

Manca Gjura Godec, Matej Nikšič: KREPITEV VKLJUČEVANJA JAVNOSTI V PROSTORSKO NAČRTOVANJE: PRISTOP S SODELOVALNIM KARTIRANJEM EMPOWERING PUBLIC ENGAGEMENT IN SPATIAL PLANNING: A COLLABORATIVE MAPPING APPROACH

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POVZETEK

Članek obravnava sodelovalno kartiranje kot pristop za izboljšanje vključevanja javnosti v prostorsko načrtovanje. Z namenom informiranja praktikov in odločevalcev članek nudi vpogled v stanje na področju sodelovalnega kartiranja, ki lahko služi kot podpora prostorskemu načrtovanju. S sistematično analizo relevantne literature proučuje razvoj, izvajanje in izzive sodelovalnega kartiranja. Celovito iskanje relevantnih virov v iskalniku *Google Scholar* razkriva naraščajoče zanimanje za sodelovalno kartiranje, še posebej od leta 2018, s poudarkom na temah, kot sta raba zemljišč in dostopnost. Pregled poudarja pomen demokratizacije zbiranja prostorskih podatkov in izpostavlja vlogo vsebine, ki jo ustvarijo uporabniki, pri participativnih pristopih. Članek proučuje vključevanje javnosti pri sodelovalnem kartiranju s posebnim poudarkom na vključevanju različnih deležnikov in potrebi po prilagojenih pristopih za motiviranje za sodelovanje. Prednosti, kot so zmanjšanje stroškov in zagotavljanje podatkov, so soočene z izzivi kot so kakovost podatkov, semantične težave in ovire pri dostopnosti. Podrobneje so obravnavane ključne dimenzije sodelovalnega kartiranja, kot so: zmanjšanje stroškov, natančnost podatkov, semantični izzivi in vprašanja vključevanja relevantnih deležnikov.

KLJUČNE BESEDE

sodelovalno kartiranje, participacija, prostorsko načrtovanje, participativni GIS, množično soustvarjanje

ABSTRACT

This paper explores collaborative mapping as an approach to enhance public engagement in spatial planning. It provides insights into the current state of the art in collaborative mapping for practitioners and policymakers aiming to utilize its potential for better spatial planning. Through a systematic analysis of relevant literature, it investigates the evolution, application, and challenges of collaborative mapping. A comprehensive search of relevant sources on Google Scholar reveals the growing interest in collaborative mapping, particularly since 2018, with a focus on topics like land use and accessibility. The review underscores the importance of democratizing spatial data collection and highlights the role of user-generated content in participatory approaches. Public participation in collaborative mapping is examined, emphasizing the inclusion of diverse stakeholders and the need for tailored approaches to accommodate varied motivations for engagement. Advantages such as cost reduction and data provision are balanced against challenges like data quality, semantic issues and accessibility barriers. Key dimensions of collaborative mapping, including cost reduction, data accuracy, semantic issues and stakeholder importance, are addressed in more detail.

KEY-WORDS

collaborative mapping, public engagement, spatial planning, participatory GIS, crowdsourcing

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1. INTRODUCTION

This article focuses on the approach of collaborative mapping as an opportunity for engaging the public in spatial planning processes. Urban planners face a significant challenge in effectively engaging the public, which shall be a central concern in their work. The inherent difficulties of traditional public involvement processes make it challenging to implement such programs efficiently. However, the use of the internet offers a unique opportunity to leverage the collective knowledge of a population in ways that are not possible with face-to-face planning meetings (Brabham, 2009).

Established methods of participation often resort to the use of maps and diagrams as a tool for disseminating information and as a basis for discussion in roundtables and public hearings. Mapping assists individuals in developing spatial awareness of their surroundings, be it in urban or rural settings (Panek & Netek, 2019), which indicates that utilizing mapping serves as a beneficial initial step in engaging the public in the planning process. Not only does mapping enhance spatial understanding but it also plays a crucial role in advocating for the recognition and support of underserved and neglected areas. As Panek and Netek (2019) stated »...what is not on the map does not exist, therefore, what does not exist needs no attention and funds/ solutions by the government«.

As highlighted in the paragraph above, mapping and cartography play a key role in the process of participation, while the use of the internet represents significant potential for the development and implementation of participation in the digital world. Over the past two decades, principles and online tools for engaging the public in planning processes have been developing rapidly in this field. Approaches such as collaborative mapping, crowdsourcing, participatory geographic information systems (PGIS), and public participatory geographic information systems (PPGIS) have emerged. Additionally, platforms and applications with maps have seen significant development, allowing users to customize and edit them according to their needs.

