Article

Access to ICT in Poland and the Co-Creation of Urban Space in the Process of Modern Social Participation in a Smart City—A Case Study

Patrycja Szarek-Iwaniuk and **Adam Senetra** *

Faculty of Geoengineering, University of Warmia and Mazury in Olsztyn, 10-720 Olsztyn, Poland; patrycja.szarek@uwm.edu.pl

* Correspondence: adam.senetra@uwm.edu.pl

check for updates

Abstract: A smart city is one of the latest concepts in the development of modern cities. It has evolved from the foregoing smart cities 1.0 and 2.0 to the smart city 3.0, where members of the local community play the main role as not only the recipients of the introduced changes and modern technology, but also as the creators of urban space. One of the goals of a smart city 3.0 is to promote sustainable urban development by improving the quality of life, enhancing social participation, and involving local community members in planning and decision-making processes. This study set out to determine the role and significance of e-participation methods in the smart city concept. The results of questionnaires exploring the importance of e-participation in urban development are presented. The paper also discusses changes in the availability of information and communication technologies (ICT) in Poland. The secondary goal was to present the geo-questionnaire and Public Participation GIS (PPGIS) as modern research tools. Internet tools based on geoinformation systems have considerable potential for mobilizing social participation in spatial planning (Public Participation GIS). The present study postulates the need for modern social participation methods in shaping urban space and promoting the sustainable development of cities. The study highlights the main challenges in the research process. The cooperation between the authorities and the citizens contributes to the development of a civil society, informed decision-making, social involvement in public life, and more effective governance at the local, regional, and national level. Measures that foster cooperation between the authorities and local communities, the use of information and communication technologies (ICT), and growing social awareness and social participation in managing development are the components of a modern smart city and the building blocks of an e-society. The study also revealed positive changes in access to ICT and their contribution to bridging the digital divide in Poland. Higher levels of social awareness regarding participation and e-participation promote the growth of smart cities.

Keywords: urban management; citizen participation; urban planning; geo-questionnaire; Public Participation GIS; sustainable development of cities; smart city concept; e-participation; urban development; ICT; smart city 3.0

1. Introduction

Living standards and quality of life play an increasingly important role in an era of globalization, growing consumerism, and rapid urbanization [1–3]. These changes are inevitable, and they are strongly reflected in urban space, not only in the world's largest metropolises, but also in smaller cities, where they pose a threat to the natural environment and the local population [3–5]. Mounting problems can compromise sustainable economic and environmental growth of cities [6,7]. The development of civilization and technology necessitates the search for new solutions in transport, economy, finance,

management, environmental protection, production, and other areas of life in line with sustainable development principles to preserve the existing resources, not only for current, but also for new, generations [7–9].

1.1. Research Aims

The aim of this study was to present the role and the significance of modern social participation (e-participation) methods in urban management as an intrinsic element of the smart city concept. The results of questionnaires exploring the role and significance of modern e-participation methods in the urban development process were presented on the example of the city of Olsztyn. The changes in the availability of information and communication technologies (ICT) in Poland were also discussed. The secondary goal of the study was to popularize the geo-questionnaire as a modern research tool based on Public Participation GIS (PPGIS). E-participation enables citizens to use ICT, and Internet access provides members of the public with an opportunity to become more involved in the decision-making process. Therefore, the present study aimed to answer the following research questions: (1) In which Polish regions and to what extent did public access to ICT change? (2) What is the level of knowledge and awareness about the development of smart cities and modern e-participation methods among individuals who could potentially support social participation, and what problems could emerge in research involving PPGIS tools are identified by these individuals? The presented results set the ground for further research into e-participation in the smart city context.

The current study addresses contemporary challenges in urban development. Sustainable development, participatory governance, preserving a healthy balance between urbanization and environmental resources, and improving the quality of life are the main challenges facing smart cities.

1.2. The Nature of Social Participation and E-Participation

Social participation is the active involvement of individuals in the collective actions undertaken by the communities to which they belong, or in which they live. Specifically, these measures include active participation in the creation and operations of civic groups and non-governmental organizations, as well as participation in the decision-making process and social, public, and political affairs [10–13]. Social participation can be defined as the process of building relationships and forming bonds at the local community level [14,15].

Active participation relies on the cooperation between the citizens and the government, where members of the public are actively involved in decision-making and management processes. Local community members are increasingly involved in various areas of urban life [11,16]. The above is dictated by growing social needs, higher awareness of community members who want to actively participate in planning and decision-making processes, and potential conflicts with the local authorities who fail to initiate urban planning measures [10,14,17,18]. E-government is a general term that describes web-based services launched by the respective agencies of local, regional, and national governments [19]. E-governance involves the use of ICT for exchanging information with citizens, involving citizens in the decision-making process, and providing administrative services to the society [19,20]. The development of ICT contributed to e-governance in many countries [21]. E-governance initially focused on government operations, but it presently also encompasses public participation [20]. E-government and e-governance increase transparency and promote communication between the government and the citizens [22]. Local and central authorities are beginning to recognize the potential, creativity, and knowledge of community members in urban planning. At the same time, the growing availability of ICT provides new opportunities for enhancing social participation and encouraging citizens to co-design innovative solutions (including e-participation methods) in the management of cities [23].

E-participation enables citizens to become actively involved in the public consultation process via ICT, mostly the Internet [24,25]. This concept denotes the interactions between the society and formal political and administrative bodies that are made possible through ICT. E-participation enables the government to reach more citizens than traditional social participation methods, and

it relies on modern technologies to enhance active social participation in the decision-making process [26]. Various e-participation tools exist, including social media (Facebook, Twitter), e-petitions, chatrooms, discussion forums, video conferencing, consultation platforms, online questionnaires, geo-questionnaires, geo-discussions, and web applications [25,27–30]. All of these tools rely on ICT.

1.3. Social Participation in National Strategic Documents in Poland

The role and significance of social participation in urban and regional development have been addressed by international policy documents [16,31,32]. The Strategy for Responsible Development [33] is one of the most important strategic documents in Poland. This document lays out the key prerequisites, goals, and directions of national development in the social, economic, regional, and spatial dimension, until 2020 and 2030. It proposes a new model of development that is driven by responsible, socially sensitive, and territorially sustainable growth. The success of the planned development measures requires the cultivation of attitudes that support cooperation, creativity, and communication and that enhance social participation and local residents' influence on public affairs. The document emphasizes that local community members are not sufficiently involved in decision-making processes. It postulates that social participation could exert a positive impact on national and local governance. The Strategy for Responsible Development advocates the following goals and measures:

- Promoting social participation in decision-making and managing cities and functional urban areas;
- Recognizing the needs of various users of urban space;
- Supporting and promoting a participatory approach to decision-making and urban management;
- Developing a comprehensive system of consulting services for municipalities by promoting good practices in the area of public consultations, participatory urban planning, and participatory budgeting;
- Increasing the scope of participatory activities and the citizen's influence on public affairs;
- Promoting social and civic dialogue;
- Supporting social organizations and civil society institutions;
- Improving communication between public administration and local communities;
- Improving the organization of public debates concerning matters that are important for community members.

The Strategy also points to the lack of effective public sector communication practices and the absence of effective social engagement methods in development processes. Ineffective social participation compromises the citizens' ability to make decisions and reach a compromise in the planning process; it enables the authorities to turn a blind eye on the community's needs and adopt subjective decisions in spatial management that promote political goals rather the well-being of local inhabitants [33]. The document also notes that digital technologies, particularly fast telecommunications networks, should play an important role in improving all aspects of public life.

In Poland, the National Strategy for Regional Development 2030 [34] is the key strategic document for the promotion of regional development until 2030. The strategy emphasizes the importance of sustainable development on the national scale, including the reduction of disproportions in the socioeconomic development of Polish regions. Regional policy should build a culture of social participation and cooperation. The discussed document advocates the implementation of the smart city concept that is geared toward innovation, ICT development, and social engagement in urban planning. The strategy highlights the need for a better coordination of development-oriented measures with the participation of citizens, institutions, and organizations. Participation is defined as civic engagement in each stage of the decision-making process. Transparency and accountability play a crucial role at every level of management, and improved communication between local governments and citizens ensures that municipal services cater to local expectations and needs. Participatory tools contribute to the utilization and development of social capital in a given area. Enhanced social participation where citizens have a voice in matters concerning public life and space promotes social activity. The document

also addresses smart cities and smart villages, whose development relies on modern technologies, big data, and social participation.

