Chapter 13
Geoweb Methods for Public Participation in Urban Planning: Selected Cases from Poland

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Abstract This chapter presents Public Participation GIS (PPGIS) methods and tools based on open data, public input and Web 2 technologies, employed in participatory urban planning processes. The recent focus on sustainable urban development and livability has increased the demand for new data sourcing techniques to capture expe-

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riences, preferences and values of urban dwellers. At the same time, developments of geospatial technologies and social media have enabled new types of user-generated geographic information and spatially explicit online communication that is place-specific and often content-rich. As a result, new methods for engaging large groups of individuals that supplement, and sometimes, supplant traditional methods (e.g. public meetings) have emerged. Despite different application domains (e.g. land use and zoning, transportation, urban revitalization, green infrastructure and landscape audit), many participatory planning processes have shared common steps, in which PPGIS/Geoweb methods have been applied including (1) collection of values and preferences to inform the creation of plan draft and (2) discussion and feedback from participants on the plan draft. This chapter presents two methods and the corresponding tools that have been used by the authors in a number of participatory planning cases between 2014 and 2017. The cases concerning various planning problem and scales have been situated in two metropolitan areas of Poland.

Keywords Geospatial technologies · Public participation · Poland · GIS

13.1 Introduction

Public participation in urban planning has been theorized about and practiced since the 1960s. Various planning theories including transactive, negotiative and communicative provided conceptual, ethical and pragmatic arguments for opening technocratic and expert-driven planning processes to public input. The emergence of alternative (to rational planning) theories accompanied the critiques of public participation including the influential Arnstein's (1969) Ladder of Citizen Participation. They spurred the proliferation of public participation methods such as public meetings, planning and design charrettes, citizen juries, citizen panels, focus groups, deliberative polling and citizen advisory committees, among others. Despite the variety of public participation methods, the predominant method in urban planning has been public meeting offering an open format, an opportunity for face-to-face interaction, a real-time setting for an argumentative discourse and an opportunity to create social bonds and trust. Its inherent limitations have been well known including the requirement of physical presence in fixed time and place setting; an environment that can be intimidating for those who are uncomfortable with public speaking due to low education, socio-economic status, gender or other reasons; and low social, demographic and geographical scalability (Nyerges and Aguirre 2011; Jankowski et al. 2017).

The emergence and quick proliferation of information and communication technologies relying on the internet and W3 coupled with developments in Geographic Information Systems, GPS, mobile data platforms and digital geographic data, spurred the interest in new methods of public participation in urban planning. The overarching motivation for these methods has been the desire to democratize public participation by broadening the base and scaling it up and out to include broader

groups of participants from geographically wider areas, and to harness local knowledge for the benefit of both participating and non-participating public.

Public participation methods and tools based on geodata, interoperable interfaces, Web 2 software services and public input have been increasingly employed in participatory urban planning within the last decade, and are often holistically referred to as Geoweb (Sieber et al. 2016). A widely spread policy focus of many governments and civic society organizations on sustainable urban development and liveability has increased the demand for new data sourcing techniques to capture experiential knowledge, preferences and values of urban dwellers. At the same time, developments in geospatial technologies and social media have enabled new types of user-generated geographic information and spatially explicit online communication that is place-specific and often content-rich (Goodchild 2007; Senaratne et al. 2017). As a result, Geoweb methods for engaging large groups of individuals that supplement, and sometimes supplant traditional methods (e.g. public meetings) have emerged. Despite different application domains (e.g. land use and zoning, transportation, urban revitalization, green infrastructure and landscape audit), many participatory planning processes share common steps including:

– collection of values and preferences to inform the creation of draft plan, and
– discussion and feedback from participants on the draft plan.

This makes it possible to develop generic methods supporting public participation that can be applied across different application domains. This chapter presents two such methods and the corresponding Geoweb applications that have been developed by the authors and subsequently applied in a number of participatory planning cases in Poland between 2014 and 2017. The cases representing various planning problem and spatial scales have been situated in two metropolitan areas: Poznań (population 542,500) and Łódź (population 701,000). The methods called *geo-questionnaire* (Jankowski et al. 2016; Czepkiewicz et al. 2017) and *geo-discussion* (Jankowski et al. 2017), have been developed to support (1) geographically informed collection of individual preferences that can be instrumental in the creation of draft plan, and (2) structured online discussion of draft plan, respectively. The tool that implements geo-questionnaire method enables capturing and storing participants' responses and analysing them with spatial analysis GIS functions. The tool implementing geo-discussion is a web application comprised of a structured discussion forum coupled with an interactive map, allowing sketching on the map geometric objects (point, line and area entities) and linking them with discussion contributions. Following the description of geo-questionnaire and geo-discussion methods, the chapter presents selected application cases focusing on the assessment of participation level and demographic characteristics of participants. The chapter closes with a discussion of issues affecting the use of geo-questionnaire and geo-discussion in planning applications.

13.2 Methods

The roots of the methods discussed in this section can be traced at least to early 1990s and the work on GIS-supported group decision-making involving interactive map sketching and annotating to capture spatial manifestations of stakeholder preferences concerning environmental management plans (Faber et al. 1994, 1995). The precursor of geo-questionnaire has been a method of soliciting and collecting public input on land use and development preferences. The method dubbed *softGIS*, used in the context of urban planning and environmental psychology (Kahila and Kyttä 2009; Kahila-Tani et al. 2016), is based on the concept of online questionnaire integrated with a map that opens up for the user a possibility of responding to questions by marking locations on a map. The precursors of geo-discussion include *argumentation maps*—a concept of asynchronous online discussion forum coupled with a map and database for storing georeferenced discussion contributions (Rinner 2001), and a parallel concept of *map-chatting* in the form of map-linked text messaging facilitating a dialogue over issues of relevance to local community (Hall et al. 2010).