This article provides a literature review, which focuses on a web-based approaches to participatory planning referred to as collaborative mapping. In this paper, the term collaborative mapping, as defined by Sajja and Akerkar (2016), refers to the aggregation of web maps and user-generated content to provide application-specific information. Over the past decade, several researchers (Panek, Netek, Voigt, García-Nieto, and others) have examined the concept of collaborative mapping in a similar manner. Their analyses, primarily stemming from the field of geography, have not only explored the significance of collaborative mapping but have also extended its applicability to various other domains, notably spatial planning. Collaborative mapping thus represents an approach where the general public contributes georeferenced data on various topics and points of interest. Tools, such as Google MyMaps and OpenStreetMap (OSM), enable users to contribute various content based on their interests or spatial issues they wish to highlight.

The term collaborative mapping is used in cartography and in broader spatial planning circles. In mapping, user contributions reflect the existing state of space. Users map the course of roads, categorize roads, terrain, the location of public institutions, and other points of interest. In broader spatial planning circles, collaborative mapping is used as additional content to existing maps. Thus, users map points of interest according to their perception of space and the issues they address. An example of

such an approach to participatory mapping would be mapping the accessibility of public facilities for people with mobility impairments. Users therefore map the suitability of accessibility of the facility under consideration for people with mobility impairments on an already existing map. Users can contribute rankings of accessibility, as well as add descriptions of entry points, photographs of the facility, its surroundings and audio recordings to the map. This allows users with reduced mobility to view the accessibility of facilities online and accordingly facilitate movement through space. At the same time, such mapping serves to highlight obstacles in space and enables easy transmission of information to spatial planners and other stakeholders responsible for spatial management.

The purpose of this paper is to highlight the importance of mapping in urban planning and design from a participatory perspective. The literature review highlights in which areas the principles of collaborative mapping are applied, what are the advantages and disadvantages of applying the principles and what potential they have for the field of urban planning.

The paper is structured into several key chapters that provide a comprehensive examination of collaborative mapping and its implications for public participation in spatial planning. The methodology chapter outlines the approach used in selecting literature and conducting the literature review. Following this, the paper delves into collaborative mapping, crowdsourcing, and related methodologies, exploring their significance and applications in various contexts. Public participation in collaborative mapping is examined, shedding light on the ways in which communities can engage in the mapping process. Subsequently, the paper explores different aspects of collaborative mapping, discussing both their advantages and disadvantages. Key factors such as: cost reduction, data accuracy, semantic issues, and the importance of different stakeholders are analysed in detail. This structured approach enables a thorough exploration of collaborative mappings' potential and challenges in fostering public participation and enhancing spatial planning efforts.

2. METHODOLOGY

For the purpose of preparing the literature review, literature was searched on Google Scholar¹. The search term 'digital participation collaborative mapping' has returned approximately 629,000 hits on Google Scholar. The search query was set to all years and sorted by relevance. Based on the search query, the literature also included a large number of articles with similar terms used in other fields, such as: crisis management and education. Therefore, the articles that effectively tackle the topic of online collaborative mapping concerning public participation in spatial planning were chosen from the search results.

In the first part, a review of the first 10 pages of articles provided by Google Scholar was prepared. Since each page displays 10 results, a total of 100 articles were reviewed based on their relevance. For each page, the number of relevant articles and the percentage of relevant articles compared to the total number of articles on the page were recorded (Table 1). The number of relevant articles per page fluctuates for the first six pages; however, there is a noticeable decrease in the number of relevant contributions from page 1 to page 10 (Figure 1). Pages 9 and 10 show a low number of relevant contributions. A total of 40 relevant contributions were gathered. The reviewed articles included those that are relevant based on the definition explained in the introductory section of the article and articles that

¹ <https://scholar.google.com/intl/en/scholar/about.html> (in December 2023)

Table 1: Research paper relevance per search page.

Search page number	Number of research papers per search page	Number of relevant research papers per search page	Percent of relevant research papers per search page
1	10	7	70%
2	10	5	50%
3	10	7	70%
4	10	4	40%
5	10	3	30%
6	10	6	60%
7	10	2	20%
8	10	4	40%
9	10	1	10%
10	10	1	10%

generally relate to the topic of participation in spatial planning in online environments.