The National Urban Policy 2023 [14] proposes a holistic approach to resolving the problems in Polish cities. The main aim of this document is to empower cities and urban areas in the process of promoting sustainable development, creating jobs, and enhancing the quality of local life by improving the quality of urban policies at the national and territorial level. Public participation is one of the topics addressed by this document, which states that the quality of urban management should be improved by supporting and developing social participation mechanisms in all areas of urban life. Formal public consultations should be gradually replaced with a partnership approach to urban planning and implementing the relevant tasks [14]. The document also underscores the need for more extensive social participation in spatial planning.

Human Smart Cities (smart cities that are co-created by the citizens) is the proprietary name of a project and a competition initiated by the Ministry of Investment and Economic Development. During the competition, local governments were encouraged to submit projects aiming to enhance the cooperation between members of the public and city authorities through the implementation of "smart" solutions. The project involved training sessions and consultations dedicated to the smart city concept in Polish cities [15]. In this initiative, smart cities are defined as urban areas that not only rely on modern technology, but above all, as cities where modern tools and solutions contribute to an improvement in the quality of life [15]. Social participation is one of the main topics addressed by the above project. The Human Smart Cities project recognizes the importance of social engagement in the decision-making process, and it links social participation with the development of smart cities, particularly smart cities 3.0.

The discussed documents emphasize the significance of social participation in the development of contemporary cities, and they promote civil engagement and activity in planning and decision-making, including with the use of ICT tools.

1.4. Social Participation as a Prerequisite for the Creation and Development of Smart Cities

Novel approaches to urban development and the accompanying modern solutions address rapid global changes and the growing pace of life. One of such approaches is the smart city concept. The smart city concept is one of the most important strategies for the development of contemporary cities which confronts rapid urbanization processes and the associated changes in the natural environment. The smart city concept [35] has attracted considerable interest as the epitome of intelligent urban development and sustainable socioeconomic growth. Its origins can be traced back to the SMART Growth movement in the late 1990s [36]. The broad concept of smart cities encompasses many urban functions. In many cities around the world, various projects have been initiated in recent decades, to upgrade urban infrastructure and services; improve environmental, social, and economic conditions; and enhance the cities' appeal and competitive edge [37]. Among the numerous concepts addressing urban design and planning, the smart city concept offers the most comprehensive and multidimensional approach to urban development. As a result, smart cities are not easy to define: Some definitions focus on technological aspects, some emphasize economic factors, and some highlight the importance of social participation. None of the numerous definitions of a smart city has been universally recognized [38]. A smart city is defined as an area that offers numerous opportunities for learning and innovation, relies on the creative potential of its inhabitants and institutions, and employs digital infrastructure for communicating and managing knowledge [39]. According to Giffinger et al. [40], a smart city is a city that looks forward to the future and bases its performance on the following six components: smart economy, smart inhabitants, smart governance, smart mobility, smart environment, and smart living. A smart city is thus built on the "smart" contributions made by independent, socially responsible, and aware citizens. A smart city is characterized by sustainable economic development and a high quality of life, which are driven by investments in human and social capital, traditional (transport) and modern (ICT) infrastructure, responsible resource management, and social participation [41].

Despite the growing body of research into the smart city concept in the international arena, the existing publications have received considerable criticism due to the multiplicity of theoretical papers and excessive focus on technological issues, big data, and the Internet of Things. According to some critics, the idea of a smart city extends far beyond the concept of a modern city that relies on advances in digital technology [42]. Civil participation is the key component of many definitions of smart cities, and ICT has considerable potential for shaping urban space, improving the quality of life, and enhancing social involvement in the decision-making process [43]. The co-creation of urban space by its users and recipients is emphasized in the literature [42]. Some authors have postulated that citizens should actively participate in the process of creating sustainable and smart cities [23,44–48].

Social participation with the involvement of ICT is an inseparable element of the smart city concept. A modern smart city recognizes the importance of cooperation between the local authorities, inhabitants, and users of urban space. Active civic engagement in decision-making, social awareness of participatory processes, and modern methods of civic involvement are the pillars of the smart city 3.0 concept.

The previous generations of smart cities (1.0 and 2.0) have evolved into the smart city 3.0 concept (Table 1), where local residents are not only the recipients, but also the creators of the implemented changes and modern technologies in urban space. One of the theoretical goals of the smart city 3.0 concept is to promote sustainable urban development through social participation and an improvement in the quality of life by engaging local community members in the process of planning urban development, setting directions for change, identifying problem areas in urban space, and proposing solutions [15,49].

Table 1. The three generations of smart cities [1].

Smart City 1.0	Smart City 2.0	Smart City 3.0
The creators of technological advancements encourage cities to implement their solutions, with the aim of improving the efficiency of urban management. Technology is the key element of the smart city 1.0 concept. Technological innovations are often implemented in cities that are not fully prepared for this process.	Local authorities play the key role in the development of smart cities 2.0. They focus on new technologies, to explore various options for improving the quality of life in cities. Cities introduce programs and projects which support the implementation of modern technologies in various areas of life. In a smart city 2.0, the significance of the quality of life and local governance is equated with that of modern technology.	This is the latest and the most advanced generation of smart cities. Citizens play the key role in urban development. Local residents consciously choose to participate in the process of building modern cities, they rely on modern social participation tools, and are creative. In the smart city 3.0, urban space is created for users and with their involvement.

[1] [15,49].

Despite the fact that the smart city concept is already being implemented in many cities as part of projects and programs that rely on smart technologies, such as public Wi-Fi networks and intelligent traffic management systems, citizen-led development should be the next step in the evolution of smart cities. Technological advancement and the availability of modern ICT tools underscore the importance of e-participation.

Due to the rapid growth of the ICT industry, the Internet and social media have become the major outlets for human communication, as well as effective tools for conducting social research [50]. The first ICT tools supporting urban planning and social participation have emerged already, in the late 1990s [51]. In the process of establishing effective communication with the citizens, governments should rely on online methods to create a more economically efficient bottom-up approach and to ensure that public services better accommodate the needs and expectations of community members [42]. ICT tools also lead to greater transparency in local and central administration and promote effective

communication between the government and the citizens [50]. The role and significance of social participation in local governance has been emphasized in the literature, but some researchers have also commented on the lack of detailed analyses that explore the importance of public involvement in the development of smart cities [44,52–54].

1.5. Public Participation GIS as an E-Participation Tool

Communication between the local authorities, city residents, and the users of urban space is one of the most important elements of a modern smart city. Active social participation in decision-making processes and social awareness of participatory processes and modern participation methods are the pillars of the smart city 3.0 concept. The Internet is a communication channel that enables members of the public to participate in decision-making processes and urban development.

Internet tools based on geoinformation systems create vast opportunities for social participation in spatial planning [55–58]. Public Participation GIS (PPGIS) are GIS tools where participatory research and planning play a central role. The Public Participation Geographic Information System (PPGIS) concept emerged in 1996, during a meeting of the National Center for Geographic Information and Analysis [59]. Public Participation GIS (PPGIS) is a group of e-participation methods and techniques which combine cartography with social research methods with the aim of engaging community members in decision-making processes. These methods are increasingly used to survey the opinions of local communities and to enhance social participation in urban planning [60]. Interactive online maps enable the respondents to submit ideas, identify problems, and propose solutions addressing specific locations in space. The knowledge gained from social research involving PPGIS is processed in GIS software. The PPGIS operates on a similar principle to traditional questionnaires or public consultations, but it also enables members of the public to locate their choices on interactive maps. Thematic data in PPGIS software can be collected from individual users (experts, residents), as well as from group discussions. As a result, the research tool and data collection methods can be adapted to a specific problem. PPGIS tools support extensive public consultations at any time and place, and they can be accessed via any device that supports web browsing without leaving home [60,61]. PPGIS tools save money and time; they are more effective, accurate, and reliable; they enhance communication and cooperation; and provide citizens with extensive access to data [62,63]. However, PPGIS tools require Internet access, which is a certain disadvantage because digitally excluded social groups are prevented from participating in such studies.

According to Barndt [64], the application of PPGIS tools in community research poses a challenge both in the social and technological dimension, and the initially enthusiastic attitude toward these tools can be diminished when problems are encountered during their implementation. Studies of urban space can benefit from public opinion surveys which provide valuable information about community members who represent different environments, attitudes, and viewpoints. In recent years, PPGIS tools have been implemented in Scandinavian, American, Canadian, British, and Polish cities [55–57,65–68].

