

THE SUITABILITY OF AN ORTHOPHOTOMAP IN THE PROCESS OF APPROVING LOCAL SPATIAL DEVELOPMENT PLANS

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Abstract

One of the assumptions of the draft of the Act on Urban Planning and Construction Code is to strengthen social participation in creating spatial policies at all levels of planning. As part of the conducted research, a questionnaire was designed for the purposes of this article. The research was carried out on people who took part in the expositions of Local Spatial Development Plans (LSDP) and public discussions taking place in the communes of Siemianowice Śląskie and Pszów. The conducted questionnaire inquiry pointed to the low level of public awareness regarding procedures, as well as the lack of understanding of these documents due to the illegible form of the presentation of the approved local plans provided by the Act on planning and spatial development. Only 26% of the respondents declared to have good knowledge of the procedures for developing and approving local plans. The draft of the Urban and Construction Code Act, which is to replace the mentioned act, provides for a substantiation of the LSDP that may contain a visualization presenting the local plan regulations in a graphic manner, understandable to people who do not have technical knowledge, including digitally excluded persons. The conducted inquiry has shown that more than half of all respondents admitted that the usage of both a large-scale map and an orthophotomap as a cartographic background for the visualization of LSDP findings was by far the most legible. The proposed solutions can be introduced directly into the regulation on the detailed rules for the preparation of spatial planning acts. The statutory delegation for its issue was included in article 243 of the Act on Urban Planning and Construction Code draft published on 23rd November 2017 on the website of the Ministry of Infrastructure and Construction.

Key words: *urban areas, land use planning, geographic information system.*

JEL Classification: *L85, Q15, R52, R58.*

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1. Introduction

At the time of writing this article, the Act on the Urban and Construction Code (MINISTRY OF ... 2018) is currently under legislative work. It is to replace, inter alia, the currently binding Act of 27th March 2003 on planning and spatial development that defines the principles of spatial policy for territorial

self-government units (ACT OF ... 2003). The current provisions of law regarding social participation in the area of spatial planning leave a lot to be desired (HANZL 2008, PARYSEK 2006). Another impulse for the introduction of the Act on Urban and Construction Code is also the critical evaluation of the functioning spatial economy system, which does not bring about positive effects in spatial development (PARYSEK 2016). One of the assumptions of the project is to strengthen social participation in creating spatial policies at all levels of planning. On the website of the Ministry of Infrastructure, a comprehensive justification for its introduction can be found (MINISTRY OF... 2018). Within it, there is a suggestion that the way of visualizing the spatial disposition proposals based only on the large-scale maps is not very legible for a large part of society. In order to prove this thesis, original questionnaire inquiries were carried out during the layout of the Local Spatial Development Plan (LSDP) for public viewing in the communes of Siemianowice Śląskie and Pszów. The scientific goal of the study was to determine the most understandable way of visualizing the findings of the LSDP for people that take part in the layout procedure. The obtained results have been presented in this paper.

2. Literature review

The provisions of law determine the way public administration operates. They set the reference framework for the functioning of the public administration system, which directly affect its efficiency and effectiveness (IZDEBSKI 2011). The Act on planning and spatial development lays the path for proceedings in matters related to spatial planning, obliging self-governments under the pain of invalidity of administrative procedures. It indicates the instruments and principles by which the local community can contribute to the planning process. Moreover, it introduces a change of approach to spatial development issues from centrally controlled towards the planning autonomy of the commune, which, by regulations of this Act, obtained the possibility of independent decision-making on the manner of managing its territory. The control authorities verify local plans only in terms of procedures without interfering with their validity and substantive content (MERGEL et al. 2013). In the draft Act on the Urban and Construction Code, this direction has been maintained. The invalidity of a commune council resolution regarding a spatial planning act is only found in the case of a substantial breach of rules or the procedures for its preparation, including the principles of financing the act and rules for excluding councillors.

An important change that the draft Act of the Urban and Construction Code sets out to make is the possibility of challenging the spatial planning act to the administrative court. The Planning Act did not provide such a possibility (article 7 ACT OF ... 2003). This provision indicated the weakness of the process of social participation in spatial planning expressed by the lack of actually carrying over conclusions and comments onto spatial decisions. The outcome of these elements is a fictitious participation process, which has been, among others, noticed by Parysek (PARYSEK 2010), Jędraszko (JĘDRASZKO 2008) and Billert (BILLERT 2006). The lack of the possibility of exerting a real influence on planning decisions by the society entails the danger of increasing the freedom of action of local authorities and various groups of particular interest (GOŹDZIEWICZ-BIECHOŃSKA 2008). The possibility of social control is definitely insufficient and the lack of a real impact on the decisions made by the authorities induces indifference and resignation, which is manifested by low attendance at the presentations of local spatial planning acts and public discussions.

