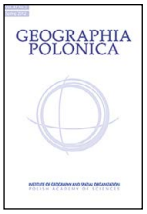

Geographia Polonica
2024, Volume 97, Issue 4, pp. 403-423
https://doi.org/10.7163/GPol.0285

INSTITUTE OF GEOGRAPHY AND SPATIAL ORGANIZATION
POLISH ACADEMY OF SCIENCES
www.igipz.pan.pl

www.geographiapolonica.pl

THE PROSPECTS FOR THE IMPLEMENTATION OF PLANNING SUPPORT SYSTEMS (PSS) IN PARTICIPATORY DECISION-MAKING IN LOCAL GOVERNMENTS IN POLAND

Edyta Bąkowska-Waldmann

Faculty of Human Geography and Planning
Adam Mickiewicz University, Poznań
Krygowskiego 10, 61-680 Poznań: Poland
e-mail: edyta.bakowska@amu.edu.pl

Abstract

The aim of the research was to investigate the use and potential of Planning Support Systems (PSS) in public participation within spatial planning in Polish local governments. Data from 718 local spatial planning departments, collected using CATI method, reveals limited current use of PSS tools in public participation, primarily passive online document viewing. Despite this, there is a growing potential for online methods, such as interactive meetings, necessitating PSS tools for real-time interaction. The study highlights a strong adherence to statutory consultation forms, suggesting a need for PSS development focused on legal requirements in public participation.

Keywords

local government • spatial planning • decision-making • planning support systems • public participation

Introduction

With the evolution of technology, there's been a notable shift towards leveraging digital tools in various sectors of territorial governance, including spatial planning. Artificial intelligence (AI) advancements are revolutionizing the way spatial data is collected and interpreted, making predictions more accurate and helping to simulate different decision outcomes (Luusua et al., 2023). Such technological innovations not only offer an opportunity to streamline processes but also hold the promise of more inclusive and effective public participation, often identified as engines of social smart city development (Cardullo, 2021; Lehtiö et al., 2023). This is particularly relevant in the context of spatial planning decision-making processes, which are critical in territorial governance at the local level and emphasize the role of public participation.

The COVID-19 pandemic exacerbated inherent challenges in public participation

in spatial planning. With face-to-face interactions being limited, how could genuine participation be maintained during a time when such contact was minimized? Poland's legal spatial planning framework at the time heavily depended on direct communication between residents and local administration in the form of public discussion. As a result, many procedures came to a halt, leading to pressing questions on the feasibility and effectiveness of public consultations in such unprecedented circumstances (Kaczmarek & Mikuła, 2021). In response, only more tech-savvy local governments implemented solutions such as online public discussions or online publications of draft projects of spatial documents, which had not been a regular practice before. The pandemic served as a catalyst, bringing to the forefront a pressing dilemma that had been simmering for some time: Are Polish local governments equipped to uphold public participation in spatial planning through digital means?

One of the concepts related to supporting participatory spatial planning via various integrated tools, methods, and actions dedicated and tailored to the needs and preferences of different stakeholders is planning support systems, or PSS (Shiffer, 1995; Klosterman, 1999; Geertman, 2002; Geertman & Stilwell, 2003; Geertman et al., 2015). It can be defined as a set of interrelated (mainly computer) techniques to support decision-making in spatial planning (Klosterman, 1997; Batty, 2007). As an idea, PSS was first proposed by Harris (1989). Yet, despite its potential, PSS has largely remained confined within academic circles, facing challenges in broader application in practice (Klosterman, 2009; Jiang, 2020). The idea of PSS derives from spatial decision support systems (SDSS), intended to support decision-making processes that will lead to optimal and effective space management and spatial problem solutions (Keenan & Jankowski, 2019; Sugumaran & DeGroote, 2019). However, the approach represented in SDSS practice is expert and technocratic in nature. Recognizing different stakeholders in spatial planning processes, PSS is an approach conducive to participatory governance at the local level, which will be examined in this work in institutional, organizational, social, methodical, and technological terms.

The aim of the research presented in the paper was to investigate the state, barriers, and potential of online PSS implementation within a current model of decision-making in spatial planning in Polish local governments. A diagnostic survey was conducted among 718 local governments (communes) of various types[1] across Poland. This study addresses two primary research questions: (1) What current practices facilitate the integration of PSS in spatial planning? (2) What challenges hinder the application of PSS tools within Polish local administrations?

By focusing on Polish local governments as a case study, the paper highlights the status of PSS integration and discerns potential obstacles to its practical application. Given the example of Poland, the paper illuminates the potential for online PSS in enhancing participatory governance locally and pinpoints challenges affecting the broader adoption of PSS in spatial planning decision-making.

Supporting participatory decision-making in spatial planning

Public participation in spatial planning in Poland has often been seen more as a legal requirement than as a genuine dialogue. This trend isn't exclusive to Poland; similar challenges have been noted in numerous countries (Murray & Greer, 2002; Miessen, 2010; Hansson et al., 2013; Jeon & Lee, 2016; Pantić et al., 2021). In Poland, public participation in spatial planning is governed by the Act on Planning and Spatial Development from 2003. This Act assures local communities and other stakeholders the opportunity to engage

[1] In Poland, there are three types of local government organization; the communes can be: rural (where whole administrative area is rural), urban-rural (where administrative area is partially rural and partially urban), and urban (where whole administrative area is urban).

in the creation of two pivotal documents that regulate spatial planning policy at the local level: the local land use plan and the study of conditions and directions of spatial development (replaced by the general plan in the 2023 amendment of the Act). In recent years, numerous modifications have been made to the forms and channels of public consultations, emphasizing the role of digital solutions. These include the introduction of online written communication methods (2015), online public discussions (2021), and the incorporation of a broader catalog of proposed public consultation methods, including geo-questionnaire[2] (Jankowski et al., 2019) in 2023. Since the 2023 reform (Act of 7 July 2023 amending the Act on Spatial Planning and Development and certain other acts), which was dictated, inter alia, by the need to broaden public involvement in decision-making in spatial planning, the toolkit for public consultations has expanded to include the following methods, which can also be implemented online:

- collecting comments (mandatory),
- organizing open meetings, expert panels, or workshops preceded by a presentation of the spatial planning document (one of these methods is mandatory),
- outdoor meetings or study walks, surveys or geo-questionnaires, interviews, consultation points, or spatial planning department's office hours (one of these methods is mandatory).

The implications of the new regulations on public consultations in spatial planning in Poland remain to be seen; however, it is expected that they will challenge the key concerns highlighted in longstanding debates: a pronounced lack of stakeholder communication, delayed involvement leading to tensions and confrontational dynamics, and a tendency to limit participation to merely reacting to pre-established plans (Niewiadomski, 2002; Jędraszko, 2008; Bąkowska-Waldmann, 2023). Conventional (analog) approaches to public consultations have often faced criticism for time and place constraints and limited population representation. While it can be assumed that digital forms of public participation will provide more flexibility to the process and promote the development of new tools, e-participation has further amplified concerns about truly representative resident participation as the challenges of this approach became visible during the COVID-19 pandemic, especially in countries like Poland where, in spite of a highly digitized society, e-government initiatives remain less developed, ranking among the EU's lowest (European Commission, 2022).

Over recent decades, many researchers have highlighted the role of technology and digital solutions in bolstering public participation in decision-making processes related to spatial planning (Carver et al., 2001; Falco, 2016; Würstle et al., 2021; Herzog et al., 2022). However, the more advanced analytical methods in spatial planning are predominantly related to professional activities. The PSS stands out as one of the rare tools designed to intensively involve the public in decision-making. Such systems operate on the premise that having access to more pertinent information fosters the development of alternative scenarios – a pivotal aspect in the realm of public discourse. This approach also taps into the unique experiential knowledge of residents, which can significantly complement expert insights in decision-making (Bąkowska-Waldmann, 2023).