13.2.1 Geo-questionnaire

Geo-questionnaire combines a web-based questionnaire with a sketchable map, making it possible to respond to spatially explicit questions by marking a point location, delineating a linear feature or drawing a polygon on the map (Jankowski et al. 2016; Czepkiewicz et al. 2017). A map accompanying the questionnaire can also facilitate nested questions by linking text with map, thus allowing a geo-questionnaire administrator to set-up a mechanism triggering additional questions in response to drawing on or selecting a feature from the map (Fig. 13.1).

In the example of geo-questionnaire functionality depicted in Fig. 13.1, a respondent sketched a polygon on the plan map to delineate commercial and retail designation (red rectangle), and in response, the geo-questionnaire tool displayed two questions concerning the minimum and the maximum number of floors for the delineated area. Such level of detail, often required in planning decisions, can be informed by (1) local knowledge of planning area and (2) specific location visible on the map and contextualized by thematic information afforded by the map and by the respondent's knowledge of the area. The difference between non-spatial online questionnaire and geo-questionnaire is an additional layer of information made available to the respondent—a map of the relevant area.

A typical geo-questionnaire is comprised of multiple pages with some questions without spatially explicit references and others linked with a map. The interactive map offers simple navigation tools such as zoom in, zoom out, and pan functions, as well as selection of base map layers (e.g. an Open Street Map layer, a satellite image or an orthophoto of the pertinent area). The responses to single- and multiple-choice questions, open-ended questions, slide bars capturing interval-scale expressions of

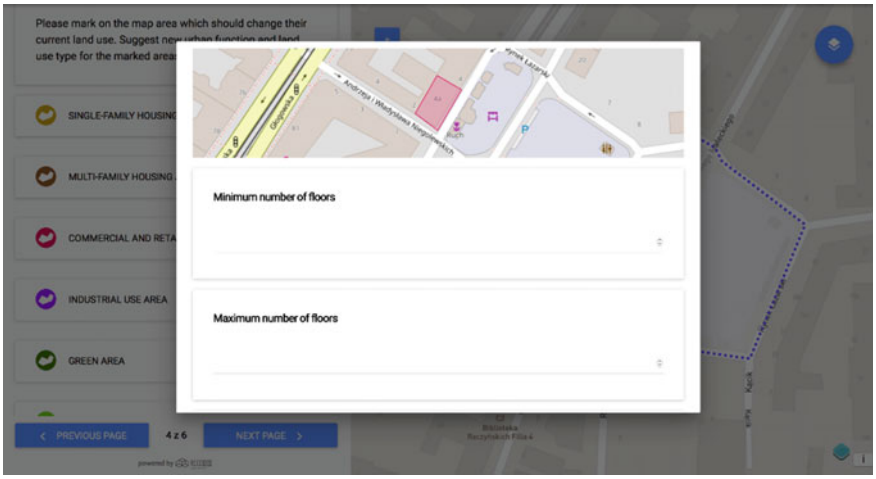

Fig. 13.1 An example of geo-questionnaire functionality showing questions in a pop-up window frame

respondent's preferences and map markings/sketches, can be stored in a database (e.g. a PostgreSQL) enabling easy access to collected data. The data can be subsequently analysed by aggregating location-specific land use preferences pertaining to the plan area using spatial analysis functions in GIS software such as map overlay, rasterization of vector features, kernel density, spatial autocorrelation measures and with qualitative text analysis (Jankowski et al. 2016).

Respondents to surveys do not need training on how to use geo-questionnaire, and the only prerequisites are basic familiarity with document browsing and map reading. An average web user familiar with browser functions including different field types, forms, buttons and basic map navigation functions (zoom in, zoom out, sketch point, lines and polygons) will be able to effectively respond to an online geo-questionnaire. The geo-questionnaires discussed in Sect. 13.3 were available for participants via standard web browsers and did not require additional software. That said, geo-questionnaire may be found difficult to respond to by those who are unfamiliar with Web technology (e.g. some seniors) and/or have not used online mapping applications before.

13.2.2 Geo-discussion

Geo-discussion combines a discussion forum with an interactive map, allowing the participant to select map objects (e.g. parcels) and/or mark/sketch geometric objects (point, line and area) on the map, and link them with discussion posts (Jankowski et al. 2017). The discussion forum offers several standard functions such as adding a

new thread, commenting on threads added by other participants, subscribing to posts and threads, adding attachments, sorting, searching posts and reacting to posts by selecting like or dislike button. The map interface of geo-discussion offers basic tools to measure distances and surfaces, search by address, toggle between map layers, filter objects from a selected area and retrieve attribute information about the selected map object (Fig. 13.2).

The screen copy of geo-discussion application in local land use planning shows the plan area subdivided into colour coded and selectable parcels. Participants can read parcel descriptions and intended use prescribed by the discussed draft plan. They can select a parcel(s) of interest and post an opinion, agreement or disagreement with the intended land use designation. They can also quickly find out the overall sentiment in regard to a particular post, statement, or discussion argument. Additionally, they can mark specific locations within the study plan in reference to a discussion post. Unlike geo-questionnaire that serves the purpose of collecting public responses to both non-spatial and spatially explicit (linked to geographical location) questions and hence, facilitates one-way communication only (from respondent to database server), geo-discussion enables communication between all participants. All geo-discussion posts and map markings can be freely queried, read and responded to by anybody who is logged into a geo-discussion application through any Internet-connected device.