Both, the provisions of the still valid Act on planning and spatial development as well as the draft of the Act on Urban and Construction Code do not limit self-governments in consultative or participatory activities. Gradually, initiatives have been appearing that lead to an increase in the scope of social participation. They may take the form of non-obligatory social consultations with citizens, organized in a continuous and systematic manner (KACZMAREK, WÓJCICKI 2015). The first stage of consultation takes place before the formal deadline for submitting applications to the local plan by interested parties, and is primarily of an informative nature. The second stage follows the internal review of the local plan project and before they are agreed on with external entities, in particular the Urban Planning and Architectural Commission. The planning document is then presented to the participants of the consultations for the first time and discussed in detail by the planners in the context of the solutions proposed in it. After these two non-statutory public consultations, the project will be publicly available with the possibility to submit comments and applications, as well as being open to public discussion provided for in the Act on planning and spatial development.

Another form of support for participation in the spatial planning process are various types of geoportals with functions allowing for discussion with the usage of interactive maps (MŁODKOWSKI et al. 2016). Inhabitants using map-based internet applications can express their opinions in relation to spatial development and exchange information with specialists in the field of spatial planning without leaving home. These systems are referred to in the literature as Public Participation Geographic Information Systems (PPGIS) or collaborative GIS (ANDRZEJSKA et al. 2007, KINGSTON 2011, JANKOWSKI 2011).

In each of the discussed cases, the problem of the visualization of planning information to the public in the most accessible form possible appears. Polish Spatial Data Infrastructure (SDI) supports urban planners in the planning process by allowing access to data regarding e.g. environmental monitoring, agricultural and aquaculture facilities, or environmental indicators (ZWIROWICZ-RUTKOWSKA, MICHALIK 2016, ZWIROWICZ-RUTKOWSKA 2017). It must be noted that different age groups perceive and react to stimuli differently, hence the form of visualization should be carefully selected in a way as to enable the correct reception of information by all participants (DUKACZEWSKI 2016). The choice of visualisation form (static or interactive, two-dimensional or three-dimensional) is also important to make sure that it is attractive to the interested parties (HORBIŃSKI, MEDYŃSKA-GULIJ 2017). In accordance with the currently binding Act on planning and spatial development, official copies of large-scale maps are used to prepare the LSDP, which also form the background for exposition during the layout procedure (article 16 ACT OF ... 2003). The draft of the Act on Urban and Construction Code in article 243 contains a statutory delegation to issue a regulation on detailed rules for the preparation of spatial planning acts, in particular the contents of the cartographic background. At the moment, the draft of the regulation is not yet in existence. There are statements that the statutory form of presentation is not very legible for the majority of the society (ANDRZEJSKA et al. 2007, MINISTRY OF ... 2018). The idea of using an orthophotomap instead of a large scale map in spatial planning appeared as early as in the years 1997-1998, during the implementation of the PHARE program (FLOREK 2001). Unfortunately, this idea has never been reflected in the provisions of law.

3. Data and Methods

In order to examine the level of public awareness in the field of planning procedures, a questionnaire was developed and used during a public layout of the LSDPs in Siemianowice Śląskie and Pszów communes located in the Silesia Province. The questionnaire was divided into two parts. The main purpose of the first part was to obtain feedback on the preferred way of visualization of planning acts. The query was accompanied by three annexes showing a part of the LSDP with different cartographic backgrounds:

- 1) Large-scale map (fig. 1).
- 2) Orthophotomap (fig. 2).
- 3) Large-scale map with an orthophotomap underneath (fig. 3).

The first of them presents the visualization of the local plan according to the currently binding Act (ACT OF ... 2003). The second proposes the use of an orthophotomap instead of the large-scale map. The third one involves the synthesis of two previous solutions, namely displaying the contents of the large-scale map above an orthophotomap. Figures 1, 2 and 3 contain an example of a fragment of a LSDP subject to layout in Siemianowice Śląskie Commune covering all three variants. For each of the three proposals, the respondents were asked to answer the following questions:

- 1) How do you assess the legibility of the presented part of the Local Spatial Development Plan in terms of buildings and fences?
- 2) How do you assess the legibility of the presented part of the Local Spatial Development Plan in terms of land use (arable land, orchards, pastures and meadows, wasteland)?
- 3) How do you assess the general legibility and clarity of the presented part of the Local Spatial Development Plan?

For each of the above questions, the respondents could give one of three possible answers: "Good", "Average", "Bad". At the end of the first part of the inquiry, the person completing the questionnaire was asked to indicate which of the presented examples was the most legible and clear to them.