In scholarly discussions, the significance of PSS in public participation is occasionally underscored by adding an extra 'P' to the acronym, which stands for 'participatory,' leading to the term PPSS (participatory planning support systems). This terminology has been showcased in studies by Kahila-Tani et al. (2016, 2019), Panek (2018), Zhang (2019), and Aspen & Amundsen (2021). However, distinguishing clear differences between PSS and PPSS to validate their separate usage proves challenging. More frequently, scholars merge the term 'PSS' with the participatory dimension, coining it 'participatory PSS'. We can find such a terminological approach

[2] Geo-questionnaire is the example of PPGIS – public participation geographic information systems.

in the publications of Yigitcanlar et al. (2008), Koekoek et al. (2009), and Flacke et al. (2020).

PSS is more commonly perceived as a versatile set of tools rather than a singular, all-encompassing solution for decision-making, reflecting the intricate nature of multi-phase planning and the varied goals at each stage (Geertman, 2002). Tools supporting decision-making in spatial planning may have a form of software that enables the presentation of the area on different layers with supplementary materials, like photographs or text documents (Geertman, 2002), interactive maptables, useful in group discussions and enabling live sketching and proposing changes (Flacke et al., 2020), GIS-based questionnaires (Kahila-Tani et al., 2016), online map-based discussion (Jankowski et al., 2019), evaluation of the proposed solutions (Steinitz, 2012; Campagna et al., 2016), or visualization of proposed changes and their implications (Stevens et al., 2007).

With developments of the public participation methods toolbox in Poland in 2023, a Public Participation Geographic Information Systems (PPGIS) that are one of the most progressive facets of PSS gained official significance due to its anchoring in legal regulations. Their core objective is to harness the distinct insights of citizens regarding their locality, leveraging their experiential wisdom and anticipating alterations they foresee in planning initiatives, especially when such decisions bear direct implications for their daily lives (Obermeyer, 1998; Talen, 1999, 2000; Sieber, 2006; Brown & Kyttä, 2014). PPGIS can be conceptualized as an ensemble of methodologies, predominantly digital, rooted in Geographic Information Systems (GIS), crafted to integrate the public voice in spatial planning deliberations (Carver et al., 2001; Craig et al., 2002; Kahila-Tani et al., 2016). It is assumed that PPGIS has the potential to engage less active social groups, increase public trust, and foster the awareness of planning's underlying dynamics (Tulloch & Shapiro, 2003; Schlossberg & Shuford, 2005; Sieber, 2006). In its essence, PPGIS promotes civic immersion in the spatial development process, mitigates conflicts, and bestows legitimacy upon consensually endorsed resolutions (Brown & Raymond, 2014; Jankowski et al., 2016). A foundational goal of PPGIS is to create a bridge between planners and residents (Kahila & Kyttä, 2009), based on the assumption that residents, everyday users of a given space, have a unique knowledge of the spatial development of their surroundings, its quality, and existing problems.

Framework for PSS implementation in local governments

The implementation of PSS in decision-making in spatial planning in local governments is conditioned by a number of factors and features characterizing the current way of advancement and functioning of local administration in the field of spatial planning. Three spheres of PSS implementation conditions were identified for the purposes of the conducted research (Fig. 1): (1) organizational, (2) institutional and public, and (3) technological and methodological (Geertman & Stillwell, 2009; Klosterman, 2009; Miller et al., 2009).

One of the key conditions for the implementation of PSS is principles and practices regarding public participation in local government, which is fundamental for including residents in decision-making in the form characteristic of the participatory model of local governance (Bąkowska-Waldmann & Kaczmarek, 2021). Moreover, it's not just the diversity of practiced methods of public consultations (relative to the design process stage and participants) that matters; equally crucial is the availability of digital platforms for public participation (Kingston, 2002). Beyond the diverse forms and methods of public consultations, equipping residents with an understanding of spatial planning decision-making – through, for instance, educational initiatives – is of paramount importance.

The implementation of more technologically advanced forms of public participation relies on the level of digitization of local administration concerning both (1) the general level

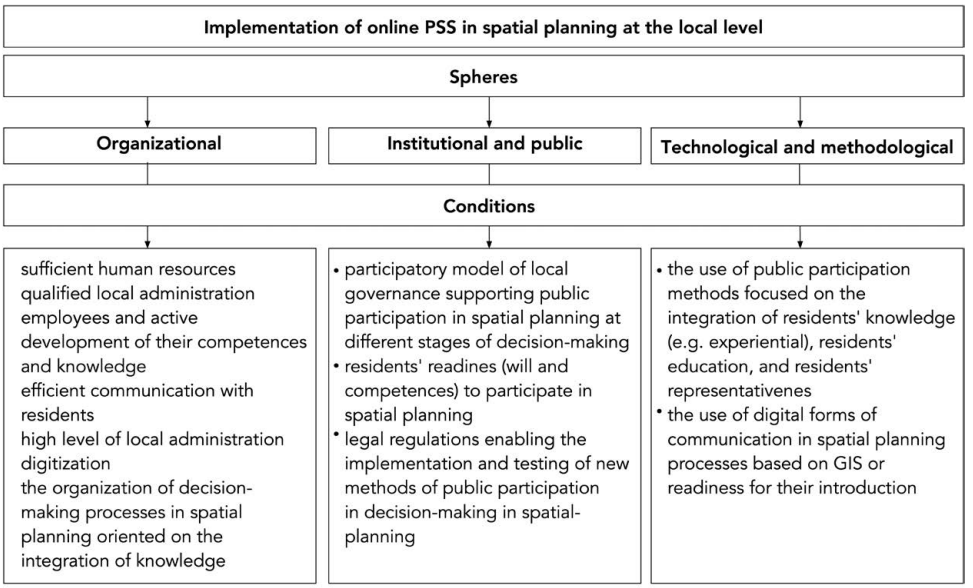

Figure 1. Conditions for the implementation of PSS in decision-making in local governments

of e-government and (2) practices related to communication with residents. The latter refers especially to remote communication techniques used in PSS, where the internet plays an important role. The Internet is a communication tool for individual actors in public life and is an increasingly important medium of a democratic society (Silva, 2022). According to Denters (2017), local governments should widely use new media and e-consultations to enhance the quality of administration services and public trust. Due to the advancement of e-participation tools, the purported role of Planning Support Systems (PSS) in enhancing public participation levels is experiencing an upward trend, indicating a more sophisticated degree of resident involvement (Johnson et al., 2015; Jankowski et al., 2017; Zhang et al., 2019).

The use of schemes or individual PSS tools requires at least basic GIS skills, the use of applications and tools for remote communication, as well as conducting design processes, i.e. the administrative and design procedure, including e.g. economic, environmental, and social aspects (Velibeyoglu, 2010). Civil servants are not only bureaucrats but also mediators between local authorities and residents in local governance (Blijleven, 2022). They are thus a key pillar of implementing PSS solutions in their units. Even if they are not the initiators of PSS implementation, their role will demand the competencies to take advantage of the PSS potential. Civil servants' competencies and awareness of new solutions may be linked to the qualifications obtained during their professional education and cooperation with external experts and institutions. Those entities, including academia, may support officials in applying PSS solutions and be a source of knowledge and skills required to implement selected technologies, contributing to innovation diffusion and the promotion of available solutions among local governments (Geertman & Stillwell, 2009).

Implementing PSS in local governments depends on several factors, especially the involvement of residents and the use of modern digital tools. Civil servants play a key role in this process, bridging the gap between the government and the public, and they often need both training and expert advice. As technology and public engagement grow,

local governments must be flexible and ready to effectively use PSS.

Research methodology

The research undertaken aimed to elucidate the prevailing conditions influencing the development of PSS application in spatial planning in Poland with reference to the formulation of local land use plans. Utilizing the CATI (computer-assisted telephone interview) method (Clark et al., 2021), a selected sample of 718 local government units from across Poland – inclusive of communes segmented by their type – was investigated. This stratified sampling was chosen (Lohr, 2009) to offer an accurate representation across both voivodeships and commune types. The structure of the sample was designed such that the size of each stratum was directly proportional to the broader population within that stratum (Tab. 1), ensuring the results retained a representative nature, reaching a statistical significance level of 5% (Field, 2018).

Table 1. Sample characteristics

		Sample		Poland	
		*n**	%	*n*	%
Type of commune	urban	88	12.3	302	12.2
	urban-rural	186	25.9	662	26.7
	rural	444	61.8	1513	61.1
	total	718	100.0	2477	100.0

**n=number of communes.*

Source: Based on the survey results and Statistics Poland.