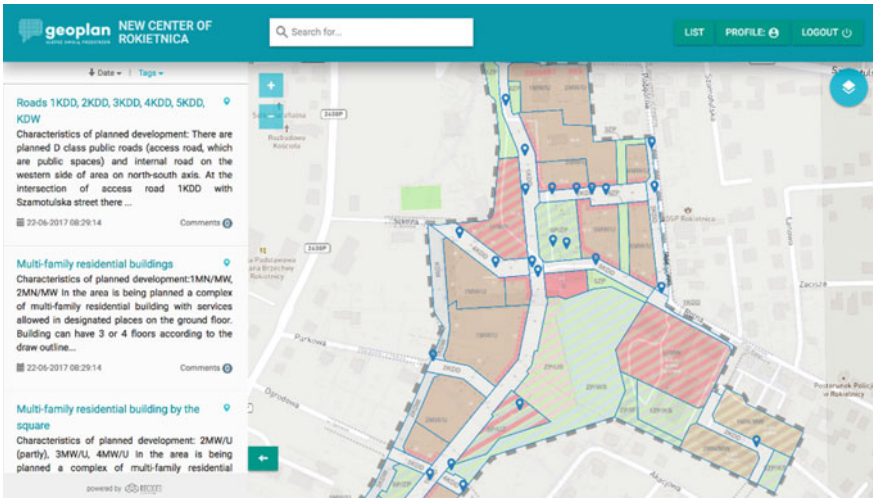

Fig. 13.2 An example of geo-discussion interface showing the discussion panel and the map panel

13.3 Application Cases

The applications of geo-questionnaire and geo-discussion presented in this section have been situated in two metropolitan areas (Poznań and Łódź) and ranged in scale from city to suburban municipality. The geo-questionnaires were used to collect urban development preferences of residents, whereas geo-discussions gave local residents and urban planners an opportunity to discuss preliminary drafts of:

– local spatial development plan, and
– local transportation infrastructure plan.

Given that all presented here applications are from Poland and deal with spatial planning issues, the section opens with a brief overview of the current spatial planning system in Poland.

13.3.1 The Spatial Planning System in Poland and Forms of Public Participation

The currently binding Polish Act on spatial planning and development of 27 March 2003 defines three tiers of the spatial planning system: national, regional and local (at municipality level), each developing spatial planning documentation differing in scope and character. These are as follows:

– at the local level: study of the conditions and directions of spatial development of a municipality and a local spatial development plan,
– at the regional level: spatial development plan of the region (i.e. province in Poland), inclusive of the spatial development plan of the metropolitan area, which primarily focuses on the province centre and its impact zone,
– at the national level: overall concept of spatial planning in the country.

Spatial planning at the national level is primarily analytical and informative. Coordination functions increase at the regional level, while at a local scale, the study of the conditions and directions of spatial development meets the following functions: analytical, coordinating and informative. The cornerstone of the system of legal acts related to physical planning in Poland is the local development plan. As an instrument of law issued by a municipality government, it is a commonly binding decision which concerns a whole range of issues, including but not limited to the division and functions to be met by a given area, constraints on investment, aesthetic qualities of development and architectural order as well as landscaping. The currently binding planning system is strongly devolved and the responsibility of the municipality for physical planning has become one of the pillars of local policy (Gawroński et al. 2010).

The procedure of drafting and adopting planning documents in Poland integrates elements which are important from the point of view of democracy instruments

safeguarding the interests of private owners, public accessibility to and public participation in the plan development activities. The legal regulations concerning the participation of local communities in the procedure of drafting planning documents are defined in the Act of 27 March 2003 on spatial planning and development. The principal planning rules as set out in Art. 1 Section 2 of the above law are defined as follows:

– assurance of public participation in the study of the conditions and directions of spatial development of a municipality, local spatial development plan and the province spatial development plan, including by electronic communications means,
– assurance of public participation in and transparency of the planning procedures.

Pursuant to the Act on spatial planning and development, participation of the general public in drafting both local spatial development plans and studies of the conditions and directions of spatial development is assured in three fundamental areas:

– filing motions related to the draft spatial planning documents at the preliminary stage,
– participation in public debate when the draft document is made available to the general public for consultations,
– submitting comments to the draft after it is no longer made publicly available.

The provisions of the relevant law, on the one hand, assure to members of the general public the minimum participation standards, which arise from the above elements of the planning procedure being obligatory, yet on the other hand, are seriously flawed. First of all, the instrument through which members of the general public can practically influence the content of the planning document, i.e. submitting comments to the draft, appears relatively late in the procedure, after the issuance of the necessary opinions and consents by external institutions. Furthermore, the introduction of the amendments postulated in the comments—in the case of the draft local development plan—requires the resumption of the formal components of the procedure. Due to the deficiencies of the statutory forms of social participation in the planning process, some Polish cities and municipalities have in the past few years introduced additional, optional methods of extending social participation in the drafting of spatial planning documents. This is based on social consultations with the residents still before the draft plan is made available for the public. This offers an opportunity to exchange views with designers of the plan and often helps eliminate or limit social conflict related to changes in spatial development.

