. Our findings indicate that expectation management is crucial when using GenAI in PD for communal neighbourhoods, for both participating residents and stakeholders of housing companies who manage and develop such buildings, but also facilitators moderating these PD settings.

With respect to residents, expectation management is needed regarding the GenAI tools themselves and their intended purpose. In our study, GenAI primarily served as a discussion starter, enabling participants to express their ideas and needs visually. Facilitators need to emphasise that generated outputs do not need to be fully refined, but rather sufficiently representative to support sharing and discussion. This becomes particularly relevant given the high fidelity of generated images, which may otherwise raise expectations of finished solutions that can be directly implemented [47]. In line with the fundamentals of PD, generated images should focus on collective exploration and negotiation, without necessarily informing immediate solutions or responding to regulatory and technical constraints. While the experts also reflected on the different styles of the generated images, for example making them more cartoon-like, this raises the question of which styles may best support provocation and discussion, highlighting a potential avenue for future work to explore the role of different styles and levels of fidelity.

Yet, it is also important to manage the expectations of stakeholders and facilitators, as the use of GenAI should not lead to the assumption that residents will produce fully developed or actionable proposals. Looking at our findings, stakeholders can easily become caught between their expectation that residents *"do not need to be engineers (E1)"* and our observation that residents may instead prefer to express with GenAI their needs rather than propose direct solutions. Therefore, GenAI should be understood as a tool within the PD process, not as a solution in itself. During the workshops, project developers suggested that GenAI could potentially be used to communicate the costs of proposed ideas to residents, thereby increasing transparency, particularly in contexts such as social housing where financial constraints are critical. While this represents a promising avenue for future research, it also raises questions about the extent to which stakeholders should intervene in residents' design processes, and how to balance such interventions with the need to preserve open and exploratory idea generation [47]. Although such features may enhance transparency, it remains an open question whether and at what stage they are appropriate, particularly given that our findings suggest the primary value of GenAI lies in supporting early-phase ideation. This highlights that, while GenAI images hold the potential to act as boundary objects [15, 59] between participants and facilitators, it is also important to explicitly outline boundary conditions [67], such as those related to expectation management regarding the capabilities of GenAI, but also its role and contribution to the process.

5.2 Limitations & Future Work

Our findings draw on activities with four residential communities and an expert workshop, in which participants discussed their lived experiences and needs for their communal neighbourhood spaces. However, these activities formed part of an exploratory research process aimed at investigating how image-based GenAI shapes the PD workshop dynamics rather than informing immediate planning decisions. Consequently, the participants represent a relatively small sample of the studied communities. Furthermore, all four communities are located in the same city, meaning that our findings may reflect local planning culture and civic norms. Further, the scope of our work focused on the micro-level lens of residential blocks and neighbourhoods, leaving it open how our findings relate to broader meso- and macro-level perspectives in urban planning [33, 36]. Replication in settings beyond the Nordic Superblock context would help test the transferability of these lessons.

We acknowledge that the small form factor of *CitizenVision* as a mobile app may have influenced collective ideation, as participants interacted with the tool individually on their smartphones. Following this, *CitizenVision* relied on Stability AI for image generation, leaving open the question of how the outputs of other widely used GenAI systems (e.g. DALL·E, Gemini, or Nano Banana) might have influenced the creative process. Although the generated images were shared on a larger display to facilitate collective reflection, and the current used GenAI system highlighted the potential value of imperfect outputs, future work could explore alternative settings, such as participants collaboratively prompting on a shared screen, or investigate how more accurate image generation might influence workshop dynamics.

While the Nordic Superblock context also includes communal indoor spaces [1], these were not explored in our sessions, as we aimed to align the workshops with residents' actual needs, and such enhancements to indoor spaces were not explicitly requested by the communities. Although research has explored the use of GenAI for interior design [64], further investigation in the specific context of the PD of communal indoor spaces would be valuable to examine whether additional considerations are required to complement our findings, as the challenges of communal indoor spaces may differ from those of outdoor spaces and therefore influence how GenAI shapes discussions in these contexts.