Conducting interviews across July and August 2022, the focus remained squarely on local governmental administrative bodies entrusted with spatial planning responsibilities. In the study, the respondents were representatives of local administrations responsible for spatial planning. This included officials involved in the preparation of local land use plans and public consultations. The interviews covered administrative staff at various levels, from those directly engaged in the technical aspects of planning to heads of departments responsible for the overall planning process. The selection of respondents was determined by the head of the spatial planning unit, if they themselves were not the respondents. Interviews were standardized (Creswell, 2009; Fowler, 2013) yet were comprised of both open-ended queries to gain qualitative insights and closed-ended ones for quantitative clarity (Tab. 2). Averaging a duration of 15 minutes, these interviews revolved around (1) organizational, (2) institutional and public, and (3) technological and methodological considerations tied to current levels of public participation in local land use plans development, as well as prospects for its augmentation using PSS.

The subsequent data analysis involved both quantitative analyses and qualitative assessments, with the latter particularly focusing on open-ended responses. The answers to open-ended questions were subjected to a coding procedure (Clark et al., 2021), categorizing them to facilitate interpretation and identify response groups. The quantitative analysis provided information about the percentage distribution of answers in different types of communes.

Results

Competences to implement PSS

Two key areas were assessed to gauge the competency preparation of local government staff: firstly, the practices surrounding the development of local land use plans, which are indicative of an administration office's readiness for independent PSS implementation; and secondly, the knowledge sources that staff employ and the significance of external entities in enhancing their qualifications.

The survey indicated that a substantial 89.4% of communes outsourced the preparation of local plans to external companies, with this tendency being more prevalent among rural communes (Tab. 3). Outsourcing the preparation of the local land use plan to an external company includes the responsibility for the legal and technical (design) side of the document preparation. Preparation of the

Table 2. Overview of questionnaire questions

Sphere	Questions
Organizational	What is the practice of preparing local plans in the unit? (single-choice question) 1 = Some plans are contracted out to private companies. Why?: ... 2 = All plans are contracted to private companies. Why?: ... 3 = All plans are prepared within the commune office. Why?: ... Where are the sources of knowledge and skills used in the decision-making in spatial planning? (multiple-choice question) 1 = Study visits in other communes 2 = Trainings for staff conducted by external institutions 3 = External experts 4 = Cooperation with academic institutions 5 = Participation in professional conferences 6 = Specialistic studies and professional literature 7 = Other: ... What are the sources of data and information used in decision-making regarding preparing local plans? (multiple-choice question) 1 = Field visits 2 = Specialized studies 3 = Archives (maps and other historical sources) 4 = External spatial databases 5 = Internally created spatial databases 6 = Information provided by residents 7 = Other: ... Which communication channel is the most frequently used by residents in communication with local administration regarding local plans? (single-choice question) 1 = Paper letters 2 = E-mail 3 = Telephone 4 = Personal visit 5 = Other: ... Which communication channels do you use in communication with residents regarding local plans? (multiple-choice question) 1 = Local administration website 2 = Local newspaper 3 = Social media 4 = Letters or leaflets delivered to households 5 = Posters in public spaces 6 = Telephone 7 = E-mail 8 = Information points in public spaces 9 = Other: ...
Institutional and public	At what stages of the procedure residents' knowledge is collected? (multiple-choice question) 1 = At the pre-planning phase 2 = At the initiation phase 3 = At the design phase 4 = At the final stage Are there any additional (non-statutory) regulations on public consultations regarding spatial planning in the unit? (single-choice question) 1 = Yes 2 = No Have any educational activities for residents concerning spatial planning been conducted in your unit in the last 5 years? (single-choice question) 1 = Yes 2 = No

Technological and methodological	What are the public participation methods used in your unit regarding development of land use plans? (multiple-choice question) 1 = Additional (non-statutory) on-site meetings 2 = Participatory planning workshops 3 = PPGIS 4 = Online public discussion 5 = Online meetings 6 = Consultation points in public spaces 7 = Other: ... Do you provide tools for residents to view local plans online? (single-choice question) 1 = Yes What are the functionalities? 2 = No If no: Why? (open) If no: Is there a chance for their introduction in the future? (Likert scale 1 – 5) Do you provide tools for residents to actively participate in the planning procedure online, excluding forms required by law? (single-choice question) 1 = Yes What are the functionalities? 2 = No If no: Why? (open) If no: Is there a chance for their introduction in the future? (Likert scale 1 – 5)

Table 3. Practices regarding the preparation of local plans in the surveyed units

	Total		Urban		Urban-rural		Rural	
Characteristic	*n*	%	*n*	%	*n*	%	*n*	%
Some plans are contracted out to private companies	53	7.4	8	9.1	16	8.6	29	6.5
All plans are contracted to private companies	642	89.4	75	85.2	163	87.6	404	91.0
All plans are prepared within the commune office	23	3.2	5	5.7	7	3.8	11	2.5

Source: Based on the survey results.

local plan by an external company does not mean that the draft is created independently of local authorities. The head of the local administration unit is responsible for preparing the draft in line with national regulations, and the final wording of the document is subject to approval by a local commune council.

The reasons for leaning towards outsourcing serve as vital indicators. Often driven by the constraints of staff shortages and a palpable gap in GIS software skills, these reasons simultaneously underscore potential challenges local units might face when considering PSS integration.

The primary avenues for enhancing competencies and skills in spatial planning are external training and consultations with experts, as evidenced in Tab. 4. Notably, only one in ten units collaborates with research institutions despite their role as leading innovators in decision-making technologies for local governments in Poland (Bąkowska-Waldmann & Kaczmarek, 2022).

Residents' input in decision-making

When considering data sources used for decision-making in local land use plan preparations, residents' input emerged as a significant contributor. However, its prominence varied across commune types (Tab. 5). This input was most evident in rural

communes, followed by urban-rural and urban areas. In contrast, urban communes more frequently employed structured databases, such as spatial data from external sources or those generated within the units during personal field visits. These differences can be attributed to the varying everyday familiarity of urban planners with the areas (Bąkowska-Waldmann, 2023). In cities, larger areas are typically transformed, and given these processes' intensity, more frequent information updates in a structured format are necessary.

Notably, residents' knowledge was predominantly collected during formal public participation phases mandated by the Act on Planning and Spatial Development: submission of proposals and public presentation of a plan connected with public discussion and submitting comments to a plan. This aligns with the stages where PSS showcases optimal applicability (Fig. 2).

Over half of the surveyed entities also consulted residents before initiating the formal local development plan preparation. Yet, the design phase witnessed minimal resident involvement, implying limited deliberative PSS utility at this juncture due to restricted collaborative decision-making.

Table 4. Sources of knowledge and skills used in the decision-making in spatial planning

	Total		Urban		Urban-rural		Rural	
Sources	*n*	%	*n*	%	*n*	%	*n*	%
Study visits in other communes	63	8.8	12	13.6	12	6.5	39	8.8
Trainings for staff conducted by external institutions	507	443	66	75.0	141	75.8	300	67.6
External experts	443	61.7	46	52.3	117	62.9	280	63.1
Cooperation with academic institutions	70	9.7	17	19.3	17	9.1	36	8.1
Participation in professional conferences	180	25.1	31	35.2	46	24.7	103	23.2
Specialistic studies and professional literature	296	41.2	43	48.9	86	46.2	167	37.6
Other	47	6.5	6	6.8	11	5.9	30	6.8

Source: Own elaboration based on the survey results.

Table 5. Sources of data and information used in decision-making during the preparation of local plans

	Total		Urban		Urban-rural		Rural	
Sources	*n*	%	*n*	%	*n*	%	*n*	%
Information provided by residents	444	61.8	58	65.9	115	61.8	271	61.0
External spatial databases	441	61.4	66	75.0	125	67.2	250	56.3
Field visits	419	58.4	62	70.5	111	59.7	246	55.4
Internally created spatial databases	419	58.4	61	69.3	109	58.6	249	56.1
Archives (maps and other historical sources)	291	40.5	48	54.5	92	49.5	151	34.0
Specialized studies*	246	34.3	41	46.6	66	35.5	139	31.3
Other	35	4.9	4	4.5	14	7.5	17	3.8

* Documentation in the form of detailed studies of the area, for example academic publications.