13.3.2 Geo-questionnaire Applications

There were five applications of geo-questionnaire during 2015–2016, of which three P1–P3 took place in Poznań agglomeration and two L1–L2 in Łódź (Table 13.1).

Table 13.1 Specification of geo-questionnaires implemented in Poznań and Łódź agglomerations in 2015–2016 (according to Bąkowska et al. 2016)

Case	Poznań agglomeration			Łódź agglomeration	
	P1: Rynek Łazarski	P2: Map of Local Needs	P3: New Centre of Rokietnica	L1: Regulating advertisement placement	L2: Public transportation plan
Spatial range	Rynek Łazarski in Poznań	Poznań Inner City	Rokietnica Centre	Łódź City	
Study area	0.58 ha	1680 ha	16 ha	29,325 ha	
Purpose of public participation	Design of Rynek Łazarski public space	Preparation of a Map of Local Needs	Plan of local urban development	Preparation of Legal Act on Landscape Protection	Development of a Model of Sustainable Public Transportation
Number of inhabitants	Św. Łazarz District: 32,000 Poznań: 542,500	Poznań Centre: 122,500 Poznań: 542,500	Rokietnica: 5500 Rokietnica Commune: 15,500	Łódź: 701,000	
Recipient of geo-questionnaire results	Municipal Authorities of Poznań, Łazarz Neighbourhood Council	Municipal Authorities of Poznań Centre, Neighbourhood Councils	Rokietnica Commune Authorities, local urban planning unit	Municipal Authorities of Łódź	

In all cases, the geo-questionnaire content was developed by the authors in close cooperation with local planning authorities interested in the implementation of public participation in spatial planning.

The cases presented in Table 13.1 differ from each other in terms of location, type of spatial planning project, purpose of public consultations and spatial scale. With the exception of Rokietnica case (P3), all other applications were related to urban areas. Only in one case study (P3), the purpose of geo-questionnaire application was to solicit public input for the local spatial development plan. The motivation for seeking public input was the Act on Spatial Planning and Management of 2003 requiring public participation in local planning. Other cases in Table 13.1 are related to urban design for an open-air marketplace (P1), neighbourhood-scale infrastructure improvements (P2), development of rules for the use of public spaces (city-owned land) for placing billboard advertisements (L1) and city transportation plan (L2). The Poznań agglomeration cases dealt with localized areas—market square (P1), inner city (P2) and suburb/village centre (P3), while those in Łódź covered the entire city (L1, L2).

In total, there were 4054 respondents who participated in 5 geo-questionnaire applications (Table 13.2). The number of respondents was the highest in case P3, where public consultation process was the longest and where postal invitations to participate were delivered to all households in the village, in addition to other recruitment methods including social media and public spaces (library, school, gym, etc.) advertisements. The high number of Rokietnica village residents who responded to the geo-questionnaire was also the result of the already established practice of public consultations in locally important issues.

The duration of geo-questionnaire consultations varied in all cases from 2 to 4 weeks. The respondents were recruited using social media (the highest effectiveness), Internet information portals, city hall/commune websites, postal invitations (only in P3) and traditional media (posters, radio and local TV ads). The geo-questionnaires ranged in length from five to seven pages where each page contained between two and four questions. Some questions pertaining to personal data and questionnaire evaluation were exclusively text-based while the other questions leveraged text with a map by focusing on evaluative and perceptual aspects of proposed land use and infrastructure changes.

The age structure of geo-questionnaire respondents (Figs. 13.3 and 13.4) shows the over-representation of people in the age cohorts 20–39 in Poznań and 15–39 in Łódź, respectively, which is the reverse to the age structure of respondents who participated in public consultations performed by traditional methods, i.e. face-to-face meetings (Kaczmarek and Wójcicki 2015). This result suggests that the geo-questionnaire method cannot fully replace the traditional consultation methods and should be complementary to public meetings, which are still favoured by older population groups. The Geoweb consultation methods such as geo-questionnaire have shown a demographic bias in that the participants tend to be younger and technologically savvier than those who attend public meetings.

The analysis of respondents' educational attainment level reveals that by far, the most numerous group (59.9% of all respondents) was comprised of people with a college level education, followed by those with a high school education (32.0% of all respondents), a vocational education (3.3% of all respondents) and a primary education (4.8% of all respondents). The educational structure of the geo-questionnaire respondents represents a significant over-representation of people with higher education (22.3% of Polish society) in comparison to those with lower education levels including secondary (33.4% of Polish society), vocational (24.4%) and primary (19.9%). Given that a similar educational structure can be observed in traditional methods, geo-questionnaire does not bridge the educational gap observed in public meetings; in both methods, the percentage of participants with higher education was much higher than in the general population.

The experience with the use of geo-questionnaire in collecting public preferences relevant to land use and transportation planning underscores the versatility of the method and reveals socio-demographic characteristic of its users. Moreover, it indicates that further development of this application should concentrate on extending its availability to persons of different age and educational backgrounds. Geo-questionnaire as a method of public consultations has been well received by both the

Table 13.2 Specification of geo-questionnaires implemented in the Poznań and Łódź agglomerations in 2015–2016 (according Bąkowska et al. 2016)