2. Materials and Methods

The selection of data sources and research methods was determined by the research topic, research area, and the level of detail needed for addressing the research question. For this reason, the Materials and Methods section is divided into subsections that correspond to the respective subsections in the Results section.

2.1. Access to Information and Communication Technology in Poland

The access to Information and Communication Technology (ICT) in Poland was analyzed based on Statistics Poland [69] data for 2004–2018. Shorter time intervals were examined if data were not available in the indicated period. The studied areas were Polish voivodeships, which are NUTS 2 regions in the European Union's statistical classification system. The above choice was dictated by the absence of more detailed data (NUTS 3 and the former NUTS 4 and NUTS 5 levels). Sixteen Polish

voivodeships were analyzed (Figure 1), and the results were compared against the average values at the national level. The analyses relied on mathematical and statistical methods.

Figure 1. Polish voivodeships (NUTS 2 regions).

The access to ICT was analyzed separately in households and businesses. The following indicators were taken into account in households:

- Proportion of households with a personal computer (minimum one) in the total number of households,
- Proportion of households with a personal computer (minimum one) and Internet access in the total number of households,
- Proportion of households with a personal computer (minimum one) and broadband Internet access in the total number of households.

The following indicators were taken into consideration in the analysis of businesses:

- Proportion of business using computers in the total number of businesses,
- Proportion of business using computers with Internet access in the total number of businesses,
- Proportion of business using computers with broadband Internet access in the total number of businesses.

Only business that employ more than 9 people were included in the analysis due to limited access to data and the data collection methods deployed by Statistics Poland [69]. The relevant data were available for the following sectors of the Polish economy based on the Polish Classification of Activities (PKD): C—industrial processing; D—generation and supply of electricity, gas, steam, hot water, and air for air-conditioning systems; E—water supply, wastewater and waste management, and re-cultivation measures; F—construction; G—wholesale and retail trade, and repair

of motor vehicles, including motorcycles; H—transport and storage; I—hotel and catering industry; J—information and communications; L—real estate services; M, sections 69 to 74—professional, scientific, and technical services; N, sections 77 to 82—administration and auxiliary services; S, group 95.1—remaining services.

Mobile Internet access (smartphones, tablets) in households and businesses was not analyzed due to the lack of the relevant data. The authors are aware that many members of the public have mobile Internet access, which can be regarded as an e-participation tool that, unlike fixed Internet access, it enables users to stay connected in any location. The availability of data on mobile Internet use in Poland would substantially contribute to the presented research.

2.2. Respondents' Opinions on Modern E-Participation

One of the most important elements of a modern smart city is communication between the local authorities, city residents, and the users of urban space. A questionnaire survey was carried out to explore opinions about the role of e-participation in urban planning. The research tool was a semi-structured interview which combined the features of structured and unstructured interviews. In a semi-structured interview, the respondents answer questions that have been formalized in the research plan, but they can also be asked additional questions on specific topics of interest. The interviews were carried in the third quarter of 2019, and they focused on three main topics: the concept and definition of a smart city, the usefulness of the geo-questionnaire as a research tools, and the potential influence of residents and users of space on decision-making relating to urban planning and improvements in the quality of life. The proposed research method (semi-structured interview) was used because, in some cases, subsequent questions may suggest answers to previous questions. Respondents who are presented with a structured questionnaire could deduce the answers to previous questions from the questions that follow. This risk is eliminated in a semi-structured interview. The present study involved qualitative research methods where the researcher had greater control over the research process by initiating free discussions and asking additional questions outside the standard questionnaire. Qualitative research involves smaller, targeted samples. Qualitative data are not statistically representative, but they produce accurate and more in-depth results.

A total of 20 persons participated in the survey. The target group was selected by non-random sampling based on the following criteria: the respondents were residents of Olsztyn (Warmia and Mazury voivodship in Poland) who were university graduates, were employed in public administration (local or central) or urban planning, owned computers with Internet access, and were active users of ICT tools. This group of respondents was targeted to explore the opinions of persons who could potentially support social participation initiatives in the city and who have theoretical or practical knowledge on the subject. The size of the sample was dictated by the fact that some of the initially targeted respondents were unable to participate in the study for reasons that were outside the authors' control. This sample size was selected due to the time-consuming nature of the research tool, and it was dictated by the specific characteristics of the research tool. The research was time-consuming because each participant was interviewed individually, on a different day, without the involvement of a third party.

The questions were divided into three main thematic areas, as follows.
Area 1: Smart City

- Are you familiar with the smart city concept?
- What comes to mind when you think of a smart city?
- Do you think that the development of a modern smart city should rely on the cooperation between the local authorities and the residents?

Area 2: Social participation

- Should the residents have a say in decisions relating to urban development, changes in urban space, or improvements in the quality of life?

- In what way could the residents participate in the decision-making process regarding changes in urban space or improvements in the quality of life?
- What types of public participation tools are available to the residents of Olsztyn in the decision-making process regarding the quality of local life and urban development?

Area 3: E-participation methods

- Have you ever taken an online survey? What is your opinion of online surveys?
- Have you ever taken an online survey concerning urban development, improvements in the quality of life, changes in urban space, decision-making processes regarding urban development, or a public consultation process? What is your opinion of such surveys?
- Are you familiar with the term "geo-questionnaire"?
- Do you think that geo-questionnaires could be a useful tool in the public consultation process to elicit greater citizen participation in urban development?
- Have you ever taken an online survey involving a geo-questionnaire?
- Do you think that geo-questionnaires could be applied in practice?
- What problems could arise in connection with geo-surveys during public consultations and decision-making processes?

A semi-structured interview enables the researcher to ask additional questions in connection with the topics that arise during the survey. This option was not included in the above list because additional questions were not a fixed component of the survey, and they appeared during a free discussion that complemented the main topic of the study. The researchers did not provide the respondents with any information about PPGIS or geo-questionnaires at the beginning of the interview. The relevant information was provided only after the respondents had revealed whether they were familiar with these concepts. Therefore, the adopted research methodology eliminated the risk of revealing the answers and the relevant information to the participants. The information about geo-questionnaires that was revealed to the respondents is presented in the following subsection.

2.3. Geo-Questionnaire as a Public Participation GIS Tool

Public Participation GIS (PPGIS) refers to various e-participation methods combining cartographic and social research techniques. Public surveys increasingly often rely on PPGIS tools to explore the opinions of local community members and to engage the residents in decision-making processes relating to urban planning and development.

A geo-questionnaire is one of PPGIS tools. A geo-questionnaire supports extensive public consultations at any time and place, and it can be completed on any device that supports web browsing without leaving home. This method is deployed to acquire information about the preferences of local community members. It involves a questionnaire with interactive maps to place the respondents' answers in the spatial context. A geo-questionnaire contains a standardized set of questions, but it also supports the acquisition of information about the respondents' spatial behaviors and choices and daily routines, as well as their preferences and suggestions concerning urban planning. Areas and locations that are regarded as important by the respondents can be indicated on interactive maps, with the use of points, lines, and polygons (surfaces). Questions that do not require the use of interactive maps can also be included in this research methodology. Similar to a conventional questionnaire, a geo-questionnaire can include both open-ended and closed-ended questions ("yes/no" and multiple-choice questions).

The stages of the research process involving a geo-questionnaire are presented in Figure 2. The research problem and the research topic are identified in the first stage of the study. A preliminary set of questions, maps, photographs, and other elements of the geo-questionnaire are prepared in the second stage. The preliminary set of questions should be validated based on expert opinions. The research tool is then developed, and a pilot study is performed on a selected sample. The results are used to modify the questionnaire, adjust its functionality, and validate the final questions. The

validated questionnaire is applied to survey the respondents in the final sample. The sampling method in the pilot study and the full-scale study is determined by the research topic, research area, and the examined population. The results are subjected to spatial, statistical, and cartographic analyses in the last stage of research.

| Identification of the research problem and the research topic |
| Development of a preliminary set of questions |
| Validation of the preliminary set of questions |
| Development of a final set of questions |
| Development of the research tool |
| Pilot study of a selected sample |
| Analysis of the results of the pilot study |
| Development of the final research tool |
| Selection of the final research sample |
| Full-scale study |
| Mathematical, statistical and cartographic analyses of the results |

Figure 2. Stages of the research procedure involving a geo-questionnaire.

2.4. Study Area

Olsztyn was selected for the study because it will participate in future research into smart cities with the involvement of PPGIS tools. Olsztyn is a county with city rights and the capital city of Warmia and Mazury voivodship (Figure 3). It has an area of 88 km^2 and a population of 172,362 [69].