Source: Based on the survey results.

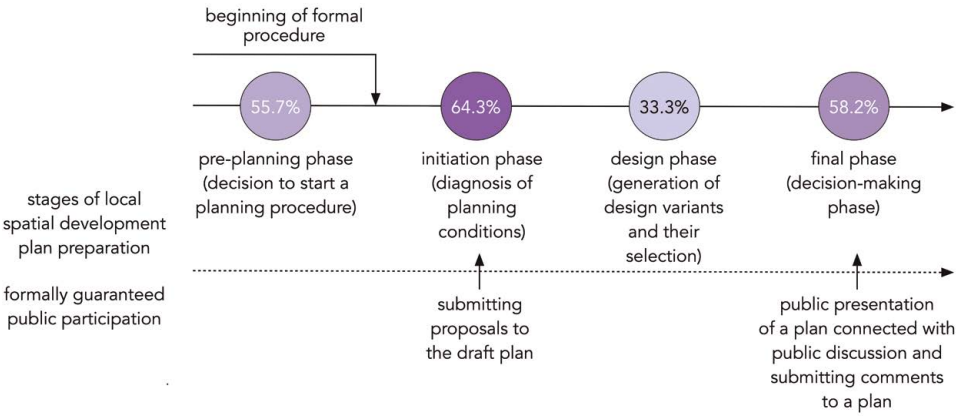

Figure 2. The percentage of units in which data and information from residents are acquired at various stages of the decision-making

Source: Based on the survey results.

Public participation methods toolkit in local governments

In examining factors that limit residents' participation during local plan drafting, intriguing patterns pertinent to PSS implementation were unearthed. The majority of respondents pointed to resident-based challenges, specifically the lack of knowledge or competencies, as significant hindrances. This insight raises a critical concern. Despite acknowledging these barriers, a staggering 81.3% of communes have not undertaken any resident-education initiatives on spatial planning in the last five years.

Meanwhile, the reported inefficiency of local administration in liaising with residents was hardly noted, especially in urban communes, where it was entirely unmentioned. Intriguingly, while it wasn't a predefined option in the survey, a significant portion of respondents specified "lack of interest among residents" as a barrier. This feedback underscores a deeper societal challenge that local administrations might need to address.

Legal frameworks remain vital in guiding public participation. Current regulations in Poland allow for formal public inclusion at only the beginning and end stages of the

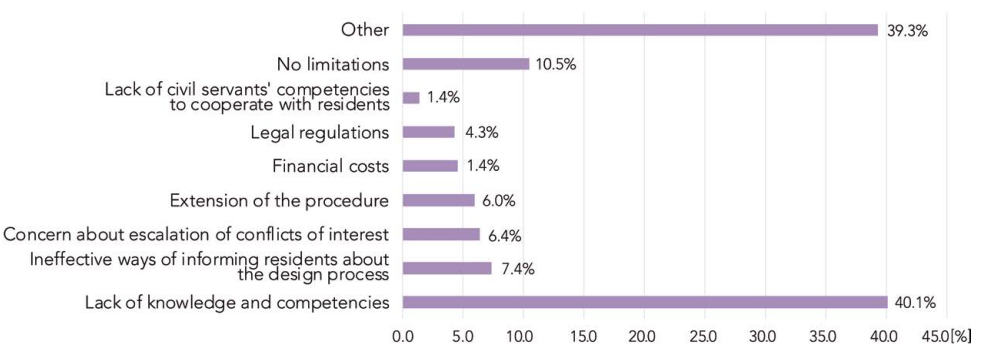

Figure 3. Factors limiting public participation in decision-making in the preparation of the local plans

Source: Based on the survey results.

Table 6. Non-statutory public consultation methods used in the studied communes during local plans drafting

	Total		Urban		Urban-rural		Rural	
Methods	*n*	%	*n*	%	*n*	%	*n*	%
Additional (non-statutory) on-site meetings	336	46.8	40	45.5	90	48.4	206	46.4
Workshops	54	7.5	11	12.5	14	7.5	29	6.5
PPGIS	74	10.3	11	12.5	17	9.1	46	10.4
Online public discussion	116	16.2	19	21.6	32	17.2	65	14.6
Online meetings	121	16.9	23	26.1	32	17.2	66	14.9
Consultation points in public spaces	247	34.4	20	22.7	61	32.8	166	37.4
Other	6	0.8	0	0.0	3	1.6	3	0.7

Source: Based on the survey results.

process. Nevertheless, the Act on Planning and Spatial Development does not prohibit further involvement, a potential which seems underutilized with only 12.3% of the surveyed local governments having local resolutions[3] that enhance public engagement.

While the legal landscape is restrictive, there is evidence of commendable innovation at the grassroots level. A significant portion of the surveyed local governments employ non-standard consultation methods, even if they are not mandated by the law. However, the majority of these methods are traditional, with the more interactive online platforms (like PPGIS tools or online meetings) being less represented. One might argue that this reflects a missed opportunity, especially in urban settings where online engagement can be pivotal. The underutilization of workshops, especially in rural settings, further reinforces the need to diversify public engagement strategies.

Communication in decision-making in spatial planning

Efficient communication channels between local administrations and residents form the bedrock for the successful implementation of PSS practices in local governance. Analyzing Poland's current standing in digital communication practices, it lags considerably. The European Commission eGovernment Benchmark report (2022) underscores this by ranking Poland 27th out of 35 European countries. The disparity in digital adoption becomes even more evident when considering the OECD 2022 Economic Survey of Poland (OECD, 2023) that highlighted Poland's underutilization of public digital services, as the percentage of individuals in Poland using the internet to interact with public authorities is below the average for all OECD countries.

The survey results (Tab. 7) are in line with this observation. Traditional communication methods dominate resident-administration interactions. Surprisingly, in an era where e-mail has become a staple mode of communication, it remains the least used channel, even falling behind the conventional telephone.

The mode of communication is not merely unidirectional. An examination of the channels by which local administrations engage with their residents (Tab. 8) reveals a juxtaposition of traditional and contemporary methods. The majority of the surveyed units primarily use their official websites as their main channel for communication. However, the notable reliance on local newspapers,

[3] They can include, e.g., the procedures for communication with residents, the catalogue of matters requiring public consultations, and the methods of engaging residents.

Table 7. Communication channels used most frequently by residents in communication with local administration regarding local plans

	Total		Urban		Urban-rural		Rural	
Communication channel	*n*	%	*n*	%	*n*	%	*n*	%
Paper letters	304	42.3	40	45.5	85	45.7	179	40.3
E-mail	41	5.7	8	9.1	8	4.3	25	5.6
Telephone	84	11.7	12	13.6	20	10.8	52	11.7
Personal visit	276	38,4	27	30.7	69	37.1	180	40.5
Other	13	1.8	1	1.1	4	2.2	8	1.8

Source: Based on the survey results.

particularly within urban communes, underscores a blend of strategies. Conversely, the infrequent employment of e-mail by rural communes indicates a potential area for enhancement, which, if addressed, could augment the efficacy of bilateral communication.

Table 8. Ranking of communication channels used by the local administration in communication with residents

Rank	Communication channel
1	Local administration website
2	Local newspaper
3	Social media
4	Letters or leaflets delivered to households
5	Posters in public spaces
6	Telephone
7	E-mail
8	Information points in public spaces

Source: Based on the survey results.

Supporting public participation in planning processes using online tools

The advancement of technology presents local governments with tools to potentially improve public participation in spatial planning processes. While Polish regulations since 2020 mandate the online availability of planning documents, a significant 8.2% of local governments had not embraced such provisions during the survey period, with rural communes lagging notably behind urban ones, with 88.5% of these non-compliant entities expressing optimism about adopting such technologies soon.

Three principal barriers to digital adoption emerged:

- Technological constraints emphasize the lack of suitable platforms.
- Financial hurdles.
- An initial need for digitization of existing paper documents (local land use plans).