Case	Poznań agglomeration			Łódź agglomeration	
	P1: Rynek Łazarski	P2: Map of Local Needs	P3: New Centre of Rokietnica	L1: Regulating advertisement placement	L2: Public transportation plan
Access time	3–16.12.2015	14–31.03.2016	14.12.2015–17.01.2016	27.11–7.12.2015	28.02–14.03.2016
Number of respondents	386	709	435	137	2387
Percentage of inhabitants (%)	0.9	0.58	7.91	0.02	0.34
Recruitment methods and their effectiveness in terms of percentage of respondents recruited with a given method	Social media (51.6%) Internet portals (18.2%) City Hall website (5.4%)	Social media (58.7%) Internet portals (9.7%) City Hall website (4.2%)	Social media (31.9%) Commune website (19.2%) Postal invitations (8.7%) Internet portal (7.5%) Traditional media (6.3%)	No data	
Geo-questionnaire content	(1) personal data (2) hitherto forms of the space use (3) directions of modernisation of Rynek Łazarski (4) expected urban development in Rynek Łazarski (5) questionnaire evaluation	(1) personal data (2) sites visited in Poznań city centre (3) mobility (4) evaluation of dwelling conditions (5) evaluation of the quality of space (6) questionnaire evaluation	(1) personal data (2) sites visited and perception of space (3) directions of urban development (4) public transportation system (5) service infrastructure (6) area development potential (7) questionnaire evaluation	(1) personal data (2) preferred forms of advertisements (3) landscape protection zones (4) evaluation of space in the context of advertisements placement (5) questionnaire evaluation	(1) personal data (2) use of public transportation (3) evaluation of public transportation effectiveness (4) expected improvements in public transportation (5) questionnaire evaluation

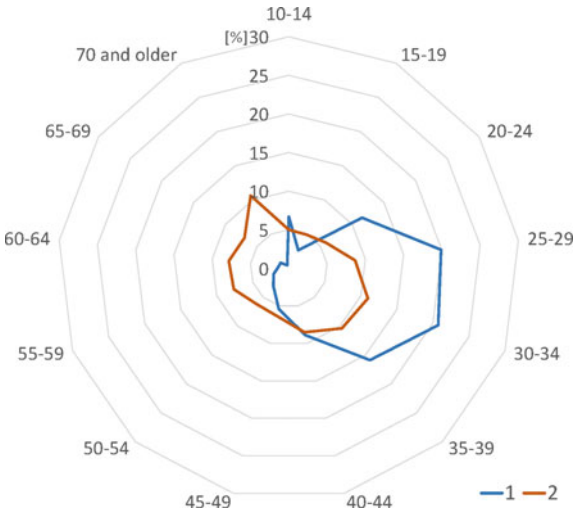

Fig. 13.3 Age structure of geo-questionnaire respondents in Poznań Agglomeration in comparison to the city age structure: 1—respondents, 2—Poznań residents (data source for Poznań residents: Central Statistical Office)

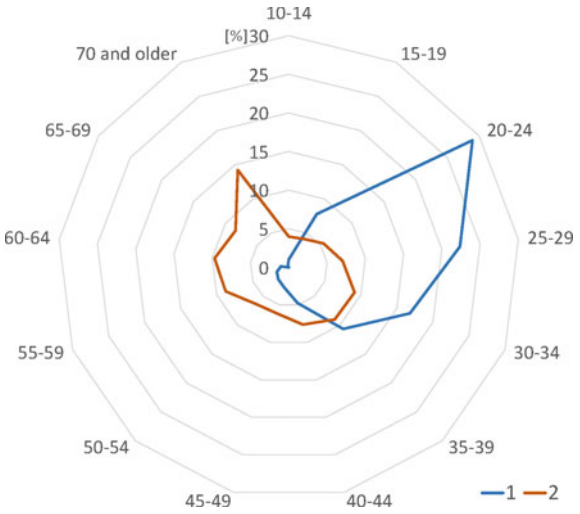

Fig. 13.4 Age structure of geo-questionnaires respondents in Łódź in comparison to the city age structure: 1—respondents, 2—Łódź residents data source for Łódź residents: Central Statistical Office)

respondents and recipients (planners and local decision makers) of collected data, who had a direct input into the geo-questionnaire content. This underscores the need for involving data recipients in the design of geo-questionnaires.

13.3.3 Geo-discussion Applications

The geo-discussion method and tool were used in 2017 in Poznań and Łódź agglomerations, and in two cases, D1 and D2 (Table 13.3) were applied as a second step of

Table 13.3 Overview of the geo-discussion implementations in Poznań and Łódź agglomerations in 2017

Case	D1: Rokietnica	D2: Łódź	D3: Jeżyce
Spatial extent	Poznań Agglomeration	City of Łódź	District in Poznań
Area concerned	16 ha	29,325 ha	198 ha
Topic of the consultation	Developing a land use plan for the future village centre	Performance of public transportation system	Introduction of district-wide traffic calming plan
Aim of the consultation	Present and consult draft land use plan for the considered area	Collect feedback on the performance of the new model of public transportation	Present and consult the draft concept of traffic calming on network level
Number of inhabitants	Rokietnica village: 5,500 Rokietnica Commune: 15,500	City of Łódź: 701,000	Jeżyce district: 24,000 City of Poznań: 542,500
Recipient of results	Communal Authority of Rokietnica Local urban planning unit	Municipal Authority of Łódź	Municipal Road Administration, designer of the traffic calming plan, Jeżyce council

the participatory process, in which a draft plan developed with public input collected via a geo-questionnaire was discussed and commented on using geo-discussion.