In the second part, a review of the age of relevant contributions was conducted. Before 2013, the number of published relevant contributions was low, with the highest number of contributions in 2015, followed by a three-year decline in published relevant literature. After 2018, there is a visible resurgence in the number of relevant contributions (Figure 2). The decrease in the number of relevant articles in 2022 is not entirely clear, however, it's plausible to speculate that the decrease could be due to global circumstances following the pandemic.

Regarding the topic of relevant contributions, it was possible to observe that early literature, before 2014, was rather general and served as an explanation of terms and approaches to the developing field of online mapping and participation. After 2014, there is a noticeable shift in the use of the collaborative mapping approach towards more focused topics such as land use, cultural heritage and accessibility.

For the purpose of conducting the literature review, 7 contributions were then selected that were closest to the topic of using collaborative mapping in public participation for spatial planning purposes. The paper examines articles that generally define the topic of participation in spatial planning in online environments, primarily those written before 2014. Additionally, it focuses on articles that have utilized collaborative mapping in various specialized domains, which were mostly written after 2014. The following sections outline the most prominent observations that seem to appear across all detail-reviewed papers.

3. TERMINOLOGY AND APPROACHES IN COLLABORATIVE MAPPING

It is hard to argue with the point that the democratization of gathering, sharing and owning the spatial information is for the greater good (Panek & Netek, 2019). From this perspective, we understand the importance of democratising the processes of collecting and using spatial data, in particular as an opportunity to empower different communities in the spatial planning process. New approaches to public participation in planning processes thus raise awareness of some of the most pressing social issues (Voigt et al., 2016).

According to Sajja and Akerkar (2016), »...collaborative mapping is the aggregation of web maps and user-generated content, in order to provide application-specific information. The term collaborative mapping is used in several different fields, specifically in crisis management (Panek & Netek, 2019). Additionally, other approaches have been developed in recent decades, using terms such as, critical cartography, digital citizenship, bottom-up GIS, PGIS and PPGIS (Panek & Netek, 2019). These approaches and terms are sometimes very similar and intertwined, which is why in the literature these terms are sometimes used interchangeably or different disciplines define the same term slightly differently. In the case of collaborative mapping, experts involved in cartography understand the term as a collection of data reflecting the actual state of space, whereas in spatial planning, collaborative mapping is described in terms of adding to a map which already reflects existing state by mapping data for a specific topic (such as mapping the accessibility of certain facilities).

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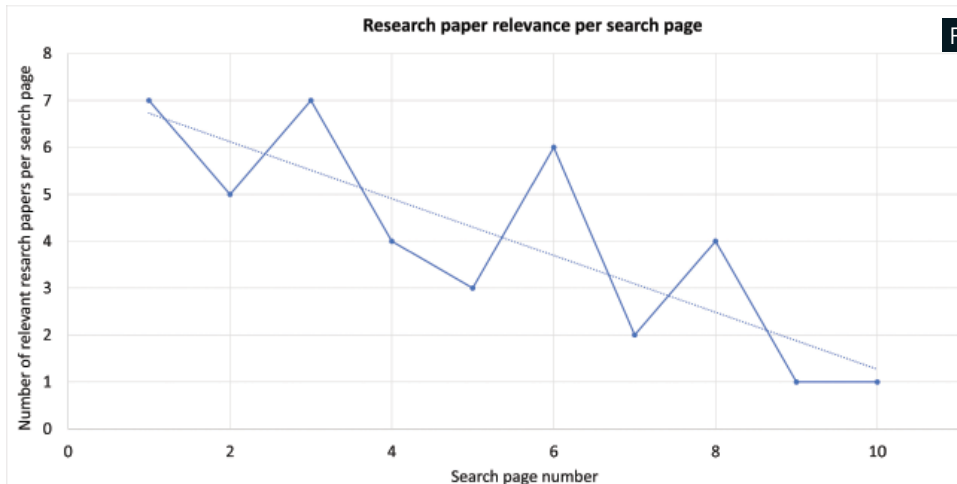
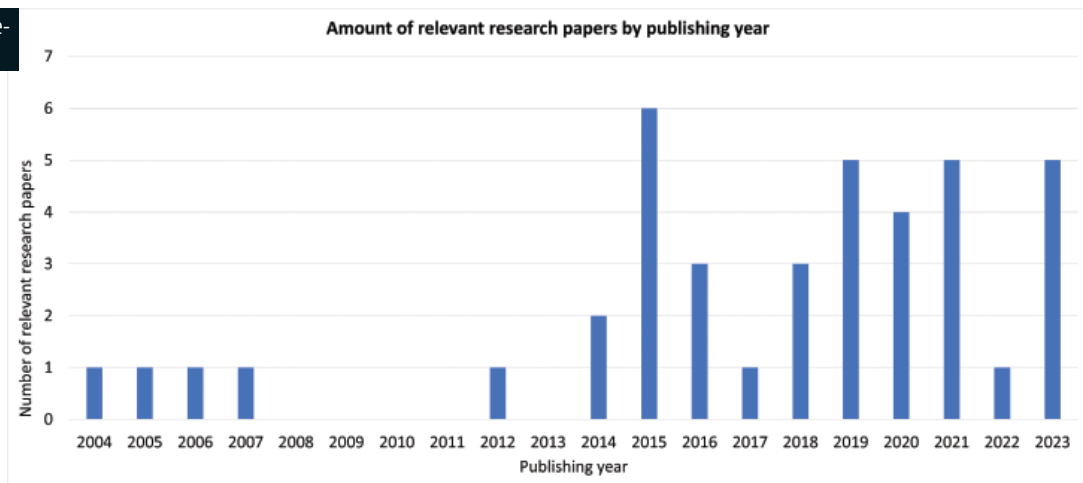