Olsztyn is the largest city in Warmia and Mazury voivodeship in terms of both area and population. According to the National Spatial Management Plan, Olsztyn is an urban center at the national level which fulfills selected metropolitan functions and combines functions of international and national significance. Olsztyn belongs to a functional network of cities. The local authorities strive to engage members of the public in urban management and planning by organizing public consultations and deploying e-participation tools, such as the Participatory Budgeting Scheme (OBO). These measures are consistent with the smart city concept, but they require further development and support in Olsztyn.

A case study is a research methodology that supports detailed analyses of the processes and phenomena in the evaluated area or case. However, these processes and phenomena can be analyzed in the context of larger communities and territorial units, and many of them apply universally. The results of the study can be used to formulate conclusions about the Olsztyn urban area, and they provide valuable inputs for research conducted in other cities.

Figure 3. Location of Olsztyn in the Warmia and Mazury voivodeship.

3. Results

3.1. Access to Information and Communication Technology in Poland

In the contemporary world, information plays a key role; it is used in different spheres of social activity and permeates all areas of life. Information is a source of knowledge which, together with the progress in information and communication technology, lays the foundations for a modern economy. General access to the Internet promotes communication in the social, cultural, and business domains. Progressing informatization eliminates spatiotemporal limitations. Access to ICT is an inseparable element of modern societies and smart cities. The growing availability of ICT decreases digital exclusion, facilitates communication with the citizens, and promotes social participation in the change process and decision-making.

The study analyzed households with at least one personal computer. In all Polish voivodeships, a significant improvement was observed in the proportion of households with personal computers in 2004–2017 (Figure 4A), personal computers with Internet access in 2004–2017 (Figure 4B), and personal computers with broadband Internet access in 2011–2017 (Figure 4C). The percentage of the digitally excluded population decreased steadily in the analyzed period. In 2004, 33% of Polish households owned computers, and only 17% of households owned computers with Internet access, on average. In 2017, 76% of households owned computers, of which nearly 75% were connected to the Internet, and 54% had broadband Internet access. The number of households with computers increased by 131% in 2004–2017, and the greatest increase was noted in the Warmia and Mazury voivodeship (179%), whereas the smallest increase was observed in Małopolska (110%). In 2004–2017, the disproportion between voivodships with the highest and the lowest number of households owing personal computers was somewhat deepened. The difference between voivodeships reached 10.6% in 2014 (Świętokrzyskie—26.3%; Małopolska—36.9%) and 11.2% in 2017 (Podlasie—68.2%; Mazowsze—77.4%). The proportion of households owning computers with Internet access increased by 343% in 2004–2017. In 2004, the above indicator was lowest in Świętokrzyskie voivodeship (11.0%) and highest in Pomerania (21.8%). In 2017, the proportion of households owning computers with Internet access was lowest in Podlasie (66.6%) and highest in Mazowsze (78.6%). The above can be attributed to the fact that Warsaw, the Polish capital, is located in Mazowsze. Warsaw is the economic hub of Mazowsze, bringing together highly specialized businesses and services that create numerous development opportunities for local community members and, consequently, influence the result for the entire voivodeship. In contrast, Podlasie is a predominantly agricultural region with much lower levels of socioeconomic development. On average, 24.1% of Polish households do not have

computers, 25.2% do not have computers with Internet access, and nearly 50% of households do not have computers with broadband Internet access. It should also be noted that the percentage of households with computers was higher in large cities than in rural areas.
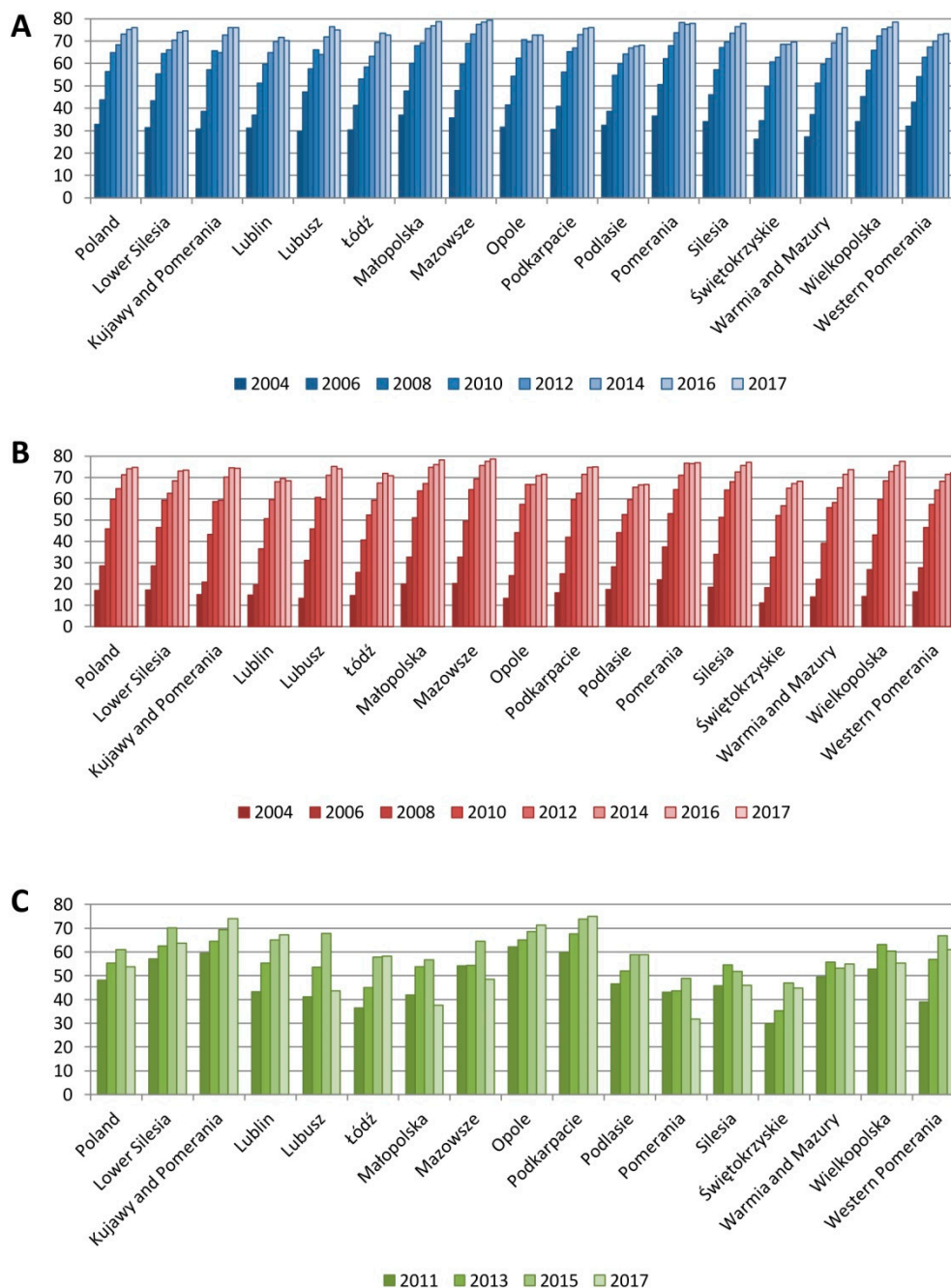

Figure 4. Proportion of Polish households with (**A**) a personal computer, (**B**) a personal computer with Internet access, and (**C**) a personal computer with broadband Internet access (in %).