The first implementation (D1) was carried out in Rokietnica (Poznań agglomeration) as the second step of land use planning process involving the future centre of growing suburban village. The aim of geo-discussion was to consult with the Rokietnica residents a draft plan for the new village centre. The plan was prepared by a private firm contracted by the village administration and was intended to present a design transforming an undeveloped plot of land, located near the geographical centre of the village, into an urban and densely built-up public space. The geo-discussion forum was open for 4 weeks between 15th of May and 11th of June 2017.

The second implementation (D2), carried out in Łódź—Poland's third most populous city, aimed at collecting feedback on the performance of public transportation system, following its significant alteration 6 months earlier, when the Model of Sustainable Public Transportation for Łódź was introduced. Unlike the other two cases (D1 and D3), where the geo-discussion was used to consult a draft plan, the geo-discussion in Łódź was carried out after the implementation of a plan and was used as a tool for collecting public feedback on the implementation results. The discussion was open during a 12-day period between 9th and 20th of October 2017.

The third implementation (D3) was carried out in Jeżyce, one of Poznań's 42 neighbourhoods (self-governing city districts). The geo-discussion was implemented during the second phase of consultations concerning the neighbourhood-wide plan of traffic calming, commissioned by the neighbourhood council and the Municipal Road

Administration, and carried out by a private company. The aim of geo-discussion was to collect opinions and suggestions of residents for preliminary traffic calming variants, and subsequently, pass them on to traffic planners for a consideration during the next phase of plan development. The draft plan in two variants, as well as supporting materials, were made available for the geo-discussion during a 2-week period from October 13 through 27, 2017.

The described geo-discussion implementations differed not only in application domain (land use planning, public transportation planning, traffic calming), but also in spatial extent (from city-wide to city district), and step in the planning procedure (consultation of a draft concept, consultation of a fully developed plan, collecting feedback during implementation phase). The overview of described geo-discussion implementations is presented in Table 13.3.

In addition to the already mentioned differences, the cases also differed in the configuration of the geo-discussion tool. In the Rokietnica land use planning case (D1), the participants were presented with an interactive visualization of the proposed land use plan, and were only allowed to attach their comments to geographical objects selected from a predefined set of land parcels comprising the plan area (Fig. 13.5). This restriction in selecting the geographical location corresponding to the object of discussion stood in contrast with the other two cases (D2 and D3) and was introduced by the application designers to satisfy the information needs of geo-discussion recipient (Rokietnica Village Authority). It is worth noting here that the presented case is representative of the top-down deployment of Geoweb tools for public participation, in which the application design follows a specification of the information recipient, i.e. a local or regional governmental authority responsible for a plan under consideration.

In the Łódź public transportation case (D2), the users were presented only with a base map of the area in question and the possibility to express their opinion by sketching a point, a line or a polygon on the map and describing the sketched features using open-ended questions, selecting from eight thematic categories related to public transit (e.g. meeting the posted departure and arrival times, frequency of service and the adequacy of transit routes in terms of meeting the demand), and assigning the number of public transit lines relevant to a sketched feature. An exemplary screen copy of the application is presented in Fig. 13.6.

In the Jeżyce traffic calming case (D3), the participants were able to freely choose the geographic location corresponding to the expressed opinion. In addition, they were also presented with two different variants of the traffic calming plan, morning and afternoon traffic conditions on the street network, and computer simulations of traffic volume (Fig. 13.7). Moreover, during the whole period of discussion, the representatives of local council, the project responsible planner and road authority representatives had access to special moderator accounts to facilitate the discussion. The role of moderator in this and in other cases was to answer questions from participants related to geo-discussion content and in isolated cases (e.g. inappropriate language) to remove discussion posts. The role of moderator was filled by geo-discussion conveners (i.e. researchers and local planers).

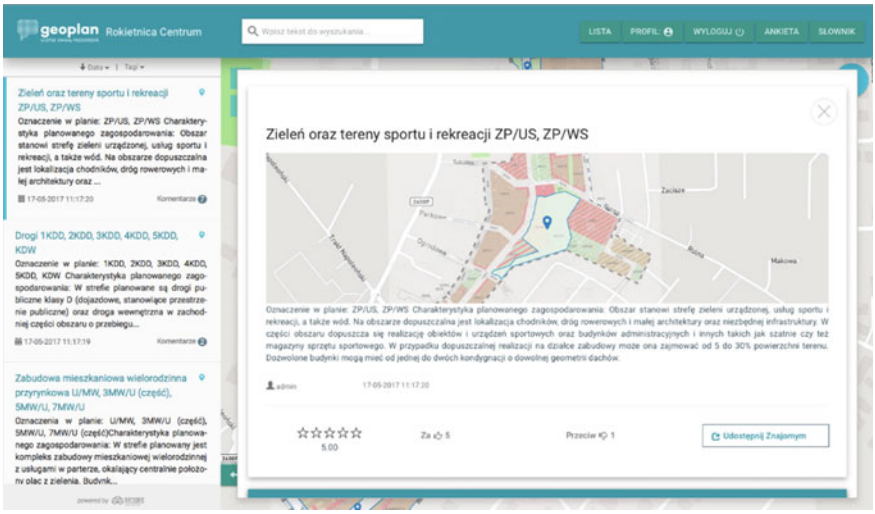

Fig. 13.5 A screen copy of the geo-discussion application used in Rokietnica land use plan case (D1). The left discussion panel contains the descriptions of land zoning codes pertinent to the plan area. The right panel shows the map of study area with a user-selected parcel and its description