For those communes that have integrated digital tools, sources to view local plans include so called 'geoportals' (enabling online interactive map browsing), public information bulletins ('BIP') websites, and official websites. The reasons driving this digital shift were almost equally divided between employee initiative and regulatory mandates.

While providing online access to documents is a leap forward, the survey further inquired about interactive tools allowing residents to participate more directly in planning processes. A significant 74.5% reported not having such facilities, with rural communes again showing a higher percentage. The most common reasons for not having these solutions in place were: (1) lack of need, as in the respondents' opinion, there is a lack of interest among residents in participating in planning procedures in general or no initiative among civil servants, (2) lack of requisite technology, due to among others excessive costs and insufficient knowledge among civil servants, and (3) opinion that traditional

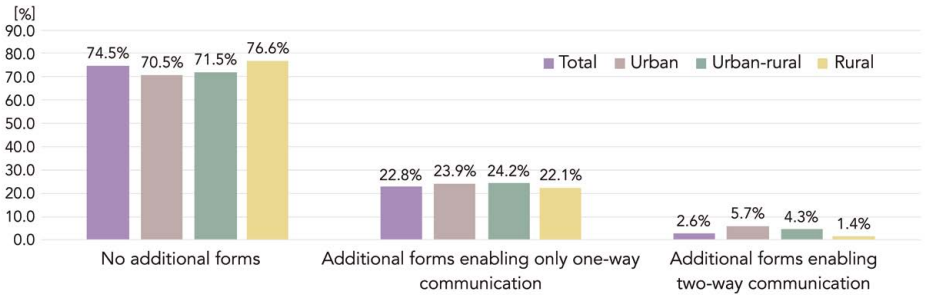

Figure 4. Availability of tools to participate in the planning procedure online, excluding forms required by law, in different types of local governments

Source: Based on the survey results.

forms (visits in the local administration office, participation in meetings, phone calls) are sufficient or better than online measures. The last opinion was especially common in rural communes and was justified by the high average age of the population.

Of the communes that provided online public participation tools, most still favored one-way communication. A mere 2.6% had long-term strategies integrating two-way communication tools, with online meetings being the most common platform.

Discussion

Research highlights a lukewarm adoption rate of PSS, notwithstanding the benefits they confer on participatory planning procedures (Vonk et al., 2005; Geertman & Stillwell, 2009; Geertman & Stillwell, 2020; Jiang et al., 2020). This trend mirrors the scenario in Polish local governments, where PSS-equipped solutions largely remain outside the ambit of mainstream planning practice. A combination of institutional, organizational, and technological barriers, as well as practices concerning public engagement in local-level spatial planning, explain this reluctance. These challenges are juxtaposed with the preconditions for PSS integration discussed in our theoretical section.

Civil servants, essential in spatial planning within the studied units, predominantly lack the requisite expertise to introduce PSS independently. Concurrently, external enterprises emerge as principal players in ushering PSS into local governance, in part owing to their instrumental role in disseminating knowledge, training civil servants, and championing innovations linked to PSS methodologies. Nevertheless, the financial constraints of implementing such technological solutions serve as significant deterrents. Given the meager workforce in local administrative units, primarily a reflection of constrained budgets and modest remuneration in Polish spatial planning sectors, the onus on private firms in PSS assimilation amplifies. Therefore, fostering collaborations between PSS-developing academic bodies and private corporations becomes paramount to heighten PSS utilization. Engagements between academia and resource-strapped local governments might not ensure the long-term viability of PSS, as shown by prior studies (Bąkowska-Waldmann & Kaczmarek, 2022).

At its core, PSS posits that enhanced information access facilitates the generation of diverse scenarios (Geertman, 2002), a desirable outcome of a design process. Local governments primarily derive their understanding of spaces through interactions with citizens, emphasizing the value of local insights in decision-making. Effective transfer of knowledge about the conditions and consequences of planning processes among stakeholders is foundational in both transactive (Friedmann, 1973, 1993) and communicative participatory planning paradigms

(Innes, 1995; Healey, 1996, 1997; Innes & Booher, 2004). In line with Bacon's maxim "knowledge is power," knowledge dynamics in spatial planning significantly influence power structures in territorial governance. In participatory planning, a holistic dialogue seeks to address all stakeholder interests (Flyvbjerg, 1998; Gunton, 2007). Fischer (2012) delves into the evolving roles of 'specialized citizens' and 'local experts', emphasizing their centrality in discerning environmental perils and enabling tangible socio-political and economic outcomes. Knowledge acquisition stimulates knowledge exchange and integration (Davoudi, 2015; Stepanova et al., 2020). In the literature, the integration of knowledge is also called knowledge production (Elwood, 2006; Pfeffer et al., 2015). In this process, the residents who share their knowledge about the local area participate in knowledge creation, facilitating a better grasp of the problem. This is seen as a way to better understand conflicts and resolve them more effectively (Jordan, 2014; Wouters et al., 2019). From this vantage, public participation not only enhances the planners' repository but also ensures the diffused dissemination of this acquired knowledge amongst the public and other stakeholders (Peltonen & Sairinen, 2010).

However, the modus operandi and timing of gleaning insights from citizens prove to be a bottleneck in PSS assimilation. Traditional communication means, such as written interactions or face-to-face engagements, overshadow digital platforms crucial for PSS predicated on remote communications. Yet, the propensity for in-person interactions hints at potential avenues for PSS tools, like maptables, that can be used during meetings. Conversely, information dissemination predominantly relies on official online portals, suggesting a fertile ground for tools like geodiscussion (Jankowski et al., 2019). An essential corollary is ensuring public awareness about the availability of these tools during the decision-making process.

The timing of knowledge acquisition is also a crucial consideration. Amongst surveyed entities, the design phase, earmarked for plan variant deliberations, witnesses the most negligible citizen input. Predominantly, this stems from statutory regulations that sidestep public engagement at this juncture. However, this phase assumes pivotal significance in shaping design trajectories when seen through the prism of deliberative and participatory decision-making. Hence, within the Polish administrative framework, PSS promises maximal efficacy during initiation (for instance, geo-questionnaires) and finalization phases (like geo-discussions).

A basic understanding of spatial planning intricacies is essential for citizens to participate meaningfully. PSS hinges on the conviction that public engagement transcends mere democratic deliberations (the 'right to the city') and perceives citizens as active contributors, enriching decision quality (Kahila-Tani, 2015). A conspicuous challenge, however, is the citizens' lack of proficiency and interest in participating, which emerges as a dominant barrier to public consultations. Concerningly, a vast majority of local governments have not initiated efforts to bolster public awareness, an essential facet for effective participatory governance. The apathy towards spatial planning, as voiced by many respondents, coupled with the sparse mention of administrative impediments affecting public engagement, underscores a pronounced shift of blame onto citizens. This reflects an inherent passivity and short-sightedness of interviewees towards institutional barriers.

Although non-statutory public consultations primarily rely on direct interactions, PSS tools could revolutionize information dissemination. For instance, geo-questionnaires (Jankowski et al., 2019) could be deployed to gather insights. Similarly, consultation points might benefit from interactive PSS modalities like maptables (Flacke et al., 2020), visual representations (Kahila & Kyttä, 2009), and solution simulations (Quan et al., 2015). Given the variegated requirements across decision-making phases, a PSS is more aptly termed a "toolbox" rather than a monolithic entity, as underscored by Geertman (2002) and Kahila-Tani (2015). Therefore, given the prevalence

of individual-centric non-statutory consultations in Poland, PSS's trajectory is likely to gravitate towards solitary practices rather than collective deliberations.

Legal regulations in place since 2020 compel Polish local governments to publish planning documents online. *Geoportals*, containing a wide range of spatial data, are the preferred platforms. Commercial platforms, offering diverse functionalities, are predominantly employed, as a centralized system catering to individual unit needs remains elusive. The conspicuous absence of expertise in areas like Geographic Information Systems (GIS) hampers local administration's independent website maintenance. On the flip side, commercial entities provide substantial support for these platforms. An impressive 92% of units had adopted such solutions, with most of the remainder contemplating similar integrations. The ubiquity of such platforms underscores their potential as vehicles for wider PSS adoption, especially in showcasing draft plans during design phases.