An analysis of Polish businesses revealed an increase in the availability of personal computers (Figure 5A), personal computers with Internet access (Figure 5B), and personal computers with broadband Internet access (Figure 5C) in all Polish voivodeships in 2012–2018. In 2012, 94.7% of businesses used computers, 93.2% of businesses used computers with Internet access, and 81.9% of businesses used computers with broadband Internet access on average. All of the analyzed indicators increased in 2018, when 96.2% of businesses used computers, 95.6% of businesses used

computers with Internet access, and 95.0% of businesses used computers with broadband Internet access. The disproportions between voivodeships were less pronounced than in the analysis of households. The number of businesses equipped with computers was highest in the voivodeship of Western Pomerania (98.7%) and lowest in Łódź (93.0%). A highly similar trend was observed in the percentage of businesses using computers with Internet access. In 2012–2018, the greatest changes were observed in the proportion of businesses using computers with broadband Internet access, which increased by 16%, on average, in the country.
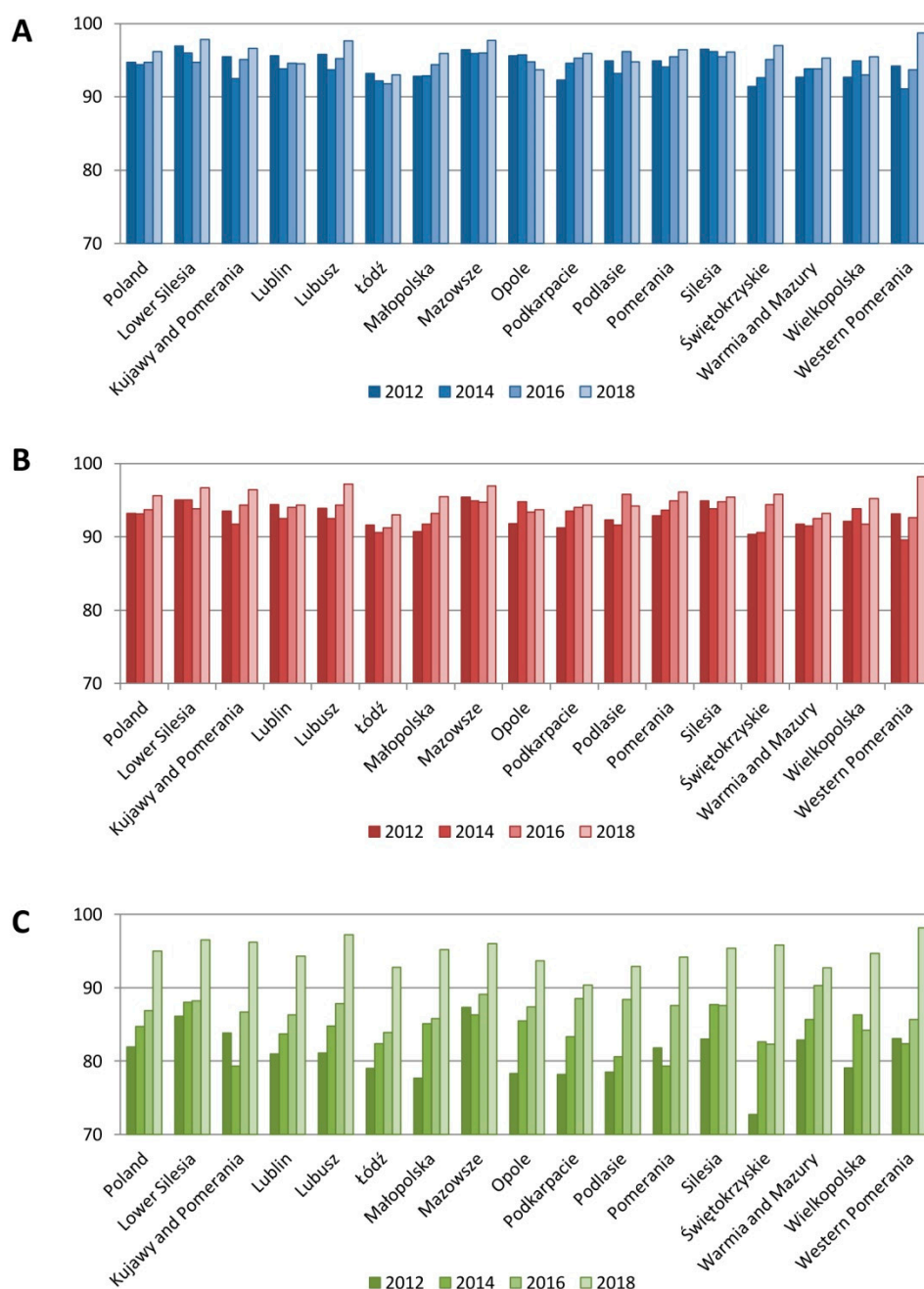

Figure 5. Proportion of Polish businesses using (**A**) personal computers, (**B**) personal computers with Internet access, and (**C**) personal computers with broadband Internet access (in %).

The results of the analysis point to a clear decrease in the digital-divide gap in Poland. However, a significant proportion of the Polish population, in particular households, still do not have access

to personal computers or the Internet. The growing availability of ICT reduces digital exclusion and creates new opportunities for communicating with Polish citizens and engaging them in change processes and decision-making through e-participation. The Polish society is thus evolving toward being an e-society.

3.2. The Respondents' Opinions on E-Participation and Geo-Questionnaires

A questionnaire survey was carried out to evaluate the importance of social participation and explore the respondents' opinions on e-participation and their familiarity with the available options for participatory urban planning. The research tool was a semi-structured interview. It should be noted that many respondents gave several answers and that many answers were similar. Therefore, only selected answers that addressed the examined topics in the most conclusive, cohesive, and comprehensive manner were cited in this paper.

The first set of questions focused on smart cities. Ninety percent of the surveyed subjects were familiar with this concept. Most respondents associated a smart city with modern technology. Broader definitions of a smart city were also proposed:

- "A smart city relies on modern technology to improve the efficiency of all urban functions, in particular transport, commerce, and recreation. Modern technology improves the performance of the entire urban system based on the information acquired from 'conscious' residents and visitors";
- "A smart city abides by the principles of sustainable development through the deployment of modern technologies in all areas of life";
- "A smart city is characterized by effective flow of information, efficient urban functions, and high levels of social participation in urban planning";
- "A smart city is a modern city with extensive infrastructure";
- "A smart city is a modern city which deploys modern technology, protects the environment, provides effective transport services, promotes the use of electric cars, and is inhabited mostly by well-educated residents";
- "A smart city relies on ICT tools which support urban development and the development of the local community".

All respondents were of the option that the development of smart cities should rely on close cooperation between the authorities and the citizens. The surveyed subjects also pointed out that the local authorities should respect and fulfill the inhabitants' expectations. All respondents agreed that members of the local community should be able to participate in the decision-making process concerning, for example, urban planning and improvements in the quality of life. More than half of the surveyed subjects were of the opinion that social participation is a necessary prerequisite for the effective functioning of modern cities.

Nineteen respondents proposed various solutions to improving social participation in decision-making processes relating to urban planning and development. The most popular solutions included the following:

- Direct participation in public consultations and meetings,
- Online participation through e-questionnaires addressing specific problems and online voting (such as participatory budgeting),
- Direct reporting of problems to the competent authorities,
- Making well-informed voting decisions based on the programs of political parties and political candidates,
- Participation in referendums,
- Active participation in urban planning (online public consultations).

The following question addressed different forms of social participation in Olsztyn. All respondents were familiar with the Olsztyn Participatory Budgeting Scheme (OBO), and most of them had participated in the program. The surveyed subjects were also familiar with the Olsztyn Civil Panel, public consultations and meetings with local community members.

Subsequent questions focused on e-participation. All respondents had participated in at least one online survey and were highly appreciative of this form of social research. In their opinion, online surveys "are interesting and provide the participants with the time required to carefully consider their responses", "are an effective means of remote communication", and "can be completed at any time and place on any device with Internet access". According to the respondents, online surveys also generate benefits for researchers because they "can be completed within a shorter period of time than conventional paper questionnaires", "enable researchers to quickly reach the required number of respondents", and "save time and money". The main limitation of online surveys was that "random sampling and the anonymity of research participants (who are not held responsible and are not "shamed" for their answers) can undermine the reliability of the results". The following question addressed participation in online surveys and public consultations regarding urban development, improvements in the quality of life, changes in urban space, and participation in decision-making in matters concerning urban planning. Fifteen respondents had participated in online surveys and public consultations. In their opinion, these research tools are highly useful, and they empower local community members to participate in the urban development process. Similar to the previous questions, random sampling and the respondents' anonymity were regarded as the main limitations which could compromise the reliability of results.

The last set of questions was dedicated to geo-questionnaires and PPGIS tools. Only half of the respondents were familiar with the terms "geo-questionnaire" and "geo-survey", and none of them had participated in this type of research. When these concepts and their practical applications were explained, all respondents agreed that geo-questionnaire surveys could be useful during public consultations, to engage local residents in urban planning and management. The surveyed subjects were of the opinion that geo-questionnaire surveys "could produce interesting results" and "are useful and legible for both respondents and researchers". According to the respondents, the fact that "this research tool could be particularly appealing for young people who often navigate change and have interesting ideas" was an advantage of geo-questionnaire surveys. One respondent pointed out that geo-questionnaires could be useful provided that "the questionnaire was carefully planned and the maps were legible". The participants also remarked that "the research sample should be carefully selected, and the questions should target individuals who have an interest in specific topics and problems".