Nevertheless, through our reflexive approach we believe that our findings provide an empirically grounded starting point for researchers and practitioners, particularly in emphasising the added value of images generated by participants as a catalyst for sparking discussion during ideation processes. While this study is situated within urban design and communal living, we believe that the lessons discussed may also apply beyond this specific context, particularly in other application domains where image based GenAI is integrated into PD processes to speculate about future scenarios or interactive systems. These considerations include participants' AI literacy in formulating prompts, managing expectations regarding

AI-generated outcomes and their purpose in facilitating dialogue rather than providing direct solutions, and how biases embedded in GenAI systems might influence the dynamics of PD processes.

Despite the promising directions for future work indicated by our findings and the lessons discussed, we emphasise that we do not advocate for GenAI as the sole approach to conducting PD. Rather, our findings suggest that GenAI should be considered as one tool among many that researchers and practitioners may draw upon [47, 48], ranging from low-fidelity prototyping [10] to AR/VR [55], to traditional brainstorming formats. We did not set out to compare GenAI with these alternatives, since our focus was on how workshop dynamics unfold when GenAI is introduced. At the same time, the literature indicates that the exploration of GenAI applications is gaining strong momentum, particularly in relation to different input formats and approaches to augmenting user input in PD (e.g. [19, 26, 28]). Beyond using GenAI as a tool to depict future scenarios, the literature also highlights its potential to engage as a more-than-human actor in participatory discussions [58]. While these developments open up new possibilities for participation, we recommend to focus also on long-term investigations of such applications in real-world settings in the form of case studies [66]. This would enable a better understanding of how they unfold over time, and their actual impact and the challenges experienced by those involved in participatory processes.

6 Conclusion

This paper explored how image-based GenAI can support the PD of communal neighbourhood spaces. Through workshops with four communities and an expert workshop, we identified five key lessons, highlighting the importance of early-stage use of GenAI, the value of imperfect outputs in stimulating dialogue, the limitations of generated images in fully addressing residents' needs, the dependence on community context, and the role of facilitation in managing expectations. Together, these findings show that GenAI can act as a conversational catalyst, supporting reflection and negotiation in participatory processes. These insights contribute to ongoing discussions in HCI on participatory formats and infrastructures that enable more motivating, inclusive, and collaborative forms of engagement. While these lessons are grounded in the Nordic Superblock context, they speak to broader questions about how image-based GenAI can be responsibly integrated into participatory processes. We hope they offer researchers and practitioners a practical starting point for both using and critically examining image-based GenAI in the PD of urban and communal spaces.

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In this paper, Overleaf's built-in spell checker, Grammarly, DeepL and ChatGPT (GPT-5.3) were used. These tools helped to fix spelling mistakes and get suggestions to improve the writing of the paper. If not specified otherwise in a specific section, these tools were not used in other forms.

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A Overview of the residential communities

Table 1: Overview of residential neighbourhood communities with brief descriptions. Pseudonyms are used to reference communities in the manuscript for anonymisation.

Community	Description
Modern Block	Residential rental apartment buildings for social housing. The community shares a range of communal spaces, including a lounge with a kitchen, sauna, laundry, and storage rooms, but also outdoor areas such as playgrounds, barbecue areas, and outdoor storage facilities. Communal life is further supported by a residential app.
Westside Block	A residential community partially supported as social housing, organised as a housing block for multiple generations, comprising multiple interconnected apartment buildings with mixed tenure types. The community shares a range of physical spaces, including a central yard building with a kitchen, dining area, and multipurpose rooms, but also distributed facilities such as a sauna and laundry. Communal life is further supported by digital services that enable space reservations and communication.
Historical Block	Residential community located in a historic early 20th-century wooden housing block, characterised by a long-standing, village-like communal way of life. The community is actively engaged in preserving both the physical heritage and the social fabric of the neighbourhood, and regularly organises cultural events that extend beyond the resident group.
Rowhouse Block	Residential community characterised by a strong sense of neighbourhood cohesion and active sharing practices. Residents collectively use shared open spaces, including playgrounds, sport fields and barbecue areas. A central community building hosts a daycare centre and serves additional functions beyond operating hours, providing spaces for communal activities, storage, a gym, and shared parking facilities.