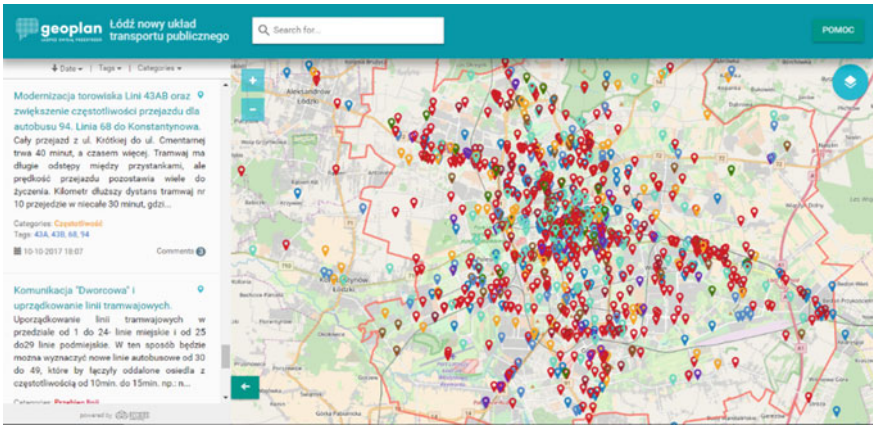

Fig. 13.6 A screen copy of the application used in the Łódź public transportation case (D2) showing point locations marked on the base map corresponding to discussion contributions. The point markers are colour coded in reference to thematic classification categories. For example, red markers denote streetcar lines, blue refer to schedule, cyan to traffic organization

Depending on the size of the case area and the public resonance of the case, the pilot implementations resulted in varying levels of usage (Table 13.4).

The most highly subscribed geo-discussion took place in Łódź (D2). This was likely due to the scale of the case (city-wide) and its resonance among the public (city public transportation system). Less popular were the geo-discussions held in

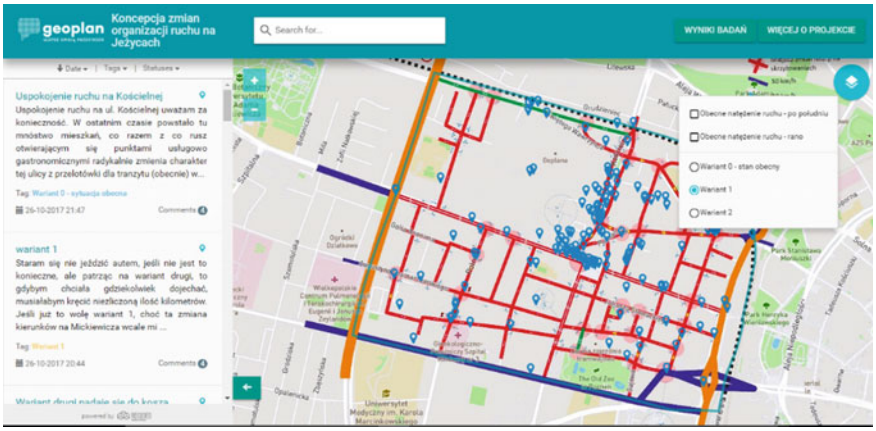

Fig. 13.7 A screen copy of the geo-discussion application used for traffic calming case (D3) in Jeżyce (Poznań). In the right top corner, there are radio buttons for switching between the maps layers representing traffic calming variants

Table 13.4 Summary of geo-discussion outcomes in Poznań and Łódź agglomerations in 2017

Case	D1: Rokietnica	D2: Łódź	D3: Jeżyce
Access time	15.05–11.06.2017	09–20.10.2017	13–27.10.2017
Number of participants	66	1390	234
Percentage of inhabitants (%)	1.2	0.2	1.0
Number of discussion threads	48	1222	160
Number of comments	131	1696	308
Percentage of threads containing a comment (%)	48.0	50.0	62.5
Percentage of returning users* (%)	52.0	56.0	39.6
Methods of recruitment	1. Link published in posters and flyers 2. Link published in social media 3. Press release	1. Link published in social media 2. Link published on websites 3. Local media	1. Link published in social media 2. Link published on websites 3. Local media

*If someone visited geo-discussion from the same device more than one time, they were marked as a Returning Visitor

Rokietnica (D1) and Jeżyce (D3). The difference in participant activity levels is most likely the result of varying target populations (from 5500 to 701,000) and, to lesser degree, areas concerned (from 16 to 29,325 ha).

The number of registered users, which varied from 66 in Rokietnica (D1), through 234 in Jeżyce (D3) to 1390 in Łódź (D2), constituted respectively 1.2, 1.0 and 0.2% of the target populations. Approximately, the half of discussion thread contained at least one comment. The percentage of such threads varied from 48% in Rokietnica (D1) through 50% in Łódź (D2) to 62.5% in Jeżyce (D3). Additionally, the percentage of returning users varied from 39.6% in Jeżyce to 56% in Łódź, which means that approximately, half of users logged into the discussion more than once.

Although the available data does not allow to draw any generalizable conclusions, there are three possible explanations for the levels of participant activity:

- the absolute values of indicators measuring participation in geo-discussion (i.e. the number of users, threads and comments) may be positively correlated with the size of target population and/or the size of area concerned,
- the relative number of participants can be inversely correlated with the size of the target population (the smaller the target population, the higher the percentage of the population taking part in the discussion),
- the percentage of returning users and the percentage of threads containing at least one comment do not bear a relationship with the size of target population or the area concerned.