The second part of the questionnaire was to outline the profile of the person under study. It included questions about: the age, gender and education of the respondent, affiliation to professional and social groups, reason for his or her presence at the LSDP layout, the level of knowledge about planning procedures, the source of information about the LSDP exhibition to public viewing, and

presence during the previous layout of the LSDP that took place in the commune. At the end, the respondents were asked for information on whether the text and drawing of the presented local plan was understandable and clear to them.



Fig. 1. Example of a local plan with a large-scale map as the background. *Source: courtesy of the Space Coordination Office, architect Bożena Konieczny.*



Fig. 2. Example of a local plan with an orthophotomap as the background. *Source: courtesy of the Space Coordination Office, architect Bożena Konieczny.*



Fig. 3. Example of a local plan with a large-scale map and an orthophotomap as the background.
Source: courtesy of the Space Coordination Office, architect Bożena Konieczny.

4. Empirical results

4.1. Basic research premises

The inquiries were carried out from December 2017 to February 2018 during public discussions and presentations for public inspection of the LSDP projects in two communes located in the Silesia province: Siemianowice Śląskie, having the status of a city with district rights and Pszów – urban-rural commune in the Wodzisław district. Questionnaires along with attachments (Figs. 1, 2, 3) were submitted to the persons present with a request to complete them, courtesy of the persons serving the applicants. Clerks did not suggest any answers, merely asking for a subjective impression on the proposed ways of visualizing the findings of the local plan. A total of 34 people completed the questionnaires. Although there were more people present, not everyone agreed to take part in the inquiry. Based on information obtained from office employees, these were mainly people dissatisfied with the decisions of local plans.

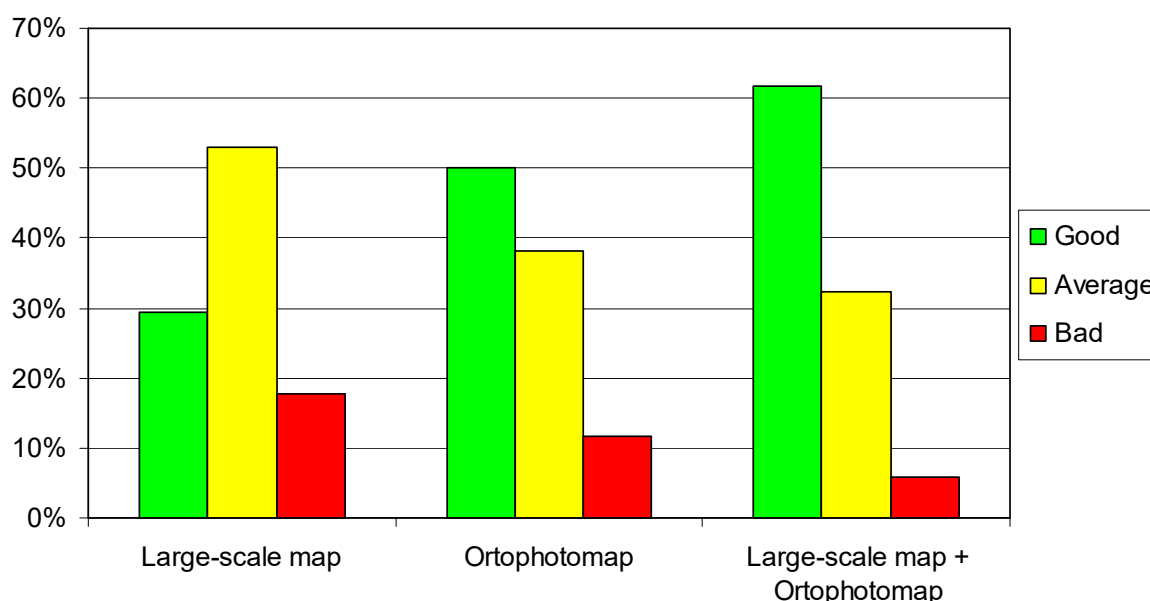


Fig. 4. The results of the questionnaire regarding the legibility of the visualization of the local plan in terms of buildings and fences with the usage of different cartographic backgrounds. *Source:* own study.

4.2. Evaluation of each option of visualization of the local plan findings

The first issue to which the attention of the surveyed people was drawn was the issue of permanent elements of land development. After familiarizing themselves with all three variants, they were asked to answer the question of to what extent each variant of visualization is legible in terms of buildings and fences, according to their subjective feelings. The results have been presented in a graph form in Figure 4. A clear upward trend in legibility can be observed. The use of an orthophotomap instead of a large-scale map as a background for the visualization of the local plan findings increased positive reception by 21%, with a simultaneous decrease in average and bad assessments by 15% and 6%, respectively. The use of both, the orthophotomap and the large-scale map, increased positive reception by the respondents even more. Two in three participants declared that, in their opinion, the visualization of the local plan in such a way shows good legibility in terms of buildings and fences.