Figure 1: Research paper relevance per search page.

Figure 2: Amount of relevant research papers by publishing year.



Key to the process of collaborative mapping is the contribution of user data. This method of data collection is also defined by terms such as ‘crowdsourcing’ and ‘volunteered geographic information’ (VGI). As described by Brabham (2009), the term crowdsourcing «...describes a new Web-based business model that harnesses the creative solutions of a distributed network of individuals through what amounts to an open call for proposals». Therefore, crowdsourcing is not only limited to collecting real-world data, but it also encompasses the collection of solutions to a given problem or call for proposals.

To facilitate collaborative mapping, it is most appropriate to conduct the process on open-source platforms. Open-source production entails providing users with access to the original source material of a product, allowing them to modify and enhance it. These users then share their enhancements back to a commons, enabling other users to freely use them (Brabham, 2009). One of the most successful open-source and crowdsourcing projects for mapping is OSM. OSM enables communities to empower themselves and ensures that high-quality and reliable data is available to everyone regardless of their background and social standing (Panek & Netek, 2019). Initiatives such as OSM have shown that individuals without professional backgrounds are willing to participate in mapping projects. With the rise of platforms like OSM, it has been demonstrated that users become more familiar with using and contributing to such platforms (Rouse et al., 2007).

4. PUBLIC PARTICIPATION IN COLLABORATIVE MAPPING

Public participation in spatial planning processes is important from various perspectives. The importance of collaboration and informed decision-making for the satisfaction of involved stakeholders is emphasized. DePaula (2004) defines participatory design as involving a concerted effort to reconcile the diverse needs, motivations and values of various stakeholders, aiming to establish socio-technical-political conditions that mitigate the disparity between design approaches and utilization practices.

One of the most significant advantages of collaborative mapping is the ability to involve a large number of diverse stakeholders, where each contributes their knowledge and has an equal opportunity to contribute. Taking into account the different needs, motivations and values of different stakeholders is key as that serves to bridge the gap between users and spatial planning processes. Incorporating the knowledge of participants who are not experts in spatial planning is beneficial to the planning process, as individuals who do not regularly partake in planning processes may discover and highlight innovative

solutions that might work well in a specific local context (Van Herzele, 2004).

The degree of engagement in collaborative mapping adheres to the principles outlined in the theory of participation and the Arnstein’s Participation ladder (Panek & Netek, 2019). In collaborative mapping, users have the autonomy to determine the extent of their involvement and contribution to the project, alongside the predetermined level of participation established by planners according to the participation ladder. Brabham (2012) points out that participants in participatory processes are distributed along a spectrum in terms of their level of involvement, ranging from the most engaged and affected to the majority who observe the process rather than actively participate. People engage in participatory processes with different reasons and goals, thus finding satisfaction in various roles. A successful collaborative mapping application designed for public participation should therefore attract diverse stakeholders, each with their own preferred degree of involvement and accommodate their preferred level of engagement.

Individuals who choose to participate do so with varying levels of motivation. Planners and other stakeholders responsible for public engagement must therefore ensure motivation by enabling intrinsic, extrinsic, rational, norm-based and affective need fulfilment through rich media engagements (Brabham, 2012).