At the end of the survey, the respondents were asked to identify possible problems resulting from the use of geo-questionnaires during public consultations and participatory planning. Twenty percent of the surveyed subjects did not identify any problems. The remaining respondents pointed out the following:

- Geo-questionnaire surveys could attract little interest from potential respondents,
- Respondents could manipulate surveys by completing the geo-questionnaire multiple times,
- Respondents could use the survey to solicit support for their projects and ideas,
- The responses could be sarcastic, irrational, malicious, or misleading,
- The respondents could fill in only the first pages of the questionnaire,
- The results could be disregarded by the authorities,
- Digitally excluded individuals (without computers or Internet access), as well as seniors, could be prevented from participating in the survey,
- The questions could be incomprehensible for the respondents,
- Not all respondents would able to use the research tools (to mark objects on the map),
- Some respondents lack spatial orientation and cannot read maps,

- The respondents' level and type of education could affect the results,
- Some respondents could be discouraged from participating in subsequent surveys due to the lack of funding for serious and expensive projects and the authorities' failure to implement the proposed projects,
- Possible conflicts of interest between large developers and environmental activists could influence the results.

The results of the study clearly indicate that Olsztyn would benefit from e-participation and that local community members' proposals and suggestions should be respected. Online surveys and geo-questionnaires were evaluated as useful tools for promoting social participation in urban life. The respondents also identified the most likely problems that could appear during surveys involving geo-questionnaires.

4. Discussion

The results of the present study indicate that the Polish society is evolving toward an e-society. Computerization and Internet access are on the rise in all Polish regions, both in households and businesses. The growing access to ICT in Polish households calls for optimism, but a certain proportion of the population still does not have Internet access and does not own computers. According to a survey of Polish households conducted by Statistics Poland in 2018 [70], respondents who did not have computers or Internet access claimed that they did not need the Internet, did not have computer skills, could not afford a computer, could not afford an Internet connection, or were reluctant to use the Internet. The growing popularity of ICT creates new opportunities for reaching the citizens and engaging them in e-participation processes. These opportunities should be seized by decision-makers in local and central administration to fully harness the potential of e-participation.

The study revealed that Olsztyn's residents who would be willing to support e-participation recognize the potential of ICT tools such as online surveys and geo-questionnaires. In their opinion, ICT tools contribute to harmonious urban development, facilitate the collection of information about the residents' opinions, and encourage members of the public to participate in the decision-making process. Social participation plays a significant role in urban development and the emergence of a civic society. The participants were also aware that online surveys would not be free of problems that could undermine the effectiveness of public opinion surveys. Various measures can be undertaken before the survey to minimize these risks. For example, the respondents could be provided with detailed instructions for filling out the questionnaire and marking their answers on maps. Survey developers should ensure that the survey is not completed many times from the same IP address. Efforts should also be made to reach digitally excluded citizens through interviews, consultations, or traditional paper questionnaires. It should also be noted that the surveyed respondents initially did not link the smart city concept with e-participation, but focused mainly on advanced technologies. This observation indicates that the role of social participation and e-participation in the development of smart cities should be better communicated to local community members.

Public Participation GIS tools are increasingly used to promote e-participation in Poland and in the world. Surveys involving PPGIS tools enable the authorities to explore the opinions of local community members and implement real changes in urban management [55]. These tools can be applied in public consultations concerning the development and modification of local zoning plans, environmental impact reports, modernization of urban centers, the residents' opinions on new legal regulations, and the quality and availability of public transport [71]. E-participation tools enable urban dwellers to participate in public consultations on local zoning plans and local land-use plans.

E-participation (social participation that relies on information and communication technology) is an inseparable component of smart cities whose development is driven by modern technology and participatory planning. Modern technology connects individuals residing in geographically distant communities who are no longer prevented from participating in local governance [72].

The growing popularity of e-participation methods in decision-making and planning contributes to the rise of e-societies in smart cities. An e-society is a type of society where information and communication technologies are used extensively by the local authorities to communicate with the citizens and solve important problems [23]. The main advantages of e-participation are as follows [42,72]:

1. Greater transparency in governance at the central and local level—e-participation tools enable citizens to participate in management processes and gain access to information that was previously unavailable. Transparency and freedom of information are the key pillars of a democratic society.
2. Greater emphasis on community needs—e-participation methods strengthen cooperation with the citizens and facilitate the collection of feedback, which enables the authorities to cater to the citizens' needs and expectations.
3. Enhanced social engagement—access to the Internet and social media, and the growing awareness of the need for greater social participation in decision-making and urban planning deliver benefits for both the citizens and the government (at the central and local level).
4. New opportunities for improvement in central and local administration.

The results of the study indicate that citizens are more likely to reach for e-participation tools if they have a positive attitude toward websites and applications that are used in the decision-making process [73]. Research also indicates that citizens tend to vest more trust in authorities that implement e-participation schemes [74].

Research involving e-participation methods via dedicated Internet platforms has an advantage over studies that rely on traditional paper questionnaires, public consultations, and community meetings. In comparison with conventional research tools, e-participation methods are more accessible, transparent, and less expensive, and online surveys can be completed at any time and place, without the participant having to leave home. ICT tools can also decrease survey costs by enabling citizens to participate in the urban planning process via any device that supports web browsing, at any time and place [75].

E-participation and PPGIS tools can also effectively target young respondents. Young people extensively use ICT tools on a daily basis, they are online nearly around the clock, and they are highly active on social media [76]. Therefore, the authorities should implement e-participation tools to reach this important target group. Young people are creative and, above all, they are the future users of urban space [76]. Social media, crowdsourcing, and mobile applications can contribute to the development of local democracies with the participation of young people. However, for this goal to be achieved, the local authorities have to recognize the potential stemming from modern social participation methods and the opinions voiced by young people [76–78]. According to Sakil [76], digital communication training and awareness-building in local and central administration is critical to bridging the ICT-capacity gap between young people and civil officers. To achieve that goal, urban development programs, services, and changes in the urban space have to meet the needs of local community members, including young people. However, improved access to ICT is not sufficient to elicit young people's interest in social participation [77]. Research indicates that various communication channels (promotional campaigns and advertisements in the media and social media) are required to effectively reach young people, that such programs should be adapted to the youth culture and other social factors, and that the content of promotional messages should be clear and easy to understand [78].

It should be noted that all citizens should be able to express their opinions regardless of age, material status, or educational background. Cooperation, dialogue, and the search for compromise are thus needed to ensure that social participation makes a tangible contribution to the quality of urban management. Trust-building is an important aspect of local governance, and the transparency of the participatory process significantly contributes to the achievement of the above goal. Citizens should be engaged in decision-making in early stages of the process, in order to boost their motivation and to develop the most effective solutions. Members of the public should be aware that final decisions

concerning urban planning are made by the authorities, who are not always able to implement all of the proposed solutions. After all, the responsibility for the adopted decisions and changes rests with the authorities, not the citizens.

It is the local authorities' role to convince the citizens that participatory planning generates tangible benefits for the local community and the urban environment. City dwellers should be educated about the positive aspects of participatory decision-making and the resulting improvements in the quality of urban life. Local, regional, and central authorities should provide members of the public with the opportunity to participate in urban planning, including through the use of e-participation tools. At the same time, local residents can assist the authorities in performing their statutory duties in a more effective manner that accounts for the needs of community members. Social participation facilitates urban management by planning urban space in line with the residents' expectations, which improves the quality of life. The cooperation between the authorities and the citizens contributes to the emergence of a civil society, social awareness, and social participation in public affairs, and it strengthens democratic governance at the local, regional, and national level.

5. Conclusions

Social participation enables citizens to have a genuine voice in decision-making and urban planning. In this process, both parties (the authorities and the citizens) should assume responsibility for the implemented decisions and changes. By engaging community members in policy-making, exploring their opinions and points of view, the authorities gain a new, broader perspective on urban management and development that accounts for the real needs of city dwellers.

Participatory planning that relies on information and communication tools is an integral part of the smart city concept. The cooperation between the authorities and the citizens is one of the pillars of a smart city. Active civic engagement in decision-making, and growing awareness regarding participatory processes and methods are essential for the growth of smart cities 3.0. E-participation and Public Participation GIS tools create numerous opportunities for the effective management of cities. Measures that promote cooperation between communities and the authorities (local and central), ICT tools, growing levels of social awareness, and civic engagement in local governance contribute to the emergence of smart cities and e-societies.