The second element of the inquiry was to examine to what extent the subjective impression changes in terms of land use. This time, the attention of the surveyed people was directed to the possibility of the interpretation of the LSDP and orientation in the field based on the location of agricultural areas, meadows, pastures, forests, orchards or wasteland. The results have been illustrated in Figure 5. In this case, the use of an orthophotomap alone already resulted in a significant increase in legibility, relative to the large-scale map. For 62% of respondents, the use of an orthophotomap as a cartographic background is a clear way to visualize the findings of the local plan.

The combination of an orthophotomap and the large-scale map did not lead to significant additional improvement of this result.

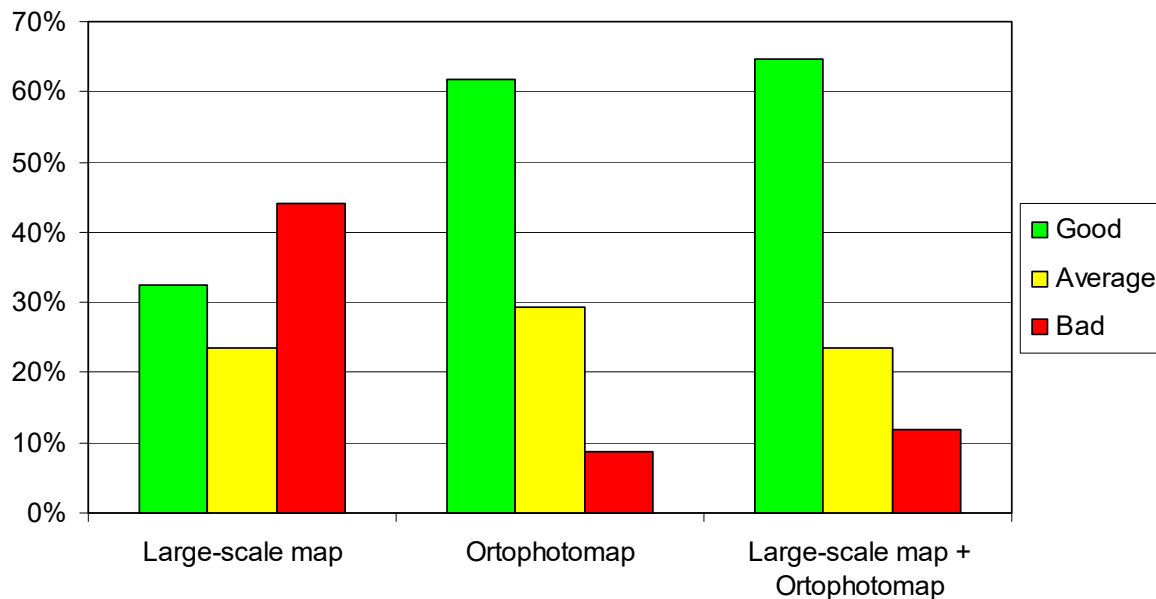


Fig. 5. The results of the questionnaire regarding the legibility of local plan visualization in terms of land use with the use of different cartographic backgrounds. *Source:* own study.