In the context of geoportals, enabling access to preliminary plans, while simultaneously facilitating online feedback, is a promising avenue. While not widespread, this approach resonates with tools like geo-questionnaires and geo-discussions, pioneered at Adam Mickiewicz University, Poznań, before commercialization (Jankowski et al., 2019; Bąkowska-Waldmann & Kaczmarek, 2022). Adding this functionality to the geoportals would significantly reduce the number of tools for communication in the field of spatial planning and also the costs of their application. However, without relying on the staff resources of the local administration and the competencies of employees, maintaining this function and its use on a routine basis would involve additional costs.

In the literature addressing the integration of technology within local governance, there is a growing emphasis on transparency and the participatory role of residents. They are central to decision-making about the technology's objectives, its application scope, and functionalities (Alfrink et al., 2022). Cardullo (2021) points out that, in many instances, residents' involvement in the rollout and usage of such technologies is restricted, relegating them to the roles of testers or mere consumers of the proposed solutions. A more progressive approach suggests that residents should actively participate in decisions concerning the technology's very essence and the imperative of its incorporation, which also should be taken into account in relation to PSS implementation.

Conclusions

At present, just over a quarter of the local governments in Poland employ non-statutory online mechanisms facilitating participation in the spatial planning process. In most cases, these forms enable one-way communication (e.g., the ability to send comments using a dedicated website or online form). Less than 3% of the units surveyed have permanently implemented solutions enabling two-way long-distance communication, which was, however, based solely on verbal communication (online meetings). Notably absent was online live sketching, which seems to be a significant limitation from the point of view of the outcomes of such meetings. The predominant reasons cited for this limited adoption of interactive PSS are a perceived lack of interest among residents—without notable consideration of officials' roles in cultivating this interest—and a deficiency in available technologies. Another commonly stated rationale pertained to an attachment to traditional methods, underpinned by a belief in their sufficiency.

Despite the subdued adoption of PSS practices in public participation in spatial planning within Polish local governments, there are some promising prospects for future development. One is offered by widely deployed *geoportals*. An additional hopeful avenue stems from incorporating residents' insights into decision-making processes and the high popularity of face-to-face interaction with citizens, based on two-way communication. Even if the experiential (residents') knowledge

is mainly collected during the initial stage (submitting proposals) and final (submitting comments) stage, the relatively high importance of it in the planning process is fundamental for the promising implementation of tools supporting public participation.

Fostering collaborations between PSS-developing academic bodies and private corporations is essential to heighten PSS utilization. Effective transfer of knowledge about the conditions and consequences of planning processes among stakeholders is foundational in both transactive and communicative participatory planning paradigms. Conducting educational initiatives to raise awareness and understanding of spatial planning intricacies among residents is also crucial to increasing meaningful participation. Additionally, investing in and implementing modern digital tools, such as *geoportals*, can facilitate easy access to planning documents and online submission of feedback.

Conversely, significant impediments to PSS implementation encompass a predominant focus on administrative procedures within staff competencies in spatial planning and a marked deficiency in collaborations with academic institutions, which are pivotal for PSS development (Klosterman, 2009). Addressing the lack of expertise in GIS and digital tools by providing training for administrative staff and investing in technology to support independent website maintenance is therefore recommended.

Despite the limitations of the study, which prevented a detailed examination of individual practices supporting public participation through PSS, the results identified both barriers to and potential directions for PSS implementation in Polish local government units. These findings also enriched the discussion on the practical development of PSS. Even as governance models emphasizing resident participation gain traction, decision-making in Poland's spatial planning predominantly adheres to the statutory measures for resident inclusion. It is within this framework that sustainable PSS implementation harbors the most potential.

Acknowledgements

This work was supported by the Adam Mickiewicz University, Poznań, under grant 038/04/NS/0004.

Editors' note:
Unless otherwise stated, the sources of tables and figures are the author's, on the basis of their own research.

References

Act of 7 July 2023 amending the Act on Spatial Planning and Development and certain other acts, Journal of Laws 2023, item 1688.

Alfrink, K., Keller, I., Doorn, N., & Kortuem, G. (2022). Tensions in transparent urban AI: Designing a smart electric vehicle charge point. *AI & Society, 38*(3), 1049-1065. https://doi.org/10.1007/s00146-022-01436-9

Aspen, D. M., & Amundsen, A. (2021). Developing a participatory planning support system for sustainable regional planning – A problem structuring case study. *Sustainability, 13*, 5723. https://doi.org/10.3390/su13105723

Bąkowska-Waldmann, E. (2023). Residents' experiential knowledge and its importance for decision-making processes in spatial planning: A PPGIS based study. *ISPRS International Journal of Geo-Information, 12*, 102. https://doi.org/10.3390/ijgi12030102

Bąkowska-Waldmann, E., & Kaczmarek, T. (2021). The use of PPGIS: Towards reaching a meaningful public participation in spatial planning. *International Journal of Geo-Information, 10*, 581. https://doi.org/10.3390/ijgi10090581

Bąkowska-Waldmann, E., & Kaczmarek, T. (2022). PPGIS potential in local governance and spatial planning: Lessons from Poland. In C. S. Silva (Ed.), *Trends and innovations in urban e-planning* (pp. 17-41). Hershey, PA: IGI Global. https://doi.org/10.4018/978-1-7998-9090-4.ch002

Batty, M. (2007). Planning support systems: Progress, predictions, and speculations on the shape of things to come. *UCL Working Paper Series, 122*, 1-25.

Blijleven, W. (2022). Expert, bureaucrat, facilitator: The role of expert public servants in interactive governance. *Local Government Studies, 49*(4), 841-860. https://doi.org/10.1080/03003930.2022.2047028

Brown, G., & Kyttä, M. (2014). Key issues and research priorities for public participation GIS (PPGIS): A synthesis based on empirical research. *Applied Geography, 46*, 122-136. https://doi.org/10.1016/j.apgeog.2013.11.004

Brown, G., & Raymond, C. M. (2014). Methods for identifying land use conflict potential using participatory mapping. *Landscape and Urban Planning, 122*, 196-208. https://doi.org/10.1016/j.landurbplan.2013.11.007

Campagna, M., Steinitz, C., Di Cesare, E. A., Cocco, Ch., Ballal, H., & Canfield, T. (2016). Collaboration in planning: The Geodesign approach. *Rozwój Regionalny i Polityka Regionalna, 35*, 55-72.

Cardullo, P. (2021). *Citizens in the 'Smart City': Participation, co-production, governance*. Routledge. https://doi.org/10.4324/9780429438806

Carver, S., Evans, A., Kingston, R., & Turton, I. (2001). Public participation, GIS, and cyberdemocracy: Evaluating on-line spatial decision support systems. *Environment and Planning B: Planning and Design, 28*(6), 907-921. https://doi.org/10.1068/b2751t

Clark, T., Foster, L., Sloan, L., & Bryman, A. (2021). *Bryman's social research methods* (6th ed.). Oxford, UK: Oxford University Press.

Craig, W., Harris, T., & Weiner, D. (2002). Community participation and Geographic Information Systems. In W. J. Craig, T. M. Harris, & D. Weiner (Eds.), *Community participation and Geographic Information Systems* (pp. 3-16). London: Taylor and Francis.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). Sage Publications.

Davoudi, S. (2015). Planning as practice of knowing. *Planning Theory, 14*(3), 316-331. https://doi.org/10.1177/1473095215575919

Denters, B. (2017). Participation and democratic accountability: Making a difference for the citizens. In Ch. Schwab, G. Bouckaert, & S. Kuhlmann (Eds.), *The future of local government in Europe: Lessons from research and practice in 31 countries* (pp. 79-100). Baden-Baden: Nomos. https://doi.org/10.5771/9783845280639-79

Elwood, S. (2006). Negotiating knowledge production: The everyday inclusions, exclusions, and contradictions of Participatory GIS research. *The Professional Geographer, 58*(2), 197-208. https://doi.org/10.1111/j.1467-9272.2006.00526.x

European Commission. (2022). eGovernment Benchmark 2022. https://digital-strategy.ec.europa.eu/en/library/egovernment-benchmark-2022

Falco, E. (2016). Digital community planning. *International Journal of E-Planning Research, 5*(2), 1-22. https://doi.org/10.4018/ijepr.2016040101

Field, A. (2018). *Discovering statistics using IBM SPSS statistics*. Sage.