5. ASPECTS OF COLLABORATIVE MAPPING

In their article, Panek and Netek (2019) have prepared a comprehensive list of advantages and disadvantages of the collaborative mapping approach. Their findings are also supported by other reviewed literature. Among the most frequently mentioned advantages, the authors highlighted the timeliness or near real-time providing of information, as well as the quick updating and correction of data in case of incorrect entries or other technical issues. Another significant advantage over conventional data collection methods is the low cost. Low costs provide an alternative to traditional data collection methods, which typically entail high expenses (Jokar Arsanjani & Vaz, 2015).

The data collected in the form of collaborative mapping are mostly (not always, as we will see later on in the semantics-related claim by Voigt, Dobner and Schmidt, 2016) accurate, with their quality particularly emphasized in urban areas (Voigt et al., 2016). Data quality is contingent on the number of users, as more contributors and users swiftly correct entered data. Jokar Arsanjani and Vaz (2015) argue that users that choose to participate generally contribute effectively, sharing their under-

standing of their surroundings. Their contribution can thus be regarded as of being of good quality. Therefore Jokar Arsanjani and Vaz (2015) claim that end-users, including planners and stakeholders, could use this information more frequently to support decision-making. They also state that the bottom-up nature of data collection therefore leads to the composition of accurate and locally relevant information. Additionally the bigger the user base, the more accurate the provided data is. Brabham (2012) claims that by presenting a given problem to an online community, a variety of diverse perspectives and heuristics are proposed, enhancing the collective intelligence of groups and potentially enhancing the problem solving process.

Collaborative mapping platforms are often open source and thus allow for easy customization to user needs and the integration of new technologies and services (Rouse et al., 2007). They are compatible with other tools and enable the merging of various databases through the use of open standards and APIs (Application Programming Interface) (Rouse et al., 2007). They are also interesting in terms of assistance since platforms like OSM have extensive forums and a large user base that mutually help each other in executing desired projects (Panek & Netek, 2019).

The reviewed literature also highlights some disadvantages associated with online collaborative mapping. The most commonly raised concern is ensuring the quality and reliability of the collected data. This is echoed by Voigt, Dobner and Schmidt (2016) who further address semantic issues in data collection and mapping. They point out that semantic issues can lead to inconsistencies and misunderstandings in the interpretation of mapped data. Related to inconsistencies in mapped data is the problem of the scale and scope of the collected data for certain areas, especially areas where there are few users contributing to mapping (Panek & Netek, 2019). Consequently, some parts of the maps may be less coherent and useful.

One of the major problems in using collaborative mapping is the lack of accessibility and usability of these tools and approaches for people who do not have internet access or lack sufficient knowledge to use these online tools, thus excluding them from the possibility of participation (Voigt et al., 2016). This may be particularly characteristic of certain user groups. These shortcomings underscore the importance of addressing various socio-technical factors to optimize user participation in online mapping.

6. KEY DIMENSIONS OF COLLABORATIVE MAPPING

The following section of the paper offers a deeper insight into the four most emphasised aspects of collaborative mapping outlined in the review literature.

6.1 Cost reduction

The reviewed articles highlight the fact that principles such as collaborative mapping and crowdsourcing present an opportunity for significant cost reductions, which poses a significant advantage when compared to commercial alternatives (Panek & Netek, 2019). To illustrate this, let's use an example from the article by Jokar Arsanjani and Vaz (2015), who investigated the use of collaborative mapping to explore land use patterns for several European metropolises using OSM. The authors argue that until recently, land use maps were often created using land surveys and digital interpretation of remotely sensed imagery. The use of these techniques is demanding and burdensome, as they often require large amounts of technical and temporal cost. They state that we can combine the attributes of remotely

sensed data and the use of collaborative mapping and crowd-sourced data to engage citizens and create cumulative shared knowledge. This can develop an alternative approach in order to better understand land use classification. Such an approach can simultaneously reduce errors in land classification and address financial burdens while enabling cost efficiency (Jokar Arsanjani & Vaz, 2015).

6.2 Data Accuracy

The most frequently raised concern in collaborative mapping is the level of quality and reliability of the mapped data. Despite this concern, most authors state that the use of collaborative mapping platforms in their research has proven to be of high quality and in some places has provided an even greater amount of data. For example, in the case of OSM, it has been shown that the reliability of data is associated with the number of users. Greater user involvement leads to better quality. Typically, densely populated areas do not face data accuracy issues due to a wide pool of volunteers participating (Panek & Netek, 2019). The challenges that still persist for OSM include ensuring comprehensive area coverage and sustaining volunteer engagement over time, the latter of which is somewhat dependant on interest and preference based decisions regarding where and when participants choose to spend their time (Voigt et al., 2016). A study done by Jokar Arsanjani and Vaz (2015) also concluded that the bottom up approach to collective datasets leads to the aggregation of accurate and locally relevant information. They add that using volunteered geographical information shows great potential for regional applications, as the degree of accuracy of data was high, even when compared to traditionally acquired data.