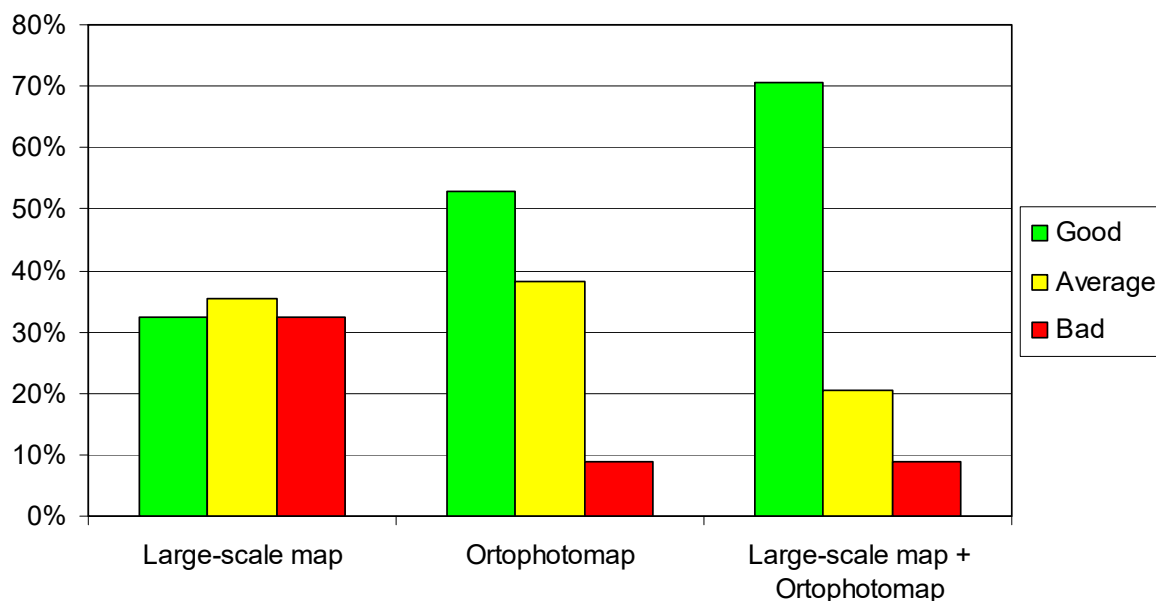


Fig. 6. The results of the questionnaire regarding the general legibility of the local plan with the use of different cartographic backgrounds. *Source:* own study.

Another aspect was the assessment of the general legibility and clarity of the presented variants. The obtained results are shown in Figure 6. A clear upward trend can be observed, similarly to the case of assessing legibility in terms of permanent elements of land development of anthropogenic origin (buildings and fences). The use of the combination of an orthophotomap and large-scale map has been well-evaluated by over 70% of respondents. For comparison, the use of only an orthophotomap or large-scale map was well-evaluated by 53% and 32% respectively. These results correlate with the feedback on the last question of the first part of the questionnaire regarding the

indication of the most legible and clear variant. The results determine the percentage of respondents who chose a particular option and present themselves as follows:

- 1) Large-scale map (18%).
- 2) Orthophotomap (26%).
- 3) Large-scale map with an orthophotomap underneath (53%).
- 4) None of the above (3%).

4.3. Profile of the respondents

One of the objectives of the survey carried out during the public exposition of local plans was to identify participants in terms of the reason for their presence, level of knowledge in the field of spatial planning, and such characteristics as: gender, age, education and occupational structure.

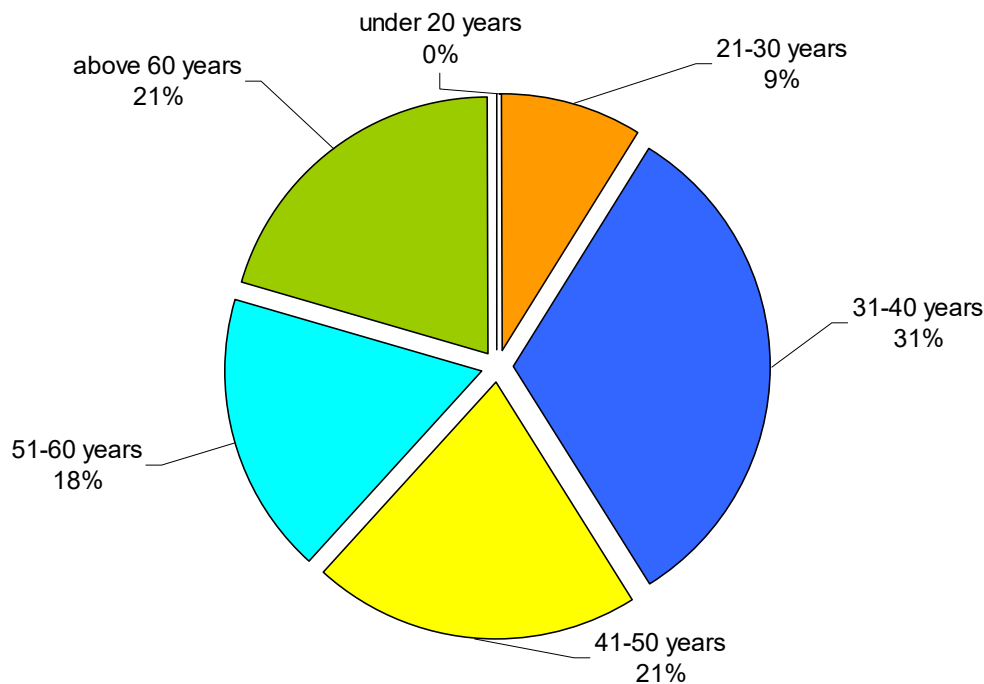


Fig. 7. Age structure of the participants of public presentations of local plans. *Source:* own study.

The vast majority of all people present during the exposition of local plans are men (65%). By age, low activity of young people (under the age of 30) is clearly visible. Other age groups are characterized by a similar sample (Fig. 7). These results are directly correlated with the structure of the educational background of the participants of the local plan presentations. Due to the low percentage of young people, none of the respondents declared primary or lower secondary education. The vast majority of participants (65%) had completed their higher education. People with secondary education accounted for 29% of all respondents, while 6% declared vocational education.