Fischer, F. (2012). Participatory governance: From theory to practice. In D. Levi-Faur (Ed.), *The Oxford handbook of governance* (pp. 457-471). Oxford: Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199560530.013.0032

Flacke, J., Shrestha, R., & Aguilar, R. (2020). Strengthening participation using interactive planning support systems: A systematic review. *ISPRS International Journal of Geo-Information, 9*(1), 49. https://doi.org/10.3390/ijgi9010049

Flyvbjerg, B. (1998). *Rationality and power*. Chicago: The University of Chicago Press.

Fowler, F. J. (2013). *Survey research methods*. Sage.

Friedmann, J. (1973). *Retracking America: A theory of transactive planning*. Garden City, NY: Anchor Press.

Friedmann, J. (1993). Toward a non-Euclidian mode of planning. *Journal of the American Planning Association, 59*(4), 482-485. https://doi.org/10.1080/01944369308975902

Geertman, S. (2002). Participatory planning and GIS: A PSS to bridge the gap. *Environment and Planning B: Planning and Design, 29*, 21-35. https://doi.org/10.1068/b2760

Geertman, S., & Stillwell, J. (Eds.). (2009). *Planning support systems: Best practice and new methods*. Springer.

Geertman, S., & Stillwell, J. (Eds.). (2020). *Handbook of planning support science*. Cheltenham: Edward Elgar Publishing.

Geertman, S., & Stillwell, J. (2009). Planning support systems: Content, issues, and trends. In S. Geertman & J. Stillwell (Eds.), *Planning support systems: Best practice and new methods* (pp. 1-26). Springer. https://doi.org/10.1007/978-1-4020-8952-7_1

Geertman, S., & Stillwell, J. (Eds.). (2003). *Planning support systems in practice*. Berlin: Springer. https://doi.org/10.1007/978-3-540-24795-1

Geertman, S., Ferreira, J., Goodspeed, R., & Stillwell, J. (Eds.). (2015). *Planning support systems and smart cities*. Berlin: Springer. https://doi.org/10.1007/978-3-319-18368-8

Gunton, T. (2007). Collaborative planning. In M. Bevir (Ed.), *Encyclopedia of governance* (pp. 106-107). Los Angeles, CA: Sage Publications.

Hansson, K., Göran, C., Love, E., & Mats, D. (2013). The importance of recognition for equal representation in participatory processes: Lessons from Husby. *Footprint, 13*, 81-98. https://doi.org/10.7480/footprint.7.2.771

Harris, B. (1989). Beyond geographic information systems: Computers and the planning professional. *Journal of the American Planning Association, 55*, 85-90. https://doi.org/10.1080/01944368908975408

Healey, P. (1996). The communicative turn in planning theory and its implications for spatial strategy formation. *Environment and Planning B: Planning and Design, 23*(2), 217-234. https://doi.org/10.1068/b230217

Healey, P. (1997). *Collaborative planning: Shaping places in fragmented societies*. Hampshire and London: McMillan Press Limited.

Herzog, R. H., Gonçalves, J. E., Slingerland, G., Kleinhans, R., Prang, H., Brazier, F., & Verma, T. (2022). Identifying public values and spatial conflicts in urban planning. arXiv. http://arxiv.org/abs/2207.04719

Innes, J. E. (1995). Planning theory's emerging paradigm: Communicative action and interactive practice. *Journal of Planning Education and Research, 14*(3), 183-189. https://doi.org/10.1177/0739456x9501400307

Innes, J. E., & Booher, D. E. (2004). Reframing public participation: Strategies for the 21st century. *Planning Theory & Practice, 5*(4), 419-436. https://doi.org/10.1080/1464935042000293170

Jankowski, P., Czepkiewicz, M., Młodkowski, M., & Zwoliński, Z. (2016). Geo-questionnaire: A method and tool for public preference elicitation in land use planning. *Transactions in GIS, 20*(6), 903-924. https://doi.org/10.1111/tgis.12191

Jankowski, P., Czepkiewicz, M., Młodkowski, M., Zwoliński, Z., & Wójcicki, M. (2017). Evaluating the scalability of public participation in urban land use planning: A comparison of Geoweb methods with

face-to-face meetings. *Environment and Planning B: Urban Analytics and City Science, 46*(3), 1-23. https://doi.org/10.1177/2399808317719709

Jankowski, P., Czepkiewicz, M., Zwoliński, Z., Kaczmarek, T., Młodkowski, M., Bąkowska-Waldmann, E., Mikuła, Ł., Brudka, C., & Walczak, D. (2019). Geoweb methods for public participation in urban planning: Selected cases from Poland. In K. Koutsopoulos, R. Gonzalez, & K. Donert (Eds.), *Geospatial Challenges in 21st Century* (pp. 249-269). Berlin: Springer. https://doi.org/10.1007/978-3-030-04750-4_13

Jędraszko, A. (2008). *Gospodarka przestrzenna w Polsce wobec standardów europejskich, czyli jak ustanowić dobre prawo dla zrównoważonego rozwoju*. Biblioteka Urbanisty, *13*. Warszawa: Urbanista.

Jeon, C. M., & Lee, H. C. (2016). The trends and characteristics of engaged urban planning in Korea: Focused on 2030 master plans for Cheongju, Suwon, and Seoul. *Seoul Studies, 17*, 1-16.

Jiang, H., Geertman, S., & Witte, P. (2020). Avoiding the planning support system pitfalls? What smart governance can learn from the planning support system implementation gap. *Urban Analytics and City Science, 47*(8), 1343-1360. https://doi.org/10.1177/2399808320934824

Johnson, P. A., Corbett, J. M., Gore, C., Robinson, P., Allen, P., & Sieber, R. (2015). A web of expectations: Evolving relationships in community participatory Geoweb projects. *ACME*: *An International Journal of Critical Geography, 14*(3), 827-848. https://doi.org/10.14288/acme.v14i3.1235

Jordan, T. (2014). Deliberative methods for complex issues: A typology of functions that may need scaffolding. *Group Facilitation: A Research and Applications Journal, 13*, 50-71.

Kaczmarek, T., & Mikuła, Ł. (2021). Konsultacje społeczne w planowaniu przestrzennym z użyciem narzędzi PPGIS. In A. Bochentyn, & J. H. Szlachetko (Eds.), *Cyfrowa czy analogowa? Funkcjonowanie administracji publicznej w stanie kryzysu* (pp. 410-433). Pelplin: Wydawnictwo Bernardinum.

Kahila-Tani, M. (2015). Reshaping the planning process using local experiences: Utilising PPGIS in participatory urban planning (Doctoral dissertation). Aalto University.

Kahila-Tani, M., Broberg, A., Kyttä, M., & Tyger, T. (2016). Let the citizens map –Public Participation GIS as a planning support system in the Helsinki master plan process. *Planning Practice & Research, 31*(2), 195-214. https://doi.org/10.1080/02697459.2015.1104203

Kahila-Tani, M., Kyttä, M., & Geertman, S. (2019). Does mapping improve public participation? Exploring the pros and cons of using public participation GIS in urban planning practices. *Landscape and Urban Planning, 186*, 45-55. https://doi.org/10.1016/j.landurbplan.2019.02.019

Kahila, M., & Kyttä, M. (2009). SoftGIS as a bridge builder in collaborative urban planning. In S. Geertman & J. Stillwell (Eds.), *Planning Support Systems: Best Practices and New Methods* (pp. 389-412). Dordrecht: Springer. https://doi.org/10.1007/978-1-4020-8952-7_19

Keenan, B. P., & Jankowski, P. (2019). Spatial decision support systems: Three decades on. *Decision Support Systems, 116*, 64-76. https://doi.org/10.1016/j.dss.2018.10.010

Kingston, R. (2002). The role of e-government and public participation in the planning process. Paper presented at XVI AESOP Congress, Volos, Greece, July 14-20.