6.3 Semantic issues

As already identified, the authors point to difficulties with semantic issues as a challenge. Mapping typically follows predefined criteria, but the problem arises in the interpretation of criteria among different contributors. Jokar Arsanjani and Vaz (2015, p. 336) explain this as »...disagreements and thematic accuracy variations are probably due to differences between the mappers' observation and the expert land use mappers' perception«.

The authors note that collaborative mapping and similar approaches to online participation in planning processes are mostly promoted only by academics, while government agencies are much less active. They suggest that possible reasons for this are fear of the public, lack of experience in participatory processes, and mistrust in the knowledge of laypeople (Voigt et al., 2016). Here again, the problem may in fact be of the semantics origin. Those who participate in the process should not be seen as replacements for technically qualified experts, but their contribution should be understood as additional local knowledge and lived experience (Voigt et al., 2016). For mitigating this, they introduce an approach described as 'boundary objects'. These are objects that are plastic enough to adapt to the local environment while also being robust enough to maintain a common identity across sites – 'they are weakly structured in common use, and become strongly structured in individual-site use' (Voigt et al., 2016). With this, they aim to emphasize the need to develop flexible mapping categories, which allow for uniformity in mapping approaches for particular interests while also being adaptable enough to accommodate peculiarities and thus enable for more site-specific data to be collected.

6.4 Importance of different stakeholders

As in any other form of public participation in planning processes there are many different stakeholders involved and each has their own interests. The study conducted by García-Nieto et al. (2015) identified high and low influence stakeholders. Low influence stakeholders are defined as stakeholders with a high degree of interest and with a low influence, while high influence stakeholders are defined as having a high degree of interest and an important influence. Involving local stakeholders with different levels of knowledge in decision-making processes can empower stakeholders and contribute to the creation of a shared vision for planning. Moreover, engaging various stakeholders is based on a process that promotes knowledge sharing and collective action (García-Nieto et al., 2015). Conflicts can thus be more successfully resolved by involving different stakeholders, as knowledge between them is complementary and allows planners to better comprehend the requirements and aspirations for further decision-making.

7. COLLABORATIVE MAPPING EXPLORED: INSIGHTS AND REFLECTIONS

The literature review revealed a renewed increase and interest in the topic of collaborative mapping in recent years, with more recent literature focusing on the applicability of collaborative mapping to specific areas of interest such as accessibility, land use, and cultural heritage.

The democratization of gathering, exchanging, and using spatial information represents a significant promise for strengthening the role of communities in spatial planning processes and addressing pressing societal issues. The theoretical background of digital participation in planning processes can be somewhat confusing, as terms such as critical cartography, collaborative mapping, bottom-up GIS, PGIS, and PPGIS are to some extent intertwined. However, through studies, these processes have proven to be successful principles for engaging the public in various aspects of the planning process.

The collaborative mapping approach is interesting in terms of the extent of participation facilitated by the online environment. The opportunity for participation is accessible to every user, who can then decide on the extent of their involvement. If a user feels more comfortable in a passive role, they can engage through voting and commenting, while more active participants have the option to actively contribute data and solutions. Platforms like OSM have proven to be successful, demonstrating that people are willing to participate in mapping processes. At the same time, applications that use OSM as a base for further mapping of points of interest show that users want to participate and do so effectively.

In addition to the advantages provided by collaborative mapping, including cost reduction, data quality improvement, timely updates, and seamless integration, there are still certain aspects requiring additional attention. Foremost among these is the challenge of actively involving and sustaining user engagement in collaborative efforts. Equally significant is the need to devise strategies for structuring collaborative mapping projects to alleviate semantic challenges.

8. CONCLUSION

The article discusses the challenges faced by planners in effectively engaging the public, focusing on the potential of collabora-

tive mapping as an approach to alleviate these challenges. The review confirms the possibility of using the online environment as an opportunity to involve a larger number of stakeholders and leverage collective knowledge through the use of collaborative mapping approaches. Mapping, both online and traditional, is recognized as a key aspect of public engagement, aiding in spatial understanding, awareness and advocacy for overlooked planning areas. The most important insight might be that collaborative mapping and digital participation provide a successful alternative approach on how to obtain information and use it to improve spatial planning processes.

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