The structure of the participants of LSDP public presentations according to the performed activity shows that the professional and social groups that are most interested and involved in spatial planning in the commune are: persons employed in private companies (38%), pensioners (21%), entrepreneurs (15%), public administration employees (12%), representatives of free professions (9%), and others (6%).

The most common source of information about the public expositions of local plans is the website of the commune office - 38% of people present indicated this form of obtaining information. Every fourth respondent (24%) learned about the layout from friends or family. Other people received information from posters and announcements (6%) or through the village council (6%). A significant part of the respondents indicated "other" as a source of knowledge (26%), which can be interpreted as a superimposition of the above possibilities. Very often, coarse information is obtained from one source, which is then supplemented and verified with data from another communication channel. The

phenomenon is particularly frequent among communities that know each other well. This is especially true in rural communes, such as Pszów Commune, where research was carried out.

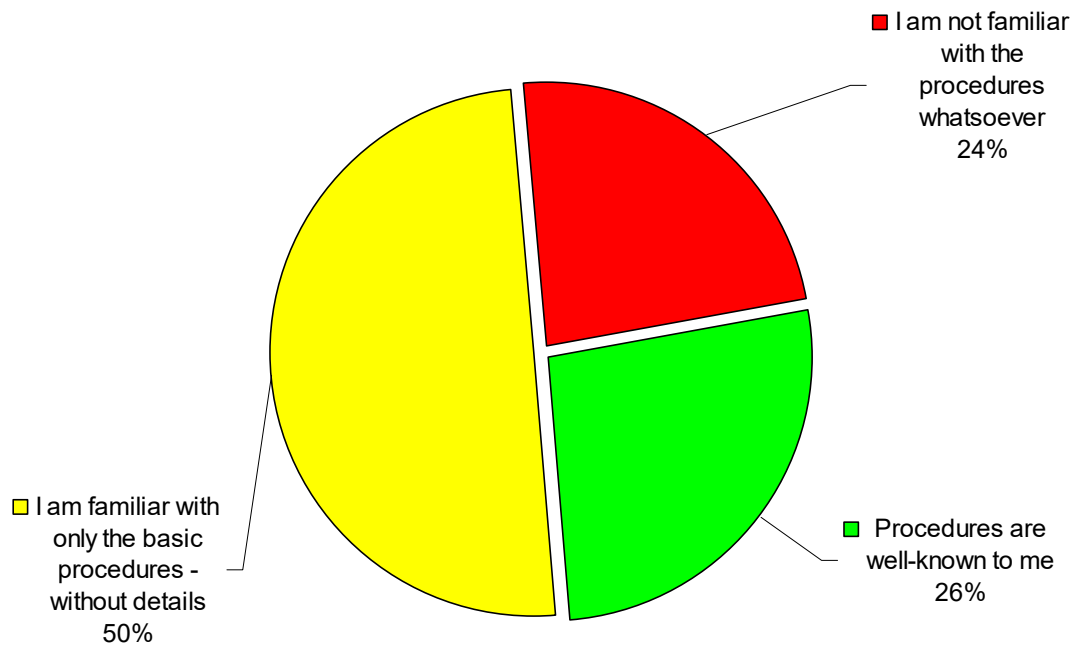


Fig. 8. Level of knowledge about planning procedures possessed by the participants of public presentations of local plans. *Source:* own study.

The main reason for being present during the expositions of local plans is the proximity of residence to the area of the plan being approved or being in possession of a real estate within the area of the plan or in its vicinity. 35% of the respondents have real estate in the area covered by the procedure or in its direct neighbourhood. On the other hand, 23% of participants declare that they are interested in spatial development matters and want to have more detailed knowledge about the intended planning directions. Other reasons for participating in the LSDP exhibition are: curiosity (15%), the need to look after the interests of the local community (10%), professional work in the area of the plan being prepared (8%) or a different reason (5%). There is also a small group of people who appeared during the layout by coincidence and have no direct interest (5%).

The vast majority of people present (74%) came to the public presentation of the local plan for the first time. Only 9% of respondents admitted to being present at the previous layout which took place in their commune, while 18% of respondents were not able to recall if they were actively involved in previous planning procedures.

Only every fourth person present at the layout declares to have good knowledge of the procedures for developing and approving local plans. Half of the respondents admit that they have only general, often imprecise knowledge, while the remaining 24% of people felt that they did not have any knowledge about planning procedures (Fig. 8). It is comforting, however, that despite these gaps in knowledge, over half of the respondents (53%) admitted that the findings of the LSDP are understandable, legible and clear to them. For a definite minority of participants (6%), local plans were incomprehensible. Quite a large group of people (32%) determined the text of the plan together with the graphical presentation as characterized by a medium level of legibility, while 9% of the respondents did not have an opinion on the matter.