Klosterman, R. E. (1997). Planning support systems: A new perspective on computer-aided planning. *Journal of Planning Education and Research, 17*(1), 45-54. https://doi.org/10.1177/0739456X9701700105

Klosterman, R. E. (1999). New perspectives on planning support systems. *Environment and Planning B: Planning and Design, 26*, 317-320. https://doi.org/10.1068/b260317

Klosterman, R. E. (2009). Planning support systems: Retrospect and prospect. In S. Geertman & J. Stillwell (Eds.), *Planning Support Systems. Best Practice and New Methods* (pp. V-VII). Berlin: Springer. https://doi.org/10.1007/978-1-4020-8952-7

Koekoek, A., Van Lammeren, R., & Vonk, G. (2009). The potential of integrating e-participation in planning support systems. *URISA Journal, 21*(2), 39-47.

Lehtiö, A., Hartikainen, M., Ala-Luopa, S., Olsson, T., & Väänänen, K. (2023). Understanding citizen perceptions of AI in the smart city. *AI & Society, 38*, 1123-1134. https://doi.org/10.1007/s00146-022-01589-7

Lohr, S. (2009). *Sampling: Design and Analysis*. Cengage Learning.

Luusua, A., Ylipulli, J., Foth, M., & Aurigi, A. (2023). Urban AI: Understanding the emerging role of artificial intelligence in smart cities. *AI & Society, 38*, 1039-1044. https://doi.org/10.1007/s00146-022-01537-5

Miessen, M. (2010). *The Nightmare of Participation: Crossbench Praxis as a Mode of Criticality*. New York: Sternberg Press.

Miller, D., Vogt, N., Nijnik, M., Brondizio, E., & Fiorini, S. (2009). Integrating analytical and participatory techniques for planning the sustainable use of land resources and landscapes. In S. Geertman & J. Stillwell (Eds.), *Planning Support Systems. Best Practice and New Methods* (pp. 317-345). Berlin: Springer. https://doi.org/10.1007/978-1-4020-8952-7_16

Murray, M., & Greer, J. (2002). Participatory planning as dialogue: The Northern Ireland regional strategic framework and its public examination process. *Policy Studies, 23*(3), 191-209. https://doi.org/10.1080/0144287022000045984

Niewiadomski, Z. (2002). *Planowanie Przestrzenne. Zarys Systemu*. Warszawa: Wydawnictwo Prawnicze LexisNexis.

Obermeyer, N. J. (1998). The evolution of public participation GIS. *Cartography and Geographic Information Systems, 25*(2), 65-66. https://doi.org/10.1559/152304098782594599

OECD. (2023). Economic Survey of Poland 2023. Retrieved May 7, 2023, from https://www.oecd.org/economy/poland-economic-snapshot/

Panek, J. (2018). Mapping citizens' emotions: Participatory planning support system in Olomouc, Czech Republic. *Journal of Maps, 15*(1), 8-12. https://doi.org/10.1080/17445647.2018.1546624

Pantić, M., Cilliers, J., Cimadomo, G., Montaño, F., Olufemi, O., Torres Mallma, S., & van den Berg, J. (2021). Challenges and opportunities for public participation in urban and regional planning during the COVID-19 pandemic –Lessons learned for the future. *Land, 10*, 1379. https://doi.org/10.3390/land10121379

Peltonen, L., & Sairinen, R. (2010). Integrating impact assessment and conflict management in urban planning: Experiences from Finland. *Environmental Impact Assessment Review, 30*(5), 328-337. https://doi.org/10.1016/j.eiar.2010.04.006

Pfeffer, K., Martinez, J., O'Sullivan, D., Scott, D. (2015). Geo-technologies for spatial knowledge: Challenges for inclusive and sustainable urban development. In J. Gupta, K. Pfeffer, H. Verrest, & M. Ros-Tonen (Eds.), *Geographies of Urban Governance: Advanced Theories, Methods and Practices* (pp. 147-174). Berlin: Springer.

Quan, S. J., Li, Q., Augenbroe, G., Brown, J., & Yang, P. P. (2015). Urban data and building energy modeling: A GIS-based urban building energy modeling system using the Urban-EPC engine. In S. Geertman, J. Ferreira, R. Goodspeed, & J. Stillwell (Eds.), *Planning Support Systems and Smart Cities* (pp. 447-470). Berlin: Springer. https://doi.org/10.1007/978-3-319-18368-8_24

Schlossberg, M., & Shuford, E. (2005). Delineating "Public" and "Participation" in PPGIS. *URISA Journal, 16*(2), 15-26.

Shiffer, M. J. (1995). Interactive multimedia planning support: Moving from stand-alone systems to the World Wide Web. *Environment and Planning B: Planning and Design, 22*, 649-664. https://doi.org/10.1068/b220649

Sieber, R. (2006). Public participation geographic information systems: A literature review and framework. *Annals of the Association of American Geographers, 96*(3), 491-507. https://doi.org/10.1111/j.1467-8306.2006.00702.x

Silva, C. S. (Ed.). (2022). *Trends and Innovations in Urban e-Planning*. Hershey: IGI Global. https://doi.org/10.4018/978-1-7998-9090-4

Steinitz, C. (2012). *A Framework for Geodesign: Changing Geography by Design*. Redlands: Esri Press.

Stepanova, O., Polk, M., & Saldert, H. (2020). Understanding mechanisms of conflict resolution beyond collaboration: An interdisciplinary typology of knowledge types and their integration in practice. *Sustainability Science, 15*, 263-279. https://doi.org/10.1007/s11625-019-00690-z

Stevens, D., Dragicevic, S., & Rothley, K. (2007). iCity: A GISeCA modelling tool for urban planning and decision making. *Environmental Modelling & Software, 22*, 761-773. https://doi.org/10.1016/j.envsoft.2006.02.004

Sugumaran, R., & DeGroote, J. (2019). *Spatial Decision Support Systems: Principles and Practices*. Boca Raton: CRC Press.

Talen, E. (1999). Constructing neighborhoods from the bottom up: The case for resident-generated GIS. *Environment and Planning B, 26*, 533-55. https://doi.org/10.1068/b260533

Talen, E. (2000). Bottom-Up GIS: A new tool for individual and group expression in participatory planning. *Journal of the American Planning Association, 66*(3), 279-294. https://doi.org/10.1080/01944360008976107

Tulloch, D. L., & Shapiro, T. (2003). The intersection of data access and public participation: Impacting GIS users' success? *Urban and Regional Information Systems Association (URISA) Journal, 15* APA II, 55-60.

Velibeyoglu, K. (2010). E-Planning applications in Turkish local governments. In S. N. Silva (Ed.), *Handbook of Research on E-Planning: ICTs for Urban Development and Monitoring* (pp. 420-434). Hershey: IGI Global.

Vonk, G., Geertman, S., & Schot, P. (2005). Bottlenecks blocking widespread usage of planning support systems. *Environment and Planning A, 37*(5), 909-924. https://doi.org/10.1068/a3712

Wouters, R., De Fraine, B., & Simons, M. (2019). What is at stake in deliberative inquiry? A review about a deliberative practice. *Systemic Practice and Action Research, 32*, 193-217. https://doi.org/10.1007/s11213-018-9457-8

Würstle, P., Santhanavanich, T., Padsala, R., & Coors, V. (2021). Development of a digital 3D participation platform – Case study of Weilimdorf (Stuttgart, Germany). *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, XLVI-4/W1-2021*, 123-129. https://doi.org/10.5194/isprs-archives-XLVI-4-W1-2021-123-2021

Yigitcanlar, T., Saygin, O., & Han, J. H. (Eds.). (2008). *Online Participatory Decision Support Tools for Knowledge-Based Urban Development*. Hershey: IGI Global. https://doi.org/10.4018/978-1-59904-838-3.ch011

Zhang, L., Geertman, S., Hooimeijer, P., & Lin, Y. (2019). The usefulness of a Web-based Participatory Planning Support System in Wuhan, China. *Computers, Environment and Urban Systems, 74*, 208-217. https://doi.org/10.1016/j.compenvurbsys.2018.11.006

Article first received • 28 January 2024
Article accepted • 3 September 2024