The significance of participatory decision making in the evolution of smart cities has been recognized at the international, national and local level. Smart cities should rely on innovative solutions, information, and communication technologies, as well as on participatory planning, to manage assets, resources, and services more efficiently.

References

1. Sirgy, M.J.; Lee, D.J.; Miller, C.; Littlefield, J.E. The Impact of Globalization on a Country's Quality of Life: Toward an Integrated Model. *Soc. Indic. Res.* **2004**, *68*, 251–298. [CrossRef]
2. Drakakis-Smith, D. Sustainability, urbanisation and development. *Int. Dev. Plan. Rev.* **1996**, *18*. [CrossRef]
3. Zhang, X.Q. The trends, promises and challenges of urbanisation in the world. *Habitat Int.* **2016**, *54*, 241–252. [CrossRef]
4. Allen, A. Sustainable Cities or Sustainable Urbanisation? 2009. Available online: http://www.ucl.ac.uk/sustainable-cities (accessed on 15 June 2019).
5. Harvey, D. *Rebel cities: From the right to the city to the urban revolution*; Verso: London, UK, 2012.
6. Tsai, M.C. Does globalization affect human well-being? *Soc. Indic. Res.* **2004**, *81*, 103–126. [CrossRef]

7.　Streeten, P. Globalization: Threat or Salvation? In *Globalization, Growth and Marginalization*; Bhalla, A.S., Ed.; Palgrave Macmillan: London, UK, 1998; pp. 13–47. [CrossRef]

8.　Montgomery, C. *Happy City*; Farrar, Straus and Giroux: New York, NY, USA, 2013.

9.　Gehl, J. *Miasta dla ludzi [Cities for people]*; Wydawnictwo RAM: Kraków, Poland, 2014.

10.　Falanga, R. Participatory Design: Participatory Urban Management. *Sustain. Cities Communities* **2019**. [CrossRef]

11.　Oh, Y.; Jeong, S.; Shin, H. A Strategy for a Sustainable Local Government: Are Participatory Governments More Efficient, Effective, and Equitable in the Budget Process? *Sustainability* **2019**, *11*, 5312. [CrossRef]

12.　Roberts, N. Public Deliberation in an Age of Direct Citizen Participation. *The American Review of Public Administration* **2004**, *34*. [CrossRef]

13.　Kwiatkowski, J. *Partycypacja Społeczna i Rozwój Społeczny [Community Participation and Social Development]*; Agencja Wydawnicza MT: Warszawa, Poland, 2003.

14.　Rozwoju, M.I. *Krajowa Polityka Miejska 2023*; Ministerstwo Inwestycji i Rozwoju: Warsaw, Poland, 2015.

15.　Ministry of Investment and Economic Development. HUMAN SMART CITY. Przewodnik dla samorządów [HUMAN SMART CITY. Guide for local governments]. Available online: https://www.popt.gov.pl/strony/wiadomosci/human-smart-city-przewodnik-dla-samorzadow/ (accessed on 5 November 2019).

16.　European Commission, Urban Agenda for the EU. *Multi-Level Governance in Action*; European Commission, Urban Agenda for the EU: Brussels, Belgium, 2019.

17.　Mititelu, C. Citizen Participation: Rationales and Approaches. In *Global Encyclopedia of Public Administration, Public Policy, and Governance*; Farazmand, A., Ed.; Springer: Cham, Switzerland, 2019.

18.　Mohammadi, S.H.; Norazizan, S.; Nikkhah, H.A. Conflicting perceptions on participation between citizens and members of local government. *Qual. Quant.* **2018**, *52*, 1761–1778. [CrossRef]

19.　Palvia, S.; Sharma, S. E-Government and e-Governance: Definitions/Domains, Framework and status around the world. In Proceedings of the International Conference on e-Government, Montreal, QC, Canada, 27–28 September 2007; pp. 1–15.

20.　Gajendra, S.; Xi, B.; Wang, Q. E-Government: Public Participation and Ethical Issues. *J. E Gov.* **2012**, *35*, 195–204. [CrossRef]

21.　United Nations. *United Nations E-Government Survey 2008: From E-Government to Connected Governance*; United Nations: New York, NY, USA, 2008.

22.　Sabri, A.; Sabri, O.; Al-Shargabi, B. Cultural E-Government Readiness Model. *Intell. Inf. Manag.* **2012**, *4*, 212–216.

23.　Mellouli, S.; Luna-Reyes, L.F.; Zhang, J. Smart government, citizen participation and open data. *Inf. Polity* **2014**, *19*, 1–4. [CrossRef]

24.　Sæbø, O.; Rose, J.; Flak, L.S. The shape of eParticipation: Characterizing an emerging research area. *Gov. Inf. Q.* **2008**, *25*, 400–428. [CrossRef]

25.　Al-Dalou, R.; Abu-Shanab, E. E-participation levels and technologies. In Proceedings of the 6th International Conference on Information Technology (ICIT 2013), Amman, Jordan, 8–10 May 2013.

26.　Sobaci, Z. What the Turkish parliamentary web site offers to citizens in terms of e-participation: A content analysis. *Inf. Polity: Int. J. Gov. Democr. Inf. Age* **2010**, *15*, 227–241. [CrossRef]

27.　Maciel, C.; Roque, L.; Garcia, A.C. Interaction and communication resources in collaborative e-democratic environments: The democratic citizenship community. *Inf. Polity Int. J. Gov. Democr. Inf. Age* **2010**, *15*, 73–88. [CrossRef]

28.　Robertson, S.; Vatrapu, R.; Medina, R. The Social Life of Social Networks: Facebook Linkage Patterns in the 2008 U.S. Presidential Election. In Proceedings of the 10th International Digital Government Research Conference, Puebla, Mexico, 17–20 May 2009; pp. 6–15.

29.　Haklay, M.; Jankowski, P.; Zwoliński, Z. Selected modern methods and tools for public participation in urban planning—A review. *Quaest. Geogr.* **2018**, *37*, 127–149. [CrossRef]

30.　Zissis, D.; Lekkas, D.; Papadopoulou, A.E. Enhancing Security in the Integration of E-Go-verment: The E-School Initiative. In Proceedings of the 4th International Conference on Web Information System and Technologies, Funchal, Madeira, Portugal, 4–7 May 2008; pp. 495–502.

31.　European Commission, Cities of tomorrow. *Challenges, Visions, Ways Forward*; European Commission, Cities of tomorrow: Brussels, Belgium, 2011.

32. European Commission, Urban Agenda for the EU. *Pact of Amsterdam*; European Commission, Urban Agenda for the EU: Brussels, Belgium, 2016.

33. Rozwoju, M.I. *Strategia Na Rzecz Odpowiedzialnego Rozwoju do Roku 2020 (z Perspektywą do 2030 Roku)*; Ministerstwo Inwestycji i Rozwoju: Warsaw, Poland, 2017.

34. Rozwoju, M.I. *Krajowa Strategia Rozwoju Regionalnego 2030. Rozwój Społecznie Wrażliwy i Terytorialnie Zrównoważony*; Ministerstwo Inwestycji i Rozwoju: Warsaw, Poland, 2019.

35. Hollands, R.G. Will the real smart city please stand up? *City* **2008**, *12*, 303–320. [CrossRef]

36. Harrison, C.; Donnelly, I.A. A theory of smart cities. In Proceedings of the 55th Annual meeting of the international society for the systems sciences, Hull, UK, 17–22 July 2011.

37. Jong, M.; Joss, S.; Schraven, D.; Zhan, C.; Weijnen, M. Sustainable–smart–resilient–low carbon–eco–knowledge cities; making sense of a multitude of concepts promoting sustainable urbanization. *J. Clean. Prod.* **2015**, *109*, 25–38. [CrossRef]

38. Cocchia, A. Smart and digital city: A systematic literature review. In *Smart City: How to Create Public and Economic Value with High Technology in Urban Space*; Dameri, R.P., Rosenthal-Sabroux, C., Eds.; Springer International Publishing: Berlin/Heidelberg, Germany, 2014; pp. 13–43.

39. Komninos, N. *Intelligent Cities: Innovation, Knowledge Systems and Digital Spaces*; Spon Press: London, UK; New York, NY, USA, 2002.

40. Giffinger, R.; Haindlmaier, G. Smart cities ranking: An effective instrument for the positioning of the cities? *ACE Archit. City Environ.* **2010**, *4*, 7–25.