5. Discussion and conclusions

The results of the carried out questionnaire inquiries clearly indicate the need for changes both at the procedural and social level. The obtained findings can be used to formulate several conclusions.

Firstly, there is a real need for changes in the procedure for approving Local Spatial Development Plans. The way of visualizing the findings of the local plans according to the applicable law (ACT OF ... 2003) is illegible and not very intuitive for the majority of people taking part in the public exhibitions of local plans. Research has shown that the most understandable form of visualization is the use of a combination of a large-scale map and an orthophotomap as the cartographic background for the plan drawing (refer to Fig. 3 and Fig. 6). In the light of the ongoing legislative work on the draft of the Act on Urban and Construction Code, this is the best time to implement these changes. The proposed solution can be introduced directly to the Regulation on the detailed rules for the preparation of spatial planning acts. The statutory delegation for its issue was included in article 243 of the draft of Act on Urban and Construction Code published on 23rd November 2017 on the website of the Ministry of Infrastructure and Construction (MINISTRY OF ... 2018).

Secondly, the knowledge of planning procedures among the society is at an unsatisfactory level (refer to Fig. 8). Only every fourth person present at the public exhibition of the local plan declared having good knowledge of planning procedures. Extensive educational activities are necessary to raise the level of awareness in society. This goal can be achieved by increasing the number of public consultations. Subsequently, it could be taken into consideration to introduce elements of planning and spatial development into the primary and secondary education program. Undoubtedly, this will translate into higher attendance during public discussions and presentations of local plans for public viewing.

Thirdly, it is necessary to motivate young people and persuade them to take part in planning procedures because they constitute a small percentage of all participants during the layout of local plans or public discussions (refer to Fig. 7). Technologies known as Public Participatory Geographic Information Systems (PPGIS) or collaborative GIS can be used for this purpose (ANDRZEJEWSKA et al. 2007, KINGSTON 2011, JANKOWSKI 2011). Thanks to them, young people could express their opinions without leaving home, directly via a web application. The use of PPGIS systems could significantly influence the socialization of the spatial planning process and strengthen social participation.

6. References

- ANDRZEJEWSKA M., BARANOWSKI M., FIEDZIUKIEWICZ K., KOWALSKA A., MATUSZKIEWICZ J.M., RUSZTECKA M., ROO-ZIELIŃSKA E., SOLON J., 2007, *O partycypacji społecznej w planowaniu przestrzennym. Zastosowania geowizualizacji w celu wzmocnienia udziału społecznego w planowaniu przestrzennym* (On Social Participation in Spatial Planning. Applications of Geovisualization to Strengthen Public Participation in Spatial Planning), http://pspe.gridw.pl/movies/O%20partycypacji_spolecznej.pdf, available at: 26.02.2018 r.
- BILLERT A., 2006, *Planowanie przestrzenne a polityka. Trzecia droga do trzeciego świata* (Spatial Planning and Politics. The Third Way to the Third World), in: *Urbanistyka w działaniu. Teoria i praktyka. Materiały z II Kongresu Urbanistyki Polskiej* (Urbanism in Action. Theory and Practice. Materials from the 2nd Congress of Polish Urban Planning), Biblioteka Urbanisty 9 (Urbanist Library 9), Warsaw.
- DUKACZEWSKI D., 2016, *Designing Static and Animated Maps for Users from Different Age Groups Dedicated to Electronic Paper Visualization Devices*, in: 6th International Conference on Cartography and GIS, pp. 378-385, <https://doi.org/10.13140/RG.2.2.33019.92964>.
- FLOREK R., 2001, *Geoinformacja pozyskana fotogrametrycznie wsparciem dla potrzeb katastru i gospodarki nieruchomościami* (Geoinformation Acquired by Photogrammetry as a Support for Cadastre and Real Estate Economy), *Archiwum Fotogrametrii, Kartografii i Teledetekcji* (Archive of Photogrammetry, Cartography and Remote Sensing), Volume 11, pp. 2.61-2.65.
- GOŹDZIEWICZ-BIECHOŃSKA J., 2008, *Partycypacja społeczna w tworzeniu prawa na przykładzie miejscowego planu zagospodarowania przestrzennego* (Social Participation in Creating the Law on the Example of the Local Spatial Development Plan), *Samorząd Terytorialny* (Territorial Self-government), No. 7-8.
- HANZL M., 2008, *Nowe możliwości udziału mieszkańców miasta w planowaniu przestrzennym jako wynik wykorzystania współczesnych technik komputerowych* (New Opportunities for Urban Residents to Participate in Spatial Planning as a Result of Using Modern Computer Techniques), *Rozprawa doktorska w Instytucie Architektury i Urbanistyki* (Dissertation at the Institute of Architecture and Urban Planning), Politechnika Łódzka (Technical University of Lodz).
- HORBIŃSKI T., MEDYŃSKA-GULIJ B., 2017, *Geovisualisation as a Process of Creating Complementary Visualisations: Static Two-dimensional, Surface Three-dimensional, and Interactive*, *Geodesy and Cartography*, Volume 66, No 1, pp. 45-58, <https://doi.org/10.1515/geocart-2017-0009>.