13.4 Discussion

The applications of two Geoweb methods: geo-questionnaire and geo-discussion, presented in the chapter, covered various topics and geographical scales, and were set in distinct phases of decision-making processes. A wider adoption of the methods and their usefulness for the planning practice depends on the quality of their outcomes and their value for planners, decision makers and the public. The chapter presents one aspect on such quality evaluation, related to the representativeness of participants and the level of their involvement.

The analysed case studies were biased towards the over-representation of young and technologically savvy segments of the population. This stresses the need for complementing Public Participation Geographical Information Systems (PPGIS) with more traditional participatory methods such as public meetings or workshops. Furthermore, the samples over-represent people with higher education, similarly to other methods of public participation (e.g. Jankowski et al. 2017). This, in turn, points out to the need for further development of participatory methods and its context-sensitive application, particularly to facilitate the participation of those with less education or otherwise marginalized, even excluded.

The case studies attracted a relatively high number of participants, from 66 in the Rokietnica geo-discussion to 2387 in the geo-questionnaire on public transportation plan for Łódź. Both methods provided rich data sets with potentially high usability for planning practice. A simple measure of the number of returning visitors ranging from 40 to 56% points out to a relatively high engagement level. On the other hand, the per-

centage of threads containing at least one comment (from 48 to 62%) suggests that to a large extent the geo-discussion was used to express individual points of view, rather than to get involved in debates with other participants. It may not be possible to draw any generalizable conclusions based on the observations gathered from the cases discussed here, but they open up several avenues for future studies. For instance, future studies could look at relationships between tool design, problem domain or characteristics of target population and study area (e.g. size, socio-demographic structure) and measures of participant activity (e.g. number of users, threads or comments and response rate) or participant interaction (e.g. comment-to-thread ratio).

Further challenges related to Geoweb methods and PPGIS applications in planning refer to the influence of the methods on the quality of public debate regarding urban planning. One positive aspect that is already evident from the data is the sheer number of geo-questionnaire respondents and geo-discussion participants. The numbers are unprecedented in Polish planning practice where public participation has been so far largely limited to sparsely attended public meetings. The Geoweb methods have thus likely enticed and enabled many previously uninvolved individuals. Further assessment of Geoweb and PPGIS influence on the quality of planning debates would require a deeper analysis of both the content contributed by participants and broader discourse surrounding the planning topics at hand. Another challenge refers to how the Geoweb methods improve and expand the body of knowledge available to planners by introducing public input, and whether such new knowledge is valued by practitioners. These questions would need to be addressed by future assessments of public-volunteered data conducted from planners' perspective.

Finally, it is worthwhile to reflect on how the methods discussed in the chapter fit into the fabric of smart cities. Geo-questionnaire and geo-discussion—just like virtually all Geoweb methods, both generate and consume geospatial data. In that sense, they contribute to the already large volume of data generated by various sensors and other systematic data collection activities undertaken passively or actively in a smart city. At the same time, they also rely on authoritative geospatial data to collect public input in the form of volunteered data. Such data can in turn be used to enrich the authoritative data and become the bases for decision-making in planning providing the quality of volunteered data meets the needs of intended users. One can argue that high-quality volunteered geospatial data contributes to a smart city by making its functioning more sustainable through, for example, more sustainable planning decisions. Still, the challenge lies in establishing what constitutes *high-quality* volunteered geospatial data as this qualification clearly goes beyond simple positional and attribute data accuracy.

13.5 Conclusion

Participatory methods of public involvement in urban planning, advocated for by proponents of communicative turn in planning (Horelli 2002; Innes and Booher 2005), have been developing in step with information and communication technologies

(Sieber et al. 2016). A rational for these methods, primarily enabling virtual (online) forms of participation, derives from scaling public participation to include larger, demographically more diverse and geographically wider groups of urban residents than what has been afforded by the traditional form of public participation in urban planning—town hall meeting (Jankowski et al. 2017). Moreover, a rational has been the need to address the limitations of town hall meetings including the requirement of physical presence, favouring experienced and highly motivated individuals over the inexperienced ones and creating an intimidating environment for those who are uncomfortable with public speaking. Methods of participation in urban planning such as online participatory mapping have been offered to circumvent some of these limitations, based on the assumption that the asynchronous and distributed character of online participatory processes may offer a path to public engagement to those who typically do not participate (Nyerges and Aguirre 2011). Another argument in favour of using Geoweb methods includes the recognition that different members of the public are willing to participate at different levels of mental and time effort required to engage in public participation. Following this argument, one would expect that improving the convenience and comfort of participation will promote the inclusion of those who are willing to participate, but only from the comfort of their homes and at the time of their choosing (Halvorsen 2001). Still another argument has been that online participation employing interactive and visual forms of communicating information may be more effective than the forms of conveying information used in town hall meetings.

Yet, despite numerous potential benefits, Geoweb methods still raise some questions concerning their viability and usefulness for aiding participatory democracy and decision-making processes at a local level—common to application domains discussed in this chapter. One concern has been the digital divide, which limits access to online participation to those who are not connected to or simply lack skills for using Internet tools. Using Geoweb methods such as participatory mapping also requires basic map literacy skills, which may further limit the pool of potential participants. Another concern has been the lack of trust among planners and decision makers in data quality generated by public participation (Brown 2015). Still, other concerns include the lack of evidence on whether or not Geoweb methods supporting participatory processes contribute to sustainable planning decisions, and whether such methods are capable of facilitating a two-way communication between urban planners and the participating public. These concerns pose valid questions that must be answered if Geoweb methods are to be trusted as a mainstream approach to supporting public participation in local decision-making processes.

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