41. Caragliu, A.; Del Bo, C.; Nijkamp, P. Smart cities in Europe. *J. Urban Technol.* **2011**, *18*, 65–82. [CrossRef]

42. Vázquez, N.A.; Vicente, M.R. Exploring the determinants of e-participation in smart cities. In *E-Participation in Smart Cities: Technologies and Models of Governance for Citizen Engagement*; Vázquez, N.A., Vicente, M.R., Eds.; Springer International Publishing AG: Cham, Switzerland, 2019; pp. 157–178. [CrossRef]

43. Granier, B.; Kudo, H. How are citizens involved in smart cities? Analysing citizen participation in Japanese "Smart Communities". *Inf. Polity* **2016**, *21*, 61–76. [CrossRef]

44. Cortés-Cediel, M.E.; Cantador, I.; Bolívar, M.P.R. Analyzing Citizen Participation and Engagement in European Smart Cities. *Soc. Sci. Comput. Rev.* **2019**. [CrossRef]

45. Martin, C.J.; Evans, J.; Karvonen, A. Smart and sustainable? Five tensions in the visions and practices of the smart-sustainable city in Europe and North America. *Technol. Forecast. Soc. Chang.* **2018**. [CrossRef]

46. Vrabie, C.I.; Tîrziu, A.M. E-participation: A key factor in developing smart cities. *Eirp Proc.* **2016**, *11*, 135–140.

47. Meijer, A.; Rodríguez Bolivar, M.P. Governing the Smart City. A Review of the Literature on Smart Urban Governance. *Int. Rev. Adm. Sci.* **2015**, *82*, 392–408. [CrossRef]

48. Khansari, N.; Mostashari, A.; Mansouri, M. Impacting Sustainable Behaviour and Planning in Smart City. *Int. J. Sustain. Land Urban Plan.* **2013**, *1*, 46–61.

49. Cohen, B. The 3 Generations of Smart Cities. 2015. Available online: https://www.fastcompany.com/3047795/the-3-generations-of-smart-cities (accessed on 14 August 2019).

50. Zhao, M.; Lin, Y.; Derudder, B. Demonstration of public participation and communication through social media in the network society within Shanghai. *Environ. Plan. B Urban Anal. City Sci.* **2018**, *45*, 529–547. [CrossRef]

51. Geertman, S. Participatory planning and GIS: A PSS to bridge the gap. *Environ. Plan. B Plan. Des.* **2002**, *29*, 21–35. [CrossRef]

52. Bednarska-Olejniczak, D.; Olejniczak, J. Participatory budget of Wrocław as an element of smart city 3.0 concept. In Proceedings of the 19th International Colloquium on Regional Sciences, Brno, Czech Republic, 15–17 June 2016; pp. 760–766.

53. Dewalska–Opitek, A. Smart City Concept—The Citizens' Perspective. In *Telematics—Support for Transport*; Springer: Berlin/Heidelberg, Germany, 2014; pp. 331–340.

54. Gollagher, M.; Hartz-Karp, J. The Role of Deliberative Collaborative Governance in Achieving Sustainable Cities. *Sustainability* **2013**, *5*, 2343–2366. [CrossRef]

55. Jankowski, P.; Czepkiewicz, M.; Młodkowski, M.; Zwoliński, Z.; Wójcicki, M. Evaluating the scalability of public participation in urban land use planning: A comparison of Geoweb methods with face-to-face meetings. *Environ. Plan. B Urban Anal. City Sci.* **2017**. [CrossRef]

56. Johnson, P.A.; Corbett, J.M.; Gore, C.; Robinson, P.; Allen, P.; Sieber, R. A Web of Expectations: Evolving Relationships in Community Participatory Geoweb Projects. *ACME Int. J. Crit. Geogr.* **2015**, *14*, 827–848.

57. Brown, G.; Kyttä, M. Key issues and research priorities for public participation GIS (PPGIS): A synthesis based on empirical research. *Appl. Geogr.* **2014**, *46*, 122–136. [CrossRef]

58. Weiner, D.; Harris, T.; Craig, W. Community Participation and Geographic Information Systems. In Proceedings of the Workshop on Access to Geographic Information and Participatory Approaches Using Geographic Information, Spoleto, Italy, 6–8 December 2001. [CrossRef]

59. Brown, G.; Reed, P. Public Participation GIS: A new method for use in National Forest Planning. *For. Sci.* **2009**, *55*, 166–182.

60. Kahila-Tani, M.; Kytta, M.; Geertman, S. Does mapping improve public participation? Exploring the pros and cons of using public participation GIS in urban planning practices. *Landsc. Urban Plan.* **2019**, *186*, 45–55. [CrossRef]

61. Jankowski, P.; Czepkiewicz, M.; Młodkowski, M.; Zwoliński, Z. Geo-questionnaire: A Method and Tool for Public Preference Elicitation in Land Use Planning. *Trans. GIS* **2016**, *20*, 903–924. [CrossRef]

62. Liu, T. *Internet-Based Public Partcipation GIS in Environmental Management in Community and Regional Planning Program: Student Projects and Theses*; University of Nebraska: Lincoln, NE, USA, 2013.

63. Thomas, C.; Sappington, N.H. *GIS for Decision Support and Public Policy Making*; ESRI Press: Redlands, CA, USA, 2009.

64. Barndt, M. Public Participation GIS—Barriers to Implementation. *Cartogr. Geogr. Inf. Syst.* **1998**, *25*, 105–112. [CrossRef]

65. Bąkowska, E.; Kaczmarek, T.; Mikuła, L. Wykorzystanie geoankiety jako narzędzia konsultacji społecznych w procesie planowania przestrzennego w aglomeracji poznańskiej. [The use of geo-questionnaire as a public consultation tool in the process of urban planning in Poznań Agglomeration]. *Rocz. Geomatyki XV* **2017**, *2*, 147–158.

66. Kahila-Tani, M.; Broberg, A.; Kyttä, M.; Tyger, T. Let the Citizens Map—Public Participation GIS as a Planning Support System in the Helsinki Master Plan Process. *Plan. Pract. Res.* **2015**. [CrossRef]

67. Broberg, A.; Salminen, S.; Kyttä, M. Physical environmental characteristics promoting independent and active transport to children's meaningful places. *Appl. Geogr.* **2013**, *38*, 43–52. [CrossRef]

68. Green, D. The role of Public Participatory Geographical Information Systems (PPGIS) in coastal decision-making processes: An example from Scotland, UK. *Ocean Coast. Manag.* **2010**, *53*, 816–821. [CrossRef]

69. Statistics Poland. Local Data Bank. Available online: Stat.gov.pl (accessed on 10 September 2019).

70. Statistics Poland. *Społeczeństwo informacyjne w Polsce w 2018 roku*; Urząd Statystyczny w Szczecinie Ośrodek Statystyki Nauki, Techniki, Innowacji i Społeczeństwa Informacyjnego: Szczecin, Poland, 2018.

71. Bąkowska, E.; Kaczmarek, T.; Jankowski, P.; Zwoliński, Z.; Mikuła, Ł.; Czepkiewicz, M.; Brudka, C. Geo-questionnaire in urban planning—preliminary results of the experimental application in Poland. *Rozw. Reg. i Polityka Reg.* **2016**, *35*, 37–54.

72. Erkul, R.E. Regional National Plan Manager at Microsoft Middle East and Africa, The 4 Pillars of e-Participation 2014. Available online: www.microsoft.com/en-us/government/blogs/the-4-pillars-ofparticipation/default.aspx?WT.z_evt=WebClick#fbid=4h79i-WKLih (accessed on 10 May 2016).

73. Zheng, Y.; Schachter, H.L. Explaining Citizens' E-Participation Use: The Role of Perceived Advantages. *Public Organ. Rev.* **2017**, *17*, 409–428. [CrossRef]

74. Kim, S.; Lee, J. E-participation, transparency and trust in local government. *Public Adm. Rev.* **2012**, *72*. [CrossRef]

75. Marres, N. *Material Participation: Technology, the Environment and Everyday Publics*; Palgrave Macmillan: London, UK, 2012.

76. Sakil, A.H. ICT, youth and urban governance in developing countries: Bangladesh perspective. *Int. J. Adolesc. Youth* **2018**, *23*, 219–234. [CrossRef]

77. Masters, Z.; Macintosh, A.; Smith, E. Young people and e-democracy: Creating a culture of participation. In Proceedings of the Third International Conference in E-Government, Zaragoza, Spain, 30 August–3 September 2004; pp. 15–22.

78. Youth Affairs Council of South Australia, Better Together. *A Practical Guide to Effective Engagement with Young People*; Youth Affairs Council of South Australia: Adelaide City Centre, Australia, 2016.