- IZDEBSKI H., 2011, *Samorząd terytorialny. Podstawy ustroju i działalności (Local Government. The Basics of the System and Activity)*, Lexis Nexis, Warsaw.
- JANKOWSKI P., 2011, *Designing Participatory Geographic Information Systems*, The SAGE Handbook of GIS and Society, SAGE Publications, London, pp. 347-360.
- JĘDRASZKO A., 2008, *Gospodarka przestrzenna w Polsce wobec standardów europejskich (Spatial Economy in Poland in the Face of European Standards)*, Biblioteka Urbanisty 13 (Urbanist Library 13), Warsaw.
- KACZMAREK T., WÓJCICKI M., 2015, *Uspołecznienie procesu planowania przestrzennego na przykładzie miasta Poznania (Socialization of the Spatial Planning Process Based on the Example of the City of Poznań)*, *Ruch Prawniczy, Ekonomiczny i Socjologiczny (Legal, Economic and Sociological Movement)*, Year LXXVII, Volume 1.
- KINGSTON R., 2011, *On-line Public Participation GIS for Spatial Planning*, The SAGE Handbook of GIS and Society, SAGE Publications, London, pp. 361-380.
- MERGEL L., POBŁOCKI K., WUDARSKI M., 2013, *Anty-bezradnik przestrzenny: prawo do miasta w działaniu (Anti-helpless Spatial Guide: the Right to the City in Action)*, Biblioteka Republiki Nowej (Library of the New Republic), Warsaw.
- MINISTERSTWO INFRASTRUKTURY I BUDOWNICTWA (Ministry of Infrastructure and Construction), http://mib.gov.pl/2-514324a4ec938-1798162-p_1.htm, available at 26.02.2018.
- MŁODKOWSKI M., WALCZAK D., JANKOWSKI P., 2016, *Projektowanie zorientowane na użytkownika oraz metody zwinnego programowania w procesie tworzenia geoportalu wspierającego partycypację społeczną w planowaniu przestrzennym (User-centered Design and Agile Programming Methods in the Process of Creating a Geoportal Supporting Public Participation in Urban Planning)*, *Roczniki Geomatyki (Geomatics Annals)*, Tom XIV, Volume 5(75), pp. 597-608.
- PARYSEK J. J., 2006, *Wprowadzenie do gospodarki przestrzennej (Introduction to Spatial Management)*, WN UAM, Poznań.
- PARYSEK J.J., 2010, *Gospodarka przestrzenna i rola partycypacji społecznej w procesie planowania przestrzennego (Spatial Economy and the Role of Social Participation in the Spatial Planning Process)*, in: *Gospodarka przestrzenna społeczeństwu (Spatial Economy for the Society)*, Bogucki Wydawnictwo Naukowe (Bogucki Scientific Publisher), Poznań.
- PARYSEK J.J., 2016, *W poszukiwaniu nowego systemu organizacji, struktury i funkcjonowania gospodarki przestrzennej w Polsce (In Search of a New System of Organization, Structure and Operation of the Spatial Economy in Poland)*, *Problemy rozwoju miast (Problems of Urban Development)*, Volume 1, pp. 39-49.
- USTAWA z dnia 27 marca 2003 r. o planowaniu i zagospodarowaniu przestrzennym, Dz. U. z 2017 r., poz. 1073, z późn. zm. (Act of 27 March 2003 on Planning and Spatial Development, Journal of Laws, 2017, item 1073, as amended).
- ZWIROWICZ-RUTKOWSKA A., MICHALIK A., 2016, *The Use of Spatial Data Infrastructure in Environmental Management: an Example from the Spatial Planning Practice in Poland*, *Environmental Management*, Volume 58, Issue 4, pp. 619-635, <https://doi.org/10.1007/s00267-016-0732-0>.
- ZWIROWICZ-RUTKOWSKA A., 2017, *A Multi-criteria Method for Assessment of Spatial Data Infrastructure Effectiveness*, *Earth Science Informatics*, Volume 10, Issue 3, pp. 369-382, <https://doi.org/10.1007/s12145-017-0292-8>.